

N-Channel NexFET™ Power MOSFET

 Check for Samples: [CSD16401Q5](#)

FEATURES

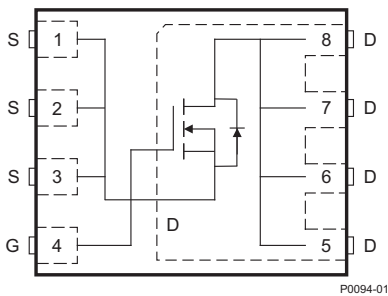
- **Ultralow Qg and Qgd**
- **Low Thermal Resistance**
- **Avalanche Rated**
- **SON 5-mm × 6-mm Plastic Package**

APPLICATIONS

- **Point-of-Load Synchronous Buck Converter for Applications in Networking, Telecom and Computing Systems**
- **Optimized for Synchronous FET Applications**

DESCRIPTION

The NexFET™ power MOSFET has been designed to minimize losses in power conversion applications.

Top View


P0094-01

PRODUCT SUMMARY

V_{DS}	Drain-to-source voltage	25	V
Q_g	Gate charge, total (4.5 V)	21	nC
Q_{gd}	Gate charge, gate-to-drain	5.2	nC
$r_{DS(on)}$	Drain-to-source on-resistance	$V_{GS} = 4.5\text{ V}$	1.8 mΩ
		$V_{GS} = 10\text{ V}$	1.3 mΩ
$V_{GS(th)}$	Threshold voltage	1.5	V

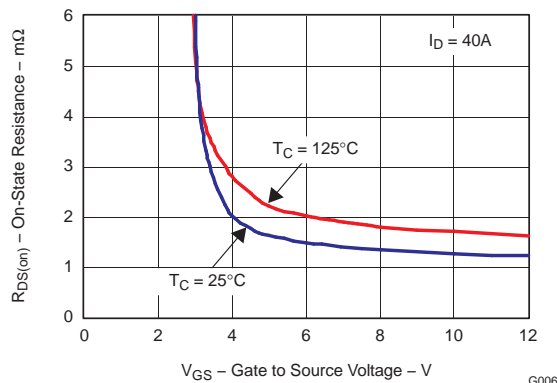
ORDERING INFORMATION

Device	Package	Media	Qty	Ship
CSD16401Q5	SON 5-mm × 6-mm plastic package	13-inch (33-cm) reel	2500	Tape and reel

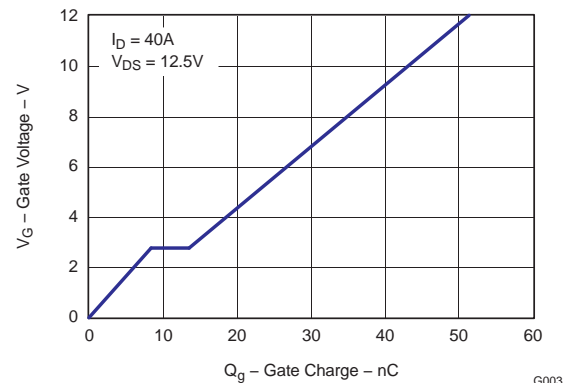
ABSOLUTE MAXIMUM RATINGS

$T_A = 25^\circ\text{C}$ unless otherwise stated		VALUE	UNIT
V_{DS}	Drain-to-source voltage	25	V
V_{GS}	Gate-to-source voltage	-12 to 16	V
I_D	Continuous drain current, $T_C = 25^\circ\text{C}$	100	A
	Continuous drain current ⁽¹⁾	38	A
I_{DM}	Pulsed drain current, $T_A = 25^\circ\text{C}$ ⁽²⁾	240	A
P_D	Power dissipation ⁽¹⁾	3.1	W
T_J, T_{STG}	Operating junction and storage temperature range	-55 to 150	$^\circ\text{C}$
E_{AS}	Avalanche energy, single-pulse $I_D = 100\text{ A}, L = 0.1\text{ mH}, R_G = 25\ \Omega$	500	mJ

- (1) $R_{\theta JA} = 40^\circ\text{C/W}$ on 1-in² (6.45-cm²) Cu [2 oz. (0.071-mm thick)] on 0.060-inch (1.52-mm) thick FR4 PCB.
- (2) Pulse duration $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$

