

## High Performance Differential MEMS Oscillators

### Features

- Very Low RMS Phase Jitter: <650 fs (typ.)
- High Stability:  $\pm 20$  ppm,  $\pm 25$  ppm,  $\pm 50$  ppm
- Wide Temperature Range:
  - Automotive:  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  (DSC12x LVDS Only)
  - For AEC-Q100 qualified parts, refer to DSA1200 Family
  - Ext. Industrial:  $-40^{\circ}\text{C}$  to  $+105^{\circ}\text{C}$
  - Industrial:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
  - Commercial:  $-20^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$
- Supports LVPECL, LVDS, or HCSL Differential Outputs
- PCIe Gen1-6 Compliant Output
- Wide Frequency Range: 2.5 MHz to 450 MHz
- Small Industry Standard Footprints:
  - 2.5 mm x 2.0 mm
  - 3.2 mm x 2.5 mm
  - 5.0 mm x 3.2 mm
  - 7.0 mm x 5.0 mm
- Excellent Shock and Vibration Immunity
  - Qualified to MIL-STD-883
- High Reliability
  - 20x Better MTF than Quartz Oscillators
- Supply Range of 2.25 to 3.6V
- Standby, Frequency Select, and Output Enable Functions
- Lead-Free and RoHS Compliant

### Applications

- Storage Area Networks
- Passive Optical Networks
- 10/100G Ethernet
- HD/SD/SDI Video and Surveillance
- PCI Express Gen 1/2/3/4/5/6
- Display Port

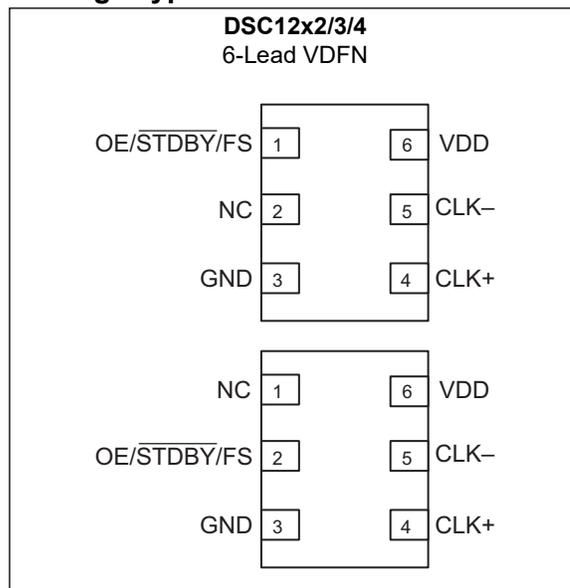
### General Description

The DSC12x2/3/4 family of high performance oscillators utilizes the latest generation of silicon MEMS technology that reduces close-in noise and provides excellent jitter and stability over a wide range of supply voltages and temperatures. By eliminating the need for quartz or SAW technology, MEMS oscillators significantly enhance reliability and accelerate product development, while meeting stringent clock performance criteria for a variety of communications, storage, and networking applications.

The DSC12x2/3/4 family features a control function on pin 1 or pin 2 that permits either a standby feature (complete power down when STDBY is low), output enable (output is tri-stated with OE low), or a frequency select (choice of two frequencies selected by FS high/low). See the Product Identification System section for detailed information.

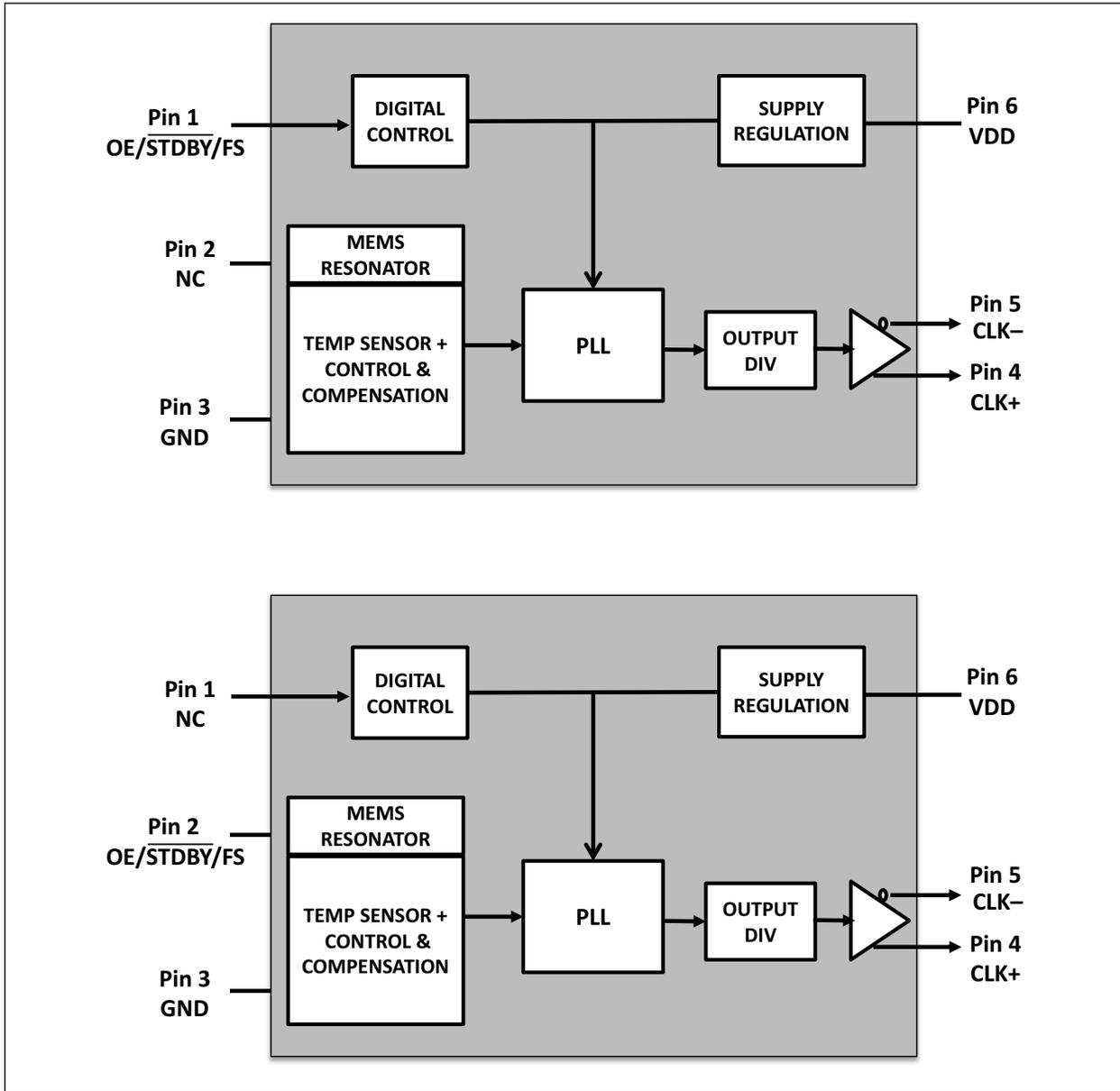
All oscillators are available in industry-standard packages, including the small 2.5 mm x 2.0 mm, and are “drop-in” replacements for standard 6-pin LVPECL/LVDS/HCSL crystal oscillators.

### Package Types



# DSC12X2/3/4

## Functional Block Diagrams



## 1.0 ELECTRICAL CHARACTERISTICS

### Absolute Maximum Ratings †

Supply Voltage .....	-0.3V to +4.0V
Input Voltage .....	-0.3V to $V_{DD} + 0.3V$
ESD Protection (HBM) .....	4 kV
ESD Protection (MM) .....	400V
ESD Protection (CDM) .....	1.5 kV

† **Notice:** Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

### ELECTRICAL CHARACTERISTICS

**Electrical Characteristics:**  $V_{DD} = 2.5V \pm 10\%$  or  $3.3V \pm 10\%$ ;  $T_A = -40^\circ C$  to  $+105^\circ C$ , unless noted.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
Supply Voltage	$V_{DD}$	2.25	—	3.63	V	Note 1
Supply Current	$I_{DD}$	—	50	—	mA	LVPECL, $f_{OUT} = 100$ MHz
		—	32	—		LVDS, $f_{OUT} = 100$ MHz
		—	40	—		HCSL, $f_{OUT} = 100$ MHz
		—	23	—		Output disabled (tri-state), $f_{OUT} = 100$ MHz
Standby Current	$I_{STDBY\_}$	—	2.5	5	$\mu A$	Input pin = $\overline{STDBY}$ = Asserted, ( $V_{DD} = 3.3V$ )
Frequency Stability	$\Delta f$	—	—	$\pm 20$	ppm	Includes frequency variations due to initial tolerance, temp., and power supply voltage
		—	—	$\pm 25$		
		—	—	$\pm 50$		
Aging	$\Delta f$	—	—	$\pm 5$	ppm	First year @ $25^\circ C$
		—	—	$\pm 1$		Per year after first year
Startup Time	$t_{SU}$	—	5.5	6	ms	From 90% $V_{DD}$ to valid clock output, $T = +25^\circ C$ , Note 2
Input Logic Levels	$V_{IH}$	$0.75 \times V_{DD}$	—	—	V	Input logic high
	$V_{IL}$	—	—	$0.25 \times V_{DD}$		Input logic low
Output Disable Time	$t_{DA}$	—	—	25	ns	Note 3
Output Enable Time	$t_{EN}$	—	—	6	ms	$\overline{STDBY}$
		—	—	350	ns	OE
Enable Pull-Up Resistor	—	—	1.5	—	M $\Omega$	Pull-up resistor on pin 1, Note 4

