

Handling Instructions

■ Soldering

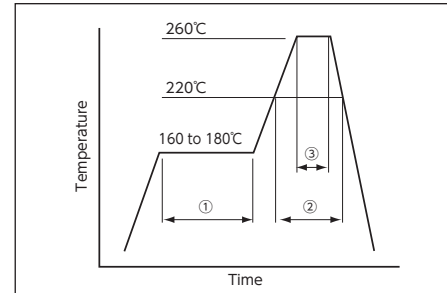
Our products are designed so they may withstand the same standard reflow soldering temperatures as most other electronics components. However, if the reflow temperature is higher than our specification allows, the performance may be affected. Avoid soldering the product at temperatures higher than specified.

For the reflow temperature profile of SMD products, refer to the figure below.

①	Preheat	160 to 180°C	120sec.
②	Primary heat	220°C	60sec
③	Peak	260°C	10sec. max.

※ The reflow temperature profile may vary depending on the product model, specifications and frequency range. Refer to the individual product specifications for details.

Reflow Temperature Profile
(Available for lead free soldering)



■ Cleaning

- General cleaning solutions or ultrasonic cleaning may be used to clean our crystal products, but verification tests are recommended prior to use.
- Tuning fork crystals resonate at frequency bands that are close to the washing frequency of ultrasonic cleaning machines and this may cause resonance deterioration in the crystal. Therefore the use of ultrasonic cleaning machines to clean tuning fork crystals should be avoided. After applying ultrasonic cleaning, the functionality of crystals should be verified by testing the performance of the end product.

■ Shock

Crystal products are designed to resist shock, but if the products receive excessive shocks or are dropped on the ground, be sure to check for any damages before using.

■ Mounting

〈SMD crystal products〉

Surface mount crystals are designed to be compatible with most automatic mounting processes, but some processes may exert excessive shock which may damage the crystal. Therefore test mounting of the crystal prior to mass production is necessary.

If there is a possibility that PCB may be warped, make sure the warping is not to such a degree that the crystal products' operating characteristics or soldering conditions will be negatively affected.

Avoid mounting and processing by Ultrasonic welding because this method has a possibility of an excessive vibration spreading inside the crystal products and becoming the cause of characteristic deterioration and not oscillating.

〈Lead type〉

When bending, forming, or mounting leaded crystal products be careful not to put too much pressure on the glassed part of the base, as it may crack and negatively affect the crystals' performance.

■ Storage

Storing crystal products at high temperatures or high humidity may deteriorate the soldering condition of pins. Do not store in direct sunlight or damp environments.

■ Others

〈Crystal Resonators〉

○ When excessive voltage is applied to crystal resonators, their performance may be affected or the crystal blank may be damaged. When handling the product, use the product within the specifications provided.

○ Negative resistance determines the tolerance margin of a circuit that oscillates the resonator. We recommend that the negative resistance be at least five times the standard series resistance for standard applications.

〈Crystal Oscillators〉

○ C-MOS is used for internal circuit of crystal oscillators. To prevent latch-up phenomena or static electricity, take careful note.

○ Some crystal oscillators do not have internally connected bypass capacitors. When using the product, use a capacitor with a good high frequency characteristic of 0.01 μ F between Vcc and GND (e.g. Ceramic chip capacitor) and connect it at the shortest possible distance. For details, refer to the specifications of each individual product.

〈Monolithic Crystal Filters〉

○ Take care so that the input pin and the output pin do not close on the PCB.

○ If the floating capacity of a PCB (on which a crystal filter is to be mounted) is too large, circuit tuning may be required to cancel out the excess floating capacity.

○ When excessive voltage is applied to crystal filters, their performance may be affected or the crystal blank may be damaged. When handling the product, use at its input level equal to or less than -10dBm.

RoHS/ELV Compliant Lead-free and Halogen-free products from KDS.

KDS is fully committed to environmental protection and has been proactively working to comply with the major environmental regulations such as RoHS Directive (Directive of the Restriction of the use of certain Hazardous Substances : 2011/65/EU and (EU) 2015/863), ELV Directive (End-of-Life Vehicles Directive : 2000/53/EC) and Halogen-free activities etc. The below spreadsheet provide the current status of the product compliance in each environmental regulations. Please visit our website for the latest information.(<https://www.kds.info>)

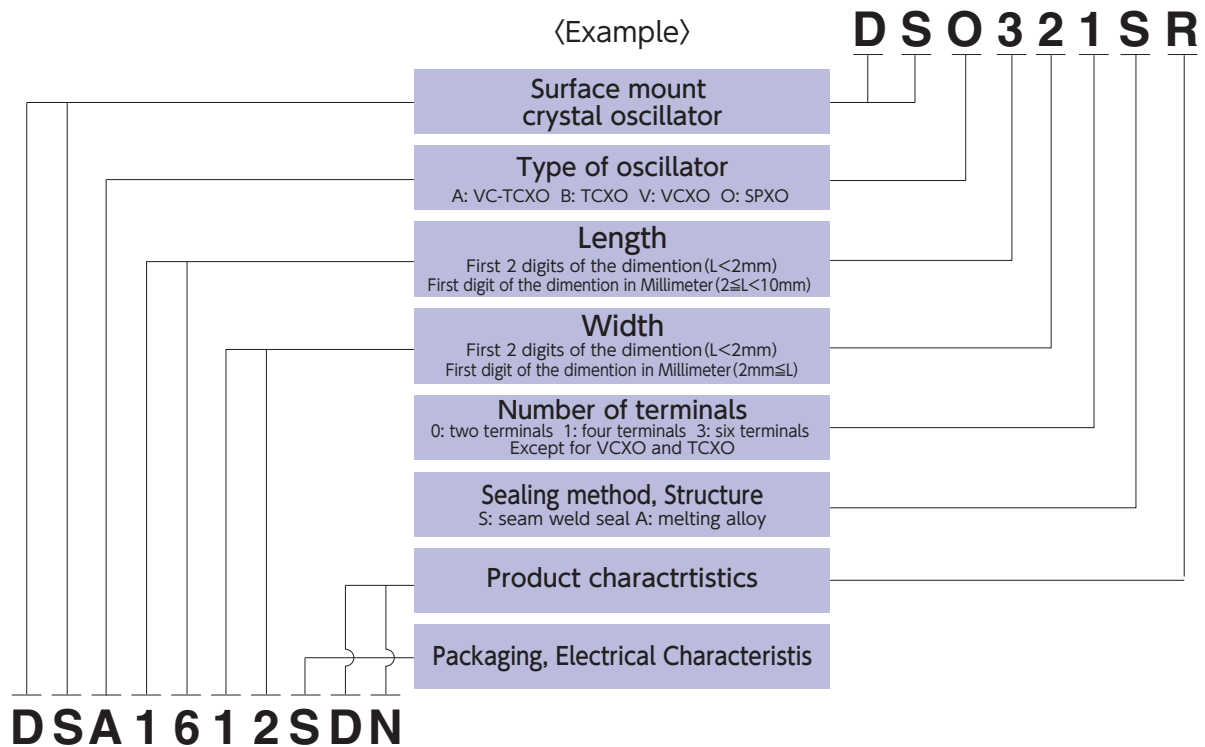
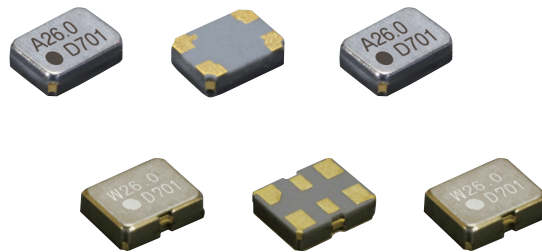
As of sept.30.2023

	Type	RoHS/ELV Compliant	Halogen-free	Pb-free	Materials of pin	Note
Crystal Resonators/ MHz Band Crystal Resonators	DX1008J SERIES	○	○	○	Ni/Au	
	DSX1210A	○	○	○	Ni/Au	
	DSX1612S	○	○	○	Ni/Au	
	DSX211S, DSX211SH	○	○	○	Ni/Au	
	DSX221SH	○	○	○	Ni/Au	
	DSX321SH	○	○	○	Ni/Au	
	DSX210GE	○	○	Pb in sealing-glass	Ni/Au	Pb in sealing-glass is exempted from RoHS/ELV Directive. ⁽⁴⁾
	DSX320GE	○	○	Pb in sealing-glass	Ni/Au	Pb in sealing-glass is exempted from RoHS/ELV Directive. ⁽⁴⁾
	DSX211G	○	○	Pb in sealing-glass	Ni/Au	Pb in sealing-glass is exempted from RoHS/ELV Directive. ⁽⁴⁾
	DSX321G, DSX321GK	○	○	Pb in sealing-glass	Ni/Au	Pb in sealing-glass is exempted from RoHS/ELV Directive. ⁽⁴⁾
Tuning Fork Crystal Resonators/ kHz Band Crystal Resonators	DSX530GA	○	○	Pb in sealing-glass	Ni/Au	Pb in sealing-glass is exempted from RoHS/ELV Directive. ⁽⁴⁾
	DT-26, DT-261	○	○	○	Sn	
	DT-38, DT-381	○	○	○	Sn	
	DMX-26S	○	○	High temperature solder	Sn	High temperature solder used inside the product is exempted from RoHS/ELV Directive. ⁽⁴⁾
	DST1210A	○	○	○	Ni/Au	
	DST1610A	○	○	○	Ni/Au	
	DST210AC	○	○	○	Ni/Au	
Crystal Resonators with dedicated temperature sensor/ MHz Band Crystal Resonators	DST310S	○	○	○	Ni/Au	
	DSR1210ATH	○	○	○	Ni/Au	
	DSR1612ATH	○	○	○	Ni/Au	
	DSR2115TH	○	○	○	Ni/Au	
Temperature Compensated Crystal Oscillators (TCXO)	DSR2215TH	○	○	○	Ni/Au	
	DSA/DSB1612 SERIES	○	○	○	Ni/Au	
	DSA/DSB211 SERIES	○	○	○	Ni/Au	
	DSA/DSB221 SERIES	○	○	○	Ni/Au	
	DSA/DSB321 SERIES	○	○	○	Ni/Au	
	DSA/DSB535 SERIES	○	○	○	Ni/Au	
	DSK1612ATD	○	○	○	Ni/Au	
Real Time Clock Module (RTC)	DSK321STD	○	○	○	Ni/Au	
	DD3225TS, DD3225TR	○	○	○	Ni/Au	
Simple Packaged Crystal Oscillators (SPXO)	DD3225TS, DD3225TR	○	○	○	Ni/Au	
	DS1008J SERIES	○	○	○	Ni/Au	
	DSO1612AR	○	○	○	Ni/Au	
	DSO211S SERIES	○	○	○	Ni/Au	
	DSO221S SERIES	○	○	○	Ni/Au	
	DSO223S SERIES	○	○	○	Ni/Au	
	DSO321S SERIES	○	○	○	Ni/Au	
	DSO323S SERIES	○	○	○	Ni/Au	
	DSO531S SERIES	○	○	○	Ni/Au	
	DSO533 SERIES	○	○	○	Ni/Au	
Voltage Controlled Crystal Oscillators (VCXO)	DLO555MBA	○	○	○	Sn	
	DSO751S SERIES	○	○	○	Ni/Au	
	DSO753S SERIES	○	○	○	Ni/Au	
	DSV221SV	○	○	○	Ni/Au	
Monolithic Crystal Filters	DSV321S	○	○	○	Ni/Au	
	DSF334 SERIES	○	○	○	Ni/Au	
	DSF444 SERIES	○	○	○	Ni/Au	
	DSF633 SERIES	○	○	○	Ni/Au	
	DSF753 SERIES	○	○	○	Ni/Au	

* RoHS Directive and ELV Directive exemptions are granted for high temperature solder, lead content in low-melting glass of DSX-G Series.

Quartz Devices

Crystal oscillators



Crystal Oscillators

Description

● Simple Packaged Crystal Oscillators (SPXO)

SPXO is an oscillator for clock, which uses crystal resonance to create an electrical signal with a more precise frequency and are suitable for clock signal generators.

● Voltage Controlled Crystal Oscillators (VCXO)

These crystal oscillators have a variable-capacitance diode inserted into a SPXO oscillation loop, and enables the oscillation frequency to change by varying the voltage of the external power supply. The temperature characteristic of these oscillators are equivalent to those of the SPXO loop and takes advantage of the good attributes of crystal resonators.

● Temperature Compensated Crystal Oscillators (TCXO)

These high-precision crystal oscillators have a built-in circuit that corrects frequency variations resulting from temperature variations of the crystal resonator. It is optimal for applications where small frequency tolerance is required across a wide temperature.

● Oven Controlled Crystal Oscillator (OCXO)

OCXO is a super high-precision crystal oscillator with very small frequency variations by a built-in thermostatic bath, to maintain a constant temperature of the crystal resonator.

Available to the frequency reference, such as instruments and infrastructure base stations.

● Real Time Clock Module (RTC)

RTC is a high-precision crystal application product with built-in tuning-fork crystal oscillator, has an interrupt function and data provide function necessary for calendar clock function, such as year, month, day, hour, minute and second.

We also have a lineup of crystal oscillators (molded oscillators) in which the crystal resonators and IC are packaged in a molded package.

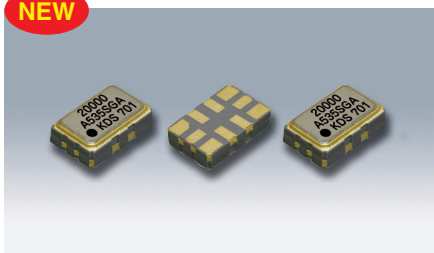
Terminology

Output Frequency	Nominal value of output frequency of a crystal controlled oscillator.
Frequency Tolerance (Crystal Oscillators)	The maximum permissible deviation of the oscillator frequency from a specified nominal value, when operating under specified condition.
Frequency Characteristics over Temperature (Crystal Oscillators)	Deviation from the frequency at the specified reference temperature due to operation over the specified temperature range, when other conditions remain constant.
Frequency Stability vs. Supply Voltage	Deviation from the frequency at the specified supply voltage due to operation over the specified range, when other conditions remain constant.
Frequency Stability vs. Load Variation	Deviation from the frequency at the specified load conditions due to changes in load impedance over the specified range, when other conditions remain constant.
Frequency Stability vs. Aging	The rate of output frequency change when an oscillator is operated under a specified condition and operating time.
Operating Temperature Range	Temperature range over which the crystal oscillator can be operated within allowable deviation range.
Supply Voltage	The DC input voltage necessary for oscillator operation.
Current Consumption	Operating current consumption.
Stand-by Current	The current consumption, when the oscillator stops oscillating by the control voltage applied to the control pin of an oscillator having the output control function.
Start up Time	The duration from the oscillation start until it reaches the specified output amplitude after power was applied.
Load Condition	Types or the number (capacity) of loads that can be connected to the oscillator.
Output Level	Amplitude of output waveform.
Rise Time	The time interval required for the leading edge of a waveform to change between two defined levels.
Fall Time	The time interval required for the trailing edge of a waveform to change between two defined levels.
Symmetry	The ratio between the time, in which the output voltage is above a specified level, and time in which the output voltage is below the specified level, in percent of the duration of the full signal period.
Output Disable Time	Time lag between control-signal input and oscillation output, where oscillation output is on. Specified for models with output control function.
Output Enable Time	Time lag between control-signal input and oscillation output, with oscillation output switched off (no output load). Specified for models with output control function.
3-state	The situation that the output goes to a high impedance when an oscillator stops oscillating by the standby function.
Phase Noise	The generic designation of the unwanted emission of energy around the nominal frequency generated by an oscillator.
Phase Jitter	The phenomenon when the phase of the pulse wave of the output signal of an oscillator moves back and forth in time from its ideal position. It is called jitter when the frequency fluctuations of the phase in time is over 10Hz.
Harmonics	Unwanted frequency component, which is higher than the desired output frequency of an oscillator.
Frequency Adjustment Range	The output frequency range which can be shifted by the control voltage from outside to VCXOs.
Frequency Control Voltage	The range of input voltage from outside to shift the frequency of VCXOs.

Ultra High-precision SMD VC-TCXO/TCXO

DSA535SGA/DSB535SGA/DSA535SGB for Stratum3/ Femtocell

NEW



Actual size

Features

- 5032 size, 1.35mm height.
- Ultra high precision SMD (VC-) TCXO
- Clipped-sine wave or CMOS level output
- Low phase noise
- Single packaged structure

Applications

- Stratum3, 5G compatible devices, Networking, Base station



Pb-Free



RoHS Compliant

Standard Specification

Item	DSA535SGB (VC-TCXO)	DSA535SGA (VC-TCXO)	DSB535SGA (TCXO)
Output Frequency Range	10 to 52MHz		
Standard Frequency	10MHz/ 19.2MHz/ 20MHz/ 38.88MHz		
Supply Voltage (Range)	+2.3 to +3.63V		
Supply Voltage (Vcc)	+2.8V/ +3.0V/ +3.3V		
Current Consumption	+4.0mA max. (Clipped sine wave)/ +8.0mA max. (CMOS)		
Output Level	0.8Vp-p min. (Clipped sine wave/DC-coupled) '0'level 0.1×Vcc V max./'1'level 0.9×Vcc V min. (CMOS)		
Output Load	10kΩ//10pF (Clipped sine wave)/15pF (CMOS)		
Frequency Stability Tolerance	±1.5×10 ⁻⁶ max. (After 2 reflows)		
vs. Temperature	±0.10×10 ⁻⁶ max. / -40 to +85°C ±0.20×10 ⁻⁶ max. / -40 to +105°C		
vs. Temperature Characteristic Control Voltage Change	±0.1×10 ⁻⁶ max. (Frequency control sensitivity ±5×10 ⁻⁶ , Vcont=+1.5V±1.0V)	—	
vs. Hysteresis	±0.1×10 ⁻⁶ max.		
vs. Supply Voltage	±0.1×10 ⁻⁶ max. (Vcc±5% : Clipped sine wave, CMOS (f≦40))/±0.2×10 ⁻⁶ max. (Vcc±5% : CMOS (40<f))		
vs. Load Variation	±0.20×10 ⁻⁶ max. (10kΩ//10pF±10%/ 15pF ±10%)		
vs. Aging	±1.0×10 ⁻⁶ max./year		
Total Frequency Tolerance	±4.6×10 ⁻⁶ max. (Inclusive of variations over operating temperature, initial tolerance, supply voltage, load variation, aging)		
Frequency Control Control Sensitivity	±3.0 to ±5.0 × 10 ⁻⁶ /Vcont=+1.5±1V		—
Response Slope	Positive		—
Phase Noise	20MHz (typ.) Offset 100Hz -118dBc/Hz Offset 1kHz -139dBc/Hz Offset 10kHz -155dBc/Hz Offset 100kHz -158dBc/Hz		20MHz (typ.) -120dBc/Hz -141dBc/Hz -155dBc/Hz -158dBc/Hz
Packing Unit (1)	1000pcs./reel (φ 180), 4000pcs./reel (φ 330)		

(1) Moisture prevention packing is unnecessary.