 $r_{DS(on)}$ vs V_{GS}


G006

Gate Charge


G003



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ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

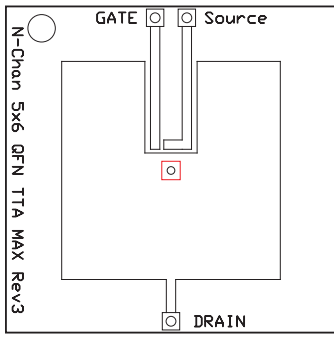
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
Static Characteristics						
BV _{DSS}	Drain-to-source voltage	V _{GS} = 0 V, I _D = 250 μA	25			V
I _{DSS}	Drain-to-source leakage current	V _{GS} = 0 V, V _{DS} = 20 V			1	μA
I _{GSS}	Gate-to-source leakage current	V _{DS} = 0 V, V _{GS} = -12 V to 16 V			100	nA
V _{GS(th)}	Gate-to-source threshold voltage	V _{DS} = V _{GS} , I _D = 250 μA	1.2	1.5	1.9	V
r _{DS(on)}	Drain-to-source on-resistance	V _{GS} = 4.5 V, I _D = 40 A		1.8	2.3	mΩ
		V _{GS} = 10 V, I _D = 40 A		1.3	1.6	mΩ
g _{fs}	Transconductance	V _{DS} = 15 V, I _D = 40 A		168		S
Dynamic Characteristics						
C _{ISS}	Input capacitance	V _{GS} = 0 V, V _{DS} = 12.5 V, f = 1 MHz	3150	4100		pF
C _{OSS}	Output capacitance		2530	3300		pF
C _{RSS}	Reverse transfer capacitance		175	230		pF
R _g	Series gate resistance	V _{DS} = 12.5 V, I _D = 40 A	1.2	2.4		Ω
Q _g	Gate charge total (4.5 V)		21	29		nC
Q _{gd}	Gate charge, gate-to-drain		5.2			nC
Q _{gs}	Gate charge, gate-to-source		8.3			nC
Q _{g(th)}	Gate charge at V _{th}		4.8			nC
Q _{OSS}	Output charge	V _{DS} = 15 V, V _{GS} = 0 V	55			nC
t _{d(on)}	Turnon delay time	V _{DS} = 12.5 V, V _{GS} = 4.5 V, I _D = 40 A R _G = 2 Ω	16.6			ns
t _r	Rise time		30			ns
t _{d(off)}	Turnoff delay time		20			ns
t _f	Fall time		12.7			ns
Diode Characteristics						
V _{SD}	Diode forward voltage	I _S = 40 A, V _{GS} = 0 V	0.85	1		V
Q _{rr}	Reverse recovery charge	V _{DD} = 15 V, I _F = 40 A, di/dt = 300 A/μs	72			nC
t _{rr}	Reverse recovery time	V _{DD} = 15 V, I _F = 40 A, di/dt = 300 A/μs	45			ns

THERMAL CHARACTERISTICS

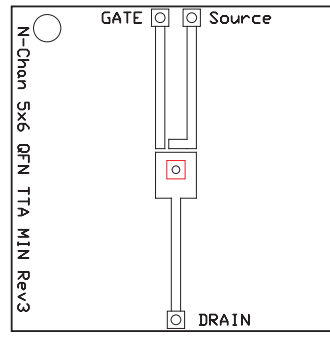
(T_A = 25°C unless otherwise stated)

PARAMETER		MIN	TYP	MAX	UNIT
R _{θJC}	Thermal resistance, junction-to-case ⁽¹⁾			1.1	°C/W
R _{θJA}	Thermal resistance, junction-to-ambient ^{(1) (2)}			50	°C/W

- (1) R_{θJC} is determined with the device mounted on a 1-inch (2.54-cm) square, 2-oz. (0.071-mm thick) Cu pad on a 1.5-inch × 1.5-inch (3.81-cm × 3.81-cm), 0.060-inch (1.52-mm) thick FR4 board. R_{θJC} is specified by design, whereas R_{θJA} is determined by the user's board design.
- (2) Device mounted on FR4 material with 1 inch² (6.45 cm²) of 2-oz. (0.071-mm thick) Cu.



Max $R_{\theta JA} = 50^{\circ}\text{C/W}$
when mounted on 1
inch² (6.45 cm²) of
2-oz. (0.071-mm thick)
Cu.