**Note 1:**  $V_{DD}$  pin should be filtered with 0.1  $\mu F$  capacitor.

**2:**  $t_{SU}$  is time to 100 ppm stable output frequency after  $V_{DD}$  is applied and outputs are enabled.

**3:**  $t_{DA}$ : See the Output Waveforms and the Test Circuits sections for more information.

**4:** Output is enabled if pad is floated (not connected).

**5:** Jitter limits are established by Gen 1.1, Gen 2.1, and Gen 3.0 PCIe standards.

# DSC12X2/3/4

## ELECTRICAL CHARACTERISTICS (CONTINUED)

Electrical Characteristics:  $V_{DD} = 2.5V \pm 10\%$  or  $3.3V \pm 10\%$ ;  $T_A = -40^\circ C$  to  $+105^\circ C$ , unless noted.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
<b>LVPECL (DSC12x2)</b>						
Frequency	$f_0$	2.5	—	450	MHz	—
Output Logic Levels	$V_{OH}$	$V_{DD} - 1.145$	—	—	V	$R_L = 50\Omega$
	$V_{OL}$	—	—	$V_{DD} - 1.695$		
Peak-to-Peak Output Swing	$V_{PP}$	—	800	—	mV	Single-Ended
Output Transition Time	$t_R$	—	200	250	ps	20% to 80%, $R_L = 50\Omega$
	$t_F$	—	250	300		
Output Duty Cycle	SYM	48	—	52	%	Differential
Period Jitter RMS	$J_{PER}$	—	2.0	—	ps	$f_0 = 156.25$ MHz, 10k cycles
Period Jitter Peak-to-Peak	$J_{PTP}$	—	20	—	ps	$f_0 = 156.25$ MHz, 10k cycles
Integrated Phase Noise (Random)	$J_{PH}$	—	0.65	—	$ps_{RMS}$	12 kHz to 20 MHz @156.25 MHz
<b>LVDS (DSC12x3)</b>						
Frequency	$f_0$	2.3	—	450	MHz	—
Output Offset Voltage	$V_{OS}$	1.15	1.25	1.35	V	$R = 100\Omega$ Differential
Peak-to-Peak Output Swing	$V_{PP}$	250	350	450	mV	Single-Ended
Output Transition Time	$t_R$	120	170	220	ps	20% to 80%, $R_L = 100\Omega$
	$t_F$					
Output Duty Cycle	SYM	40	—	52	%	Differential
Period Jitter RMS	$J_{PER}$	—	2.5	—	ps	$f_0 = 156.25$ MHz, 10k cycles
Period Jitter Peak-to-Peak	$J_{PTP}$	—	20	—	ps	$f_0 = 156.25$ MHz, 10k cycles
Period Jitter RMS	$J_{PER}$	—	3	—	ps	$f_0 = 156.25$ MHz, $T_A = -40^\circ C$ to $+125^\circ C$
Period Jitter Peak-to-Peak	$J_{PTP}$	—	25	—	ps	$f_0 = 156.25$ MHz, $T_A = -40^\circ C$ to $+125^\circ C$
Integrated Phase Noise (Random)	$J_{PH}$	—	0.65	—	$ps_{RMS}$	12 kHz to 20 MHz @156.25 MHz, $T_A = -40^\circ C$ to $+105^\circ C$
		—	0.9	—		2 kHz to 20 MHz @156.25 MHz, $T_A = -40^\circ C$ to $+105^\circ C$
Phase Jitter	$J_{RMS-CC}$	—	0.025	0.1	$ps_{RMS}$	PCIe Gen 6.0, 64 GT/s

- Note 1:**  $V_{DD}$  pin should be filtered with 0.1  $\mu F$  capacitor.
- Note 2:**  $t_{SU}$  is time to 100 ppm stable output frequency after  $V_{DD}$  is applied and outputs are enabled.
- Note 3:**  $t_{DA}$ : See the Output Waveforms and the Test Circuits sections for more information.
- Note 4:** Output is enabled if pad is floated (not connected).
- Note 5:** Jitter limits are established by Gen 1.1, Gen 2.1, and Gen 3.0 PCIe standards.

## ELECTRICAL CHARACTERISTICS (CONTINUED)

Electrical Characteristics:  $V_{DD} = 2.5V \pm 10\%$  or  $3.3V \pm 10\%$ ;  $T_A = -40^\circ C$  to  $+105^\circ C$ , unless noted.

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
<b>HCSL (DSC12x4)</b>						
Frequency	$f_0$	2.3	—	450	MHz	—
Output Logic Levels	$V_{OH}$	0.64	—	—	V	$R_L = 50\Omega$
	$V_{OL}$	—	—	0.1		
Peak-to-Peak Output Swing	$V_{PP}$	—	750	—	mV	Single-Ended
Output Transition Time	$t_R$	200	260	400	ps	20% to 80%, $R_L = 50\Omega$
	$t_F$	250	370	500		
Output Duty Cycle	SYM	48	—	52	%	Differential
Period Jitter RMS	$J_{PER}$	—	2	—	ps	$f_0 = 100.00$ MHz, 10k cycles
Period Jitter Peak-to-Peak	$J_{PTP}$	—	16	—	ps	$f_0 = 100.00$ MHz, 10k cycles
Integrated Phase Noise (Random)	$J_{PH}$	—	0.617	—	$pS_{RMS}$	12 kHz to 20 MHz @100 MHz $T_A = -40^\circ C$ to $+105^\circ C$
		—	0.460	—		100 kHz to 20 MHz @100 MHz $T_A = -40^\circ C$ to $+105^\circ C$
		—	0.212	—		1.875 MHz to 20 MHz @100 MHz $T_A = -40^\circ C$ to $+105^\circ C$
Phase Jitter	$T_J$	—	3.42	86	$pS_{PP}$	PCIe Gen 1.1, $T_J = D_J + 14.069 \times R_J$ (BER $10^{-12}$ ), <a href="#">Note 5</a>
	$J_{RMS-CCHF}$	—	0.247	3.1	$pS_{RMS}$	PCIe Gen 2.1, 1.5 MHz to Nyquist, <a href="#">Note 5</a>
	$J_{RMS-CCHF}$	—	0.08	3.0	$pS_{RMS}$	PCIeGen2.1, 10 kHz to 1.5 MHz, <a href="#">Note 5</a>
	$J_{RMS-CC}$	—	0.107	1.0	$pS_{RMS}$	PCIe Gen 3.0, <a href="#">Note 5</a>
		—	0.107	0.30		PCIe Gen 4.0, 16 GT/s
		—	0.043	0.12		PCIe Gen 5.0, 32 GT/s
		—	0.054	0.1		PCIe Gen 6.0, 64 GT/s

**Note 1:**  $V_{DD}$  pin should be filtered with 0.1  $\mu F$  capacitor.

**2:**  $t_{SU}$  is time to 100 ppm stable output frequency after  $V_{DD}$  is applied and outputs are enabled.

**3:**  $t_{DA}$ : See the Output Waveforms and the Test Circuits sections for more information.

**4:** Output is enabled if pad is floated (not connected).

**5:** Jitter limits are established by Gen 1.1, Gen 2.1, and Gen 3.0 PCIe standards.

# DSC12X2/3/4

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## TEMPERATURE SPECIFICATIONS (Note 1)

Parameters	Sym.	Min.	Typ.	Max.	Units	Conditions
<b>Temperature Ranges</b>						
Maximum Junction Temperature	$T_J$	—	—	+150	°C	—
Storage Temperature Range	$T_S$	-55	—	+150	°C	—
Lead Temperature	—	—	—	+260	°C	Soldering, 40 sec.

**Note 1:** The maximum allowable power dissipation is a function of ambient temperature, the maximum allowable junction temperature and the thermal resistance from junction to air (i.e.,  $T_A$ ,  $T_J$ ,  $\theta_{JA}$ ). Exceeding the maximum allowable power dissipation will cause the device operating junction temperature to exceed the maximum +150°C rating. Sustained junction temperatures above +150°C can impact the device reliability.

## 2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in [Table 2-1](#) and [Table 2-2](#).

**TABLE 2-1: DSC120x/1x/2x PIN FUNCTION TABLE**

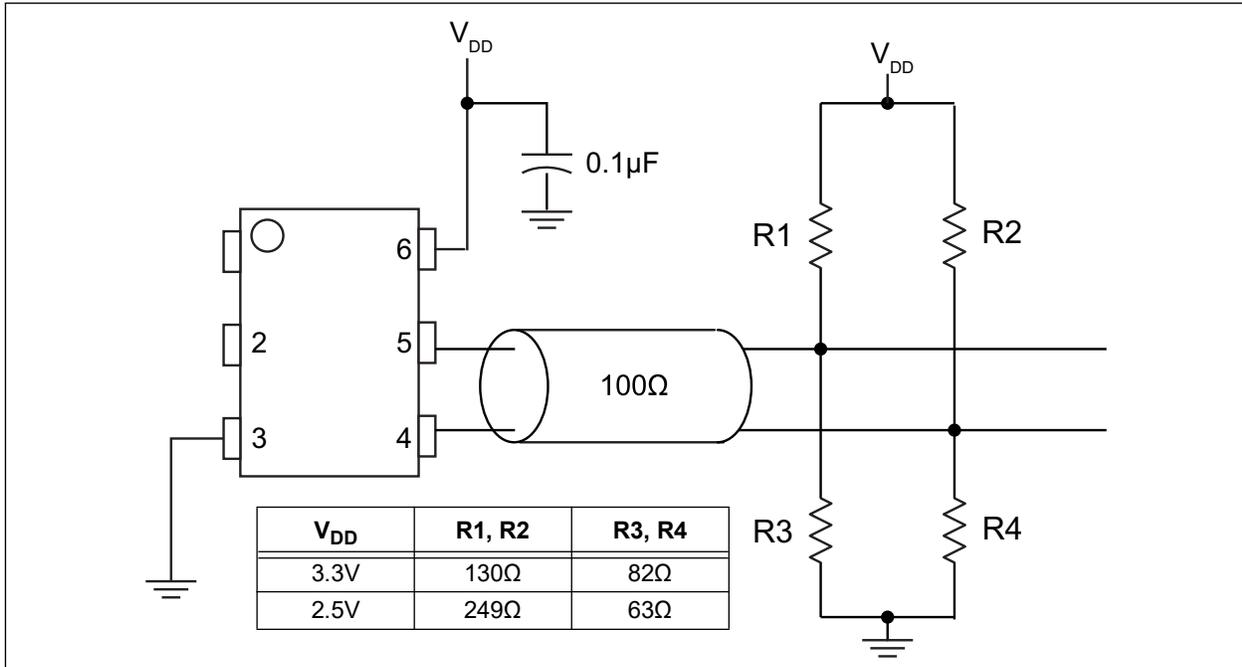
Pin Number	Pin Name	Description
1	OE/ $\overline{\text{STDBY}}$ /FS	Control pin: Output enable/standby/frequency select.
2	NC	No connect.
3	GND	Power supply ground.
4	CLK+	Clock output +.
5	CLK-	Clock output -.
6	VDD	Power supply.

**TABLE 2-2: DSC123x/4x/5x PIN FUNCTION TABLE**

Pin Number	Pin Name	Description
1	NC	No connect.
2	OE/ $\overline{\text{STDBY}}$ /FS	Control pin: Output enable/standby/frequency select.
3	GND	Power supply ground.
4	CLK+	Clock output +.
5	CLK-	Clock output -.
6	VDD	Power supply.

