# THE DATASHEET OF

# DSC557-04444KI1

# DSC557-04

## Crystal-less™ Three Output PCIe Clock Generator

## General Description

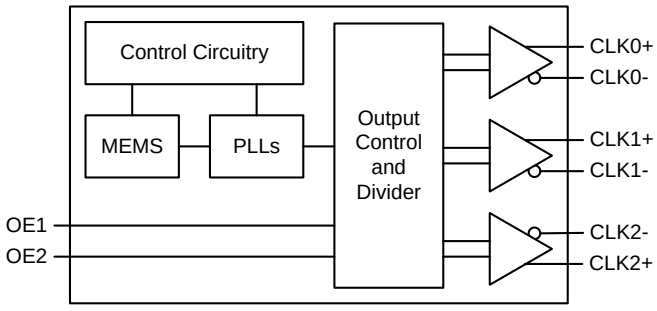
The DSC557-04 is a Crystal-less™, three output PCI express clock generator meeting Gen1, Gen2, and Gen3 specifications. The clock generator uses proven silicon MEMS technology to provide excellent jitter and stability over a wide range of supply voltages and temperatures. By eliminating the external quartz crystal, MEMS clock generators significantly enhance reliability and accelerate product development, while meeting stringent clock performance criteria for a variety of communications, storage, and networking applications.

DSC557-04 has an Output Enable / Disable feature allowing it to disable all outputs when OE1 and OE2 are low. OE1 controls CLK0 and OE2 controls CLK1/2. CLK1/2 are synchronous PCIe clocks. See the OE function diagram for more detail. The device is available in a 20 pin QFN. Additional output formats are in any combination of LVPECL, LVDS, and HCSL.

## Features

- **Meets PCIe Gen1, Gen2 & Gen3 specs**
- **Available Output Formats:**
  - HCSL, LVPECL, or LVDS
  - Mixed Outputs: LVPECL/HCSL/LVDS
- **Wide Temperature Range**
  - Ext. Industrial: -40° to 105° C
  - Industrial: -40° to 85° C
  - Ext. commercial: -20° to 70° C
- **Supply Range of 2.25 to 3.6 V**
- **Low Power Consumption**
  - 30% lower than competing devices
- **Excellent Shock & Vibration Immunity**
  - Qualified to MIL-STD-883
- **Available Footprints:**
  - 20 QFN
- **Lead Free & RoHS Compliant**
- **Short Lead Time: 2 Weeks**

## Block Diagram




* Clk0+/-, Clk1+/- and Clk2 +/- are 100 MHz as per PCIe standards. For other frequencies, please contact the factory.

## Applications

- **Communications/Networking**
  - **Ethernet**
  - **1G, 10GBASE-T/KR/LR/SR, and FcoE**
  - **Routers and Switches**
  - **Gateways, VoIP, Wireless AP's**
  - **Passive Optical Networks**
- **Storage**
  - **SAN, NAS, SSD, JBOD**
- **Embedded Applications**
  - **Industrial, Medical, and Avionics**
  - **Security Systems and Office Automation**
  - **Digital Signage, POS and others**
- **Consumer Electronics**
  - **Smart TV, Bluray, STB**

# Specifications (Unless specified otherwise: T=25° C, VDD =3.3V)

| Parameter | | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage[1] | $V_{DD}$ | | 2.25 | | 3.6 | V |
| Supply Current | $I_{DD}$ | EN pin low – outputs are disabled | | 42 | 46 | mA |
| Supply Current[2] (Two HCSL Outputs) | $I_{DD}$ | EN pin high – outputs are enabled $R_L$=50 Ω, $F_{O1}$=$F_{O2}$=$F_{O3}$=100 MHz | | 100 | | mA |
| Frequency Stability | Δf | Includes frequency variations due to initial tolerance, temp. and power supply voltage | | | ±100<br>±50 | ppm |
| Startup Time[3] | $t_{SU}$ | T=25°C | | | 5 | ms |
| Input Logic Levels<br>Input logic high<br>Input logic low | <br>$V_{IH}$<br>$V_{IL}$ | | <br>0.75x$V_{DD}$<br>- | | <br>-<br>0.25x$V_{DD}$ | V |
| Output Disable Time[4] | $t_{DA}$ | | | | 5 | ns |
| Output Enable Time | $t_{EN}$ | | | | 20 | ns |
| Pull-Up Resistor[2] | | Pull-up on OE pin | | 40 | | kΩ |