Moisture Sensitivity Level: LEVEL 1 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

DSA535SGA/DSB535SGA/DSA535SGB (4terminals) [mm]

DSA535SGA/DSB535SGA/DSA535SGB (10 terminals) [mm]

Dimensions

Model Code
DSA535SGA→A535SGA
DSB535SGA→B535SGA
DSA535SGB→A535SGB

Pin Connections(4terminals)

Pin No.	Connection
#1	VCONT(VC-TCXO)/ GND(TCXO)
#2	GND
#3	Output
#4	Vcc

Recommended Land Pattern <Top View>

Connect to GND Bypass Capacitance
Connect to Test Circuit DC-cut Capacitance

Dimensions

Model Code
DSA535SGA→A535SGA
DSB535SGA→B535SGA
DSA535SGB→A535SGB

Pin Connections

Pin No.	Connection
#1	Vcont(VC-TCXO)/GND(TCXO)
#2	Do Not Connect
#3	ENABLE/DISABLE
#4	GND
#5	Do Not Connect
#6	Output
#7	Do Not Connect/Vcfilter(Optional)
#8	Do Not Connect
#9	Vcc
#10	GND

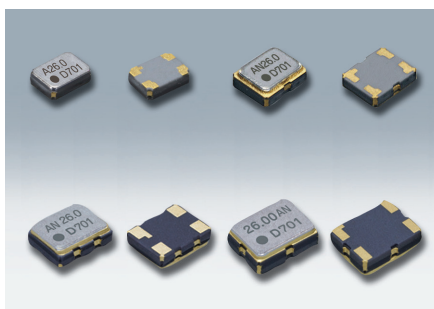
() : Internal connection

Recommended Land Pattern <Top View>

Connect to GND Bypass Capacitance
Connect to Test Circuit DC-cut Capacitance

High-precision SMD VC-TCXO/TCXO

DSA1612SDN/DSA211SDN/DSA221SDN/DSA321SDN, DSB1612SDN/DSB211SDN/DSB221SDN/DSB321SDN



Actual size DSA1612SDN □ DSA211SDN □
DSA221SDN □ DSA321SDN □

■ Features

- Low voltage operation
- Low phase noise
- Single package structure

■ Applications

- Mobile phones
- GPS/GNSS and Industrial radio communications



[Type]

VC-TCXO	TCXO	Size
DSA1612SDN	DSB1612SDN	1612 size
DSA211SDN	DSB211SDN	2016 size
DSA221SDN	DSB221SDN	2520 size
DSA321SDN	DSB321SDN	3225 size

■ Standard Specification

Item	Type	VC-TCXO				TCXO			
		DSA1612SDN	DSA211SDN	DSA221SDN	DSA321SDN	DSB1612SDN	DSB211SDN	DSB221SDN	DSB321SDN
Frequency Range		16 to 60MHz	12.288 to 52MHz	9.6 to 52MHz		16 to 60MHz	12.288 to 52MHz	9.6 to 52MHz	
Standard Frequency		19.2MHz/26MHz/38.4MHz/40MHz/52MHz				16.3676MHz/16.367667MHz/16.368MHz/16.369MHz/16.8MHz/26MHz/33.6MHz			
Supply Voltage Range		+1.68 to +3.5V							
Supply Voltage (Vcc)		+1.8V/+2.6V/+2.8V/+3.0V/+3.3V							
Current Consumption		+1.5mA max. (f≤26MHz) /+2.0mA max. (26<f≤52MHz) /+2.5mA max. (f≤60MHz)							
Output Level		0.8Vp-p min. (f≤52MHz) (Clipped Sinewave/DC-coupled)							
Output Load		10kΩ//10pF							
Frequency Stability Tolerance		±1.5×10 ⁻⁶ max. (After 2 reflows)							
vs. Temperature		±1.0×10 ⁻⁶ , ±2.5×10 ⁻⁶ max./-30 to +85°C ±1.0×10 ⁻⁶ , ±2.5×10 ⁻⁶ max./-40 to +85°C (Option)				±0.5×10 ⁻⁶ , ±2.5×10 ⁻⁶ max./-30 to +85°C ±0.5×10 ⁻⁶ , ±2.5×10 ⁻⁶ max./-40 to +85°C (Option)			
vs. Supply Voltage		±0.2×10 ⁻⁶ max. (Vcc ±5%)							
vs. Load Variation		±0.2×10 ⁻⁶ max. (10kΩ//10pF±10%)							
vs. Aging		±1.0×10 ⁻⁶ max./year							
Frequency Control Control Sensitivity		±3.0×10 ⁻⁶ to ±5.0×10 ⁻⁶ /Vcont=+1.4V±1V @Vcc≥+2.6V ±3.0×10 ⁻⁶ to ±5.0×10 ⁻⁶ /Vcont=+0.9V±0.6V @Vcc=+1.8V				-			
Response Slope		Positive				-			
Start up Time		2.0ms max.							
Phase Noise		[f≤26MHz]		[26MHz<f≤40MHz]		[40MHz<f≤52MHz]			
Offset 100Hz		-115dBc/Hz		-110dBc/Hz		-105dBc/Hz			
Offset 1kHz		-130dBc/Hz		-130dBc/Hz		-125dBc/Hz			
Offset 10kHz		-150dBc/Hz		-150dBc/Hz		-145dBc/Hz			
Offset 100kHz		-155dBc/Hz		-155dBc/Hz		-150dBc/Hz			
Packing Unit (1)		DSA1612SDN/DSA211SDN/DSA221SDN, DSB1612SDN/DSB211SDN/DSB221SDN : 3000pcs./reel (φ180) DSA321SDN, DSB321SDN : 2000pcs./reel (φ180)							

(1) Moisture prevention packing is unnecessary.
Moisture Sensitivity Level : LEVEL 1 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

High-precision SMD VC-TCXO/TCXO

For Mobile communications/Industrial system/GPS/GNSS

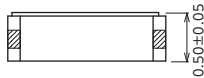
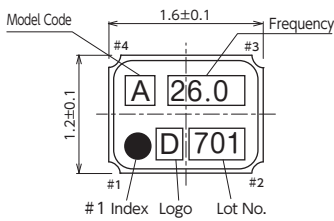
■ Dimensions

[mm]

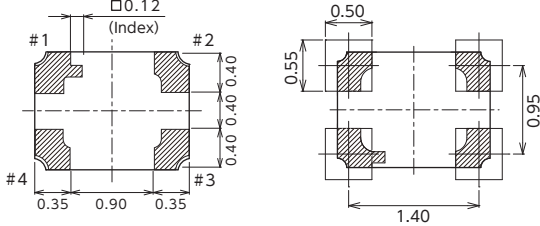
■ DSA1612SDN/DSB1612SDN

Model Code
A: VC-TCXO (DSA1612SDN)
B: TCXO (DSB1612SDN)

Pin Connections	
Pin No.	Connection
#1	Vcont(VC-TCXO)/GND(TCXO)
#2	GND
#3	Output
#4	Vcc



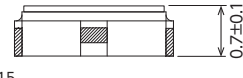
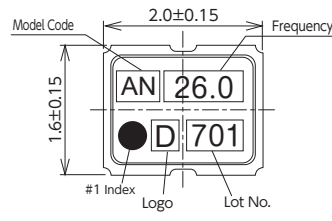
■ Recommended Land Pattern <Top View>



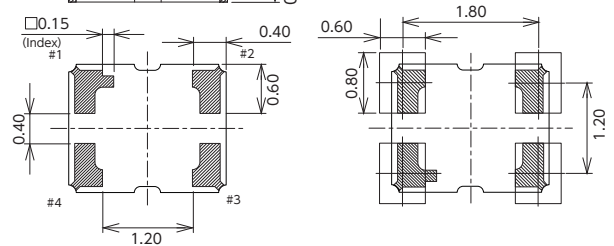
■ DSA211SDN/DSB211SDN

Model Code
AN : VC-TCXO (DSA211SDN)
BN : TCXO (DSB211SDN)

Pin Connections	
Pin No.	Connection
#1	Vcont(VC-TCXO)/GND(TCXO)
#2	GND
#3	Output
#4	Vcc



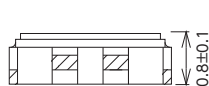
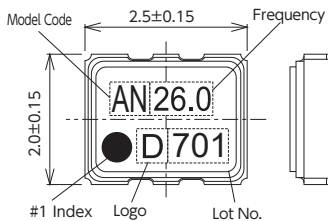
■ Recommended Land Pattern <Top View>



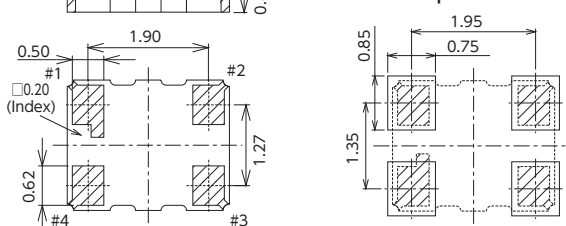
■ DSA221SDN/DSB221SDN

Model Code
AN : VC-TCXO (DSA221SDN)
BN : TCXO (DSB221SDN)

Pin Connections	
Pin No.	Connection
#1	Vcont(VC-TCXO)/GND(TCXO)
#2	GND
#3	Output
#4	Vcc



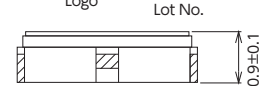
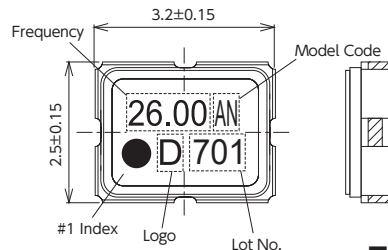
■ Recommended Land Pattern <Top View>



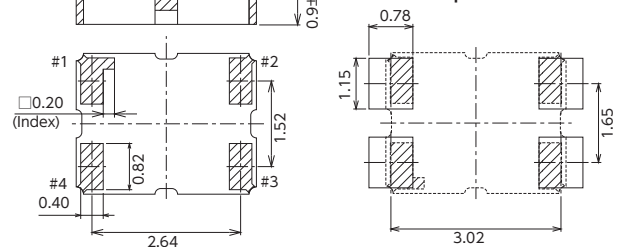
■ DSA321SDN/DSB321SDN

Model Code
AN : VC-TCXO (DSA321SDN)
BN : TCXO (DSB321SDN)

Pin Connections	
Pin No.	Connection
#1	Vcont(VC-TCXO)/GND(TCXO)
#2	GND
#3	Output
#4	Vcc

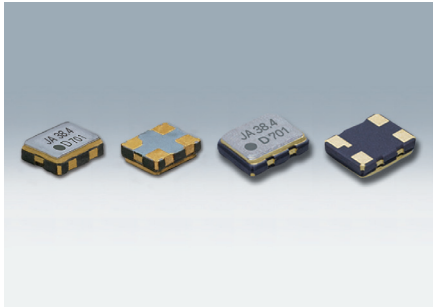


■ Recommended Land Pattern <Top View>



SMD TCXO

DSB211SJA/DSB221SJA



Actual size DSB211SJA □ DSB221SJA □

■ Features

- Capable of operating over a wide temperature range, from -40 to +105°C
- Supply voltage from +1.7 up to +3.6V
- CMOS Level Output
- Low phase noise
- Single package structure
- AEC-Q100/AEC-Q200 Compliant (DSB211SJA)



■ Applications

- WiLAN, WiMAX, Smart Grid, visual applications and industrial radio communications

■ Standard Specification

Item	Type	DSB211SJA	DSB221SJA
Frequency Range		13 to 52MHz	11 to 52MHz
Standard Frequency		19.2MHz/ 25MHz/ 26MHz/ 32MHz/ 38.4MHz/ 40MHz/ 48MHz/ 52MHz	
Supply Voltage (Vcc)		+1.8V/ +2.5V/ +2.8V/ +3.3V	
Current Consumption		5.0mA max. [No Load]	
Stand-by Current (#1 pin "L" Level)		+10μA max.	
Frequency Stability Tolerance		±1.5×10 ⁻⁶ max.(After 2 reflows)	
vs. Temperature		±2.5×10 ⁻⁶ max./ -40 to +85°C ±5.0×10 ⁻⁶ max./ -40 to +105°C ±20×10 ⁻⁶ max./ -40 to +125°C (Option)	
vs. Aging		±1.0×10 ⁻⁶ max./year	
Symmetry		45 to 55% (50% Vcc Level)	
0 Level Output Voltage		Vcc×0.1V max.	
1 Level Output Voltage		Vcc×0.9V min.	
Output Load		15pF	
Rise and Fall Time		5ns max.(10% to 90% Vcc Level)	
OE Pin 0 Level Input Voltage		Vcc×0.2V max.	
OE Pin 1 Level Input Voltage		Vcc×0.8V min.	
Start Up Time		3.0ms max.	
Output Enable Time		3.0ms max.	
Output Disable Time		150ns max.	
Phase Noise		[f≤26MHz]	[26MHz<f≤52MHz]
Offset 1kHz		-145dBc/Hz	-141dBc/Hz
Offset 100kHz		-158dBc/Hz	-157dBc/Hz
Packing Unit (1)		3000pcs./reel (φ180)	

(1) Moisture prevention packing is unnecessary.
Moisture Sensitivity Level : LEVEL 1 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

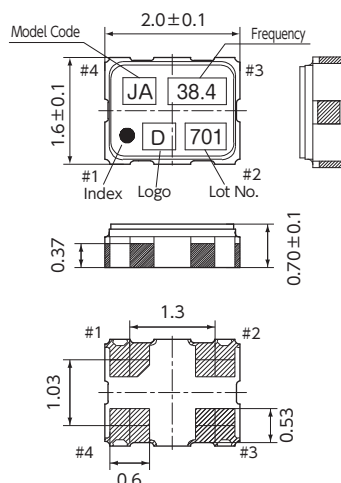
■ DSB211SJA

[mm]

■ DSB221SJA

[mm]

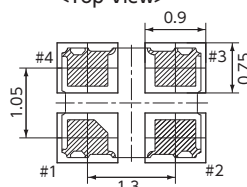
■ Dimensions



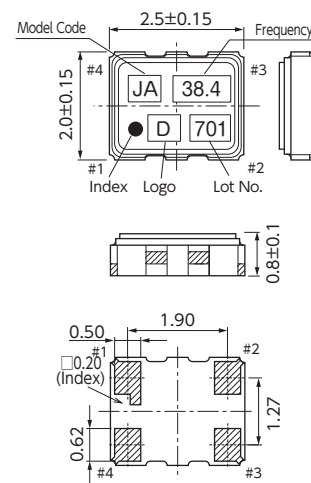
Pin Connections	
Pin No.	Connection
#1	OE (Output Enable)
#2	GND
#3	Output
#4	Vcc

Function	
#1 Input	#3 Output condition
H	Oscillation out
L	High Z

■ Recommended Land Pattern <Top View>



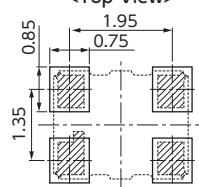
■ Dimensions



Pin Connections	
Pin No.	Connection
#1	OE (Output Enable)
#2	GND
#3	Output
#4	Vcc

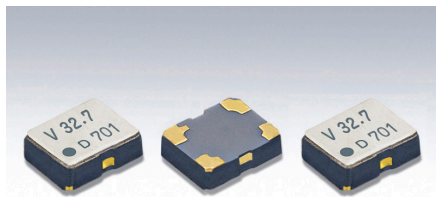
Function	
#1 Input	#3 Output condition
H	Oscillation out
L	High Z

■ Recommended Land Pattern <Top View>



SMD TCXO

DSK1612ATD



Actual size □

■ Features

- Digital temperature compensated type
- High precision : $\pm 5.0 \times 10^{-6}$ (-40 to +85°C)
- Low current consumption

■ Applications

- High precision clock source
- High precision clock source for RTC



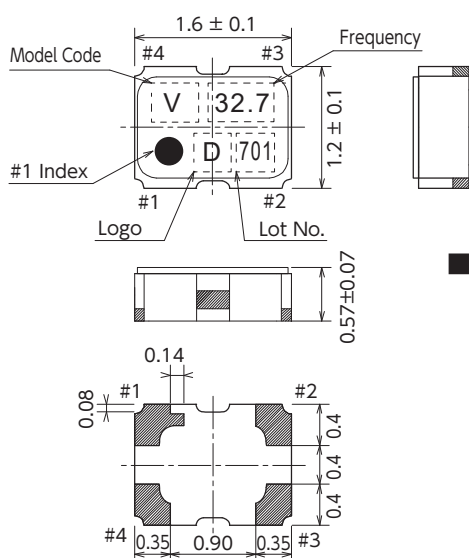
■ Standard Specification

Item	Legend	Spec.				Condition
		min.	typ.	max.	Unit	
Output Frequency	f_0	—	32.768	—	kHz	
Supply Voltage Range	V _{CC}	+1.5	—	3.63	V	Temperature Compensated Operating
Frequency Tolerance	f _{tol}	-5.0	—	+5.0	$\times 10^{-6}$	V _{CC} =+1.8V or +3.3V, T _A =-40 to +85°C (Standard operating temperature range, Referenced to 32.768kHz)
Current Consumption	I _{CC1}	—	0.90	1.90	μ A	V _{CC} =+1.8V, T _A =-40 to +85°C, at No Load (1)
		—	1.23	2.60		V _{CC} =+3.3V, T _A =-40 to +85°C, at No Load (1)
	I _{CC2}	—	1.26	2.43		V _{CC} =+1.8V, T _A =-40 to +85°C, at No Load Temperature Compensation Interval: 0.5s (standard specification) (2)
		—	1.59	3.12		V _{CC} =+3.3V, T _A =-40 to +85°C, at No Load Temperature Compensation Interval: 0.5s (standard specification) (2)
Symmetry	SYM	40	50	60	%	at 50% V _{CC}
0 Level Output Voltage	V _{OL}	—	—	V _{CC} ×0.1	V	
1 Level Output Voltage	V _{OH}	V _{CC} ×0.9	—	—	V	
Rise and Fall Time	t _r , t _f	—	—	40	ns	10 to 90% V _{CC} Level
Load Condition	L _{CMOS}	—	—	15	pF	
Start Up Time	T _{start}	—	—	0.5	s	
Packing Unit (3)						3000pcs./reel (φ180)

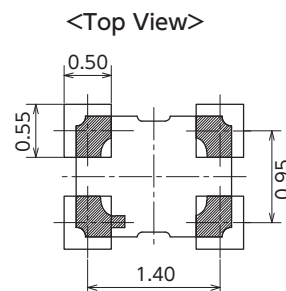
- (1) I_{CC1} is the current value when the temperature compensation circuit is not operating. Consult our sales representative for other specifications.
 (2) I_{CC2} is the average current value when the temperature compensation circuit is operating and non-operating.
 (3) Moisture prevention packing is unnecessary. Moisture Sensitivity Level : Level1 (IPC/JEDEC J-STD-033)

[mm]

■ Dimensions

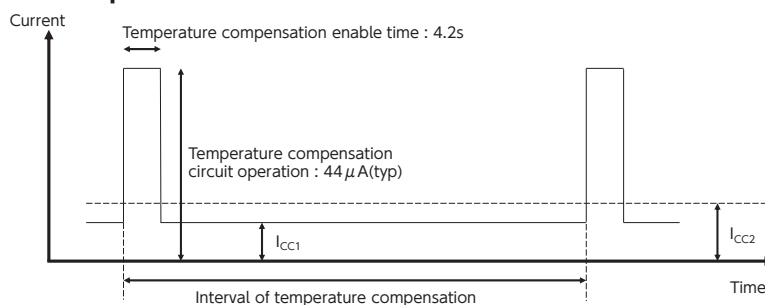


■ Recommended Land Pattern



Pin No.	Connection
#1	GND
#2	Output
#3	V _{CC}
#4	GND

■ Current profile

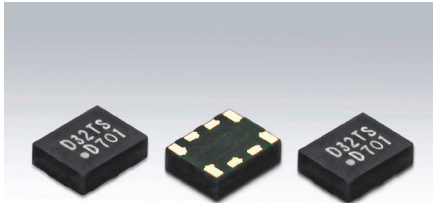


$$I_{CC2}(\text{typ}) = 0.90 \mu\text{A} \times (0.5\text{s} - 4.2\text{ms}) / 0.5\text{s} + 44 \mu\text{A} \times 4.2\text{ms} / 0.5\text{s} = 1.26 \quad (V_{CC} = 1.8\text{V})$$

$$I_{CC2}(\text{typ}) = 1.23 \mu\text{A} \times (0.5\text{s} - 4.2\text{ms}) / 0.5\text{s} + 44 \mu\text{A} \times 4.2\text{ms} / 0.5\text{s} = 1.59 \quad (V_{CC} = 3.3\text{V})$$

SMD Real Time Clock Module

DD3225TS



Actual size

Features

- Digital temperature compensated type
- High precision : $\pm 5.0 \times 10^{-6}$ (-40 to +85°C), $\pm 7.0 \times 10^{-6}$ (-40 to +105°C)
- Low current consumption
- Low voltage operation : +1.5 to +5.5V (Temperature Compensated Operating), +1.3 to +5.5V (Clock Timing Operating)
- I²C-BUS serial interface : 400kHz fast-mode compatible
- Clock function : hour·minute·second, Calendar function with auto leap year adjustment : year·month·day·day of week
- Alarm interrupt function : day·day of week·hour·minute
- Fixed-cycle timer interrupt function : 244μs to 255min
- Time update interrupt function : minute·second
- Clock output function : 32.768kHz, 1024Hz, 32Hz, 1Hz
- Supply voltage detection function :
+1.5V temperature compensation operating voltage detection
+1.3V supply voltage under voltage detection
- CMOS Level Output
- AEC-Q100/AEC-Q200 compliant
- * "I²C-BUS" is a trademark of NXP semiconductors.



