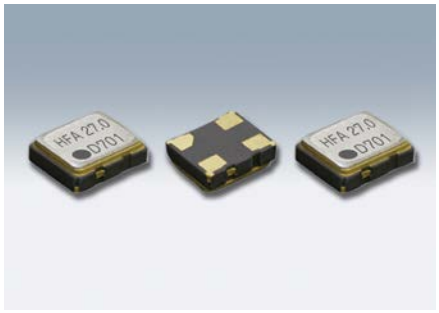
# SMD Low Phase Noise Crystal Oscillators〈For Automotive〉

## DSO221SHF



Actual size

### ■ Features

- Supply Voltage: 1.8V/2.5V/2.8V/3.3V
- Low phase noise: fout ±1kHz -145 dBc/Hz(typ.)
  fout ±100kHz -158 dBc/Hz(typ.)
- Low profile: 0.8mm
- 3-state function
- AEC-Q100/AEC-Q200 Compliant

Pb-Free

RoHS/ELV Compliant

[Function Code]

DSO221SHF A A

A : 3.3V
B : 2.8V
C : 2.5V
D : 1.8V

A,Y : ±100×10⁻⁶
B : ±50×10⁻⁶

When requesting the product, please select the model and function

### ■ Applications

- Multimedia devices such as car navigation systems and car audio
- Automotive radio applications such as Bluetooth, wireless LAN and automotive camera

### ■ Standard Specification

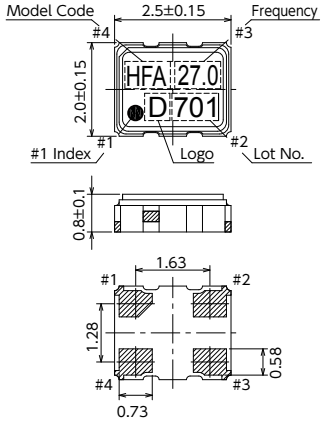
| Item | Function Code | | Output Frequency Range (MHz) | Legend | Spec. | | | | Condition |
|---|---|---|---|---|---|---|---|---|---|
| | Supply Voltage | Frequency tolerance | | | min. | typ. | max. | Unit | |
| Supply Voltage | A | * | 1.5≦f0≦80 | Vcc | +3.0 | +3.3 | +3.6 | V | |
| | B | | | | +2.6 | +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.) | * | Y | 1.5≦f0≦80 | f_tol | −100 | − | +100 | ×10⁻⁶ | −40 to +125℃ L_CMOS=15pF |
| | | A | | | −100 | − | +100 | | −40 to +85℃ |
| | | B | | | −50 | − | +50 | | |
| Current Consumption | A | * | 1.5≦f0<50 | Icc | − | − | 4.9 | mA | No Load |
| | | | 50≦f0≦80 | | − | − | 9.1 | | |
| | B | | 1.5≦f0<50 | | − | − | 4.3 | | |
| | | | 50≦f0≦80 | | − | − | 8.1 | | |
| | C | | 1.5≦f0<50 | | − | − | 4.0 | | |
| | | | 50≦f0≦80 | | − | − | 7.6 | | |
| | D | | 1.5≦f0<50 | | − | − | 3.7 | | |
| | | | 50≦f0≦80 | | − | − | 6.2 | | |
| Stand-by Current(#1 pin "L" Level) | * | * | * | I_std | − | − | 10 | μA | |
| Load Condition | * | * | * | L_CMOS | − | − | 15 | pF | |
| Symmetry | * | * | * | SYM | 45 | 50 | 55 | % | at 50% Vcc |
| 0 Level Output Voltage | * | * | * | VOL | − | − | Vcc×0.1 | V | |
| 1 Level Output Voltage | * | * | * | VOH | Vcc×0.9 | − | − | | |
| Rise and Fall Time | * | * | 1.5≦f0<50 | tr, tf | − | − | 8 | ns | 10 to 90% Vcc Level |
| | | | 50≦f0≦80 | | − | − | 6 | | |
| OE Pin 0 Level Input Voltage | * | * | * | VIL | − | − | Vcc×0.2 | V | |
| OE Pin 1 Level Input Voltage | * | * | * | VIH | Vcc×0.8 | − | − | | |
| Output Disable Time | * | * | * | tPLZ | − | − | 150 | ns | |
| Output Enable Time | * | * | * | tPZL | − | − | 3 | ms | |
| Phase Noise | A·B·C | * | 10≦f0<50 | − | − | −145 | − | dBc/Hz | Offset 1kHz |
| | D | | | | − | −140 | − | | |
| | A·B·C·D | | 50≦f0≦80 | | − | −135 | − | | |
| | A·B·C | | 10≦f0<50 | | − | −158 | − | | Offset 100kHz |
| | D | | | | − | −152 | − | | |
| | A·B·C | | 50≦f0≦80 | | − | −156 | − | | |
| | D | | | | | −150 | − | | |
| Period Jitter (1) | * | * | * | tRMS | − | 2.4 | − | ps | σ |
| | | | | tp-p | − | 23 | − | | Peak to peak |
| Total Jitter (1) | * | * | * | tTL | − | 34 | − | ps | tDJ+n×tRJ n=14.1(BER=1×10⁻¹²) (2) |
| Phase Jitter | * | * | 40≦f0≦80 | tpj | − | − | 1 | ps | f0 offset12kHz to 20MHz |
| | | | 10≦f0<40 | | | | | | f0 offset12kHz to 5MHz |
| Reliability | AEC-Q100/AEC-Q200 | | | | | | | | |
| Packing Unit (3) | 3000pcs./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.

[mm]

### ■ Dimensions




Pin Connections

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

Function

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

### ■ Recommended Land Pattern

<Top View>