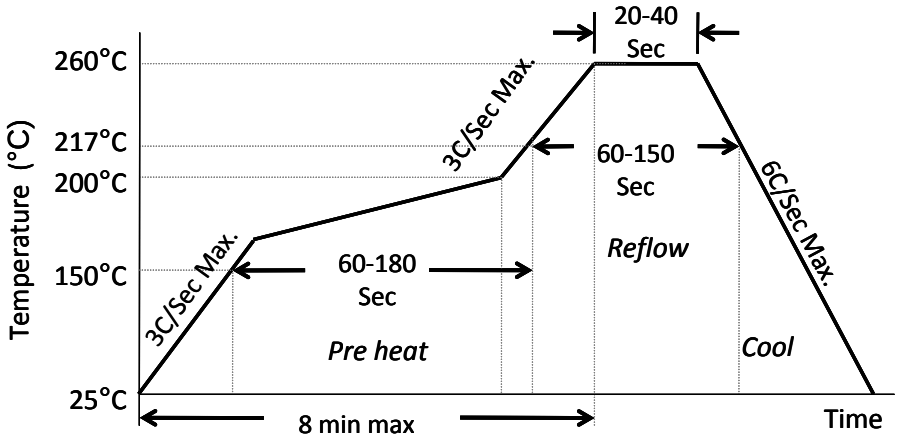
| HCSL Outputs[6] | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | | **Condition** | **Min.** | **Typ.** | **Max.** | **Unit** |
| Output Logic Levels<br>Output logic high<br>Output logic low | <br>$V_{OH}$<br>$V_{OL}$ | $R_L$=50Ω | <br>0.725<br>- | | <br>-<br>0.1 | V |
| Pk to Pk Output Swing | | Single-Ended | | 750 | | mV |
| Output Transition time[4]<br>Rise Time<br>Fall Time | <br>$t_R$<br>$t_F$ | 20% to 80%<br>$R_L$=50Ω, $C_L$= 2pF | 200 | | 400 | ps |
| Frequency | $f_0$ | Single Frequency | 2.3 | 100[7] | 460 | MHz |
| Output Duty Cycle | SYM | Differential | 48 | | 52 | % |
| Period Jitter[5] | $J_{PER}$ | $F_{O1}$=$F_{O2}$= $F_{O3}$ =100 MHz | | 2.5 | | $ps_{RMS}$ |
| Jitter, Phase (Common Clock Architecture) | $T_J$ | PCIe Gen 1.1 | | 22.7 | 86.0[8] | $ps_{p-p}$ |
| | $J_{RMS-CCHF}$ | PCIe Gen 2.1, 1.5MHz to Nyquist | | 2.20 | 3.1[8] | $ps_{RMS}$ |
| | $J_{RMS-CCLF}$ | PCIe Gen 2.1, 10 kHz to 1.5 MHz | | 0.08 | 3.0[8] | $ps_{RMS}$ |
| | $J_{RMS-CC}$ | PCIe Gen 3.0 | | 0.37 | 1.0[8] | $ps_{RMS}$ |
| Integrated Phase Noise (Data Clock Architecture) | $J_{RMS-DCHF}$ | PCIe Gen 2.1, 1.5MHz to Nyquist | | 2.15 | 4.0[8] | $ps_{RMS}$ |
| | $J_{RMS-DCLF}$ | PCIe Gen 2.1, 10 kHz to 1.5 MHz | | 0.06 | 7.5[8] | $ps_{RMS}$ |
| | $J_{RMS-DC}$ | PCIe Gen 3.0 | | 0.32 | 1.0[8] | $ps_{RMS}$ |

Notes:
1. $V_{DD}$ should be filtered with 0.01uf capacitor.
2. Output is enabled if OE pin is floated or not connected.
3. $t_{su}$ is time to 100PPM stable output frequency after $V_{DD}$ is applied and outputs are enabled.
4. Output Waveform and Connection Diagram define the parameters.
5. Period Jitter includes crosstalk from adjacent output.
6. Contact Sales@Discera.com for alternate output options (LVPECL, LVDS, LVCMOS).
7. Contact Sales@Discera.com for alternative frequency options
8. Jitter limits established by Gen 1.1, Gen 2.1, and Gen 3.0 PCIe standards.