Applications

- High precision clock source
- Car navigation, Smart meter, Data logger

Standard Specification

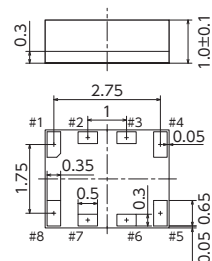
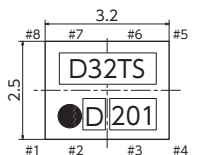
Item	Legend	Spec.				Condition
		min.	typ.	max.	unit	
Output Frequency	f _o	—	32.768	—	kHz	
Supply Voltage Range	V _{cc}	+1.3	—	+5.5	V	(Clock Timing Operating)
	V _{tem}	+1.5	—	+5.5		(Temperature Compensated Operating)
	V _{int}	+1.5	—	+5.5		(Interface Operation) I ² C-BUS
Frequency Tolerance	f _{tol}	-5	—	+5	× 10 ⁻⁶	-40 to +85°C
		-7	—	+7		-40 to +105°C
Current Consumption	I _{cc1}	—	0.30	2.10	μA	V _{cc} = +3.0V Temperature Compensation Interval:30s, SCL = SDA = INTN = V _{cc} ,OE = GND (Output Off)
		—	0.42	2.90		
	I _{cc2}	—	0.90	2.80		V _{cc} = +3.0V Temperature Compensation Interval:30s, SCL = SDA = INTN = OE = V _{cc} (Output On), No Load
		—	1.30	4.00		
Load Condition	L _{CMOS}	—	—	15	pF	
Symmetry	SYM	40	—	60	%	50%V _{cc}
1 level Output Voltage	V _{OH}	0.8xV _{cc}	—	—	V	I _{OH} =-1mA
0 level Output Voltage	V _{OL}	—	—	0.2xV _{cc}	V	I _{OL} =1mA
Rise / Fall Time	Tr/Tf	—	—	100	ns	20 to 80%V _{cc}
OE Pin 1 level Input Voltage	V _{IH}	0.8xV _{cc}	—	V _{cc}	V	
OE Pin 0 level Input Voltage	V _{IL}	0	—	0.2xV _{cc}	V	
Start Up Time	T _{start}	—	—	1	s	T _a = +25°C, V _{cc} = +1.3V
Packing Unit (1)						2000pcs./reel (φ 180)

(1) Moisture prevention packing
Moisture sensitivity level : Level 2 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

[mm]

Dimensions

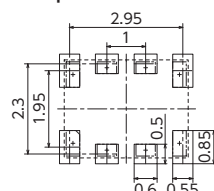


Function	
#1 Input	#5 Output Condition
H	Oscillation out
L	High Z

Marking	
(1) Type	D32TS
(2) Logo	D
(3) Date code	Year(1digit) + Week(2digits) e.g.2022/1/1 → 201

Recommended Land Pattern

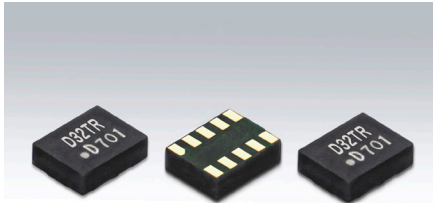
<Top View>



Pin Function			
No.	Name	I/O	Description
#1	OE	I	Output control enable input (L:High impedance,H:Clock output) 1Hz signal, alarm interrupt signal, fixed-cycle timer interrupt signal, and time update interrupt signal, Nch open-drain output.
#2	INTN	0	
#3	N.C.	-	Do not connect
#4	GND	-	Ground connection.
#5	Output	0	Clock output connection.
#6	SCL	I	I ² C-BUS serial interface clock input connection.
#7	SDA	I/O	I ² C-BUS serial interface data input/output connection.
#8	V _{cc}	-	Supply Voltage

SMD Real Time Clock Oscillator

DD3225TR



Actual size

Features

- Precision : $\pm 11.5 \times 10^{-6}$ (30 seconds per month), $\pm 23.0 \times 10^{-6}$ (60 seconds per month)
- Low current consumption
- Low voltage operation : +1.5 to +5.5V, +1.3 to +5.5V (Clock Timing Operating)
- I²C-BUS serial interface : 400kHz fast-mode compatible
- Clock function : hour·minute·second, Calendar function with auto leap year adjustment : year·month·day·day of week
- Alarm interrupt function : day·day of week·hour·minute
- Fixed-cycle timer interrupt function : 244 μ s to 255min
- Time update interrupt function : minute·second
- Clock output function : 32.768kHz, 1024Hz, 32Hz, 1Hz
- CMOS Level Output
- * "I²C-BUS" is a trademark of NXP semiconductors.



Applications

- Calendar, Timer, Alarm, Standard for watches
- Remote control with calendar, Data logger, Wireless sensor, Amusement device

Standard Specification

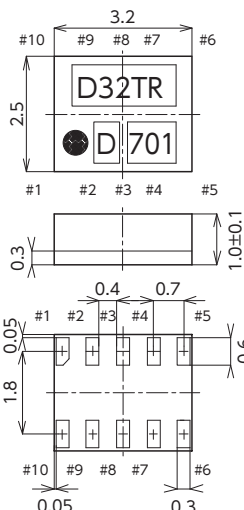
Item	Legend	Spec.				Condition
		min.	typ.	max.	unit	
Output Frequency	f _o	—	32.768	—	kHz	
Supply Voltage Range	V _{cc}	+1.3	—	+5.5	V	(Clock Timing Operating)
	V _{int}	+1.5	—	+5.5		(Interface Operation) I ² C-BUS
Frequency Tolerance	f _{tol}	-11.5	—	+11.5	$\times 10^{-6}$	T _a = 25°C, V _{cc} = +3.0V (30 seconds per month)
		-23	—	+23		T _a = 25°C, V _{cc} = +3.0V (60 seconds per month)
Operating temperature range	T _a	-40	—	+85	°C	
Current Consumption	I _{cc1}	—	0.29	2.10	μ A	V _{cc} = +3.0V SCL = SDA = INTN = V _{cc} , OE = GND (Output Off)
		—	0.41	2.90		V _{cc} = +5.0V
	I _{cc2}	—	0.89	2.80	μ A	V _{cc} = +3.0V SCL = SDA = INTN = OE = V _{cc} (Output On), No Load
		—	1.29	4.00		V _{cc} = +5.0V
Load Condition	L _{CMOS}	—	—	15	pF	
Symmetry	SYM	40	—	60	%	50%V _{cc}
1 level Output Voltage	V _{OH}	0.8xV _{cc}	—	—	V	I _{OH} =-1mA
0 level Output Voltage	V _{OL}	—	—	0.2xV _{cc}	V	I _{OL} =1mA
Rise / Fall Time	Tr/Tf	—	—	100	ns	20 to 80%V _{cc}
OE Pin 1 level Input Voltage	V _{IH}	0.8xV _{cc}	—	V _{cc}	V	
OE Pin 0 level Input Voltage	V _{IL}	0	—	0.2xV _{cc}	V	
Start Up Time	T _{start}	—	—	1	s	T _a = +25°C, V _{cc} = +1.3V
Packing Unit (1)						2000pcs./reel (ϕ 180)

(1) Moisture prevention packing
Moisture sensitivity level : Level 2 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

[mm]

Dimensions

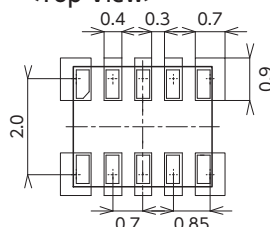


Function	
#2 Input	#4 Output Condition
H	Oscillation out
L	High Z

Marking	
(1) Type	D32TR
(2) Logo	D
(3) Date code	Year(1digit) + Week(2digits) e.g.2022/1/1 → 201

Recommended Land Pattern

<Top View>

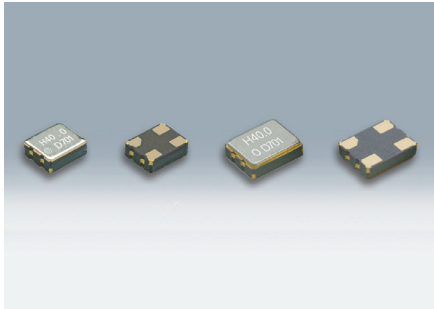


Pin Function

No.	Name	I/O	Function
#1	V _{cc}	-	Supply Voltage
#2	OE	I	Output control enable input (L:High impedance,H:Clock output)
#3	N.C.	-	Do not connect
#4	Output	O	Clock output connection
#5	SCL	I	I ² C-BUS serial interface clock input connection.
#6	EVENT	I	Trigger input for Time stamp request. Internal pull-up resistor can be selected. Input polarity can be selected.
#7	SDA	I/O	I ² C-BUS serial interface data input/output connection.
#8	N.C.	-	
#9	GND	-	Ground connection.
#10	INTN	O	1Hz signal, alarm interrupt signal, fixed-cycle timer interrupt signal, and time update interrupt signal, Nch open-drain output.

SMD Low Phase Noise Crystal Oscillators

DSO221SH/DSO321SH



Actual size DSO221SH DSO321SH

■ Features

- Supply Voltage : 1.8V/2.5V/2.8V/3.0V/3.3V
- Low phase noise : $f_{out} \pm 1\text{kHz}$ $-145 \text{ dBc/Hz(Typ.)}$
 $f_{out} \pm 100\text{kHz}$ $-158 \text{ dBc/Hz(Typ.)}$
- Low profile : 0.815mm(DSO221SH), 1.1mm(DSO321SH)
- AEC-Q200 Compliant (Option: Equivalent to AEC-Q100)
- CMOS Level Output
- 3-state function

■ Applications

- WiLAN, WiMAX, Bluetooth
- DVC, HDTV, Blu-ray
- PC, gaming equipment, audio equipment
- Automotive multimedia device

[Type]	DSO221SH	2520 size
	DSO321SH	3225 size

[Function Code]

DSO****H	A A
A : 3.3V	A : $\pm 100 \times 10^{-6}$
M : 3.0V	B : $\pm 50 \times 10^{-6}$
B : 2.8V	C : $\pm 30 \times 10^{-6}$
C : 2.5V	D : $\pm 25 \times 10^{-6}$
D : 1.8V	E : $\pm 20 \times 10^{-6}$



■ Standard Specification

Item	Function Code		Output Frequency Range (MHz)	Legend	Spec.				Condition	
	Supply Voltage	Frequency tolerance			min.	typ.	max.	Unit		
Supply Voltage	A	*	$3.5 \leq f_0 \leq 52$	V _{cc}	+3.0	+3.3	+3.6	V		
	M				+2.7	+3.0	+3.3			
	B				+2.6	+2.8	+3.0			
	C				+2.25	+2.5	+2.75			
	D				+1.6	+1.8	+2.0			
Frequency Tolerance (Includes frequency tolerance at room temperature.)	*		$3.5 \leq f_0 \leq 52$	f _{tol}	-100	-	+100	$\times 10^{-6}$	-40 to +85°C -10 to +70°C (Standard Operating Temperature Range)	
					B	-50	-			+50
					C	-30	-			+30
					D	-25	-			+25
					E	-20	-			+20
Current Consumption	A,M	*	$3.5 \leq f_0 \leq 52$	I _{cc}	-	-	4.2	mA	No Load	
	B	*			-	-	2.3			
	C	*			-	-	-			
	D	*			-	-	-			
Stand-by Current (#1 pin "L" Level)	*	*	*	I _{std}	-	-	10	μA		
Load Condition	*	*	*	L _{cmos}	-	-	15	pF		
Symmetry	A,M,B,C	*	*	SYM	45	50	55	%	at 50% V _{cc}	
	D				40	50	60			
0 Level Output Voltage	*	*	*	V _{OL}	-	-	V _{cc} × 0.1	V		
1 Level Output Voltage	*	*	*	V _{OH}	V _{cc} × 0.9	-	-			
Rise and Fall Time	A,M,B	*	*	tr, tf	-	-	4.0	ns	10 to 90% V _{cc} Level	
	C,D				-	-	6.5			
OE Pin 0 Level Input Voltage	*	*	*	V _{IL}	-	-	V _{cc} × 0.2	V		
OE Pin 1 Level Input Voltage	*	*	*	V _{IH}	V _{cc} × 0.8	-	-			
Output Disable Time	*	*	*	tPLZ	-	-	100	ns		
Output Enable Time	*	*	*	tPZL	-	-	2.0	ms		
Phase Noise	*	*	*	-	-	-140	-	dBc/Hz	Offset 1kHz Offset 100kHz	
					-	-153	-			
Period Jitter (1)	*	*	*	tRMS	-	2.4	-	ps	σ	
Total Jitter (1)	*	*	*	tp-p	-	23	-	ps	Peak to peak	
Phase Jitter	*	*	$40 \leq f_0 \leq 52$ $10 \leq f_0 < 40$	tpj	-	34	-	ps	tDJ+n×tRJ n=14.1 (BER=1×10 ⁻¹⁵) (2) f ₀ offset: 12kHz to 20MHz f ₀ offset: 12kHz to 5MHz	
					-	-	1			
Packing Unit (3)	2000pcs./reel (φ180)									

- (1) Measured WAVECREST DTS-2075
 (2) tDJ : Deterministic jitter tRJ : Random jitter
 (3) Moisture prevention packing is unnecessary.
 Moisture Sensitivity Level : Level 1 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

■ DSO221SH

[mm] ■ DSO321SH

[mm]

■ Dimensions

Model Code: H40.0 D701

Pin Connections

Pin No.	Connection
#1	OE (Output Enable)
#2	GND
#3	Output
#4	V _{cc}

Function

#1 Input	#3 Output condition
H	Oscillation out
Open	Oscillation out
L	High Z

■ Recommended Land Pattern <Top View>

■ Dimensions

Model Code: H40.0 D701

Pin Connections

Pin No.	Connection
#1	OE (Output Enable)
#2	GND
#3	Output
#4	V _{cc}

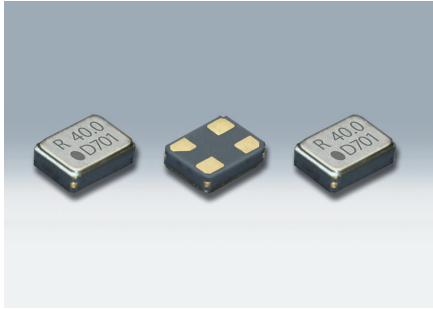
Function

#1 Input	#3 Output condition
H	Oscillation out
Open	Oscillation out
L	High Z

■ Recommended Land Pattern <Top View>

SMD Crystal Oscillators

DSO1612AR



Actual size □

■ Features

- 1612 size, 0.5 mm height. Ultra miniature and lightweight SMD SPXO
- 3-state function
- AEC-Q200 Compliant (Option: Equivalent to AEC-Q100)
- Supply Voltage : 1.8V/2.5V/2.8V/3.0V/3.3V
- Available frequency range : 0.584375 to 80MHz
- Available up to 80MHz by using AT cut fundamental resonator. Low jitter provides for high performance.
- CMOS Level Output



■ Applications

- PC, DSC, DVD, DVC, HDD
- Smartphone, WiLAN, WiMAX, Bluetooth
- Gaming equipment
- Automotive multimedia device
- Wearable devices

[Function Code]

DSO1612AR

A A

A : 3.3V	A : $\pm 100 \times 10^{-6}$
M : 3.0V	B : $\pm 50 \times 10^{-6}$
B : 2.8V	C : $\pm 30 \times 10^{-6}$
C : 2.5V	D : $\pm 25 \times 10^{-6}$
D : 1.8V	E : $\pm 20 \times 10^{-6}$

When requesting the product, please select the model and function code of your request.

■ Standard Specification

Item	Function Code		Output Frequency Range (MHz)	Legend	Spec.			Unit	Condition	
	Supply Voltage	Frequency tolerance			min.	typ.	max.			
Supply Voltage	A	*	$0.584375 \leq f_o \leq 80$	Vcc	+3.0	+3.3	+3.6	V		
	M				+2.7	+3.0	+3.3			
	B				+2.6	+2.8	+3.0			
	C				+2.25	+2.5	+2.75			
	D				+1.6	+1.8	+2.0			
Frequency Tolerance (includes frequency tolerance at room temperature)	*	A	$0.584375 \leq f_o \leq 80$	f_tol	-100	-	+100	$\times 10^{-6}$	-40 to +85°C	-10 to +70 (Standard Operating Temperature Range)
		B			-50	-	+50			
		C			-30	-	+30			
		D			-25	-	+25			
		E			-20	-	+20			
Current Consumption	A,M	*	$0.584375 \leq f_o < 40$	Icc	-	-	3.0	mA	No Load	
			$40 \leq f_o \leq 80$		-	-	4.2			
	B		$0.584375 \leq f_o < 40$		-	-	2.4			
			$40 \leq f_o \leq 80$		-	-	3.7			
	C		$0.584375 \leq f_o < 40$		-	-	2.0			
			$40 \leq f_o \leq 80$		-	-	3.4			
	D		$0.584375 \leq f_o < 40$		-	-	1.7			
$40 \leq f_o \leq 80$		-	-	2.7						
Stand-by Current (#1 pin "L" Level)	*	*	*	I_std	-	-	10	μA	-40 to +85°C	
Load Condition	*	*	$0.584375 \leq f_o \leq 80$	L_CMOS	-	-	15	pF		
Symmetry	*	*	$0.584375 \leq f_o \leq 80$	SYM	45	50	55	%	at 50% Vcc	
0 Level Output Voltage	*	*	*	V_OL	-	-	Vcc×0.1	V		
1 Level Output Voltage	*	*	*	V_OH	Vcc×0.9	-	-	V		
Rise and Fall Time	A,M,B,C	*	$0.584375 \leq f_o \leq 80$	tr, tf	-	-	3.0	ns	10 to 90% Vcc Level	
OE Pin 0 Level Input Voltage	*	*	*	V_IL	-	-	Vcc×0.2	V		
OE Pin 1 Level Input Voltage	*	*	*	V_IH	Vcc×0.8	-	-	V		
Output Disable Time	*	*	*	tPZL	-	-	200	ns		
Output Enable Time	*	*	*	tPZL	-	-	2	ms		
Period Jitter (1)	*	*	*	tRMS	-	2.2	-	ps	σ	
Total Jitter (1)	*	*	*	tp-p	-	20	-	ps	Peak to peak	
Phase Jitter	*	*	$40 \leq f_o \leq 80$	tpj	-	-	1	ps	tDJ+n×tRJ n=14.1 (BER=1×10 ⁻¹²) (2)	
			$10 \leq f_o < 40$		fo offset: 12kHz to 20MHz					
Packing Unit (3)					3000pcs./reel (φ180)					

(1) Measured WAVECREST DTS-2075

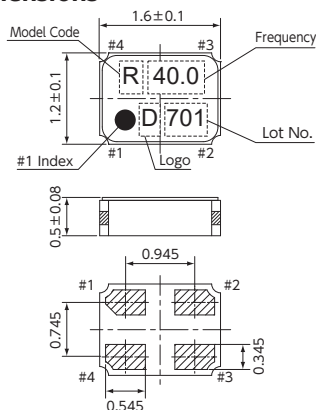
Consult our sales representative for other specifications.