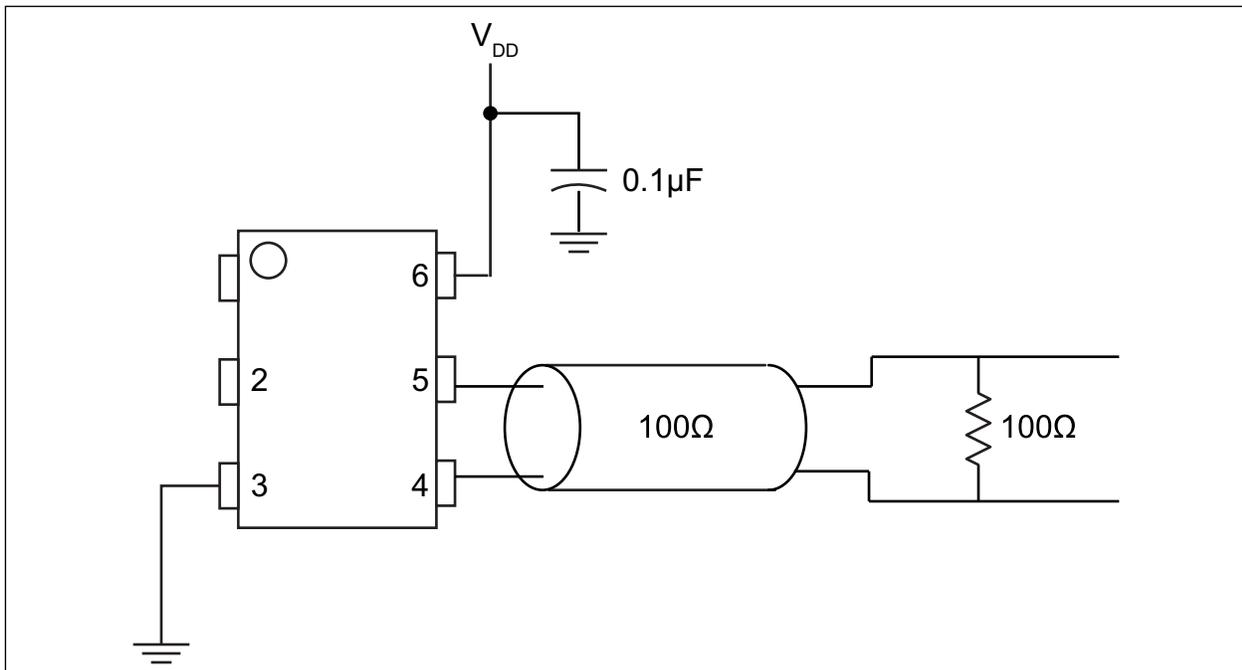
# DSC12X2/3/4

## 3.0 TERMINATION SCHEME

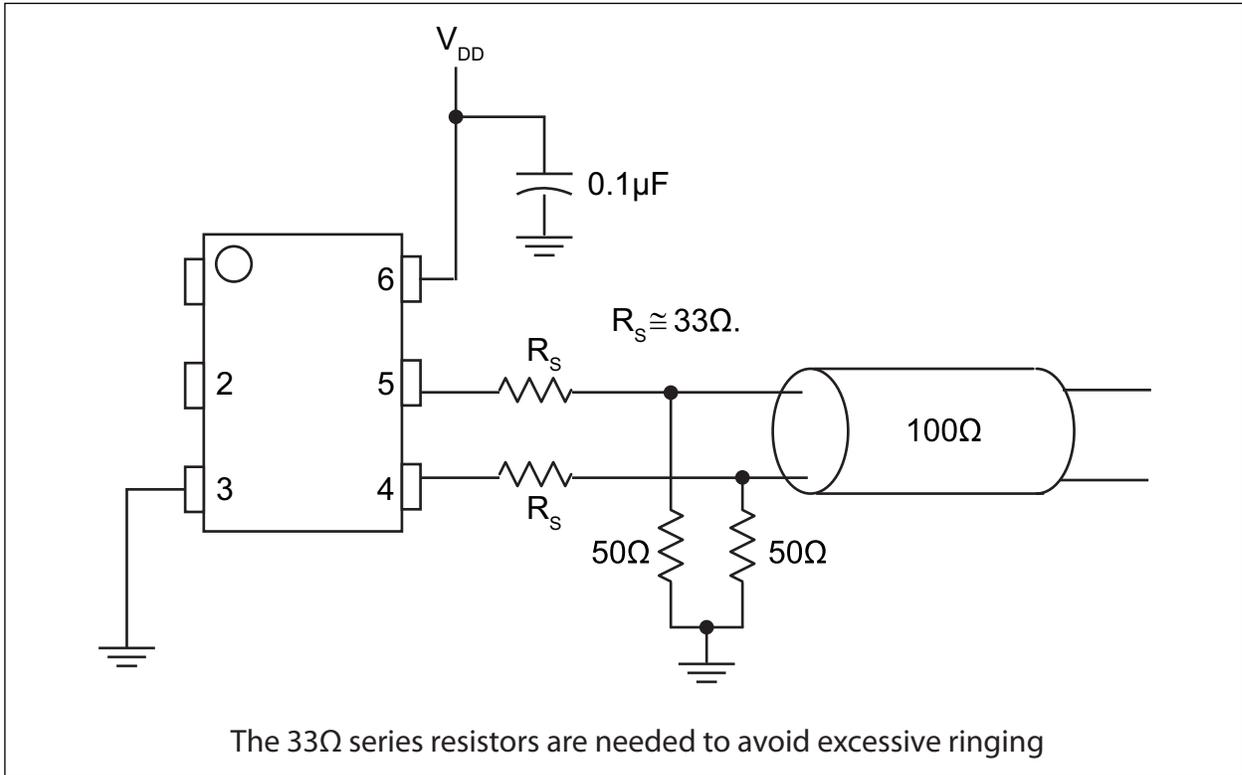


**FIGURE 3-1:** LVPECL Termination (DSC12x2).

In [Figure 3-1](#), Thevenin termination for 3.3V operation. Values will differ for  $V_{DD} = 2.5V$



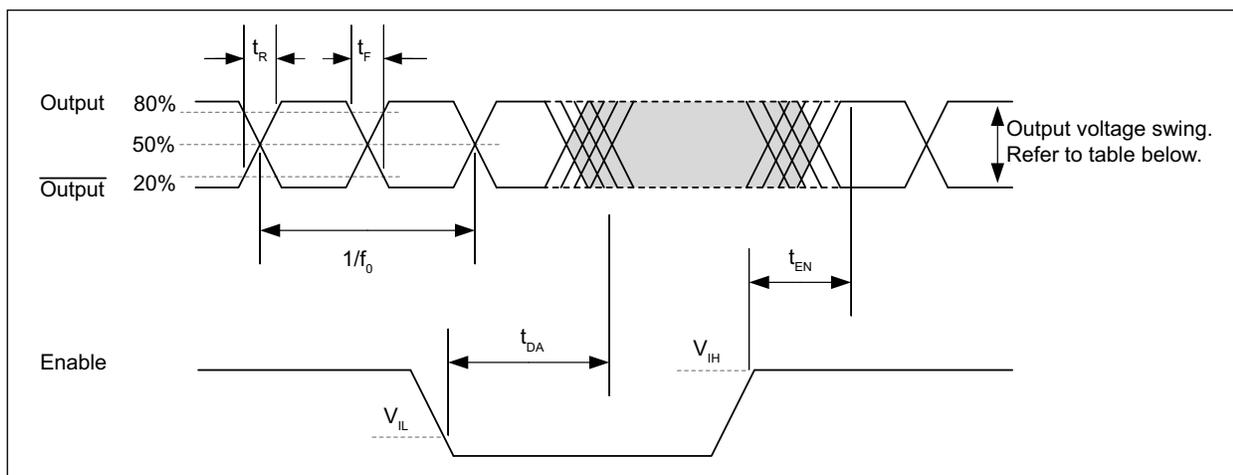
**FIGURE 3-2:** LVDS Termination (DSC12x3).



**FIGURE 3-3:** HCSSL Termination (DSC12x4).

# DSC12X2/3/4

## 4.0 OUTPUT WAVEFORM

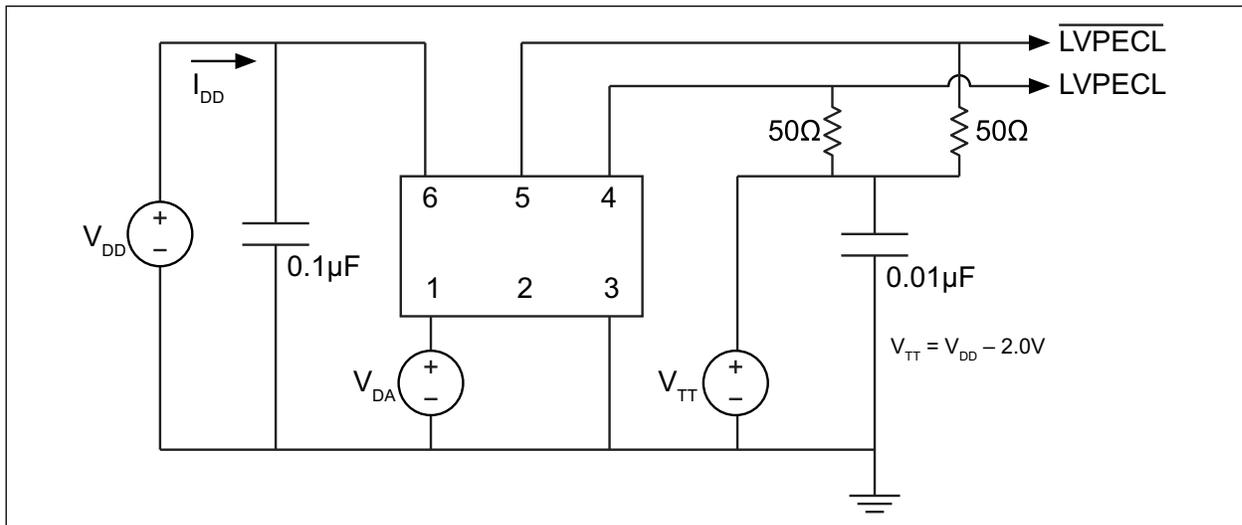


**FIGURE 4-1:** LVPECL, LVDS, and HCSL Output Waveform.

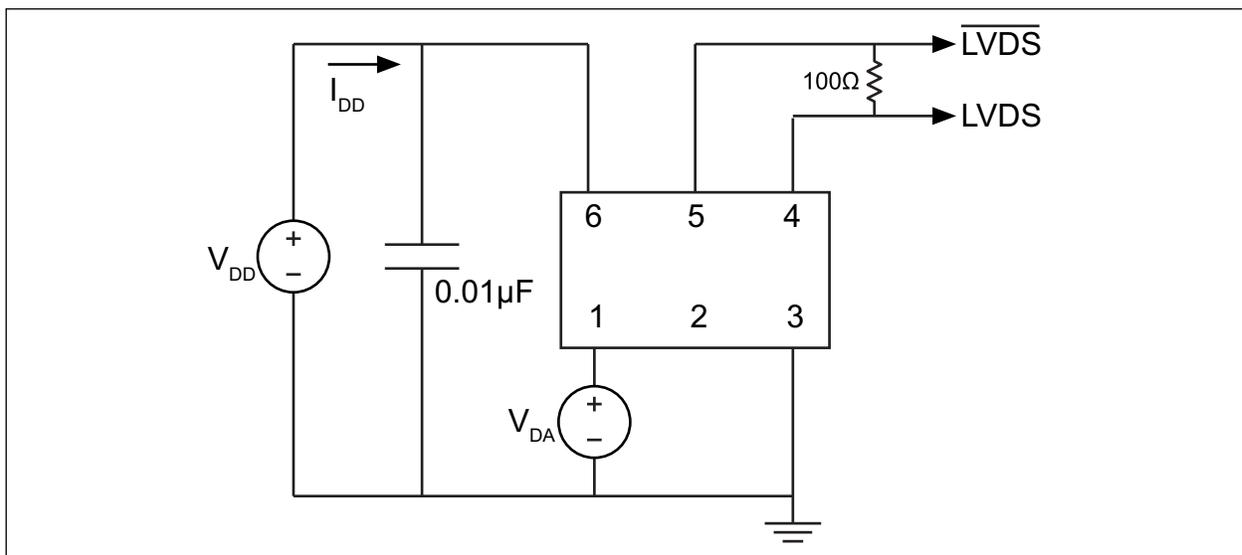
**TABLE 4-1: OUTPUT VOLTAGE SWING BY LOGIC TYPE**