Max $R_{\theta JA} = 121^{\circ}\text{C/W}$
when mounted on
minimum pad area of
2-oz. (0.071-mm thick)
Cu.

TYPICAL MOSFET CHARACTERISTICS

($T_A = 25^{\circ}\text{C}$ unless otherwise stated)

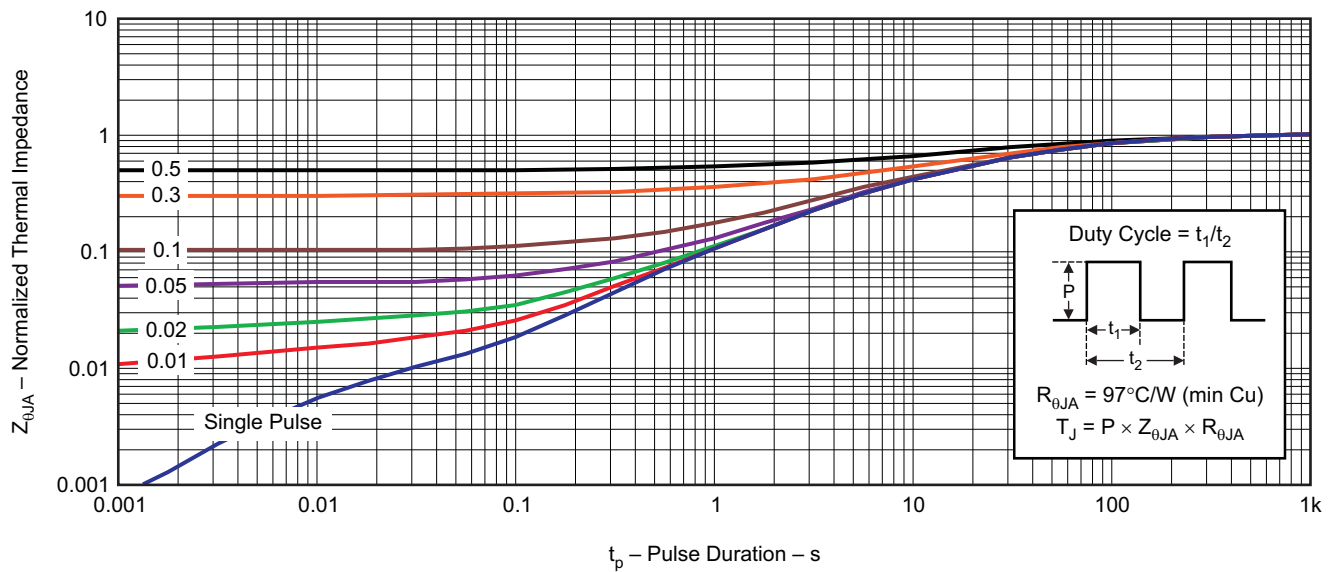


Figure 1. Transient Thermal Impedance

G012

TYPICAL MOSFET CHARACTERISTICS (continued)

($T_A = 25^\circ\text{C}$ unless otherwise stated)