(2) tDJ : Deterministic jitter tRJ : Random jitter

(3) Moisture prevention packing is unnecessary. Moisture Sensitivity Level : Level 1 (IPC/JEDEC J-STD-033)

[mm]

■ Dimensions

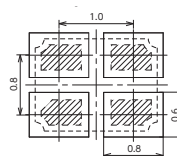


Pin Connections	
Pin No.	Connection
#1	OE (Output Enable)
#2	GND
#3	Output
#4	Vcc

Function	
#1 Input	#3 Output condition
H	Oscillation out
Open	Oscillation out
L	High Z

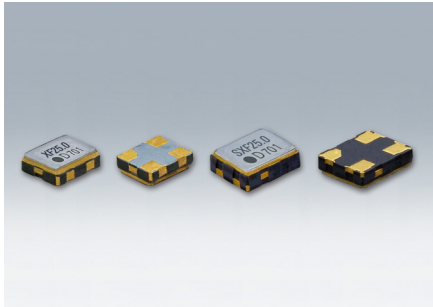
■ Recommended Land Pattern

<Top View>



SMD Crystal Oscillators

DSO211SXF/DSO221SXF



Actual size DSO211SXF □ DSO221SXF □

Features

- Supply Voltage: 1.8V/2.5V/2.8V/3.3V
- Available frequency range: 1 to 125MHz
- Low profile: 0.7mm (DSO211SXF), 0.8mm (DSO221SXF)
- CMOS Level Output
- Capable of operating over a wide temperature range, from -40 to 125°C.
- 3-state function

Applications

- Audio equipment, communication equipment, visual equipment, FA equipment, PC, gaming equipment and WiLAN



[Function Code]

DSO***SXF A Z

- | | |
|----------|---------------------------|
| A : 3.3V | A : ±100×10 ⁻⁶ |
| B : 2.8V | Z : ±80×10 ⁻⁶ |
| C : 2.5V | B : ±50×10 ⁻⁶ |
| D : 1.8V | C : ±30×10 ⁻⁶ |
| | D : ±25×10 ⁻⁶ |
| | E : ±20×10 ⁻⁶ |

[Type]

DSO211SXF	2016 size
DSO221SXF	2520 size

When requesting the product, please select the model and function code of your request.

Standard Specification

Item	Function Code		Output Frequency Range (MHz)	Legend	Spec.			Unit	Condition	
	Supply Voltage	Frequency tolerance			min.	typ.	max.			
Supply Voltage	A	*	1 ≤ f ₀ ≤ 125	V _{cc}	+3.0	+3.3	+3.6	V		
	B				+2.6	+2.8	+3.0			
	C		+2.25		+2.5	+2.75				
	D		+1.6		+1.8	+2.0				
Frequency Tolerance (includes frequency tolerance at room temperature)	A	*	1 ≤ f ₀ ≤ 100	f _{tol}	-	-	±100	×10 ⁻⁶	-40 to +125°C	-10 to +70°C (Standard Operating Temperature Range)
	Z				-	-	±80			
	B				-	-	±50			
	C				-	-	±50			
	D				-	-	±30			
Current Consumption	A	*	100 ≤ f ₀ ≤ 125	I _{cc}	-	-	10.0	mA	No Load	
			40 ≤ f ₀ < 100		-	-	4.2			
			1 ≤ f ₀ < 40		-	-	2.4			
	B		100 ≤ f ₀ ≤ 125		-	-	9.0			
			40 ≤ f ₀ < 100		-	-	3.7			
			1 ≤ f ₀ < 40		-	-	2.2			
	C		100 ≤ f ₀ ≤ 125		-	-	8.0			
			40 ≤ f ₀ < 100		-	-	3.4			
			1 ≤ f ₀ < 40		-	-	2.0			
	D		40 ≤ f ₀ ≤ 100		-	-	2.7			
			1 ≤ f ₀ < 40		-	-	1.7			
			Stand-by Current (#1 pin "L" Level)		*	*	*			
Load Condition	*	*	*	L _{CMOS}	-	-	15	pF		
Symmetry	*	*	*	SYM	45	50	55	%	50% V _{cc} Level	
0 Level Output Voltage	*	*	*	V _{OL}	-	-	V _{cc} ×0.1	V		
1 Level Output Voltage	*	*	*	V _{OH}	V _{cc} ×0.9	-	-	V		
Rise and Fall Time	A, B, C	*	*	tr, tf	-	-	3	ns	10 to 90% V _{cc} Level	
OE Pin 0 Level Input Voltage	D	*	*	-	-	-	5	V		
OE Pin 1 Level Input Voltage	*	*	*	V _{IH}	V _{cc} ×0.7	-	-	V		
Output Disable Time	*	*	*	tPLZ	-	-	200	ns		
Output Enable Time	*	*	*	tPZL	-	-	2	ms		
Period Jitter (1)	*	*	*	tRMS	-	2.4	-	ps	σ	
Total Jitter (1)	*	*	*	tp-p	-	23	-	ps	Peak to peak	
Phase Jitter	*	*	40 ≤ f ₀ ≤ 125	tTL	-	34	-	ps	tDJ+n×tRJ n=14.1 (BER=1×10 ⁻¹²) (2)	
			10 ≤ f ₀ < 40		-	-	1	ps	f ₀ offset: 12kHz to 20MHz f ₀ offset: 12kHz to 5MHz	
Packing Unit (3)					3000pcs./reel (φ 180)					

(1) Measured WAVECREST DTS-2075

Consult our sales representative for other specifications.

(2) tDJ: Deterministic jitter tRJ: Random jitter

(3) Moisture prevention packing is unnecessary. Moisture Sensitivity Level: Level1 (IPC/JEDEC J-STD-033)

DSO211SXF

[mm]

DSO221SXF

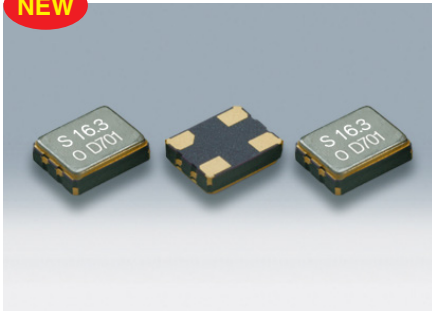
[mm]

<h4>Dimensions</h4> <p>Model Code: 2.0±0.1 Frequency</p> <p>Pin Connections</p> <table border="1"> <tr><th>Pin No.</th><th>Connection</th></tr> <tr><td>#1</td><td>OE(Output Enable)</td></tr> <tr><td>#2</td><td>GND</td></tr> <tr><td>#3</td><td>Output</td></tr> <tr><td>#4</td><td>V_{cc}</td></tr> </table> <p>Function</p> <table border="1"> <tr><th>#1 Input</th><th>#3 Output condition</th></tr> <tr><td>H</td><td>Oscillation out</td></tr> <tr><td>L</td><td>High Z</td></tr> </table> <h4>Recommended Land Pattern (Top View)</h4>	Pin No.	Connection	#1	OE(Output Enable)	#2	GND	#3	Output	#4	V _{cc}	#1 Input	#3 Output condition	H	Oscillation out	L	High Z	<h4>Dimensions</h4> <p>Model Code: 2.5±0.15 Frequency</p> <p>Pin Connections</p> <table border="1"> <tr><th>Pin No.</th><th>Connection</th></tr> <tr><td>#1</td><td>OE(Output Enable)</td></tr> <tr><td>#2</td><td>GND</td></tr> <tr><td>#3</td><td>Output</td></tr> <tr><td>#4</td><td>V_{cc}</td></tr> </table> <p>Function</p> <table border="1"> <tr><th>#1 Input</th><th>#3 Output condition</th></tr> <tr><td>H</td><td>Oscillation out</td></tr> <tr><td>L</td><td>High Z</td></tr> </table> <h4>Recommended Land Pattern (Top View)</h4>	Pin No.	Connection	#1	OE(Output Enable)	#2	GND	#3	Output	#4	V _{cc}	#1 Input	#3 Output condition	H	Oscillation out	L	High Z
Pin No.	Connection																																
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#1 Input	#3 Output condition																																
H	Oscillation out																																
L	High Z																																

SMD Crystal Oscillators

DSO321SRS

NEW



Actual size

Features

- Fast output enable time : 200ns
- 3-state function
- Supply Voltage : 3.3V
- Available frequency range : 8.25 to 66MHz
- CMOS Level Output

Applications

- Visual applications, Sever, SSD
- Industrial equipment

[Function Code]

DSO321SRS

A : 3.3V

- A A
- A : $\pm 100 \times 10^{-6}$
 - B : $\pm 50 \times 10^{-6}$
 - C : $\pm 30 \times 10^{-6}$
 - D : $\pm 25 \times 10^{-6}$
 - E : $\pm 20 \times 10^{-6}$



一般仕様

Item	Function Code		Output Frequency Range (MHz)	Legend	Spec.				Condition
	Supply Voltage	Frequency tolerance			min.	typ.	max.	Unit	
Supply Voltage	A	*	$8.25 \leq f_0 \leq 66$	V _{cc}	+3.0	+3.3	+3.6	V	
Frequency Tolerance (Includes frequency tolerance at room temperature)	*	A	*	f _{tol}	-100	-	+100	$\times 10^{-6}$	-40 to +100°C -10 to +70°C (Standard Operating Temperature Range)
		B			-50	-	+50		
		C			-30	-	+30		
		D			-25	-	+25		
		E			-20	-	+20		
Current Consumption	A	*	$33 < f_0 \leq 66$	I _{cc}	-	-	4.8	mA	No Load
			$16.5 < f_0 \leq 33$		-	-	4.1		
			$8.25 \leq f_0 \leq 16.5$		-	-	3.7		
Stand-by Current (#1 pin "L" Level)	A	*	$33 < f_0 \leq 66$	I _{std}	-	-	3.8	mA	No Load
			$16.5 \leq f_0 \leq 33$		-	-	2.9		
			$8.25 \leq f_0 < 16.5$		-	-	2.4		
Load Condition	*	*	*	L _{CMOS}	-	-	15	pF	
Symmetry	*	*	*	SYM	45	50	55	%	at 50% V _{cc}
0 Level Output Voltage	*	*	*	V _{OL}	-	-	V _{cc} ×0.1	V	
1 Level Output Voltage	*	*	*	V _{OH}	V _{cc} ×0.9	-	-	V	
Rise and Fall Time	*	*	*	tr, tf	-	-	10	ns	10 to 90% V _{cc} Level
OE Pin 0 Level Input Voltage	*	*	*	V _{IL}	-	-	V _{cc} ×0.2	V	
OE Pin 1 Level Input Voltage	*	*	*	V _{IH}	V _{cc} ×0.8	-	-	V	
Output Disable Time	*	*	*	t _{PLZ}	-	-	100	ns	
Output Enable Time	*	*	*	t _{PZL}	-	-	200	ns	
Period Jitter (1)	*	*	*	t _{RMS}	-	2.2	-	ps	σ
	*	*	*	t _{p-p}	-	20	-		Peak to peak
Total Jitter (1)	*	*	*	t _{TL}	-	31	-	ps	t _{DJ} +n×t _{RJ} n=14.1 (BER=1×10 ⁻¹²) (2)
Phase Jitter	*	*	$40 \leq f_0 \leq 66$ $10 \leq f_0 < 40$	t _{pj}	-	-	1		f _o offset: 1.2kHz to 20MHz f _o offset: 1.2kHz to 5MHz
Packing Unit (3)	2000pcs./reel (φ 180)								

(1) Measured WAVECREST DTS-2075

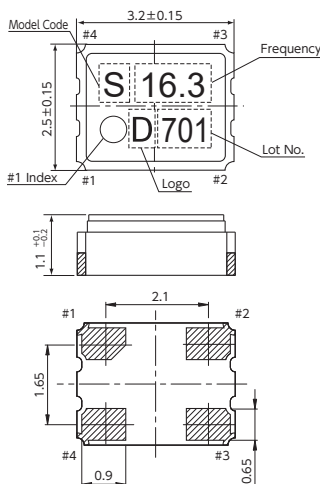
Consult our sales representative for other specifications.

(2) t_{DJ} : Deterministic jitter t_{RJ} : Random jitter

(3) Moisture prevention packing is unnecessary. Moisture Sensitivity Level : Level 1 (IPC/JEDEC J-STD-033)

[mm]

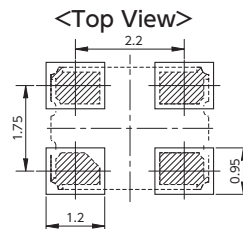
Dimensions



Pin No.	Connection
#1	OE (Output Enable)
#2	GND
#3	Output
#4	V _{cc}

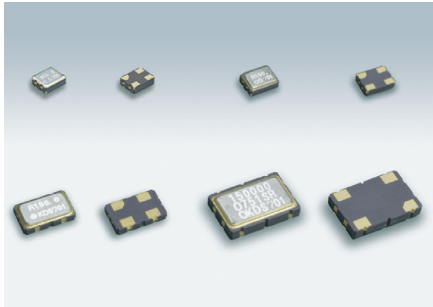
Function	#1 Input	#3 Output condition
H	Oscillation out	Oscillation out
Open	Oscillation out	Oscillation out
L	High Z	High Z

Recommended Land Pattern



SMD Crystal Oscillators

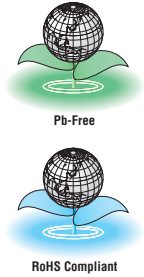
DSO221SR/DSO321SR/DSO531SR/DSO751SR



Actual size DSO221SR DSO321SR
DSO531SR DSO751SR

Features

- Low current consumption: 8mA max (167MHz, 3.3V)
- Supply Voltage: 1.8V/2.5V/2.8V/3.0V/3.3V
- Offers Narrow deviation: $\pm 20 \times 10^{-6} / \pm 30 \times 10^{-6} / \pm 50 \times 10^{-6} / \pm 100 \times 10^{-6}$
- Available up to 167MHz by using AT cut fundamental resonator.
- Low jitter provides for high performance.
- Low profile: 0.815mm(DSO221SR), 1.1mm(DSO321SR/DSO531SR), 1.5mm(DSO751SR)
- AEC-Q200 Compliant (Option: Equivalent to AEC-Q100) (DSO221SR/DSO321SR)
- CMOS Level Output



[Type]	DSO221SR	2520 size
	DSO321SR	3225 size
	DSO531SR	5032 size
	DSO751SR	7349 size

[Function Code]

DSO***SR

A A

- A : 3.3V
- M : 3.0V
- B : 2.8V
- C : 2.5V
- D : 1.8V

- A : $\pm 100 \times 10^{-6}$
- B : $\pm 50 \times 10^{-6}$
- C : $\pm 30 \times 10^{-6}$
- D : $\pm 25 \times 10^{-6}$
- E : $\pm 20 \times 10^{-6}$

Standard Specification

When requesting the product, please select the model and function code of your request.

Item	Function Code		Output Frequency Range (MHz)	Legend	Spec.				Condition
	Supply Voltage	Frequency tolerance			min.	typ.	max.	Unit	
Supply Voltage	A	*	$0.2 \leq f_0 \leq 167$	V _{CC}	+3.0	+3.3	+3.6	V	
	M		$0.2 \leq f_0 \leq 167$		+2.7	+3.0	+3.3		
	B		$0.2 \leq f_0 \leq 157$		+2.6	+2.8	+3.0		
	C		$0.2 \leq f_0 \leq 157$		+2.25	+2.5	+2.75		
	D		$0.2 \leq f_0 \leq 80$		+1.6	+1.8	+2.0		
Frequency Tolerance (Includes frequency tolerance at room temperature.)	*	A	$0.2 \leq f_0 \leq 167$	f _{tol}	-100	-	+100	$\times 10^{-6}$	-40 to +85°C -10 to +70°C (Standard Operating Temperature Range)
		B	$0.2 \leq f_0 \leq 125$		-50	-	+50		
		C	$0.2 \leq f_0 \leq 80$		-30	-	+30		
		D	$0.2 \leq f_0 \leq 80$		-25	-	+25		
		E	$0.2 \leq f_0 \leq 50$		-20	-	+20		
Current Consumption	A,M	*	$0.2 \leq f_0 < 32$	I _{CC}	-	-	1.8	mA	No Load
			$32 \leq f_0 < 54$		-	-	2.5		
			$54 \leq f_0 < 80$		-	-	5.0		
			$80 \leq f_0 < 125$		-	-	6.0		
			$125 \leq f_0 \leq 167$		-	-	8.0		
	B	*	$0.2 \leq f_0 < 32$		-	-	1.8		
			$32 \leq f_0 < 54$		-	-	2.5		
			$54 \leq f_0 < 125$		-	-	5.0		
			$125 \leq f_0 \leq 157$		-	-	7.0		
	C	*	$0.2 \leq f_0 < 32$		-	-	1.5		
			$32 \leq f_0 < 54$		-	-	2.0		
			$54 \leq f_0 < 125$		-	-	4.0		
$125 \leq f_0 \leq 157$			-	-	6.0				
D	*	$0.2 \leq f_0 < 32$	-	-	1.0				
		$32 \leq f_0 < 54$	-	-	1.4				
		$54 \leq f_0 \leq 80$	-	-	3.0				
Stand-by Current (#1 pin "L" Level)	*	*	*	I _{std}	-	-	10	μA	
Load Condition	*	*	*	L _{CMOS}	-	-	15	pF	
	A,M	*	$0.2 \leq f_0 \leq 80$		-	-	30		
Symmetry	*	*	$f_0 < 50$	SYM	45	50	55	%	50% V _{CC} Level
			$f_0 \geq 50$		40	50	60		
0 Level Output Voltage	*	*	*	V _{OL}	-	-	V _{CC} × 0.1	V	
1 Level Output Voltage	*	*	*	V _{OH}	V _{CC} × 0.9	-	-		
Rise and Fall Time	A,M,B,C	*	$0.2 \leq f_0 \leq 54$	tr, tf	-	-	5(4)	ns	L _{CMOS} :15pF 10 to 90% V _{CC} Level (20 to 80% V _{CC} Level)
	D		$0.2 \leq f_0 \leq 54$		-	-	7(6)		
	*		$54 < f_0 < 100$		-	-	4(3)		
	*		$100 \leq f_0 \leq 167$		-	-	3(2.5)		
	A,M		$0.2 \leq f_0 \leq 54$		-	-	10		
	A,M		$54 < f_0 \leq 80$		-	-	6		
OE Pin 0 Level Input Voltage	*	*	*	V _{IL}	-	-	V _{CC} × 0.2	V	
OE Pin 1 Level Input Voltage	*	*	*	V _{IH}	V _{CC} × 0.8	-	-		
Output Disable Time	*	*	*	t _{PLZ}	-	-	150	ns	
Output Enable Time	*	*	*	t _{PZL}	-	-	1		
Period Jitter (1)	*	*	*	t _{RMS}	-	2.2	-	ps	σ
					t _{p-p}	-	20		
Total Jitter (1)	*	*	*	t _{TL}	-	31	-	ps	t _{DJ} +n×t _{RJ} n=14.1(BER=1×10 ⁻¹²) (2)
Phase Jitter	*	*	$40 \leq f_0 \leq 167$	tpj	-	-	1		
			$10 \leq f_0 < 40$						
Packing Unit (3)	DSO221SR, DSO321SR: 2000pcs./reel (φ 180) , DSO531SR: 1000pcs./reel (φ 180) , DSO751SR: 1000pcs./reel (φ 254)								

(1) Measured WAVECREST DTS-2075

(2) t_{DJ} : Deterministic jitter t_{RJ} : Random jitter

(3) Moisture prevention packing is unnecessary.