Output Logic Protocol	Typical Peak-to-Peak Output Swing
LVPECL	830 mV
LVDS	350 mV
HCSL	675 mV

## 5.0 TEST CIRCUITS

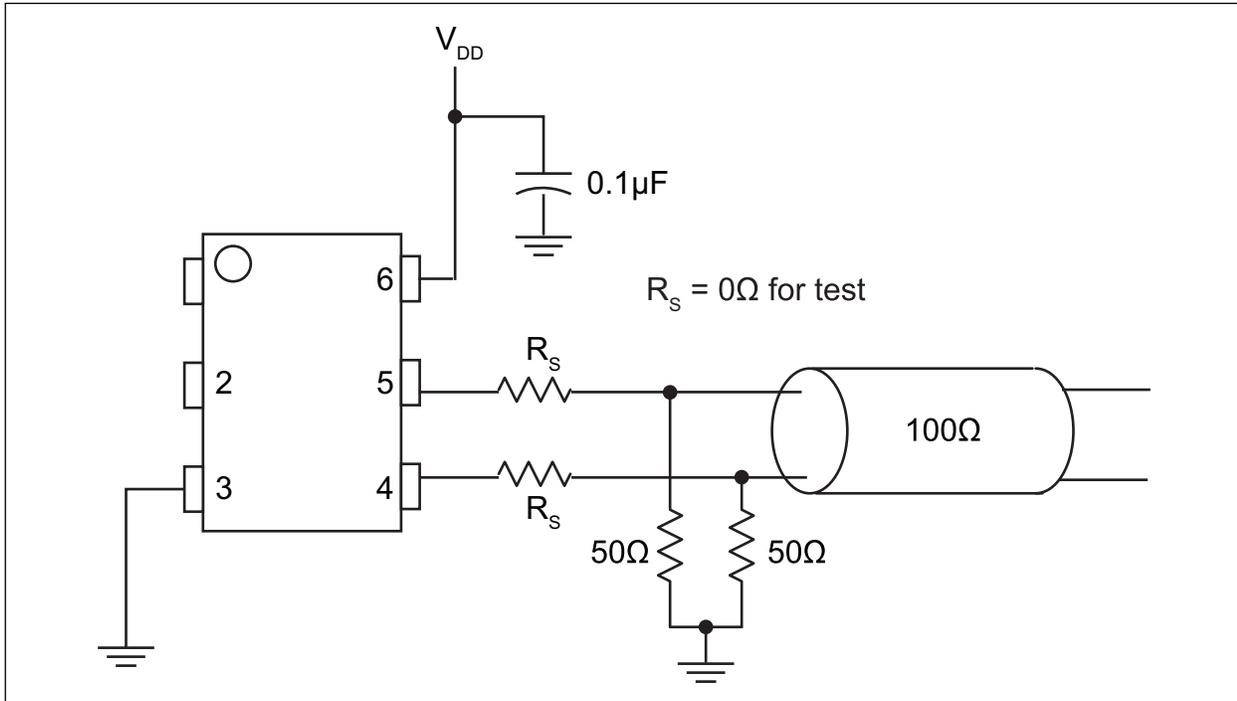


**FIGURE 5-1:** LVPECL Test Circuit.



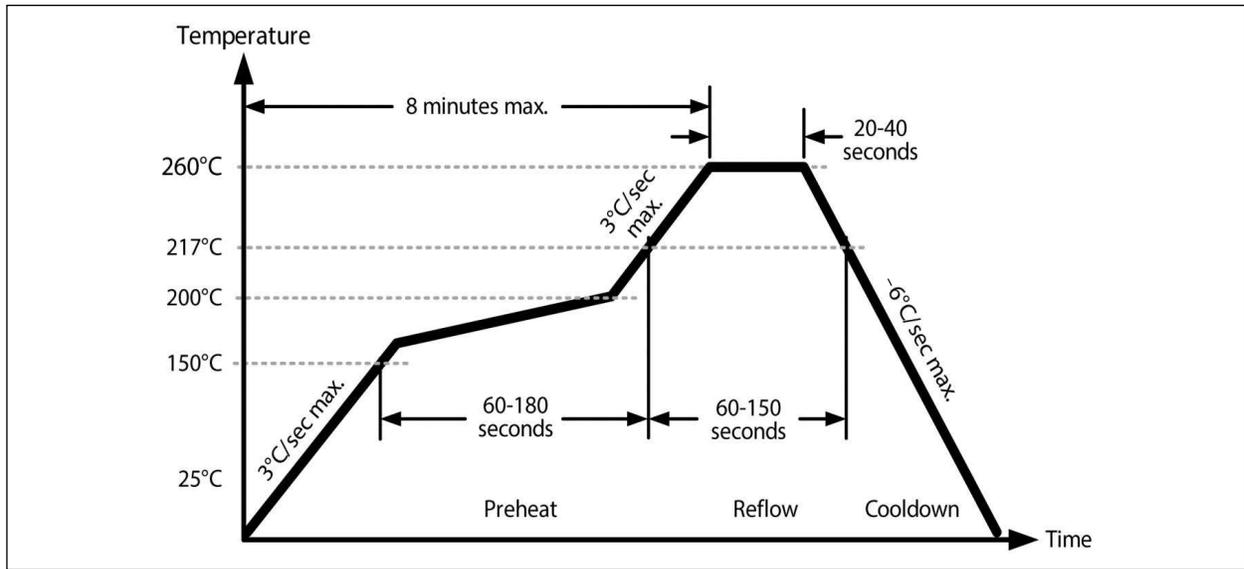
**FIGURE 5-2:** LVDS Test Circuit.

# DSC12X2/3/4



**FIGURE 5-3:** HCSL Test Circuit.

## 6.0 SOLDER REFLOW PROFILE



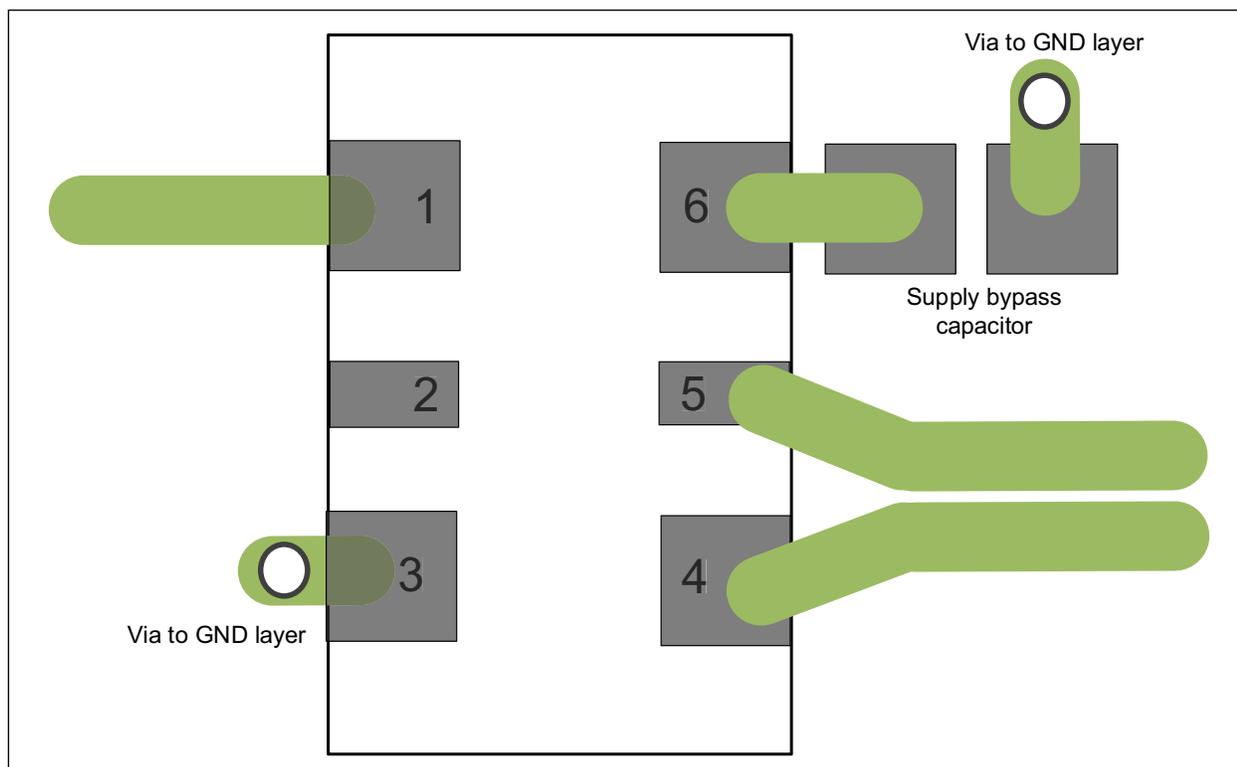
**FIGURE 6-1:** Solder Reflow Profile.

**TABLE 6-1: SOLDER REFLOW**

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°C to 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 minute Max.