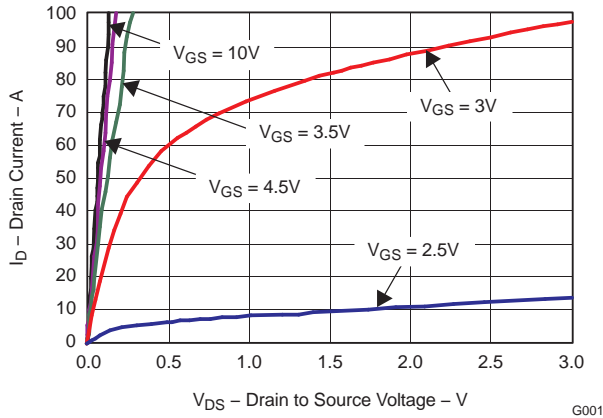


Figure 2. Saturation Characteristics

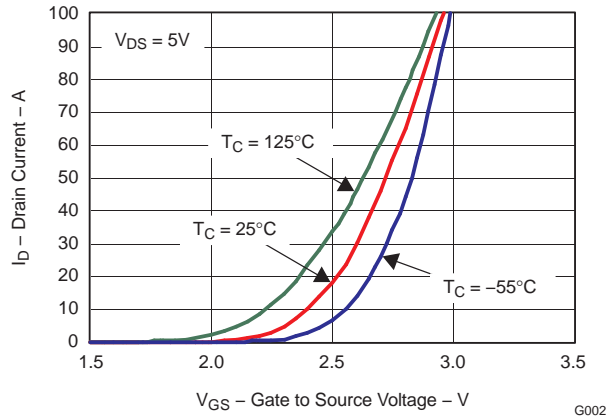


Figure 3. Transfer Characteristics

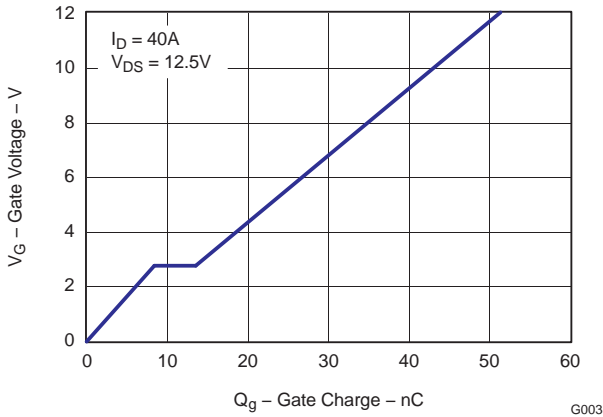


Figure 4. Gate Charge

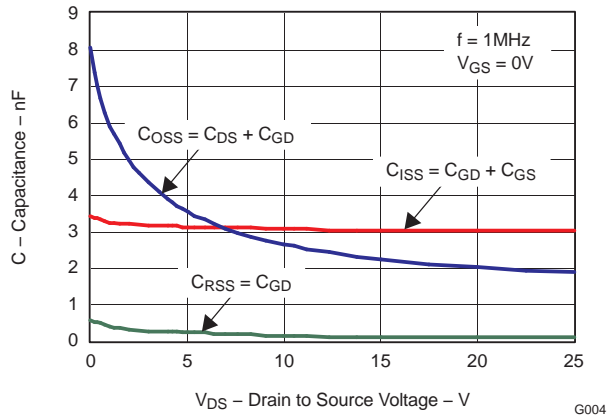


Figure 5. Capacitance

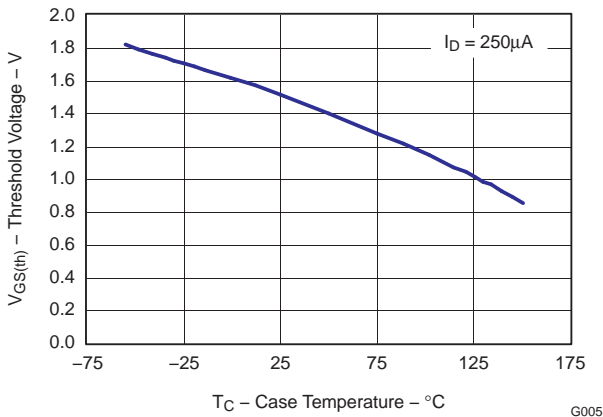


Figure 6. Threshold Voltage vs. Temperature

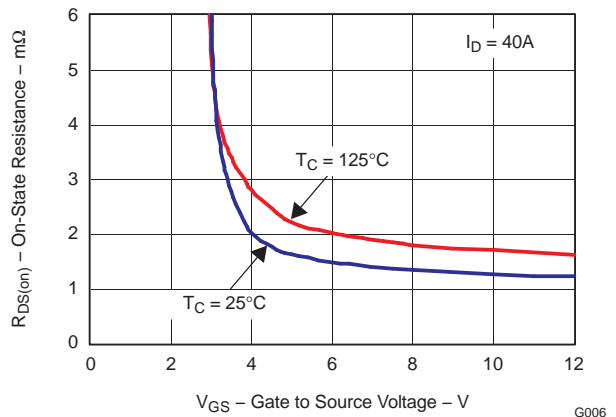


Figure 7. On-Resistance vs. Gate Voltage

TYPICAL MOSFET CHARACTERISTICS (continued)

($T_A = 25^\circ\text{C}$ unless otherwise stated)