Moisture Sensitivity Level : Level 1 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

SMD Crystal Oscillators

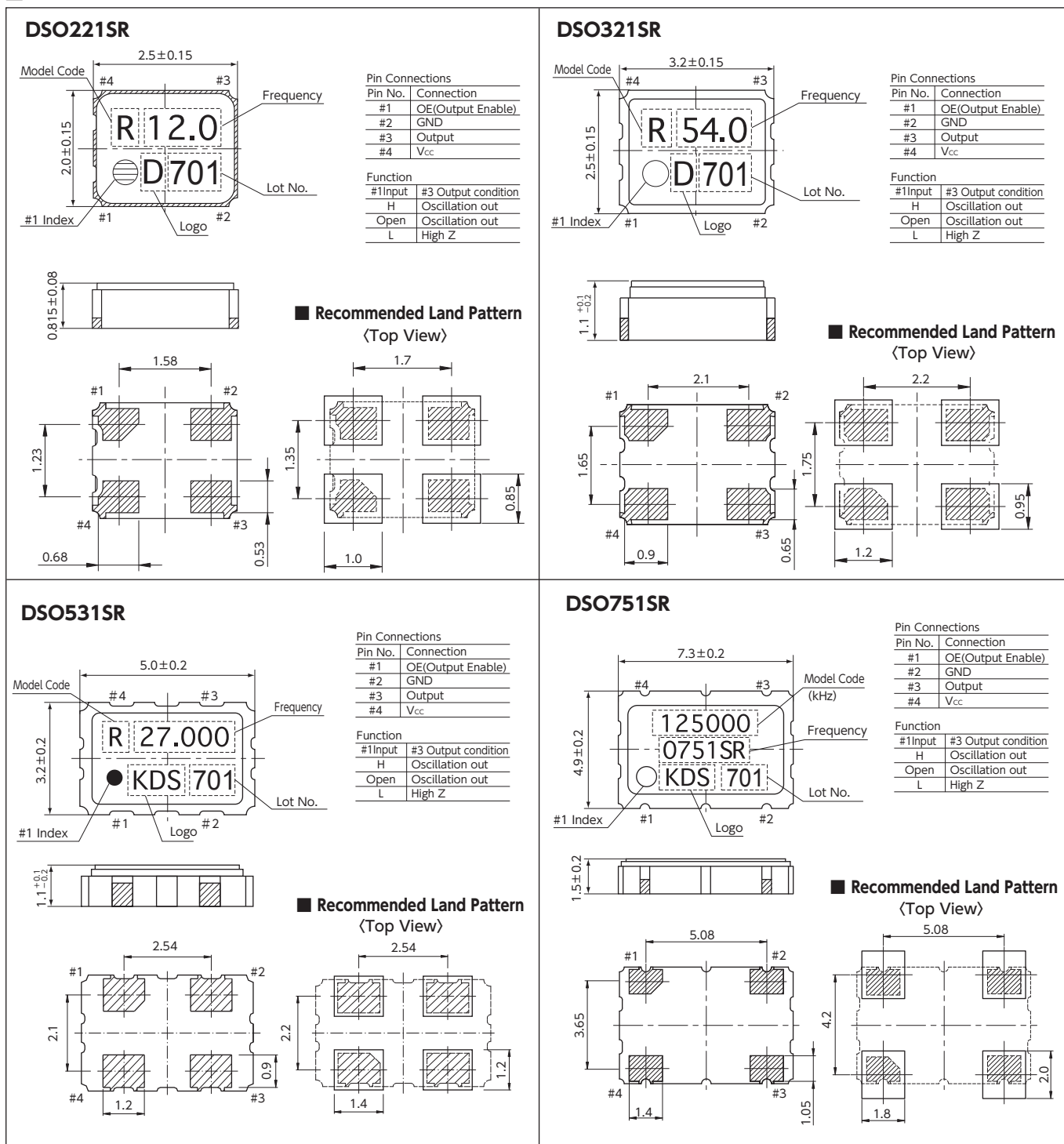
DSO221SR/DSO321SR/DSO531SR/DSO751SR

Applications

- PC, gaming equipment
- DSC, DVD, Blu-ray, HDTV, DVC, HDD
- WiMAX
- Camera module
- GbEthernet
- Automotive multimedia device

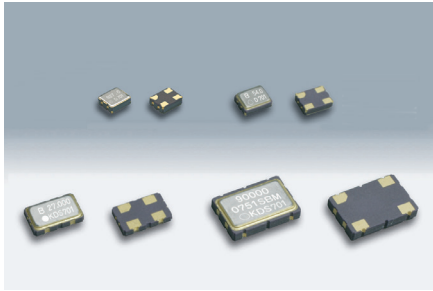
Dimensions

[mm]



SMD Crystal Oscillators

DSO221SBM/DSO321SBM/DSO531SBM/DSO751SBM



Actual size DSO221SBM DSO321SBM
DSO531SBM DSO751SBM

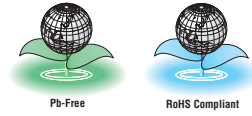
Features

- Low current consumption
- 3-state function
- General purpose +5.0V HCMOS oscillator
- CMOS Level Output

Applications

- PC, visual and FA equipment applications

[Type]	Model	Size
	DSO221SBM	2520 size
	DSO321SBM	3225 size
	DSO531SBM	5032 size
	DSO751SBM	7349 size



[Function Code]

DSO***SBM Y A
 Y : 5.0V $\left\{ \begin{array}{l} A : \pm 100 \times 10^{-6} \\ B : \pm 50 \times 10^{-6} \\ C : \pm 30 \times 10^{-6} \end{array} \right.$

When requesting the product, please select the model and function code of your request.

Standard Specification

Item	Legend	Function Code		DSO221SBM			DSO321, 531, 751 SBM				Condition		
		Supply Voltage	Frequency tolerance	Output Frequency Range (MHz)	Spec.			Output Frequency Range (MHz)	Spec.				
Supply Voltage	V _{CC}	*	*	3.25 ≤ f ₀ ≤ 52	+4.5	+5.0	+5.5	0.7 ≤ f ₀ ≤ 90	+4.5	+5.0	+5.5	V	
Frequency Tolerance (Includes frequency tolerance at room temperature.)	f _{tol}	*	A	3.25 ≤ f ₀ ≤ 52	-100	-	+100	0.7 ≤ f ₀ ≤ 90	-100	-	+100	X10 ⁻⁶	-40 to +85°C -20 to +70°C (Standard Operating Temperature Range)
			B	3.25 ≤ f ₀ ≤ 52	-50	-	+50	0.7 ≤ f ₀ ≤ 90	-50	-	+50		
			C	3.25 ≤ f ₀ ≤ 52	-30	-	+30	0.7 ≤ f ₀ ≤ 54	-30	-	+30		
Current Consumption	I _{CC}	*	*	3.25 ≤ f ₀ ≤ 52	-	-	8.0	0.7 ≤ f ₀ < 32	-	-	4.0	mA	No Load
								32 ≤ f ₀ < 54	-	-	6.0		
								54 ≤ f ₀ < 90	-	-	8.0		
Stand-by Current (#1 pin "L" Level)	I _{std}	*	*	*	-	-	10	*	-	-	50	μA	
Load Condition	L _{CMOS}	*	*	*	-	-	15	*	-	-	30	pF	
Symmetry	SYM	*	*	*	45	50	55	f ₀ < 26	45	50	55	%	50% V _{CC} Level
0 Level Output Voltage	V _{OL}	*	*	*	-	-	V _{CC} × 0.1	*	-	-	V _{CC} × 0.1	V	
1 Level Output Voltage	V _{OH}	*	*	*	V _{CC} × 0.9	-	-	*	V _{CC} × 0.9	-	-	V	
Rise and Fall Time	t _r , t _f	*	*	3.25 ≤ f ₀ ≤ 52	-	-	4.0	0.7 ≤ f ₀ ≤ 54	-	-	7 (6)	ns	L _{CMOS} : 30pF 10 to 90% V _{CC} Level (20 to 80% V _{CC} Level)
								54 < f ₀ ≤ 90	-	-	5 (4)		
OE Pin 0 Level Input Voltage	V _{IL}	*	*	*	-	-	V _{CC} × 0.2	*	-	-	V _{CC} × 0.2	V	
OE Pin 1 Level Input Voltage	V _{IH}	*	*	*	V _{CC} × 0.8	-	-	*	V _{CC} × 0.8	-	-	V	
Output Disable Time	t _{PLZ}	*	*	*	-	-	100	*	-	-	150	ns	
Output Enable Time	t _{PZL}	*	*	*	-	-	2.0	*	-	-	1	ms	
Period Jitter (1)	t _{RMS}	*	*	*	-	2.5	-	*	-	2.5	-	ps	σ Peak to peak
	t _{p-p}	*	*	*	-	20	-	*	-	20	-		
Total Jitter (1)	t _{TJ}	*	*	*	-	35	-	*	-	35	-	ps	t _{DJ} + n × t _{RJ} n=14.1 (BER=1 × 10 ⁻¹²) (2)
Phase Jitter	t _{pj}	*	*	40 ≤ f ₀ ≤ 52	-	-	1	40 ≤ f ₀ ≤ 90	-	-	1	ps	fo offset: 12kHz to 20MHz fo offset: 12kHz to 5MHz
				10 ≤ f ₀ < 40	-	-	1	10 ≤ f ₀ < 40	-	-	1		
Packing Unit (3)	DSO221SBM, DSO321SBM: 2000pcs./reel (φ 180), DSO531SBM: 1000pcs./reel (φ 180), DSO751SBM: 1000pcs./reel (φ 254)												

- (1) Measured WAVECREST DTS-2075
- (2) t_{DJ}: Deterministic jitter t_{RJ}: Random jitter
- (3) Moisture prevention packing is unnecessary.
Moisture Sensitivity Level: Level 1 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

DSO221SBM [mm] ■ DSO321SBM [mm] ■ DSO531SBM [mm] ■ DSO751SBM [mm]

DSO221SBM [mm]

Dimensions

Recommended Land Pattern (Top View)

Pin Connections
 #1 Connection
 #2 OE/Output Enable
 #3 GND
 #4 Output
 #5 V_{CC}

Function
 #1 Input #3 Output condition
 H Oscillation out
 Open Oscillation out
 L High Z

DSO321SBM [mm]

Dimensions

Recommended Land Pattern (Top View)

Pin Connections
 #1 Connection
 #2 OE/Output Enable
 #3 GND
 #4 Output
 #5 V_{CC}

Function
 #1 Input #3 Output condition
 H Oscillation out
 Open Oscillation out
 L High Z

DSO531SBM [mm]

Dimensions

Recommended Land Pattern (Top View)

Pin Connections
 #1 Connection
 #2 OE/Output Enable
 #3 GND
 #4 Output
 #5 V_{CC}

Function
 #1 Input #3 Output condition
 H Oscillation out
 Open Oscillation out
 L High Z

DSO751SBM [mm]

Dimensions

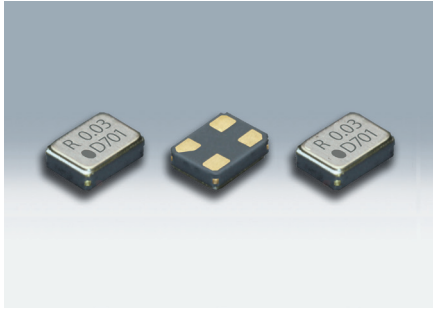
Recommended Land Pattern (Top View)

Pin Connections
 #1 Connection
 #2 OE/Output Enable
 #3 GND
 #4 Output
 #5 V_{CC}

Function
 #1 Input #3 Output condition
 H Oscillation out
 Open Oscillation out
 L High Z

SMD Crystal Oscillators

DSO1612AR (kHz)



Actual size □

■ Features

- 1612 size, 0.5mm height, ultra miniature and lightweight
- Output Frequency : 32.768kHz
- Supply Voltage : 1.8V/2.5V/2.8V/3.0V/3.3V
- Low current consumption: 18μA typ
- Stable frequency variation realized by adopting an At cut resonator
- Capable of operating over a wide temperature range, from -40 to +125°C
- CMOS Level Output
- 3-state function



■ Applications

- short-range wireless modules, PC, car navigation systems, car audio, multimedia devices, industrial measuring equipment, consumer product

[Function Code]

DSO1612AR

Function Code	Supply Voltage	Frequency Tolerance
A	3.3V	±100×10 ⁻⁶
M	3.0V	±80×10 ⁻⁶
B	2.8V	±50×10 ⁻⁶
C	2.5V	±30×10 ⁻⁶
D	1.8V	±25×10 ⁻⁶
E	1.8V	±20×10 ⁻⁶

When requesting the product, please select the model and function code of your request.

■ Standard Specification

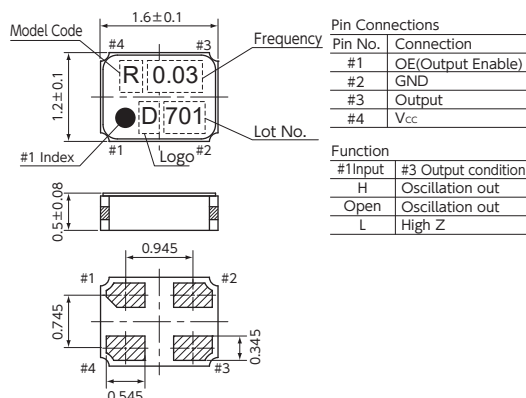
Item	Function Code		Output Frequency (kHz)	Legend	Spec.			Unit	Condition	
	Supply Voltage	Frequency tolerance			min.	typ.	max.			
Supply Voltage	A	*	*	V _{cc}	+3.0	+3.3	+3.6	V		
	M				+2.7	+3.0	+3.3			
	B				+2.6	+2.8	+3.0			
	C				+2.25	+2.5	+2.75			
	D				+1.6	+1.8	+2.0			
Frequency Tolerance (includes frequency tolerance at room temperature)	*	Y	*	f _{tol}	-	-	±100	×10 ⁻⁶	-40 to +125°C	-10 to +70°C (Standard Operating Temperature Range)
	*	Z			-	-	±80		-40 to +110°C	
	*	A			-	-	±100		-40 to +85°C	
	*	B			-	-	±50		-20 to +70°C	
	*	C			-	-	±30			
	*	D			-	-	±25			
Current Consumption	*	*	*	I _{cc}	-	18	32	μA	No Load	
Stand-by Current (#1 pin "L" Level)	*	*	*	I _{std}	-	-	5	μA		
Load Condition	*	*	*	L _{CMOS}	-	-	15	pF		
Symmetry	*	*	*	SYM	45	50	55	%	50% V _{cc} Level	
0 Level Output Voltage	*	*	*	V _{OL}	-	-	V _{cc} ×0.1	V		
1 Level Output Voltage	*	*	*	V _{OH}	V _{cc} ×0.9	-	-			
Rise and Fall Time	*	*	*	t _r , t _f	-	-	50	ns	10 to 90% V _{cc} Level	
OE Pin 0 Level Input Voltage	*	*	*	V _{IL}	-	-	V _{cc} ×0.3	V		
OE Pin 1 Level Input Voltage	*	*	*	V _{IH}	V _{cc} ×0.7	-	-			
Output Disable Time	*	*	*	t _{PLZ}	-	-	1	μs		
Output Enable Time	*	*	*	t _{PZL}	-	-	10	ms		
Packing Unit (1)	3000pcs./reel (φ180)									

(1) Moisture prevention packing is unnecessary.
Moisture Sensitivity Level : Level1 (IPC/JEDEC J-STD-033)

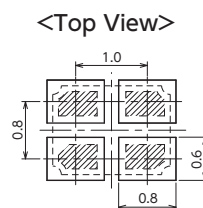
Consult our sales representative for other specifications.

[mm]

■ Dimensions

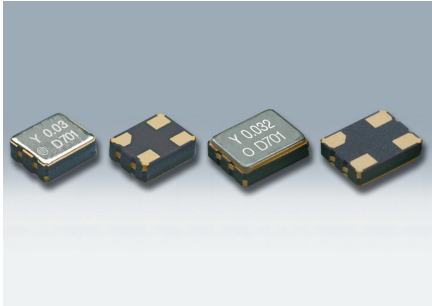


■ Recommended Land Pattern



SMD Crystal Oscillators

DSO221SY/DSO321SY



Actual size DSO221SY DSO321SY

Features

- Available frequency range : 32.768kHz, 1.049 to 8.5MHz
- Supply Voltage: 1.8V/2.5V/2.8V/3.3V
- 3-state function
- Low current consumption: 10μA typ.(32.768kHz)
- CMOS Level Output
- Stable frequency variation realized by adopting an At cut resonator
- AEC-Q200 Compliant (Option: Equivalent to AEC-Q100)

Applications

- Timer module, Industrial measuring equipment, Consumer Product



[Type]

DSO221SY	2520 size
DSO321SY	3225 size

[Function Code]

DSO***SY AA

A : 3.3V	A : ±100×10 ⁻⁶
B : 2.8V	B : ±50×10 ⁻⁶
C : 2.5V	N : ±35×10 ⁻⁶
D : 1.8V	C : ±30×10 ⁻⁶
	D : ±25×10 ⁻⁶

When requesting the product, please select the model and function code of your request.

Standard Specification

Item	Function Code		Output Frequency Range	Legend	Spec.				Condition	
	Supply Voltage	Frequency tolerance			min.	typ.	max.	Unit		
Supply Voltage	A	*	32.768kHz 1.049 ≤ f ₀ ≤ 8.5MHz	V _{cc}	+3.0	+3.3	+3.6	V		
	B				+2.6	+2.8	+3.0			
	C				+2.25	+2.5	+2.75			
	D				+1.6	+1.8	+2.0			
Frequency Tolerance (includes frequency tolerance at room temperature)	*		32.768kHz 1.049 ≤ f ₀ ≤ 8.5MHz	f _{tol}	-100	-	+100	× 10 ⁻⁶	-40 to +85°C -10 to +70°C (Standard Operating Temperature Range)	
					B	-50	-			+50
					N	-35	-			+35
					C	-30	-			+30
Current Consumption	*	*	32.768kHz 1.049 ≤ f ₀ ≤ 8.5MHz	I _{cc}	-	-	18	μA	No Load	
					-	-	700			
Stand-by Current (#1 pin "L" Level)	*	*	*	I _{std}	-	-	3	μA	-40 to +85°C	
Load Condition	*	*	*	L _{CMOS}	-	-	15	pF		
Symmetry	*	*	32.768kHz 1.049 ≤ f ₀ ≤ 8.5MHz	SYM	45	50	55	%	at 50% V _{cc}	
0 Level Output Voltage	*	*	*	V _{OL}	-	-	V _{cc} ×0.1	V		
1 Level Output Voltage	*	*	*	V _{OH}	V _{cc} ×0.9	-	-	V		
Rise and Fall Time	*	*	*	tr, tf	-	-	15	ns	10 to 90% V _{cc} Level	
OE Pin 0 Level Input Voltage	*	*	*	V _{IL}	-	-	V _{cc} ×0.2	V		
OE Pin 1 Level Input Voltage	*	*	*	V _{IH}	V _{cc} ×0.8	-	-	V		
Output Disable Time	*	*	*	tPLZ	-	-	100	ns		
Output Enable Time	*	*	*	tPZL	-	-	20	ms		
Packing Unit (1)	2000pcs./reel (φ 180)									

(1) Moisture prevention packing is unnecessary.
Moisture Sensitivity Level : Level 1 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

DSO221SY

[mm] DSO321SY

[mm]

Dimensions

Model Code: Y 0.03 D:701

Pin Connections:

Pin No.	Connection
#1	OE(Output Enable)
#2	GND
#3	Output
#4	V _{cc}

Function:

#1 Input	#3 Output condition
H	Oscillation out
Open	Oscillation out
L	High Z

Recommended Land Pattern (Top View)

Dimensions

Model Code: Y 0.032 D:701

Pin Connections:

Pin No.	Connection
#1	OE(Output Enable)
#2	GND
#3	Output
#4	V _{cc}

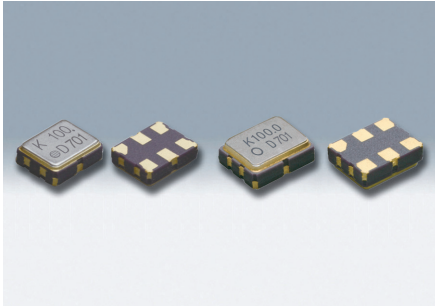
Function:

#1 Input	#3 Output condition
H	Oscillation out
Open	Oscillation out
L	High Z

Recommended Land Pattern (Top View)

SMD Differential Output Crystal Oscillators

DSO223SK/DSO323SK/DSO223SJ/DSO323SJ/DSO223SD/DSO323SD



Actual size DSO223S DSO323S

■ Features

- 2.5V/3.3V operating voltage, High speed type
- 3-state function
- LV-PECL output (DSO223/323SK)
- LVDS output (DSO223/323SJ)
- HCSL output (DSO223/323SD)
- DSO223SK/SJ/SD: AEC-Q200 Compliant
- DSO323SK/SJ/SD: AEC-Q200 Compliant (Option: Equivalent to AEC-Q100)



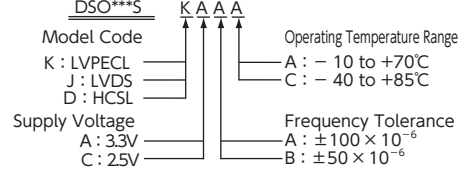
■ Applications

- Sever, Optical transmission device, Communication base station and Automotive multimedia device

[Type]

DSO223S SERIES	2520 size
DSO323S SERIES	3225 size

[Function Code]



■ Standard Specification

When requesting the product, please select the model and function code of your request.