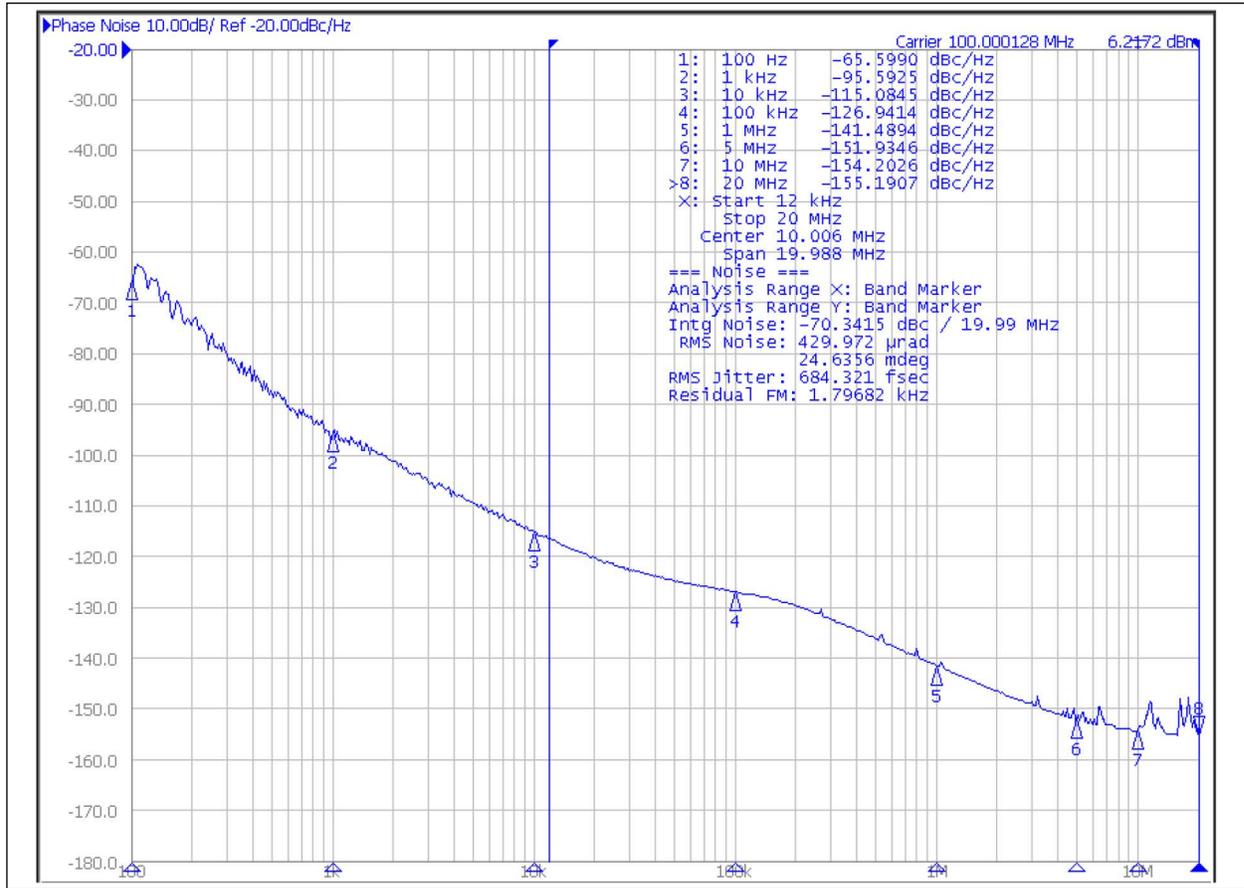
# DSC12X2/3/4

## 7.0 BOARD LAYOUT (RECOMMENDED)



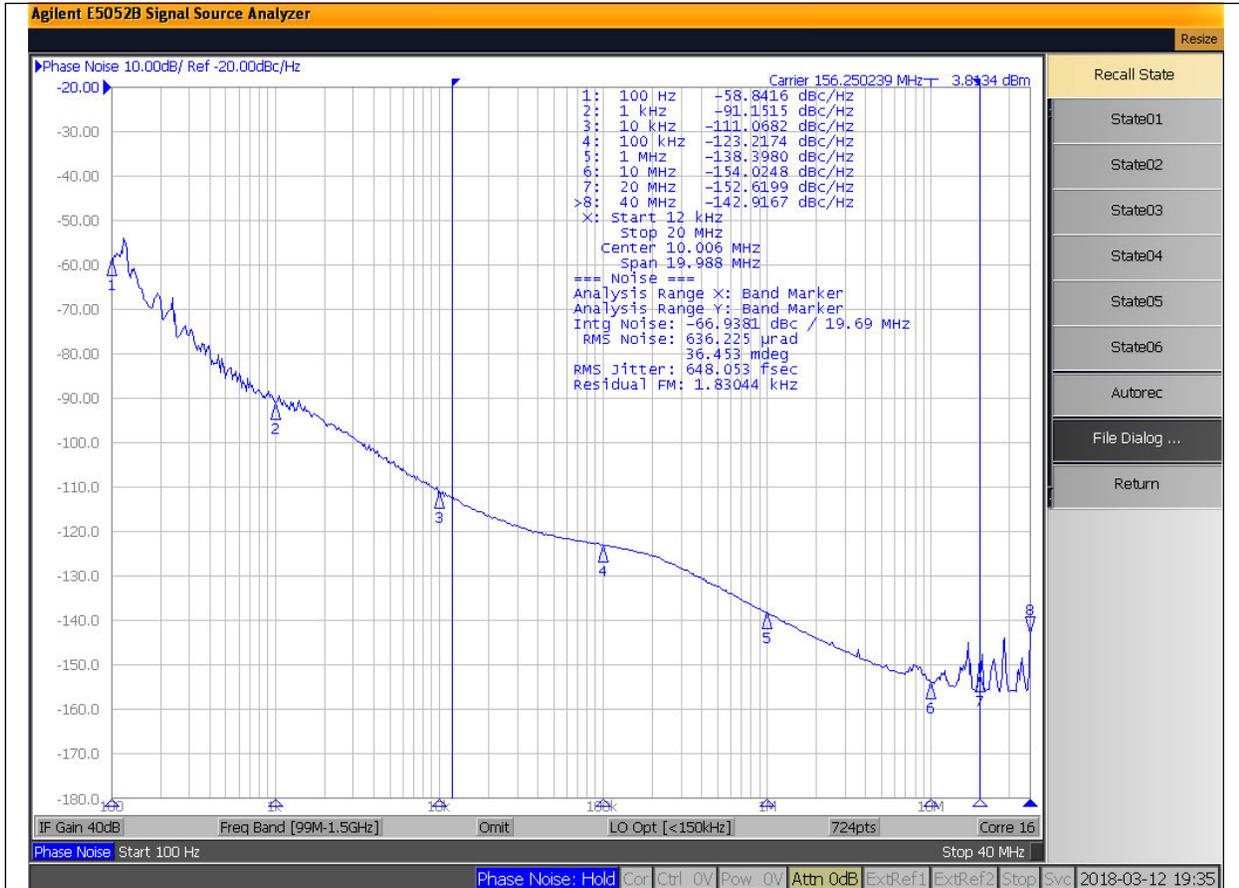
**FIGURE 7-1:** DSC12x2/3/4 Recommended Board Layout.

## 8.0 PHASE NOISE



**FIGURE 8-1:** DSC12x4 Phase Noise at 100 MHz.

# DSC12X2/3/4

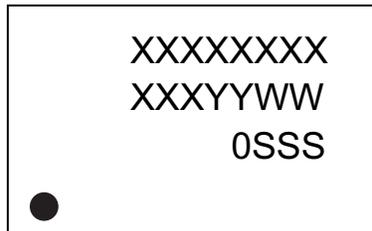


**FIGURE 8-2:** DSC12x2 Phase Noise at 156.25 MHz.

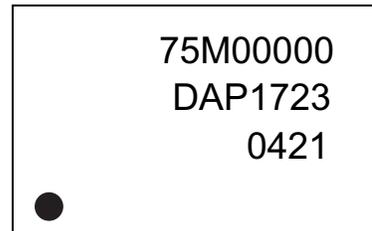
## 9.0 PACKAGING INFORMATION

### 9.1 Package Marking Information

6-Lead VDFN\*



Example



<b>Legend:</b>	XX...X	Product code, customer-specific information, or frequency in MHz without printed decimal point
	Y	Year code (last digit of calendar year)
	YY	Year code (last 2 digits of calendar year)
	WW	Week code (week of January 1 is week '01')
	SSS	Alphanumeric traceability code
	(e3)	Pb-free JEDEC® designator for Matte Tin (Sn)
	*	This package is Pb-free. The Pb-free JEDEC designator (e3) can be found on the outer packaging for this package.
	•, ▲, ▼	Pin one index is identified by a dot, delta up, or delta down (triangle)

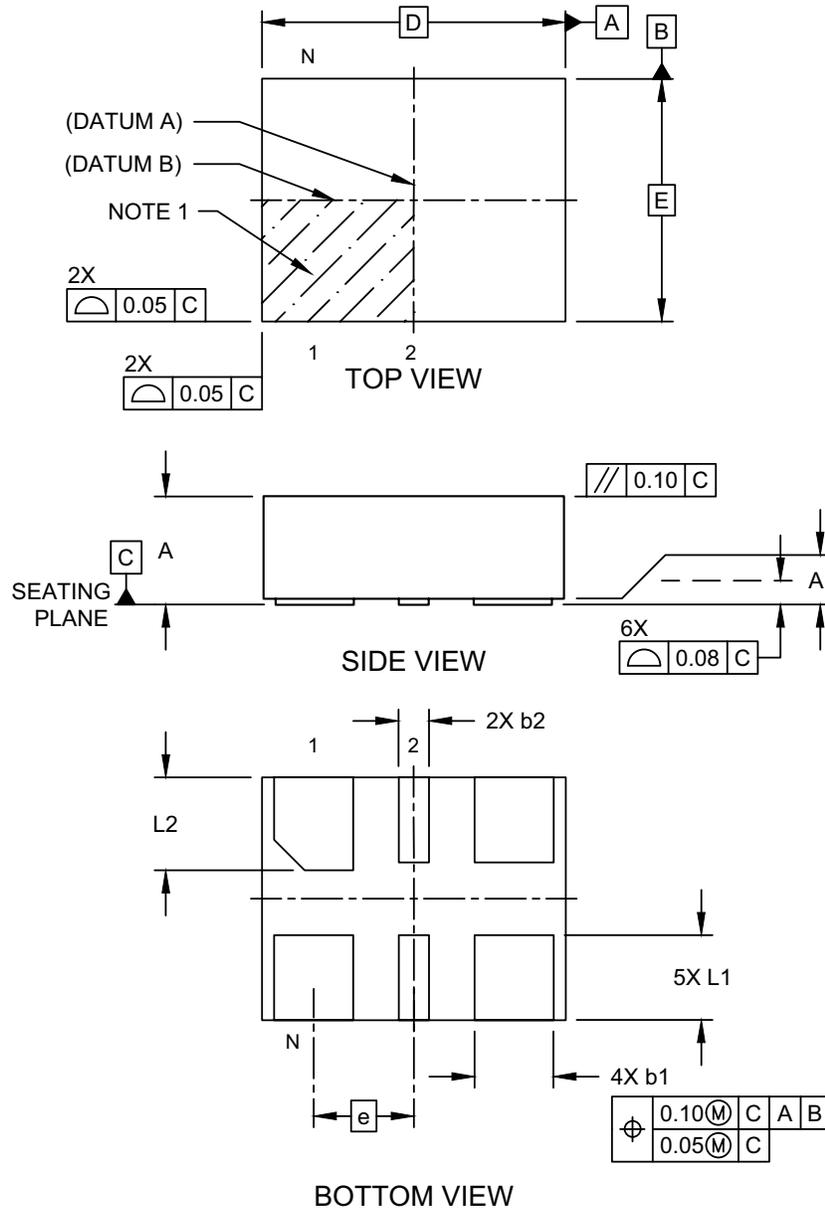
**Note:** In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information. Package may or may not include the corporate logo.

Underbar ( \_ ) and/or Overbar ( ¯ ) symbol may not be to scale.