## Absolute Maximum Ratings

| Item | Min | Max | Unit | Condition |
|---|---|---|---|---|
| Supply Voltage | -0.3 | +4.0 | V | |
| Input Voltage | -0.3 | $V_{DD}$+0.3 | V | |
| Junction Temp | - | +150 | °C | |
| Storage Temp | -55 | +150 | °C | |
| Soldering Temp | - | +260 | °C | 40sec max. |
| ESD<br>HBM<br>MM<br>CDM | - | <br>4000<br>400<br>1500 | V | |

## Solder Reflow Profile

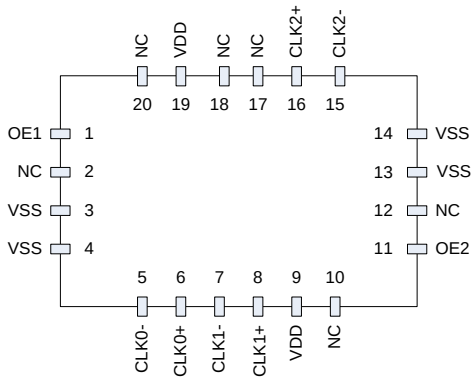



| 20 QFN MSL 1 @ 260°C refer to JSTD-020C | |
|---|---|
| Ramp-Up Rate (200°C to Peak Temp) | 3°C/Sec Max. |
| Preheat Time 150°C to 200°C | 60-180 Sec |
| Time maintained above 217°C | 60-150 Sec |
| Peak Temperature | 255-260°C |
| Time within 5°C of actual Peak | 20-40 Sec |
| Ramp-Down Rate | 6°C/Sec Max. |
| Time 25°C to Peak Temperature | 8 min Max. |

## Pin Description (20 QFN)

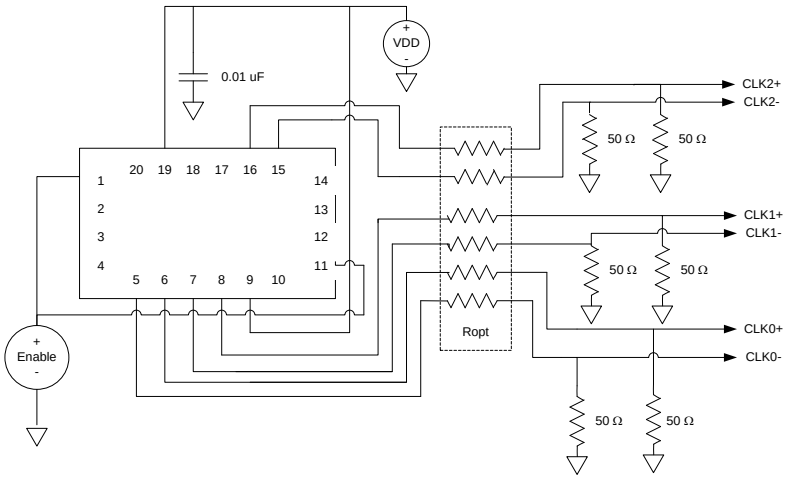
| Pin No. | Pin Name | Pin Type | Description |
|---|---|---|---|
| 1 | OE1 | I | Output Enable; active high |
| 2 | NC | NA | Leave unconnected or grounded |
| 3 | VSS | Power | Ground |
| 4 | VSS | Power | Ground |
| 5 | CLK0- | O | Complement output of differential pair |
| 6 | CLK0+ | O | True output of differential pair |
| 7 | CLK1- | O | Complement output of differential pair |
| 8 | CLK+ | O | True output of differential pair |
| 9 | VDD | Power | Power Supply |
| 10 | NC | NA | Leave unconnected or grounded |
| 11 | OE2 | I | Output Enable; active high |
| 12 | NC | NA | Leave unconnected or grounded |
| 13 | VSS | Power | Ground |
| 14 | VSS | Power | Ground |
| 15 | CLK2- | O | Complement output of differential pair |
| 16 | CLK2+ | O | True output of differential pair |
| 17 | NC | NA | Package pin is Not Connected to internal IC or MEMS |
| 18 | NC | NA | Package pin is Not Connected to internal IC or MEMS |
| 19 | VDD | Power | Power Supply |
| 20 | NC | NA | Leave unconnected or grounded |