Item	Type	Legend	DSO223SK DSO323SK	DSO223SJ DSO323SJ	DSO223SD DSO323SD
Output Specification	—		LV-PECL	LVDS	HCSL
Output Frequency Range	f_o		13.5 to 167MHz (DSO223S SERIES) / 13.5 to 212.5MHz (DSO323S SERIES)		
Supply Voltage	V_{CC}		+2.5V \pm 0.125V/+3.3V \pm 0.165V		
Frequency Tolerance (Includes frequency tolerance at room temperature.)	f_{tol}		$\pm 50 \times 10^{-6}$ max., $\pm 100 \times 10^{-6}$ max.		
Storage Temperature Range	T_{stg}		-40 to +85°C		
Operating Temperature Range	T_{use}		-10 to +70°C, -40 to +85°C		
Current Consumption	I_{CC}		45mA max. ($f_o \leq 170$ MHz), 50mA max. (170MHz $\leq f_o \leq 212.5$ MHz)	20mA max.	30mA max. ($f_o \leq 170$ MHz), 35mA max. (170MHz $\leq f_o \leq 212.5$ MHz)
Stand-by Current (#1 pin "L" Level)	I_{std}		10 μ A max.		
Load Condition	Load-R		50 Ω to $V_{CC}-2V$	100 Ω (Output-OutputN)	50 Ω
Symmetry	SYM		45 to 55% [at outputs cross point]		
0 Level Output Voltage	V_{OL}		$V_{CC}-1.81$ to $V_{CC}-1.62V$	—	-0.15 to 0.15V
1 Level Output Voltage	V_{OH}		$V_{CC}-1.025$ to $V_{CC}-0.88V$	—	0.58 to 0.85V
Rise and Fall Time	t_r, t_f		0.5ns max. [20 to 80% Output, OutputN]	0.4ns max. [20 to 80% Output-OutputN]	0.5ns max. [0.175 to 0.525V Level]
Differential Output Voltage	V_{OD1}, V_{OD2}		—	0.247 to 0.454V	—
Change to V_{OD}	ΔV_{OD}		—	50mV [$\Delta V_{OD} = V_{OD1} - V_{OD2} $]	—
Offset Voltage	V_{OS}		—	1.125 to 1.375V	—
Offset to V_{OS}	ΔV_{OS}		—	50mV	—
Crossing Point Voltage	V_{cr}		—	—	250 to 550mV
OE Pin 0 Level Input Voltage	V_{L}		$V_{CC} \times 0.3$ max.		
OE Pin 1 Level Input Voltage	V_{H}		$V_{CC} \times 0.7$ min.		
Output Disable Time	t_{PLZ}		200ns		
Output Enable Time	t_{PZL}		2ms		
Period Jitter (1)	t_{RMS}		5ps typ. (13.5MHz $\leq f_o < 27$ MHz) / 2.5ps typ. (27MHz $\leq f_o \leq 212.5$ MHz) (σ)		
	t_{p-p}		33ps typ. (13.5MHz $\leq f_o < 27$ MHz) / 22ps typ. (27MHz $\leq f_o \leq 212.5$ MHz) (Peak to peak)		
Total Jitter (1)	t_{TL}		50ps typ. (13.5MHz $\leq f_o < 27$ MHz) / 35ps typ. (27MHz $\leq f_o \leq 212.5$ MHz) [$t_{DJ} + n \times t_{RJ}$ n=14.1 (BER=1 $\times 10^{-12}$) (2)]		
Phase Jitter	t_{pj}		1.5ps max. (13.5MHz $\leq f_o < 27$ MHz) / 1ps max. (27MHz $\leq f_o \leq 212.5$ MHz) [13.5MHz $\leq f_o < 40$ MHz, f_o offset: 12kHz to 5MHz $f_o \geq 40$ MHz, f_o offset: 12kHz to 20MHz]		
Packing Unit (3)	—		2000pcs./reel (ϕ 180)		

- (1) Measured WAVECREST DTS-2075
 (2) t_{DJ} : Deterministic jitter t_{RJ} : Random jitter
 (3) Moisture prevention packing is unnecessary.
 Moisture Sensitivity Level: Level 1 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

■ DSO223S SERIES

[mm] ■ DSO323S SERIES

[mm]

■ Dimensions

Model Code: DSO223SJ: J, DSO223SK (2.5V): KB, DSO223SK (3.3V): K, DSO223SD: D

Pin Connections:

Pin No.	Connection
#1	OE(Output Enable)
#2	NC
#3	GND
#4	Output
#5	OutputN
#6	V _{CC}

Function: #4,#5 Output condition: H: Oscillation out, Open: Oscillation out, L: High Z

■ Recommended Land Pattern

■ Dimensions

Model Code: DSO323SJ: J, DSO323SK (2.5V): KB, DSO323SK (3.3V): K, DSO323SD: D

Pin Connections:

Pin No.	Connection
#1	OE(Output Enable)
#2	NC
#3	GND
#4	Output
#5	OutputN
#6	V _{CC}

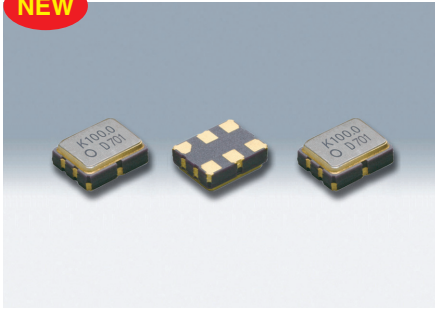
Function: #1 Input, #4,#5 Output condition: H: Oscillation out, Open: Oscillation out, L: High Z

■ Recommended Land Pattern

SMD Differential Output Crystal Oscillators - Low Voltage

DSO323SJ/DSO323SD

NEW



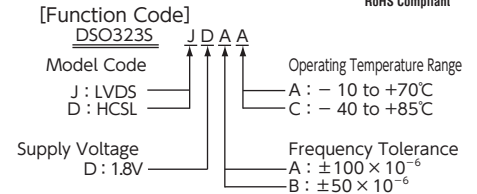
Actual size

Features

- 1.8V operating voltage, High speed type
- 3-state function
- LVDS output (DSO323SJ)
- HCSL output (DSO323SD)
- AEC-Q200 Compliant (Option: Equivalent to AEC-Q100)

Applications

- Server, Optical transmission device, Communication base station and Automotive multimedia device



When requesting the product, please select the model and function code of your request.

Standard Specification

Item	Type	Legend	DSO323SJ	DSO323SD
Output Specification	—		LVDS	HCSL
Output Frequency Range	f_0		100 to 167MHz	
Supply Voltage	V_{CC}		$+1.8V \pm 0.09V$	
Frequency Tolerance (Includes frequency tolerance at room temperature)	f_{tol}		$\pm 50 \times 10^{-6}$ max., $\pm 100 \times 10^{-6}$ max.	
Storage Temperature Range	T_{stg}		-40 to +85°C	
Operating Temperature Range	T_{use}		-10 to +70°C, -40 to +85°C	
Current Consumption	I_{CC}		25mA max.	50mA max.
Stand-by Current (#1 pin "L" Level)	I_{std}		30 μA max.	
Load Condition	Load-R		100 Ω (Output-OutputN)	50 Ω
Symmetry	SYM		45 to 55% [at outputs cross point]	
0 Level Output Voltage	V_{OL}		—	-0.15 to 0.15V
1 Level Output Voltage	V_{OH}		—	0.55 to 1.0V
Rise and Fall Time	t_r, t_f		0.4ns max. [20 to 80% Output-OutputN]	0.5ns max. [-0.15 to 0.15V/Output-OutputN]
Differential Output Voltage	V_{OD1}, V_{OD2}		0.247 to 0.454V	—
Change to V_{OD}	ΔV_{OD}		50mV [$\Delta V_{OD} = V_{OD1} - V_{OD2} $]	—
Offset Voltage	V_{OS}		1.125 to 1.375V	—
Offset to V_{OS}	ΔV_{OS}		50mV	—
OE Pin 0 Level Input Voltage	V_{IL}		$V_{CC} \times 0.3$ max.	
OE Pin 1 Level Input Voltage	V_{IH}		$V_{CC} \times 0.7$ min.	
Output Disable Time	t_{PLZ}		200ns	
Output Enable Time	t_{PZL}		2ms	
Period Jitter (1)	t_{RMS}		2.5ps typ. (σ)	
	t_{p-p}		22ps typ. (Peak to peak)	
Total Jitter (1)	t_{TL}		35ps typ. [$t_{DJ} + n \times t_{RJ}$ n=14.1 (BER=1 $\times 10^{-12}$) (2)]	
Phase Jitter	t_{pj}		0.15ps max.	
Packing Unit (3)	—		2000pcs./reel ($\phi 180$)	

- (1) Measured WAVECREST DTS-2075
- (2) t_{DJ} : Deterministic jitter t_{RJ} : Random jitter
- (3) Moisture prevention packing is unnecessary.
Moisture Sensitivity Level : Level 1 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

DSO323S SERIES

[mm]

Dimensions

Model Code
DSO323SJ
DSO323SD

Pin Connections

Pin No.	Connection
#1	OE(Output Enable)
#2	NC
#3	GND
#4	Output
#5	OutputN
#6	Vcc

Function

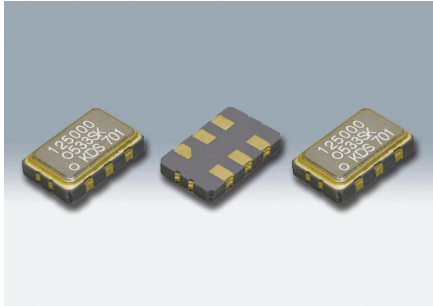
#1 Input	#4,#5 Output condition
H	Oscillation out
Open	Oscillation out
L	High Z

Recommended Land Pattern

<Top View>

SMD Differential Output Crystal Oscillators

DSO533SK/DSO533SJ



Actual size

Features

- 5032 size, 1.1mm height
- 2.5V/3.3V operating voltage, High speed type (13.5 to 212.5MHz)
- 3-state function
- LV-PECL output (DSO533SK)
- LVDS output (DSO533SJ)

Applications

- Sever, SONET/SDH, PC



Standard Specification

Item	Type	Legend	DSO533SK	DSO533SJ
Output Specification	-	-	LV-PECL	LVDS
Output Frequency Range	f_0	-	13.5 to 212.5MHz	
Supply Voltage	V_{CC}	-	+2.5V \pm 0.125V/+3.3V \pm 0.165V	
Frequency Tolerance (Includes frequency tolerance at room temperature.)	f_{tol}	-	$\pm 50 \times 10^{-6}$ max., $\pm 100 \times 10^{-6}$ max.	
Storage Temperature Range	T_{stg}	-	-40 to +85°C	
Operating Temperature Range	T_{use}	-	-10 to +70°C, -40 to +85°C	
Current Consumption	I_{CC}	-	45mA max. ($f_0 \leq 170$ MHz), 50mA max. (170 MHz $< f_0 \leq 212.5$ MHz)	20mA max.
Stand-by Current (#1 pin "L" Level)	I_{std}	-	10 μ A max.	
Load Condition	Load-R	-	50 Ω to $V_{CC}-2V$	100 Ω (Output-OutputN)
Symmetry	SYM	-	45 to 55% [at outputs cross point]	
0 Level Output Voltage	V_{OL}	-	$V_{CC}-1.81$ to $V_{CC}-1.62V$	-
1 Level Output Voltage	V_{OH}	-	$V_{CC}-1.025$ to $V_{CC}-0.88V$	-
Rise and Fall Time	t_r, t_f	-	0.5ns max. [20 to 80% Output, OutputN]	0.4ns max. [20 to 80% Output-OutputN]
Differential Output Voltage	V_{OD1}, V_{OD2}	-	-	0.247 to 0.454V
Change to V_{OD}	ΔV_{OD}	-	-	50mV [$\Delta V_{OD} = V_{OD1} - V_{OD2} $]
Offset Voltage	V_{OS}	-	-	1.125 to 1.375V
Offset to V_{OS}	ΔV_{OS}	-	-	50mV
OE Pin 0 Level Input Voltage	V_{IL}	-	$V_{CC} \times 0.3$ max.	
OE Pin 1 Level Input Voltage	V_{IH}	-	$V_{CC} \times 0.7$ min.	
Output Disable Time	t_{PLZ}	-	200ns	
Output Enable Time	t_{PZL}	-	2ms	
Period Jitter (1)	t_{RMS}	-	5ps typ. (13.5MHz $\leq f_0 < 27$ MHz) / 2.5ps typ. (27MHz $\leq f_0 \leq 212.5$ MHz) (σ)	
	t_{p-p}	-	33ps typ. (13.5MHz $\leq f_0 < 27$ MHz) / 22ps typ. (27MHz $\leq f_0 \leq 212.5$ MHz) (Peak to peak)	
Total Jitter (1)	t_{TL}	-	50ps typ. (13.5MHz $\leq f_0 < 27$ MHz) / 35ps typ. (27MHz $\leq f_0 \leq 212.5$ MHz) [$t_{DJ} + n \times t_{RJ}$ n=14.1 (BER=1 $\times 10^{-12}$) (2)]	
Phase Jitter	t_{pj}	-	1.5ps max. (13.5MHz $\leq f_0 < 27$ MHz) / 1ps max. (27MHz $\leq f_0 \leq 212.5$ MHz) [13.5MHz $\leq f_0 < 40$ MHz, f_0 offset: 12kHz to 5MHz $f_0 \geq 40$ MHz, f_0 offset: 12kHz to 20MHz]	
Packing Unit (3)	-	-	1000pcs./reel (ϕ 180)	

- (1) Measured WAVECREST DTS-2075
- (2) t_{DJ} : Deterministic jitter t_{RJ} : Random jitter
- (3) Moisture prevention packing is unnecessary.
Moisture Sensitivity Level: Level 1 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

[mm]

Dimensions

Frequency (kHz)

Model Code

Lot No.

#1 Index

#2 Logo

#3

#4

#5

#6

5.0 \pm 0.2

3.2 \pm 0.2

1.1

+0.1 -0.2

1.27

1.27

2.1

0.64

0.9

Recommended Land Pattern

<Top View>

1.27

1.27

2.6

0.89

1.6

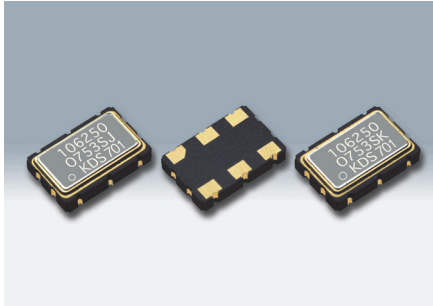
Pin No.	Connection
#1	OE(Output Enable)
#2	NC
#3	GND
#4	Output
#5	OutputN
#6	V_{CC}

Function	
#1 Input	#4,#5 Output condition
H	Oscillation out
Open	Oscillation out
L	High Z

DSO533SJ(2.5V,3.3V) \rightarrow O533SJ
DSO533SK(2.5V) \rightarrow O533SKB
DSO533SK(3.3V) \rightarrow O533SK

SMD Differential Output Crystal Oscillators

DSO753SK/DSO753SJ/DSO753SD



Actual size

■ Features

- Package size : 7.3×4.9×1.5mm
- 2.5V/3.3V operating voltage, High speed type (13.5 to 212.5MHz)
- 3-state function
- LV-PECL output (DSO753SK)
- LVDS output (DSO753SJ)
- HCSL output (DSO753SD)

■ Applications

- Server, FC-HBA



■ Standard Specification

Item	Type	Legend	DSO753SK	DSO753SJ	DSO753SD
Output Specification	-	-	LV-PECL	LVDS	HCSL
Output Frequency Range	f _o	-	13.5 to 212.5MHz		
Supply Voltage	V _{cc}	-	+2.5V±0.125V/+3.3V±0.165V		
Frequency Tolerance (Includes frequency tolerance at room temperature.)	f _{tol}	-	±50×10 ⁻⁶ max., ±100×10 ⁻⁶ max.		
Storage Temperature Range	T _{stg}	-	-40 to +85°C		
Operating Temperature Range	T _{use}	-	-10 to +70°C, -40 to +85°C		
Current Consumption	I _{cc}	-	45mA max. (f _o ≤170MHz), 50mA max. (170MHz<f _o ≤212.5MHz)	20mA max.	30mA max. (f _o ≤170MHz), 35mA max. (170MHz<f _o ≤212.5MHz)
Stand-by Current (#1 pin "L" Level)	I _{std}	-	10μA max.		
Load Condition	Load-R	-	50Ω to V _{CC} -2V	100Ω (Output-OutputN)	50Ω
Symmetry	SYM	-	45 to 55% [at outputs cross point]		
0 Level Output Voltage	V _{OL}	-	V _{CC} -1.81 to V _{CC} -1.62V	-	-0.15 to 0.15V
1 Level Output Voltage	V _{OH}	-	V _{CC} -1.025 to V _{CC} -0.88V	-	0.58 to 0.85V
Rise and Fall Time	t _r , t _f	-	0.5ns max. [20 to 80% Output, OutputN]	0.4ns max. [20 to 80% Output-OutputN]	0.5ns max. [0.175 to 0.525V Level]
Differential Output Voltage	V _{OD1} , V _{OD2}	-	-	0.247 to 0.454V	-
Change to V _{od}	ΔV _{od}	-	-	50mV [ΔV _{od} = V _{OD1} -V _{OD2}]	-
Offset Voltage	V _{os}	-	-	1.125 to 1.375V	-
Offset to V _{os}	ΔV _{os}	-	-	50mV	-
Crossing Point Voltage	V _{cr}	-	-	-	250 to 550mV
OE Pin 0 Level Input Voltage	V _{IL}	-	V _{CC} ×0.3 max.		
OE Pin 1 Level Input Voltage	V _{IH}	-	V _{CC} ×0.7 min.		
Output Disable Time	t _{PLZ}	-	200ns		
Output Enable Time	t _{PZL}	-	2ms		
Period Jitter (1)	t _{RMS}	-	5ps typ. (13.5MHz≤f _o <27MHz) / 2.5ps typ. (27MHz≤f _o ≤212.5MHz) (σ)		
	t _{p-p}	-	33ps typ. (13.5MHz≤f _o <27MHz) / 22ps typ. (27MHz≤f _o ≤212.5MHz) (Peak to peak)		
Total Jitter (1)	t _{TL}	-	50ps typ. (13.5MHz≤f _o <27MHz) / 35ps typ. (27MHz≤f _o ≤212.5MHz) [t _{DJ} + n×t _{RJ} n=14.1 (BER=1×10 ⁻¹²) (2)]		
Phase Jitter	t _{pj}	-	1.5ps max. (13.5MHz≤f _o <27MHz) / 1ps max. (27MHz≤f _o ≤212.5MHz) [13.5MHz≤f _o <40MHz, f _o offset: 12kHz to 5MHz f _o ≥40MHz, f _o offset: 12kHz to 20MHz]		
Packing Unit (3)	-	-	1000pcs./reel (φ254)		