# DSC12X2/3/4

## 6-Lead Very Thin Dual Flatpack No-Leads (J7A) - 2.5x2.0 mm Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>

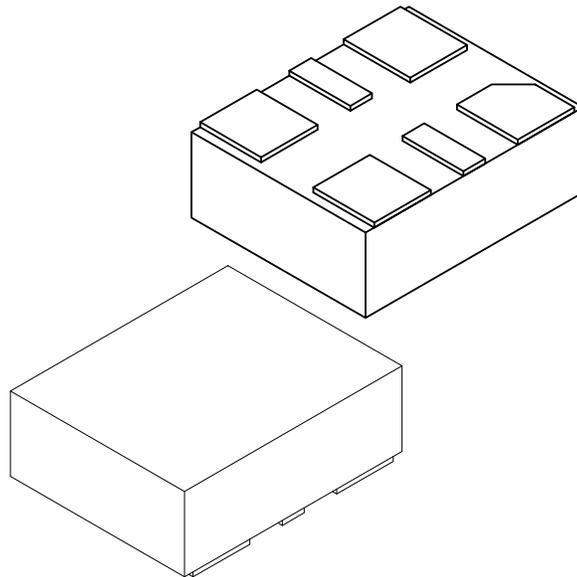


Microchip Technology Drawing C04-1005-J7A Rev E Sheet 1 of 2

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## 6-Lead Very Thin Dual Flatpack No-Leads (J7A) - 2.5x2.0 mm Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Terminals	N	6		
Pitch	e	0.825 BSC		
Overall Height	A	0.80	0.85	0.90
Standoff	A1	0.00	0.02	0.05
Overall Length	D	2.50 BSC		
Overall Width	E	2.00 BSC		
Terminal Width	b1	0.60	0.65	0.70
Terminal Width	b2	0.20	0.25	0.30
Terminal Length	L1	0.60	0.70	0.80
Terminal Length	L2	0.665	0.765	0.865

**Notes:**

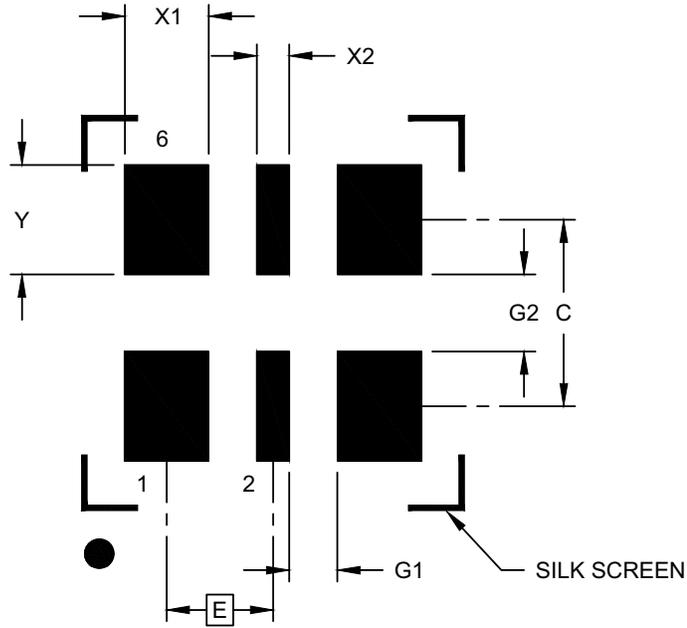
- Pin 1 visual index feature may vary, but must be located within the hatched area.
- Package is saw singulated
- Dimensioning and tolerancing per ASME Y14.5M
  - BSC: Basic Dimension. Theoretically exact value shown without tolerances.
  - REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-1005-J7A Rev E Sheet 2 of 2

# DSC12X2/3/4

## 6-Lead Very Thin Dual Flatpack No-Leads (J7A) - 2.5x2.0 mm Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



RECOMMENDED LAND PATTERN

Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Contact Pitch	E		0.825 BSC	
Contact Pad Width (X4)	X1			0.65
Contact Pad Width (X2)	X2			0.25
Contact Pad Length (X6)	Y			0.85
Contact Pad Spacing	C		1.45	
Space Between Contacts (X4)	G1	0.38		
Space Between Contacts (X3)	G2	0.60		

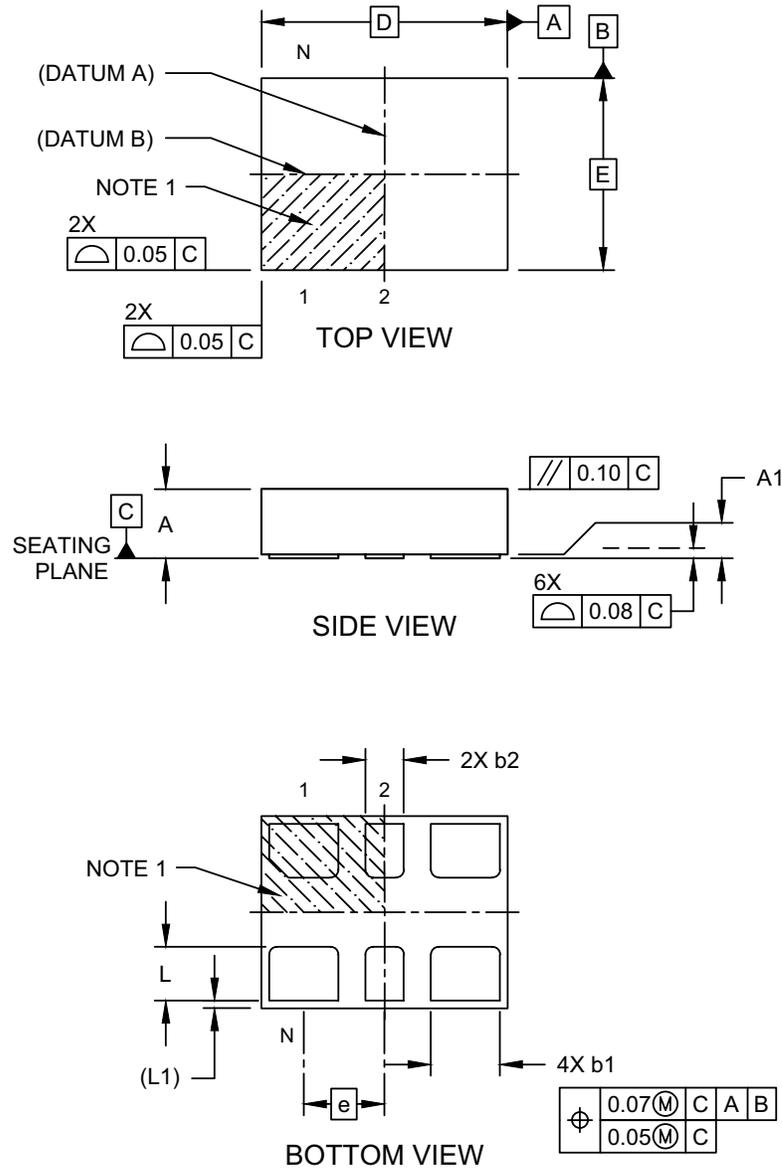
**Notes:**

- Dimensioning and tolerancing per ASME Y14.5M  
BSC: Basic Dimension. Theoretically exact value shown without tolerances.
- For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

Microchip Technology Drawing C04-3005-J7A Rev E

## 6-Lead Very Thin Plastic Dual Flatpack No-Lead (H5A) - 3.2x2.5 mm Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



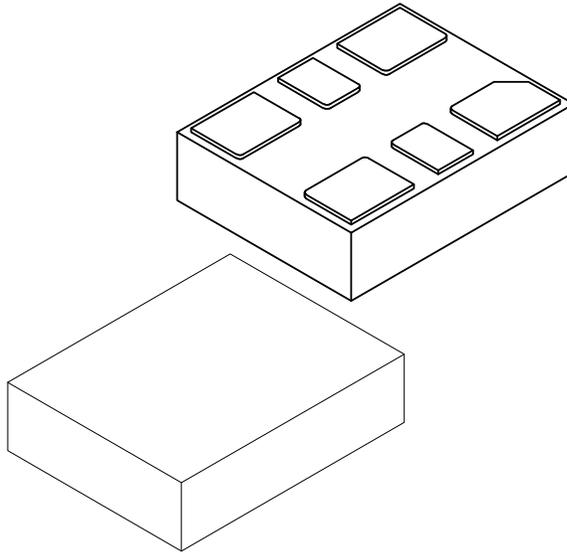
Microchip Technology Drawing C04-1007-H5A Rev C Sheet 1 of 2

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# DSC12X2/3/4

## 6-Lead Very Thin Plastic Dual Flatpack No-Lead (H5A) - 3.2x2.5 mm Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Units		MILLIMETERS		
Dimension Limits		MIN	NOM	MAX
Number of Terminals	N	6		
Pitch	e	1.05 BSC		
Overall Height	A	0.80	0.85	0.90
Standoff	A1	0.00	0.02	0.05
Overall Length	D	3.20 BSC		
Overall Width	E	2.50 BSC		
Terminal Width	b1	0.85	0.90	0.95
Terminal Width	b2	0.45	0.50	0.55
Terminal Length	L	0.65	0.70	0.75
Terminal Pullback	L1	0.10 REF		

**Notes:**

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is saw singulated
3. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

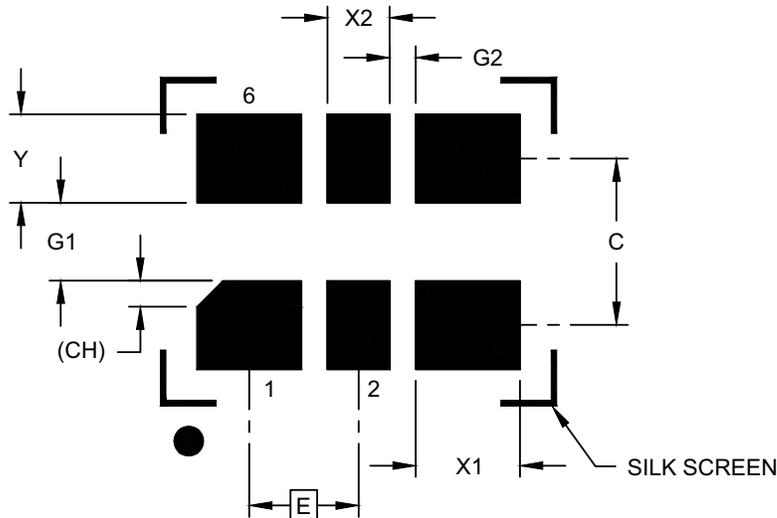
REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-1007-H5A Rev C Sheet 2 of 2

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## 6-Lead Very Thin Plastic Dual Flatpack No-Lead (H5A) - 3.2x2.5 mm Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



RECOMMENDED LAND PATTERN

Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Contact Pitch	E	1.05 BSC		
Contact Pad Spacing	C		1.60	
Contact Pad Width (X4)	X1			1.00
Contact Pad Width (X2)	X2			0.60
Contact Pad Length (X6)	Y			0.85
Space Between Contacts (X4)	G1	0.75		
Space Between Contacts (X3)	G2	0.25		
Pin 1 Index Chamfer (X4)	CH		0.25	