## Pin Diagram (20 QFN)

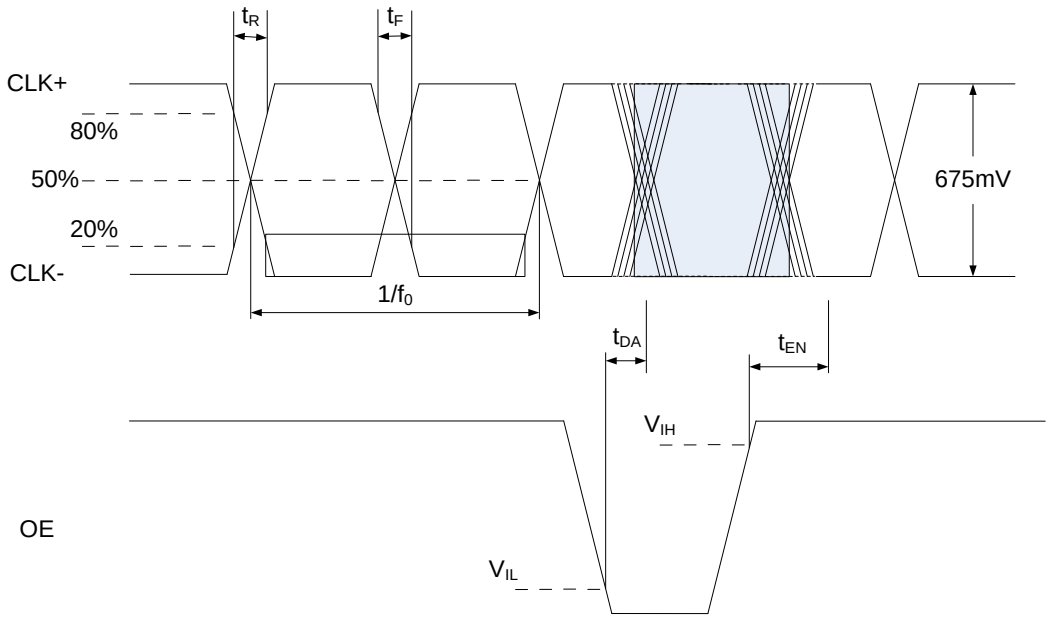



20 QFN 5.0 x 3.2mm

## Connection Diagram (20 QFN Three HCSL Outputs)



## OE Function and Output Waveform: HCSL




| | | | Synchronous | |
|---|---|---|---|---|
| OE1 | OE2 | CLK0 | CLK1 | CLK2 |
| 0 | 0 | Hi-Z | Hi-Z | Hi-Z |
| 0 | 1 | Hi-Z | EN | EN |
| 1 | 0 | EN | Hi-Z | Hi-Z |
| 1 | 1 | EN | EN | EN |

## Ordering Information

**DSC557-04** 4 4 4 K I 0 - T

**CLK 2 Output Format**
1: LVCMOS
2: LVPECL
3: LVDS
4: HCSL

**CLK 1 Output Format**
1: LVCMOS
2: LVPECL
3: LVDS
4: HCSL

**CLK 0 Output Format**
1: LVCMOS
2: LVPECL
3: LVDS
4: HCSL

**Packing**
T: Tape & Reel

**Stability**
0: ±100ppm
1: ±50ppm

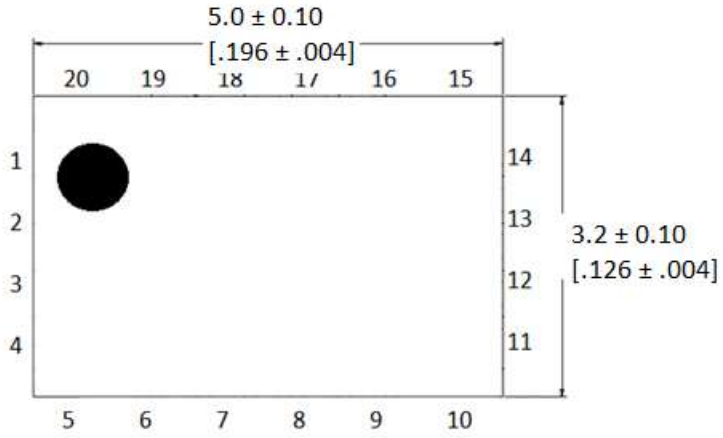
**Temp Range**
E: -20 to 70
I: -40 to 85
L: -40 to 105