- (1) Measured WAVECREST DTS-2075
 (2) t_{DJ}: Deterministic jitter t_{RJ}: Random
 (3) Moisture prevention packing is unnecessary.
 Moisture Sensitivity Level: Level 1 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

[mm]

■ Dimensions

7.3±0.2
4.9±0.2
1.5±0.2
2.54
3.65
1.4
1.05

#6 #5 #4
#1 Index #1 #2 #3
#6 #5 #4

■ Recommended Land Pattern

<Top View>

2.54 2.54
4.2
1.8

Model Code
 DSO753SJ (2.5V, 3.3V) → O753SJA
 DSO753SK (2.5V) → O753SKB
 DSO753SK (3.3V) → O753SKA
 DSO753SD (2.5V, 3.3V) → O753SDA

Pin Connections

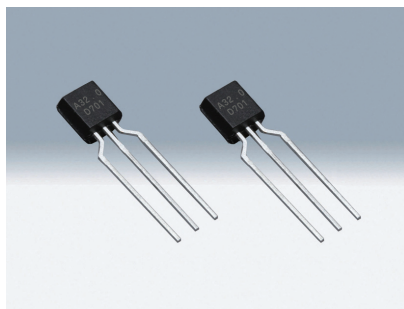
Pin No.	Connection
#1	OE (Output Enable)
#2	NC
#3	GND
#4	Output
#5	OutputN
#6	V _{CC}

Function

#1 Input	#4/#5 Output condition
H	Oscillation out
Open	Oscillation out
L	High Z

Crystal Oscillators

DLO555MBA



■ Features

- Small crystal oscillator in TO92 package
- Built-in bypass capacitor to improve noise resistance
- No PLL, No multiplier in oscillation circuit (The divider circuit, some cases be used)
- High-speed oscillation start up time(1ms)
- CMOS Level Output

■ Type D L O 5 5 5 M B A

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

- ① D : Corporate name (Daishinku)
- ② L : Lead type
- ③ O : SPXO
- ④, ⑤ 5 : Dimensions
- ⑥ 5 : 3 terminals
- ⑦ M : Mold type
- ⑧ B : Vcc : 5V, CMOS Level Output
- ⑨ A : Improved impact electric field resistance



■ Applications

- Gaming equipment
- Industrial equipment

■ Absolute Maximum Ratings

Item	Legend	Spec.	Unit
Supply Voltage	V _{CC}	-0.5 to +6.0	V
Output Pin Voltage	V _{OUT}	-0.5 to V _{CC} +0.5	V
Output Pin Current	I _{OUT}	10	mA
Storage Temperature Range	T _{str}	-40 to +105	°C

■ Recommended Operating Conditions

Item	Legend	min.	typ.	max.	Unit
Supply Voltage	V _{CC}	3.0	5.0	5.5	V
Load Condition	L _{CMOS}	-	-	15	pF
				30	
Operating Temperature Range	T _{opr}	-10	-	+85	°C

■ Standard Specification

Item	Legend	Spec.			Unit	Condition
		min.	typ.	max.		
Output Frequency Range	f ₀	1.5	-	54	MHz	L _{CMOS} : 30pF
Frequency Tolerance	f _{tol}	-100	-	+100	×10 ⁻⁶	T _{opr} =-10 to +85°C V _{CC} =+3.0 to +5.5V
		-50		+50		
Aging	-	-	-	±5	×10 ⁻⁶ /year	
Current Consumption	I _{CC}	-	-	8	mA	No load
Symmetry	SYM	45	-	55	%	50% V _{CC} level
0 Level Output Voltage	V _{OL}	-	-	V _{CC} ×0.1	V	
1 Level Output Voltage	V _{OH}	V _{CC} ×0.9	-	-	V	
Rise and Fall Time	t _r ,t _f	-	-	7.5	ns	L _{CMOS} : 30pF 20 to 80% V _{CC} level
Start Up Time	T _{start}	-	-	1	ms	t=0 at 90% V _{CC}
Phase Noise	-	-	-139	-	dBc/Hz	Offset 1kHz
		-	-156	-		Offset 100kHz
Period Jitter (1)	t _{RMS}	-	2.4	-	ps	σ
	t _{p-p}	-	20	-		Peak to peak
Total Jitter (1)	t _{TL}	-	34	-	ps	t _{DJ} +n×t _{RJ} n=14.1 (BER=1×10 ⁻¹²) (2)
Phase Jitter (3)	t _{pj}	-	-	1		10MHz≤f ₀ <54MHz f ₀ offset 12kHz to 5MHz
					40MHz≤f ₀ ≤60MHz f ₀ offset 12kHz to 20MHz	
Built-in Bypass Capacitors Capacitance	C _{bp}	-	0.1	-	μF	V _{CC} to GND capacitance

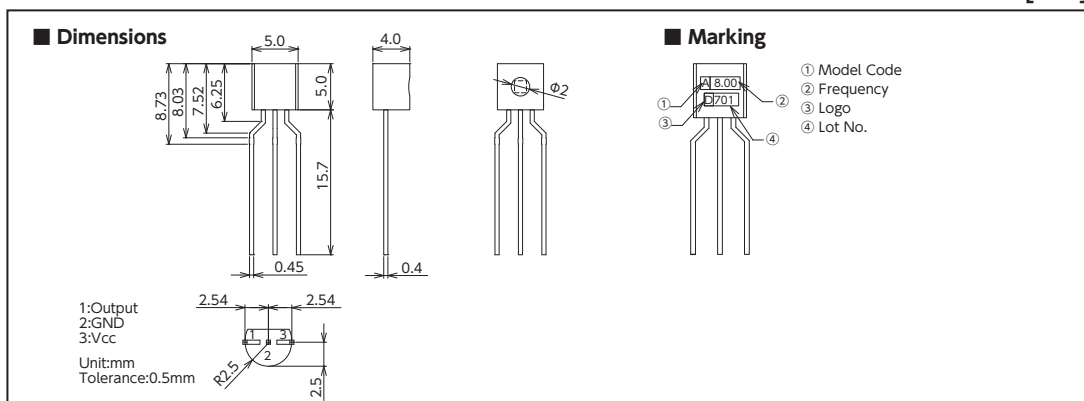
- (1) Measured WAVECREST DTS-2075
 (2) t_{DJ}: Deterministic jitter t_{RJ}: Random jitter
 (3) Measured Keysight Technologies E5052B

Consult our sales representative for other specifications.

*Moisture prevention packing is unnecessary. Moisture Sensitivity Level : Level 1 (IPC/JEDEC J-STD-033)

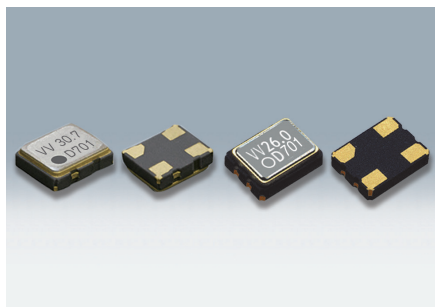
■ Dimensions

[mm]



SMD Voltage Controlled Crystal Oscillators

DSV221SV/DSV321SV



■ Features

- DSV221SV: 2520 size, 0.8 mm height
DSV321SV: 3225 size, 1.1mm height
- The product is an analog VCXO which ensures good variable frequency and a linear changing frequency.
- Low current consumption
- CMOS Level Output

■ Applications

- DVD, Digital TV, STB, backbone transmission equipment



Actual size DSV221SV DSV321SV

■ Standard Specification

Item	Type	Legend	DSV221SV	DSV321SV
Output Frequency Range		f ₀	30.72MHz	6.75 to 125MHz
Supply Voltage		V _{cc}	+3.3V±0.33V	
Frequency Control Voltage		V _{cont}	+1.65V±1.65V	
Storage Temperature Range		T _{stg}	-40 to +85°C	
Operating Temperature Range		T _{use}	-30 to +85°C	-10 to +70°C / -30 to +85°C
Frequency Tolerance (Includes frequency tolerance at room temperature.)		f _{tol}	±40×10 ⁻⁶ max.	
Frequency Adjustment Range		f _{cont}	±100×10 ⁻⁶ min. [Positive Slope]	
Current Consumption		I _{cc}	7mA max. [No Load]	7mA max. (6.75MHz≤f ₀ ≤36MHz) 17mA max. (36MHz<f ₀ ≤70MHz) 27mA max. (70MHz<f ₀ ≤125MHz) [No Load]
Load Condition		L _{CMOS}	15pF	
Symmetry		SYM	40 to 60% [50% V _{cc} Level]	
0 Level Output Voltage		V _{OL}	V _{cc} ×0.1 max.	
1 Level Output Voltage		V _{OH}	V _{cc} ×0.9 min.	
Rise and Fall Time		t _r , t _f	5ns max. [10 to 90% V _{cc} Level]	5ns max. (6.75MHz≤f ₀ ≤90MHz) 3ns max. (90MHz<f ₀ ≤125MHz) [10 to 90% V _{cc} Level]
Period Jitter (1)		t _{RMS}	2.4ps typ. (σ)	
		t _{p-p}	22ps typ. (Peak to peak)	
Total Jitter (1)		t _{TL}	33ps typ. [t _{DJ} + n×t _{RJ} n=14.1 (BER=1×10 ⁻¹²)(2)]	
Phase Jitter		t _{pj}	1ps max. (10MHz≤f ₀ <40MHz, f ₀ offset : 12kHz to 5MHz, f ₀ ≥40MHz, f ₀ offset : 12kHz to 20MHz)	
Packing Unit (3)		-	2000pcs./reel (φ180)	

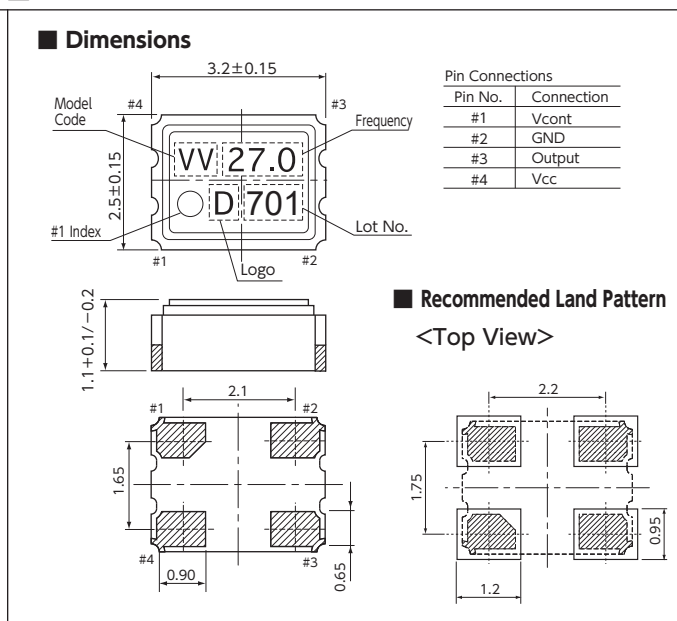
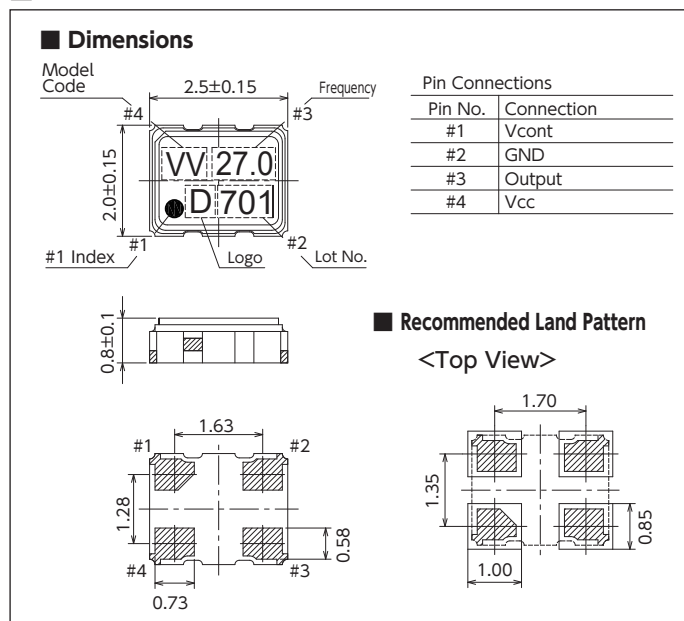
- (1) Measured WAVECREST DTS-2075
 (2) t_{DJ}: Deterministic jitter t_{RJ}: Random jitter
 (3) Moisture prevention packing is unnecessary.
 Moisture Sensitivity Level : Level 1 (IPC/JEDEC J-STD-033)

Consult our sales representative for other specifications.

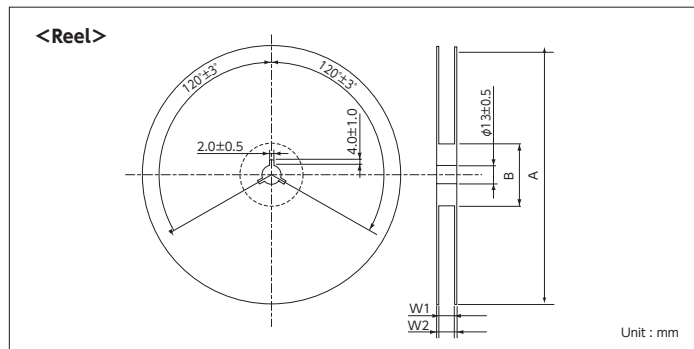
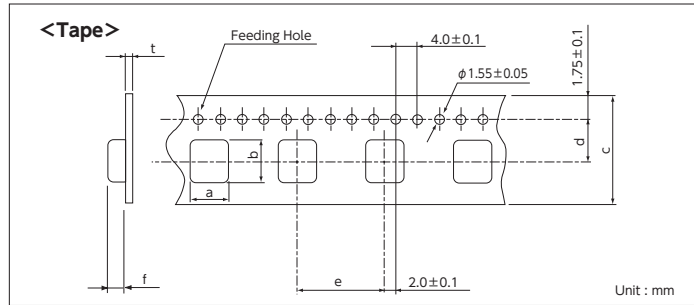
■ DSV221SV

■ DSV321SV

[mm]



Emboss Carrier Tape (SMD Crystal Oscillators)



Standard Specification

VC-TCXO/TCXO

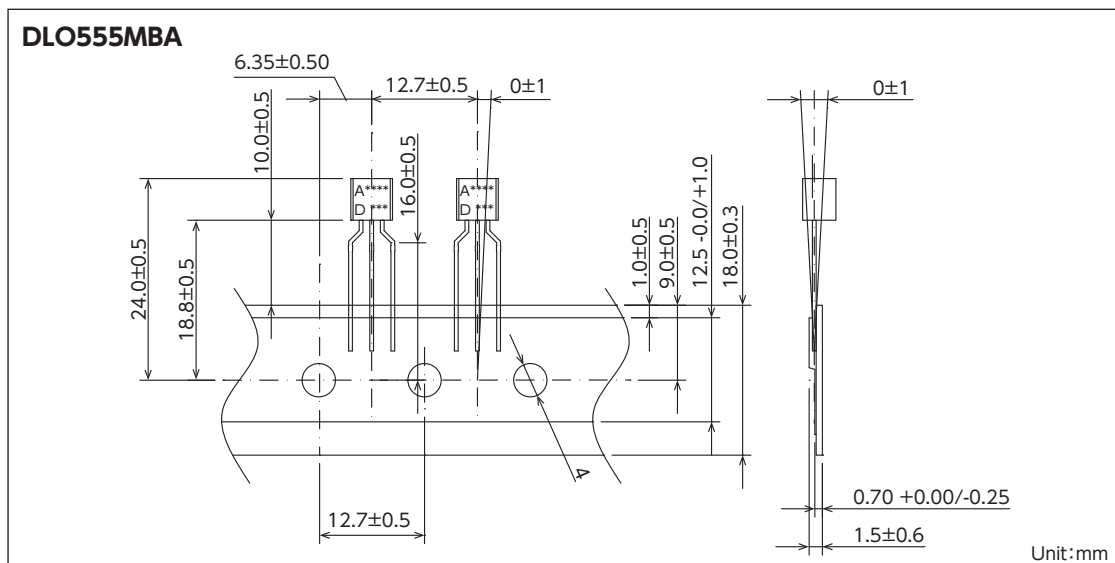
TYPE	a	b	c	d	e	f	t	A	B	W1	W2
DSA/DSB535SGA DSA535SGB	3.5 ±0.1	5.4 ±0.1	12.0 ±0.2	5.50 ±0.1	8.0 ±0.1	1.7 ±0.1	0.30 ±0.05	φ330 ±2	φ100 ±1	13.5 ±1.0	18.5 max.
DSK321STD DSA/DSB321SDN	2.8 ±0.1	3.5 ±0.1	8.0 ±0.2	3.50 ±0.05	4.0 ±0.1	1.5 ±0.1	0.25 ±0.05	φ180 +0/-3	φ60 +1/-0	9.0 ±0.3	11.4 ±1.0
DSA/DSB221SDN DSB221SJA	2.3 ±0.1	2.8 ±0.1	8.0 ±0.2	3.50 ±0.05	4.0 ±0.1	1.15 ±0.1	0.30 ±0.05	φ180 +0/-3	φ60 +1/-0	9.0 ±0.3	11.4 ±1.0
DSA/DSB211SDN/SP DSB211SJA	1.95 ±0.10	2.35 ±0.10	8.0 ±0.2	3.50 ±0.05	4.0 ±0.1	0.85 ±0.1	0.20 ±0.05	φ180 +0/-3	φ60 +1/-0	9.0 ±0.3	11.4 ±1.0
DSA/DSB1612SDN	1.4 ±0.10	1.8 ±0.10	8.0 ±0.2	3.50 ±0.05	4.0 ±0.1	0.7 ±0.1	0.25 ±0.05	φ180 +0/-3	φ60 +1/-0	9.0 ±0.3	11.4 ±1.0
DSK1612ATD	1.45 ±0.10	1.8 ±0.1	8.0 ±0.2	3.50 ±0.05	4.0 ±0.1	0.75 ±0.10	0.25 ±0.05	φ180 +0/-3	φ60 +1/-0	9.0 ±0.3	11.4 ±1.0

SPXO/VCXO/RTC

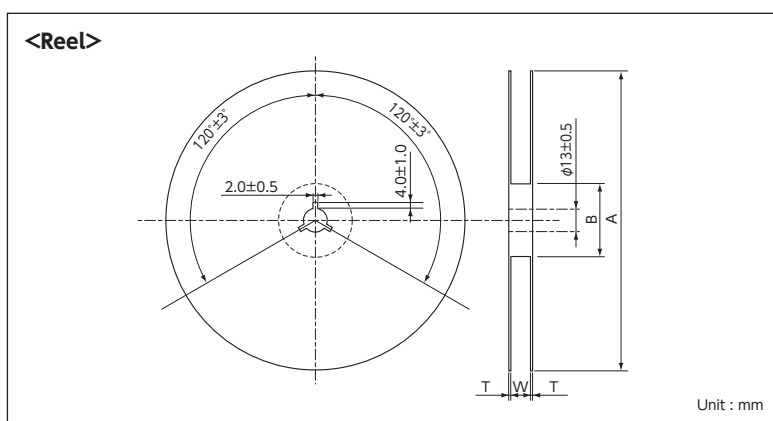
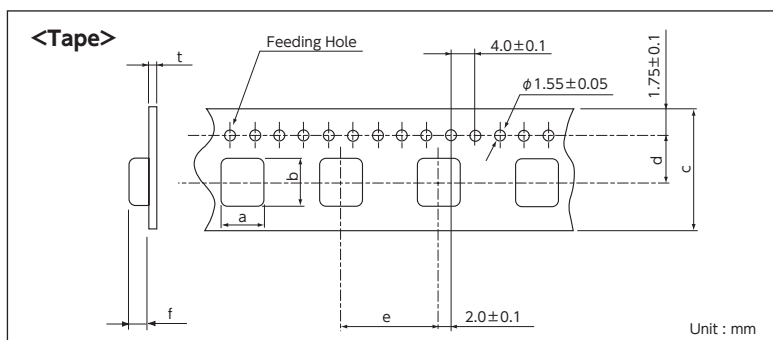
TYPE	a	b	c	d	e	f	t	A	B	W1	W2
DSO751SR DSO751SBM DSO753SK/SJ/SD	5.5 ±0.1	7.9 ±0.1	16.0 ±0.3	7.5 ±0.1	8.0 ±0.1	2.4 ±0.1	0.30 ±0.05	φ254 ±2	φ80 ±0.5	17.0 ±0.5	21.0 ±1.0
DSO531SR DSO531SBM DSO533SK/SJ	3.6 ±0.1	5.45 ±0.1	12.0 ±0.2	5.50 ±0.05	8.0 ±0.1	1.55 ±0.10	0.30 ±0.05	φ180 +0/-3	φ60 +1/-0	13.0 ±0.3	15.4 ±1.0
DD3225TS DD3225TR DSO323SK/SJ/SD DSO321SR/SH/SY/SRS DSO321SBM DSV321SV	2.8 ±0.1	3.5 ±0.1	8.0 ±0.2	3.50 ±0.05	4.0 ±0.1	1.5 ±0.1	0.25 ±0.05	φ180 +0/-3	φ60 +1/-0	9.0 ±0.3	11.4 ±1.0
DSO221SR/SH/SY/SX/SXF DSO221SBM DSO223SK/SJ/SD DSV221SV	2.3 ±0.1	2.8 ±0.1	8.0 ±0.2	3.50 ±0.05	4.0 ±0.1	1.15 ±0.10	0.30 ±0.05	φ180 +0/-3	φ60 +1/-0	9.0 ±0.3	11.4 ±1.0
DSO211SX/SXF	1.85 ±0.10	2.25 ±0.10	8.0 ±0.2	3.50 ±0.05	4.0 ±0.1	0.95 ±0.10	0.25 ±0.05	φ180 +0/-3	φ60 +1/-0	9.0 ±0.3	11.4 ±1.0
DSO1612AR	1.4 ±0.1	1.8 ±0.1	8.0 ±0.2	3.50 ±0.05	4.0 ±0.1	0.7 ±0.1	0.25 ±0.05	φ180 +0/-3	φ60 +1/-0	9.0 ±0.3	11.4 ±1.0
DS1008JS/JN/JC/JK/JJ	1.0 ±0.05	1.2 ±0.05	8.0 ±0.2	3.50 ±0.05	4.0 ±0.1	0.45 ±0.05	0.20 ±0.05	φ180 +0/-3	φ60 +1/-0	9.0 ±0.3	11.4 ±1.0

- * 1: To indicate product name and other information, place those information on a label, and affix the label on one side of the flange.
 2: DSA/DSB535SGA, DSA535SGB: reel φ180 available.