**Notes:**

1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

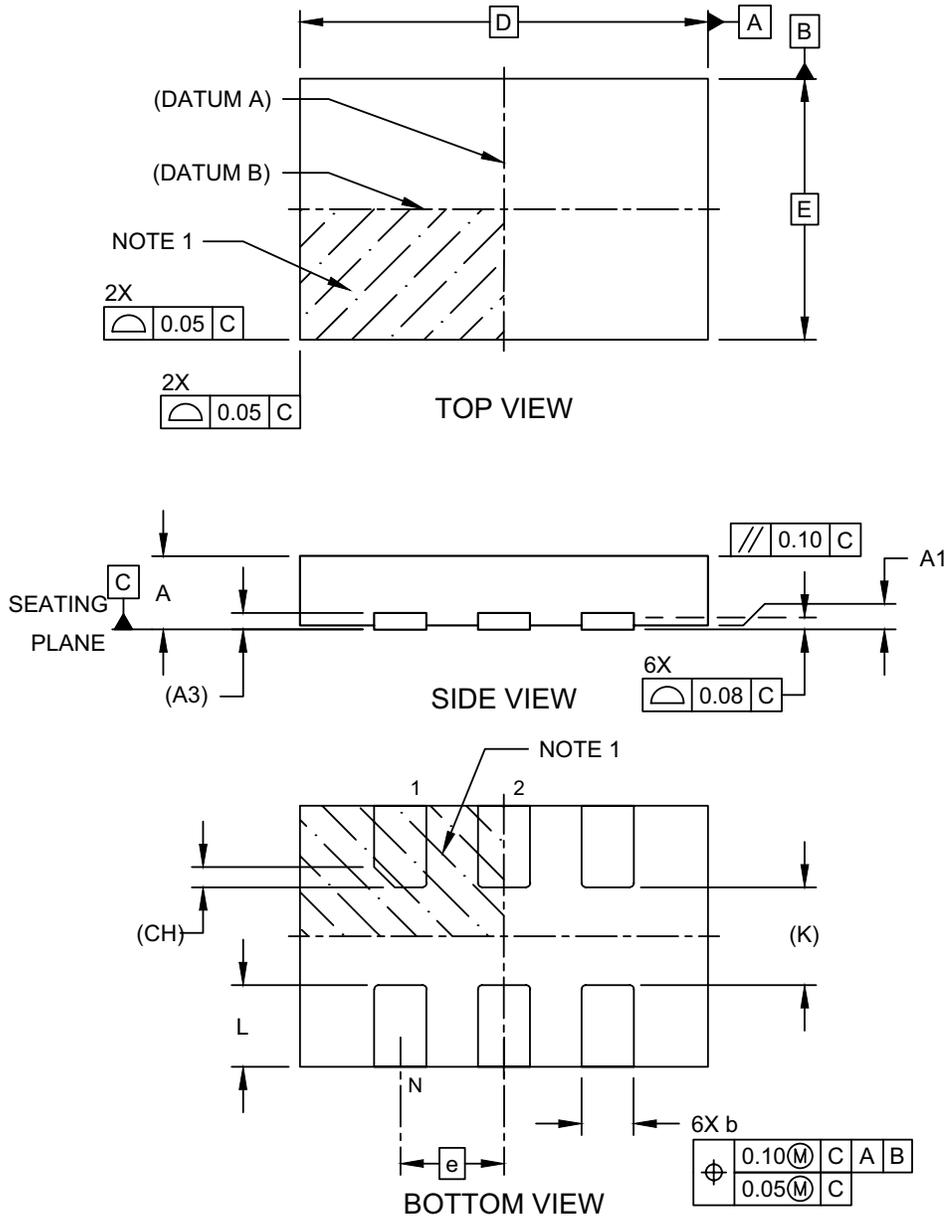
Microchip Technology Drawing C04-3007-H5A Rev C

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# DSC12X2/3/4

## 6-Lead Very Thin Plastic Dual Flat, No Lead Package (H7A) - 3.2x5.0 x0.9 Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>

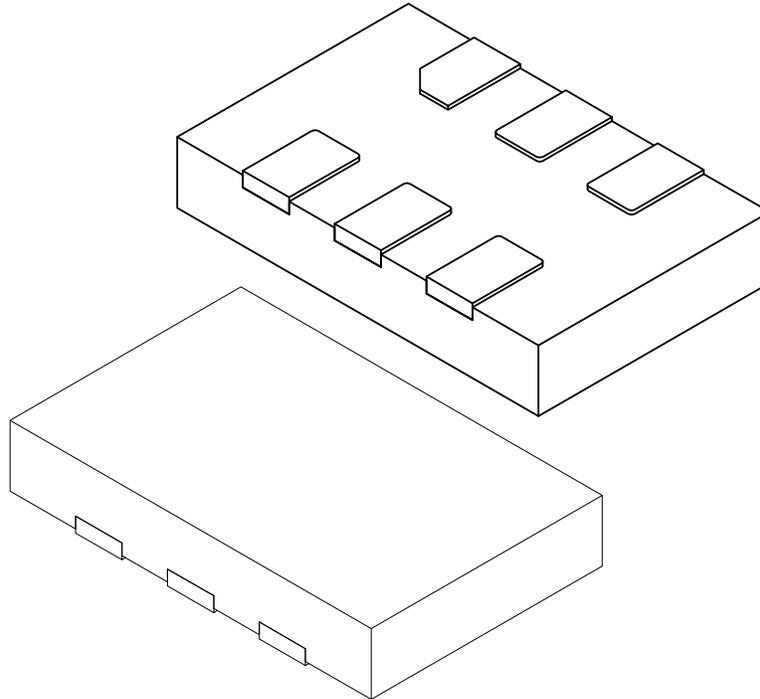


Microchip Technology Drawing C04-1009-H7A Rev B Sheet 1 of 2

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## 6-Lead Very Thin Plastic Dual Flat, No Lead Package (H7A) - 3.2x5.0 x0.9 Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Number of Terminals	N	6		
Pitch	e	1.27 BSC		
Overall Height	A	0.80	0.85	0.90
Standoff	A1	0.00	0.02	0.05
Terminal Thickness	A3	0.203 REF		
Overall Length	D	5.00 BSC		
Overall Width	E	3.20 BSC		
Terminal Width	b	0.59	0.64	0.69
Terminal Length	L	0.90	1.00	1.10
Terminal 1 Index Chamfer	CH	0.25 REF		
Terminal-to-Terminal	K	1.20 REF		

**Notes:**

1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is saw singulated
3. Dimensioning and tolerancing per ASME Y14.5M  
 BSC: Basic Dimension. Theoretically exact value shown without tolerances.  
 REF: Reference Dimension, usually without tolerance, for information purposes only.

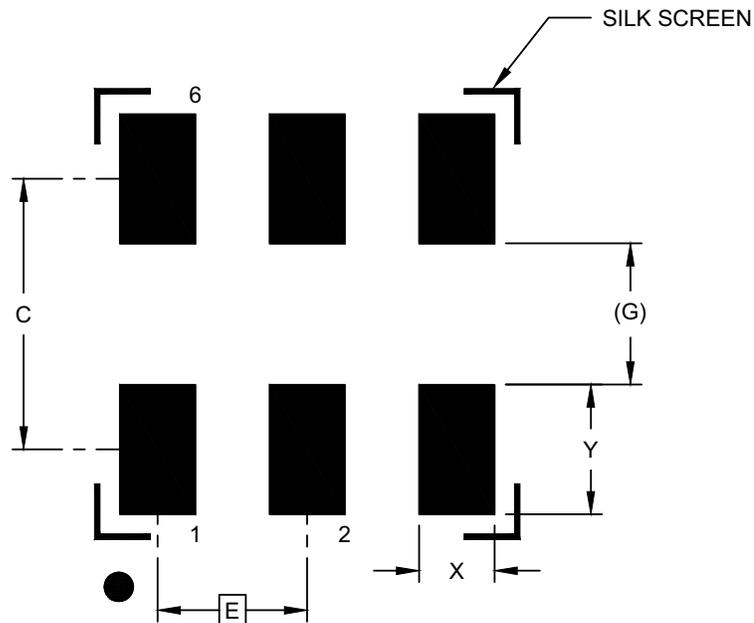
Microchip Technology Drawing C04-1009-H7A Rev B Sheet 2 of 2

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# DSC12X2/3/4

## 6-Lead Very Thin Plastic Dual Flat, No Lead Package (H7A) - 3.2x5.0 x0.9 Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packageing>



RECOMMENDED LAND PATTERN

Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Contact Pitch	E	1.27 BSC		
Contact Pad Spacing	C	2.30		
Contact Pad Width (X6)	X			0.64
Contact Pad Length (X6)	Y			1.10
Contact Pad to Contact Pad (X4)	G	1.20 REF		

**Notes:**

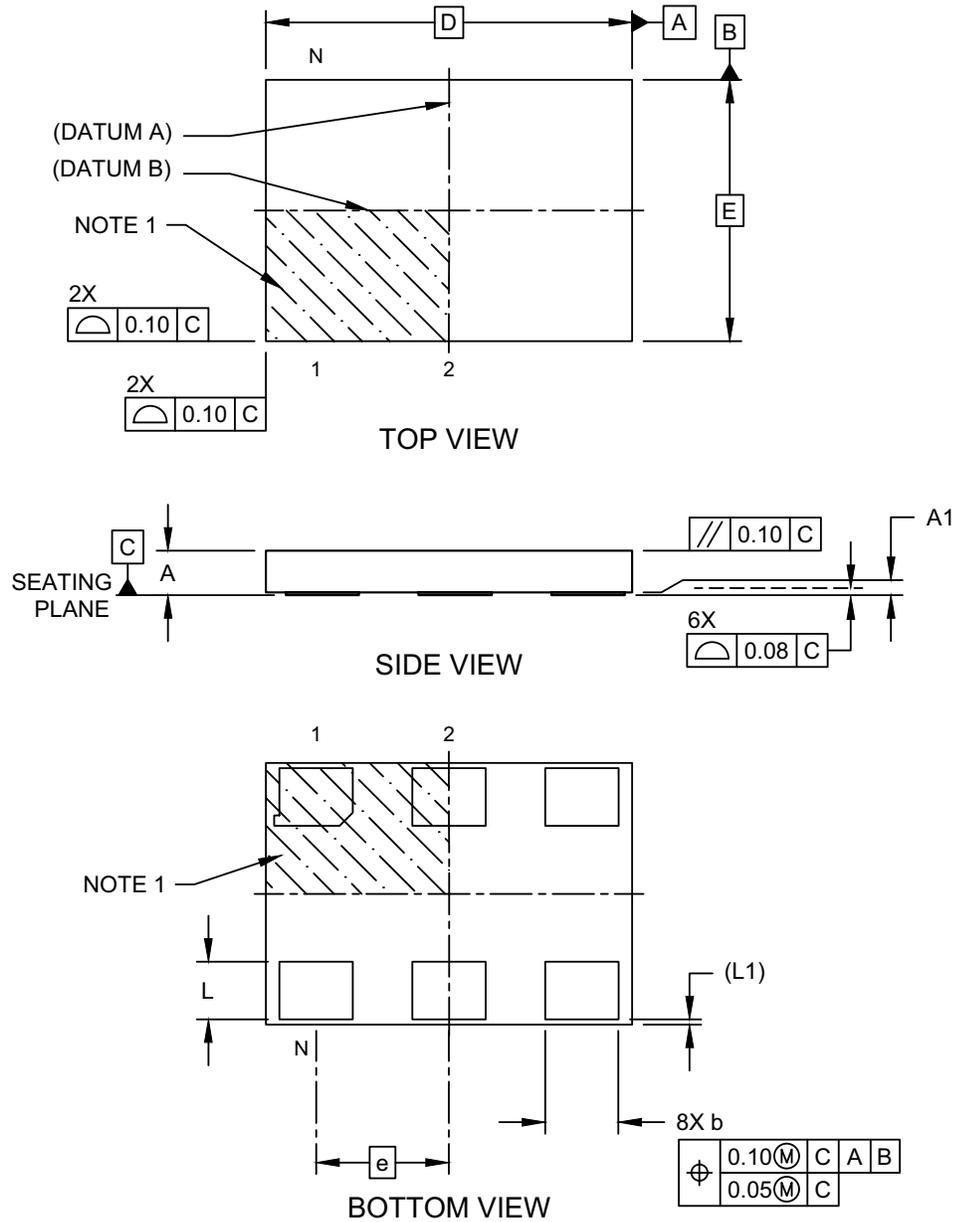
- Dimensioning and tolerancing per ASME Y14.5M  
BSC: Basic Dimension. Theoretically exact value shown without tolerances.
- For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