**Package**
K: 20 QFN

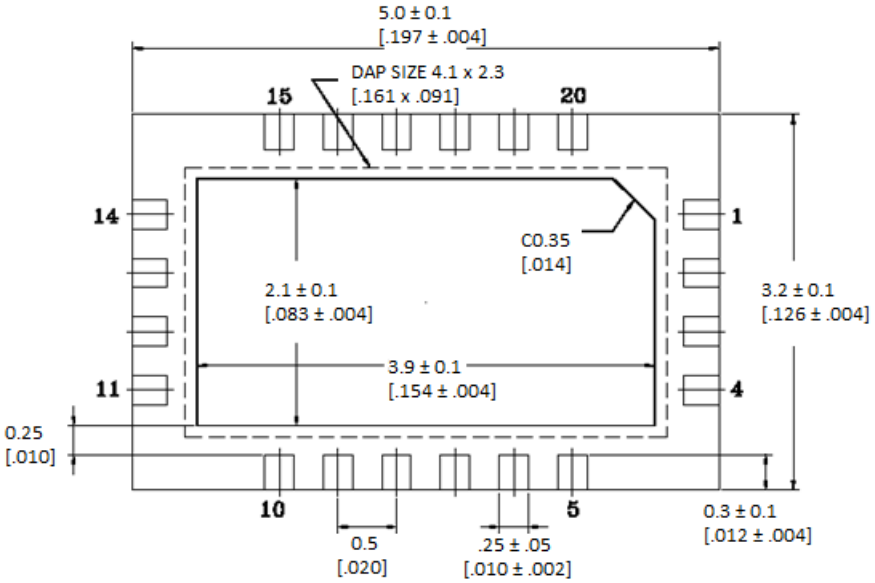
## Package Dimensions

**20 QFN, 5.0 x 3.2 mm**

**Top View**
**units: mm[inches]**

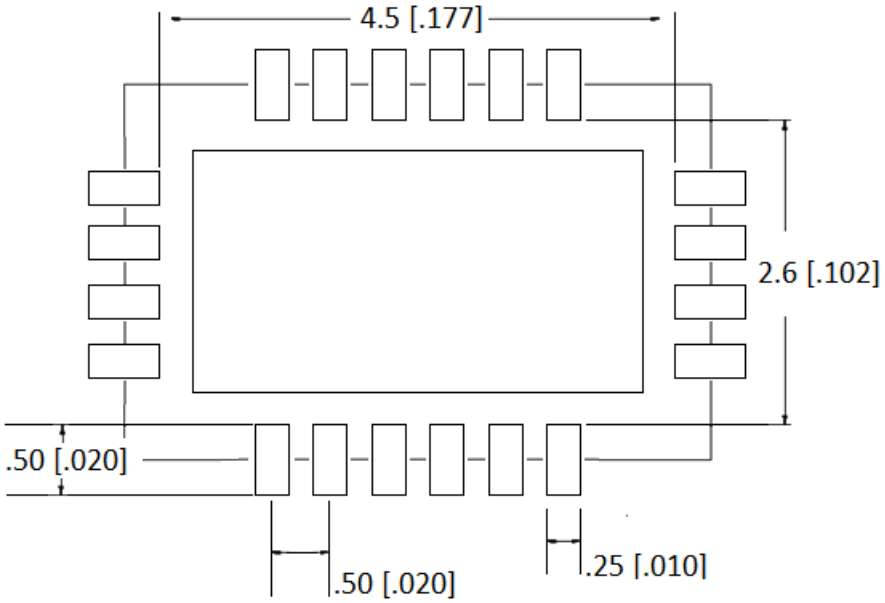



**Bottom View**
**units: mm[inches]±**



**Side View**
**units: mm[inches]**


**Recommended Solder Pad Layout**
**units: mm[inches]**




*Connect the center pad to VSS for best thermal performance

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