Radial Tape (Crystal Oscillators)



Emboss Carrier Tape (SMD Monolithic Crystal Filters)



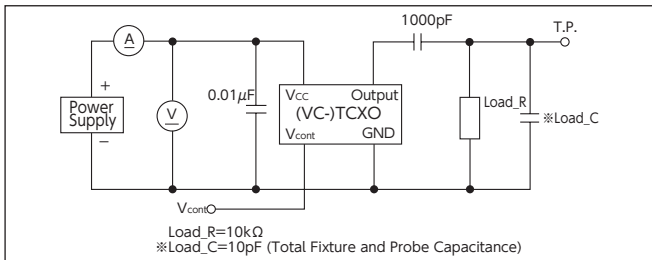
Standard Specification

TYPE	a	b	c	d	e	f	t	A	B	T	W
DSF753S SERIES	5.6 ±0.1	7.6 ±0.1	16.0 ±0.3	7.5 ±0.1	8.0 ±0.1	1.7 ±0.1	0.30 ±0.05	φ178 ±2	φ60 +1/-0	1.2 ±0.5	17.0 ±0.3
DSF633S SERIES	4.0 ±0.1	6.5 ±0.1	12.0 ±0.2	5.5 ±0.05	8.0 ±0.1	1.7 ±0.1	0.30 ±0.05	φ178 ±2	φ60 ±1/-0	1.2 ±0.5	13.0 ±0.3
DSF444S SERIES	4.0 ±0.1	4.0 ±0.1	12.0 ±0.3	5.5 ±0.1	8.0 ±0.1	1.5 ±0.1	0.30 ±0.05	φ178 ±2	φ60 ±1/-0	1.2 ±0.5	13.0 ±0.3
DSF334S SERIES	3.2 ±0.1	3.2 ±0.1	8.0 ±0.2	3.5 ±0.05	4.0 ±0.1	1.5 ±0.1	0.25 ±0.05	φ178 ±2	φ60 +1/-0	1.2 ±0.5	9.0 ±0.3

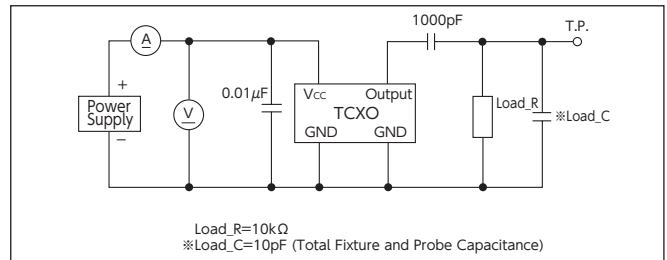
※ 1: To indicate product name and other information, place those information on a label, and affix the label on one side of the flange.
 2: The taping dimensions should be as per JIS C 0806. 1,000 units should be packaged per reel.
 3: The standard packaged quantity per reel is 2,000 units for DSF334S.

Measurement Circuit (Crystal Oscillators)

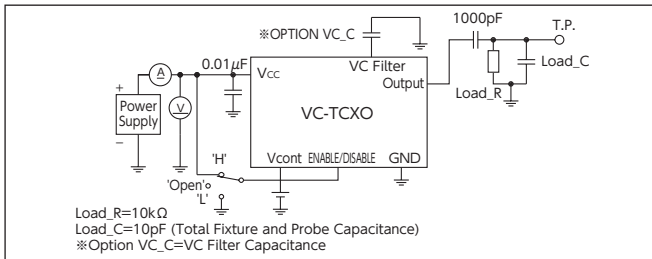
VC-TCXO (DSA***SDN, SP)



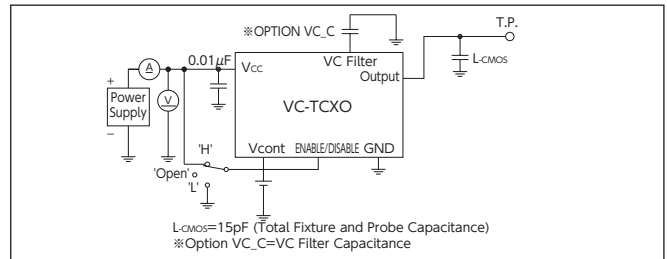
TCXO (DSB***SDN, SP)



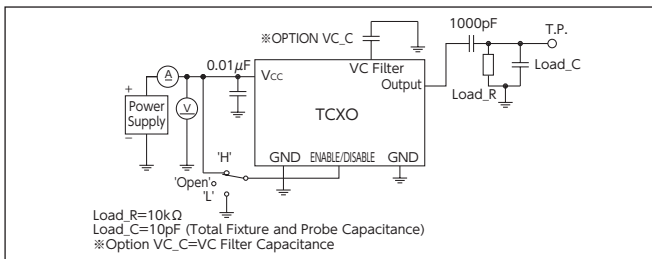
DSA535SGA, DSA535SGB (Clipped Sine)



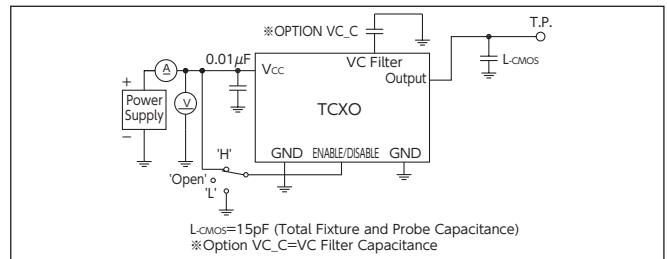
DSA535SGA, DSA535SGB (CMOS)



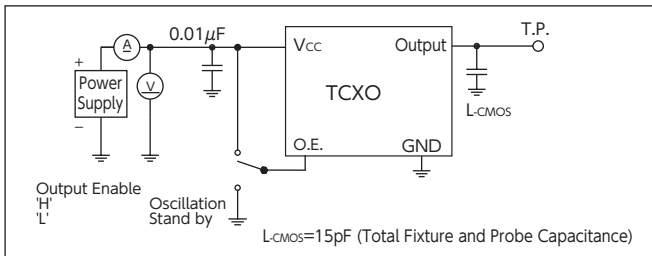
DSB535SGA (Clipped Sine)



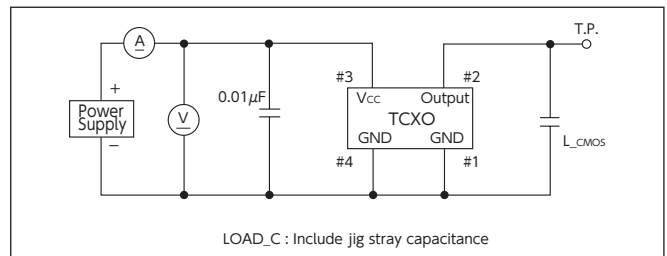
DSB535SGA (CMOS)



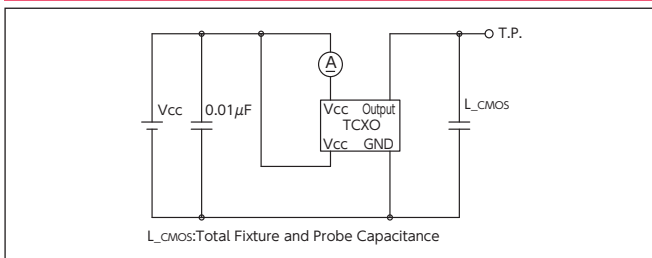
DSB211SJA, 221SJA



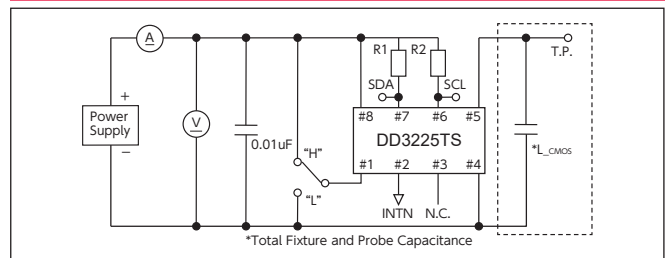
DSK1612ATD



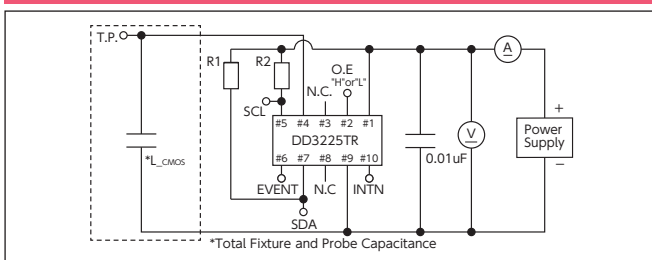
DSK321STD



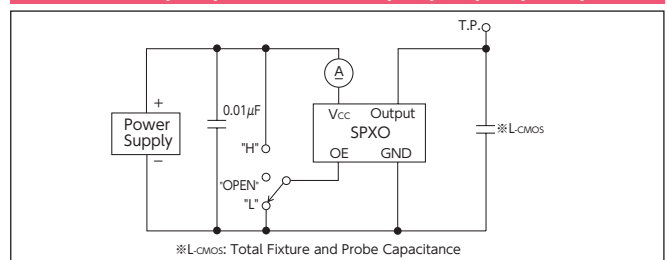
DD3225TS



DD3225TR

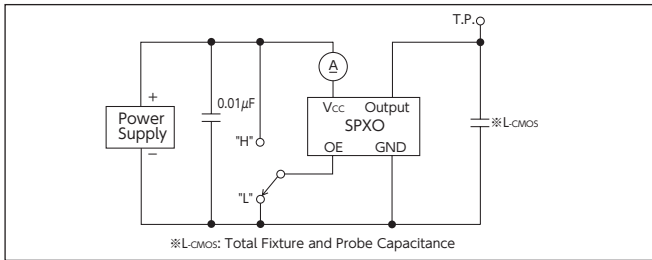


DS1008JS, JN, DSO***AR, SR, SH, SY, SRS, SBM

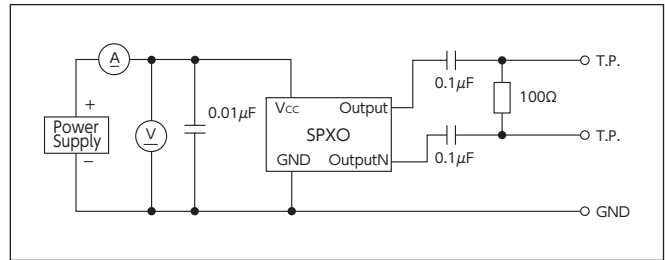


Measurement Circuit (Crystal Oscillators)

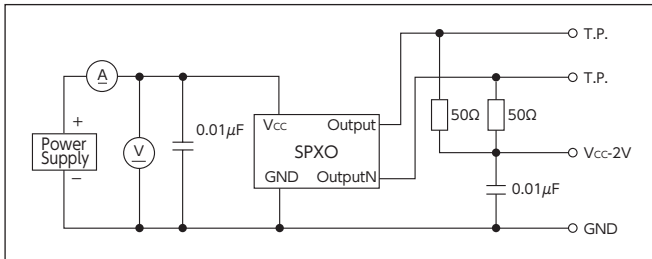
DSO***SX, SXF



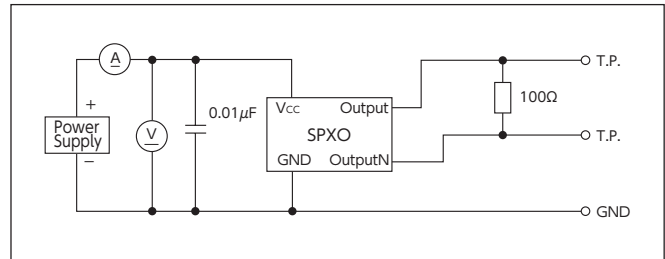
DS1008JC



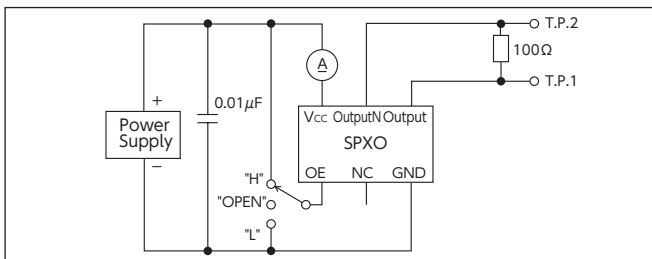
DS1008JK



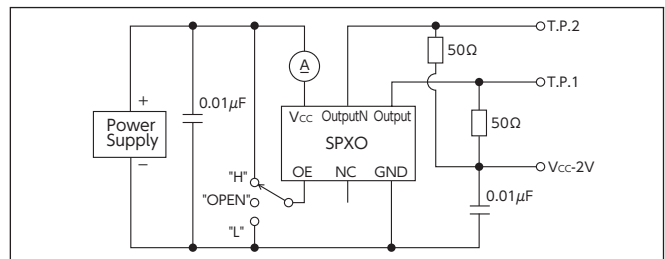
DS1008JJ



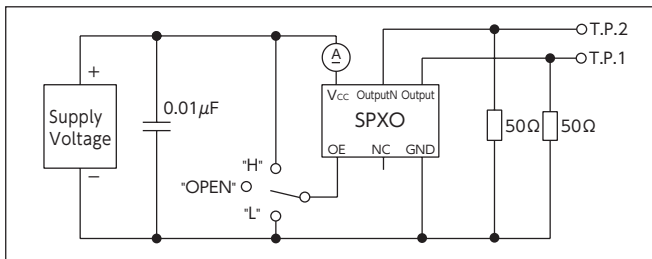
DSO223SJ, DSO323SJ, DSO533SJ, DSO753SJ



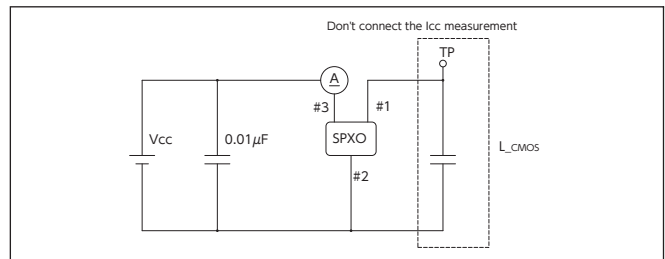
DSO223SK, DSO323SK, DSO533SK, DSO753SK



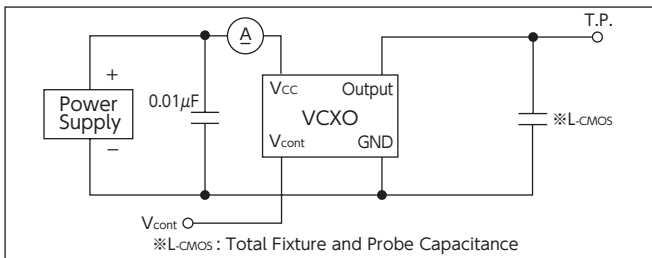
DSO223SD, DSO323SD, DSO753SD



DLO55MBA

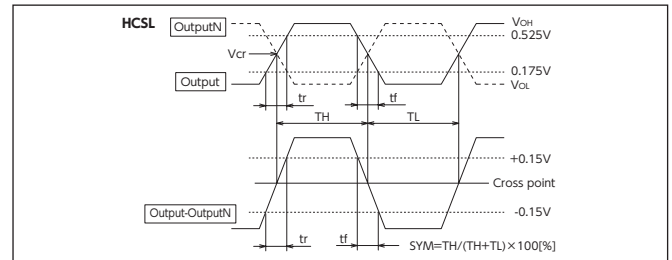
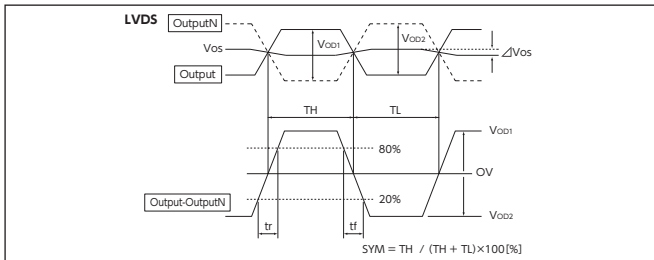
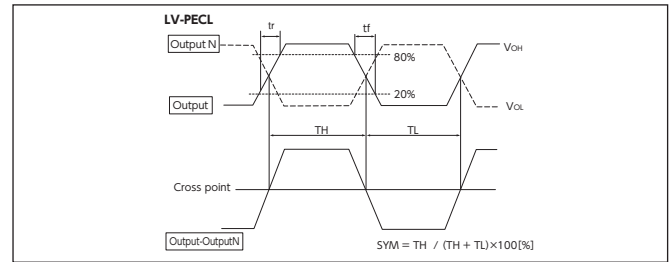
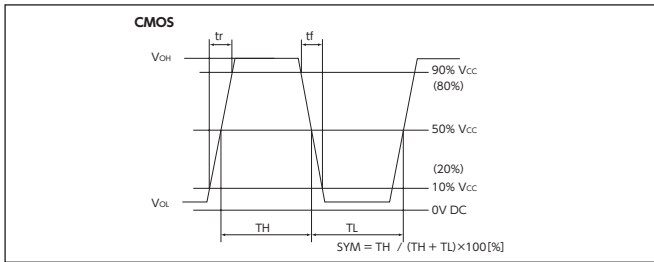


DSV221SV, 321SV



Measurement Circuit

Output Wave Form



Input and Output Conditions