Microchip Technology Drawing C04-3009-H7A Rev B

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## 6-Lead Very Thin Dual Flatpack, No Lead Package (HPA) - 7x5 mm Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>

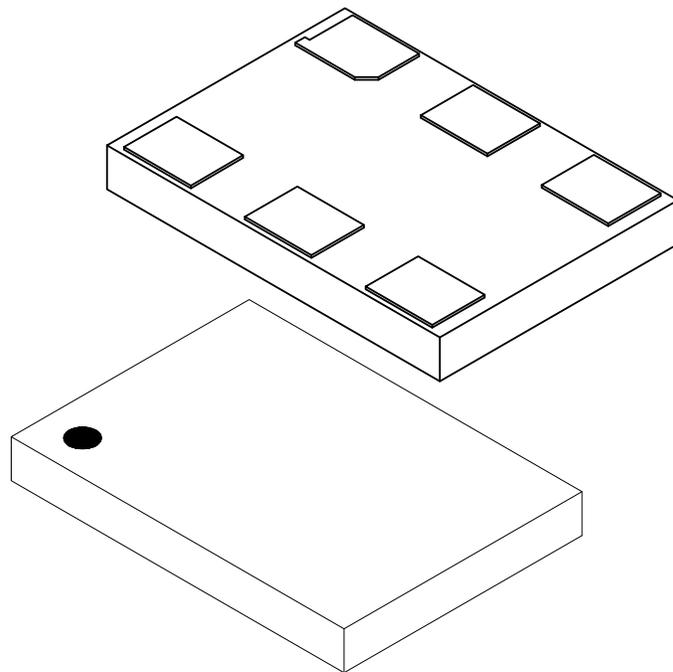


Microchip Technology Drawing C04-1227-HPA Rev B Sheet 1 of 2

# DSC12X2/3/4

## 6-Lead Very Thin Dual Flatpack, No Lead Package (HPA) - 7x5 mm Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Number of Terminals	N	6		
Pitch	e	2.54 BSC		
Overall Height	A	0.80	0.85	0.90
Standoff	A1	0.00	0.02	0.05
Overall Length	D	7.00 BSC		
Overall Width	E	5.00 BSC		
Terminal Width	b	1.30	1.40	1.50
Terminal Length	L	1.00	1.10	1.20
Pullback	L1	0.10 REF		

**Notes:**

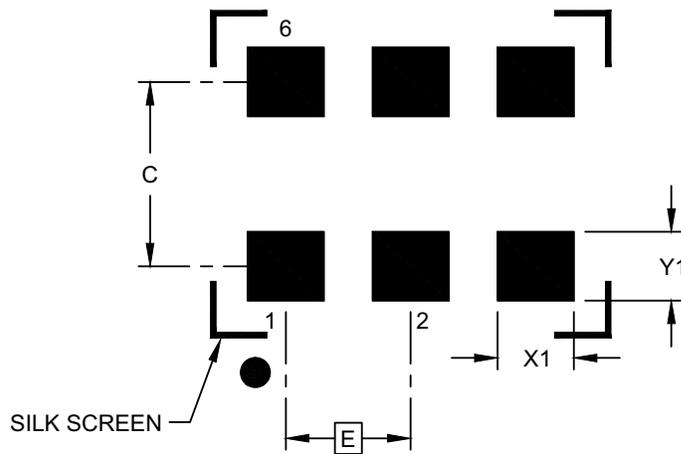
1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is saw singulated
3. Dimensioning and tolerancing per ASME Y14.5M  
BSC: Basic Dimension. Theoretically exact value shown without tolerances.  
REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-1227-HPA Rev B Sheet 2 of 2

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## 6-Lead Very Thin Dual Flatpack, No Lead Package (HPA) - 7x5 mm Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at <http://www.microchip.com/packaging>



### RECOMMENDED LAND PATTERN

Dimension Limits	Units	MILLIMETERS		
		MIN	NOM	MAX
Contact Pitch	E		2.54 BSC	
Contact Pad Spacing	C		3.90	
Contact Pad Width (X6)	X1			1.55
Contact Pad Length (X6)	Y1			1.40

**Notes:**

- Dimensioning and tolerancing per ASME Y14.5M  
BSC: Basic Dimension. Theoretically exact value shown without tolerances.
- For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

Microchip Technology Drawing C04-3227-HPA Rev B

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# DSC12X2/3/4

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NOTES:

## APPENDIX A: REVISION HISTORY

### Revision A (April 2019)

- Initial release of DSC12x2/3/4 as Microchip data sheet DS20006011A.

### Revision B (June 2020)

- Revisions to the data sheet made in the [Electrical Characteristics](#) table under HCSL: Added new rows for Integrated Phase Noise and Phase Jitter.
- Also added a new bullet under the [Features](#) section.

### Revision C (January 2021)

- Updated Phase Jitter maximum values for  $J_{\text{RMS-CC}}$  in the [Electrical Characteristics](#) table and added a sixth note.
- Updated package drawing for 6-Lead VDFN 2.5 mm x 2.0 mm Package Outline and Recommended Land Pattern.
- Updated [Figure 3-1](#).

### Revision D (March 2021)

- Removed Note 6 from the [Electrical Characteristics](#) table.

### Revision E (March 2022)

- Added PCI Express Gen 5 to the [Applications](#) list.

### Revision F (May 2023)

- Added PCI Express Gen 6 to the [Applications](#) list and the [Features](#) list.
- Corrected the maximum value for Peak-to-Peak Output Swing in the LVDS (DSC12x3) section of the [Electrical Characteristics](#) table.
- Added PCIe Gen 6 Phase Jitter values to the LVDS (DSC12x3) and HCSL (DSC12x4) sections of the [Electrical Characteristics](#) table.

### Revision G (June 2025)

- Added DSA1200 reference to [Features](#) and the [Product Identification System](#) sections for customers seeking AEC-Q100 qualified parts.
- Updated the package outline drawings to the most current versions.

# DSC12X2/3/4

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NOTES:

## PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

<u>PART NO.</u>		X	X	X	X	X	-XXXXXXXX	X
Device		Control Pin	Output Format	Package	Temperature	Freq. Stability	Output Frequency	Media Type
<b>Device:</b>	DSC12:	High Performance Differential MEMS Oscillators ( <a href="#">Note 1</a> )						
<b>Control Pin:</b>	0	=	Pin 1 $\overline{\text{STDBY}}$ with Pull-up					
	1	=	Pin 1 Frequency Select with Pull-up					
	2	=	Pin 1 $\overline{\text{OE}}$ with Pull-up					
	3	=	Pin 2 $\overline{\text{STDBY}}$ with Pull-up					
	4	=	Pin 2 Frequency Select with Pull-up					
	5	=	Pin 2 OE with Pull-up					
<b>Output Format:</b>	2	=	LVPECL					
	3	=	LVDS					
	4	=	HCSL					
<b>Package:</b>	N	=	7 mm x 5 mm 6-Lead VDFN					
	B	=	5 mm x 3.2 mm 6-Lead CDFN					
	C	=	3.2 mm x 2.5 mm 6-Lead VDFN					
	D	=	2.5 mm x 2 mm 6-Lead VDFN					
<b>Temperature:</b>	A	=	-40°C to +125°C (Available on certain options)					
	L	=	-40°C to +105°C					
	I	=	-40°C to +85°C					
	E	=	-20°C to +70°C					
<b>Frequency Stability:</b>	1	=	±50 ppm					
	2	=	±25 ppm					
	3	=	±20 ppm					
<b>Output Frequency:</b>	xMxxxxx=	<	10 MHz					
	xxMxxxx=	<	100 MHz					
	xxxMxxx=	>	100 MHz					
	CCCCC=	with	Frequency Select					
	PROG =		TimeFlash					
<b>Media Type:</b>	<blank>=	Bulk						
	T	=	1,000/Reel					
	B	=	3,000/Reel					

<p><b>Examples:</b></p> <p>a) DSC1202NE1-25M0000T: Pin 1 <math>\overline{\text{STDBY}}</math> with Pull-up, LVPECL Output, 7x5 VDFN, -20°C to +70°C, ±50 ppm, 25 MHz Output Frequency, 1,000/Reel</p> <p>b) DSC1243CL3-C0013: Pin 2 Frequency Select with Pull-up, LVDS Output, 3.2x2.5 VDFN, -40°C to +105°C, ±20 ppm, Multiple Output Frequency, Bulk</p> <p>c) DSC1224BI2-19M5000B: Pin 1 OE with Pull-up, HCSL Output, 5x3.2 CDFN, -40°C to +85°C, ±25 ppm, 19.5 MHz Output Frequency, 3,000/Reel</p> <p>d) DSC1232DL3-55M8200T: Pin 2 <math>\overline{\text{STDBY}}</math> with Pull-up, LVPECL Output, 2.5x2 VDFN, -40°C to +105°C, ±20 ppm, 55.82 MHz Output Frequency, 1,000/Reel</p> <p>e) DSC1213NI1-C0014B: Pin 1 Frequency Select with Pull-up, LVDS Output, 7x5 VDFN, -40°C to +85°C, ±50 ppm, Multiple Output Frequency, 3,000/Reel</p>	<p><b>Note 1:</b> Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.</p> <p>Please visit the <a href="http://clockworks.microchip.com/configurator">Microchip ClockWorks Configurator®</a> website to configure the part number for customized frequency select settings.</p> <p><a href="http://clockworks.microchip.com/timing">http://clockworks.microchip.com/timing</a></p>
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**Note 1:** For AEC-Q100 qualified parts, please refer to the DSA1200 family.

# DSC12X2/3/4

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