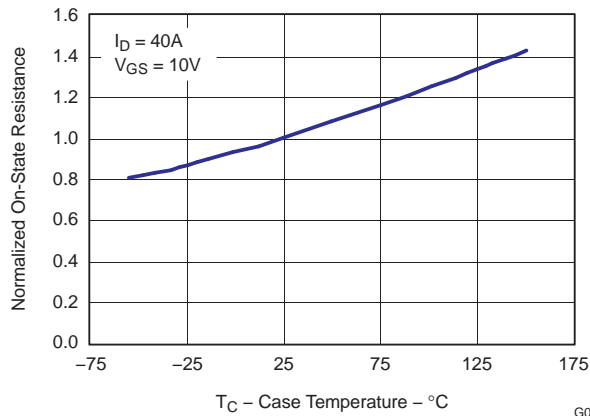


Figure 8. On-Resistance vs. Temperature

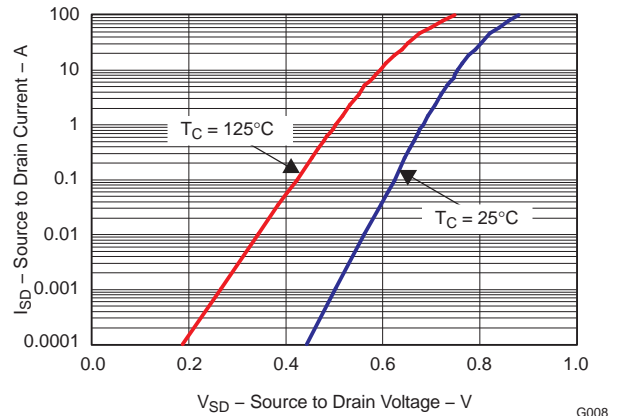


Figure 9. Typical Diode Forward Voltage

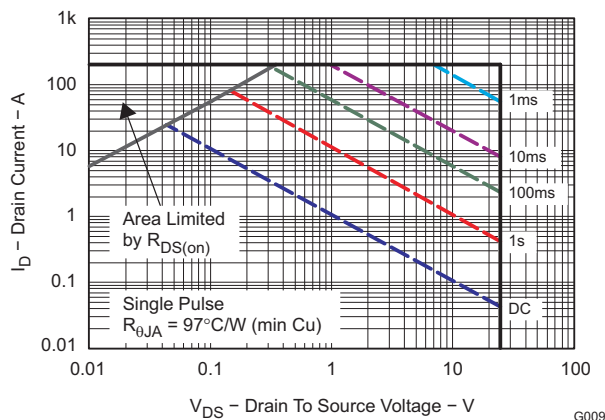


Figure 10. Maximum Safe Operating Area

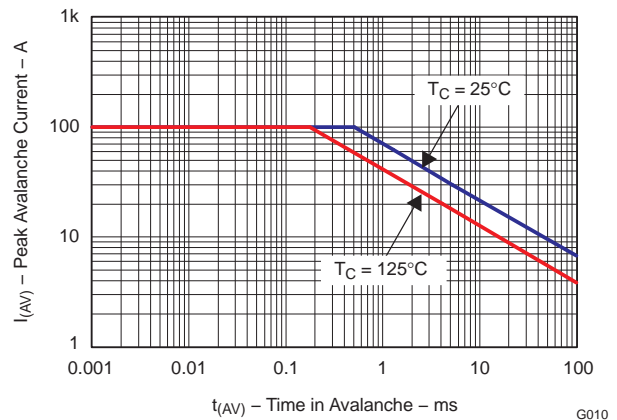


Figure 11. Single-Pulse Unclamped Inductive Switching

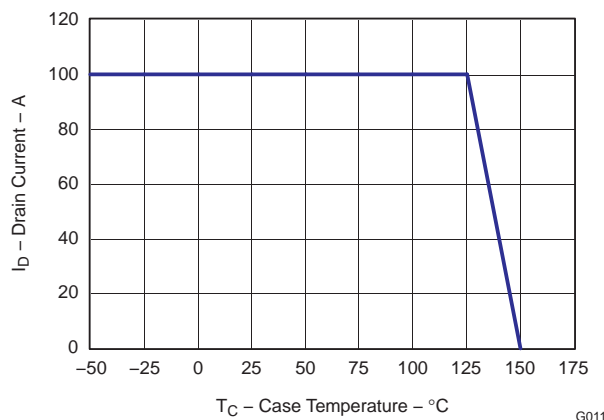
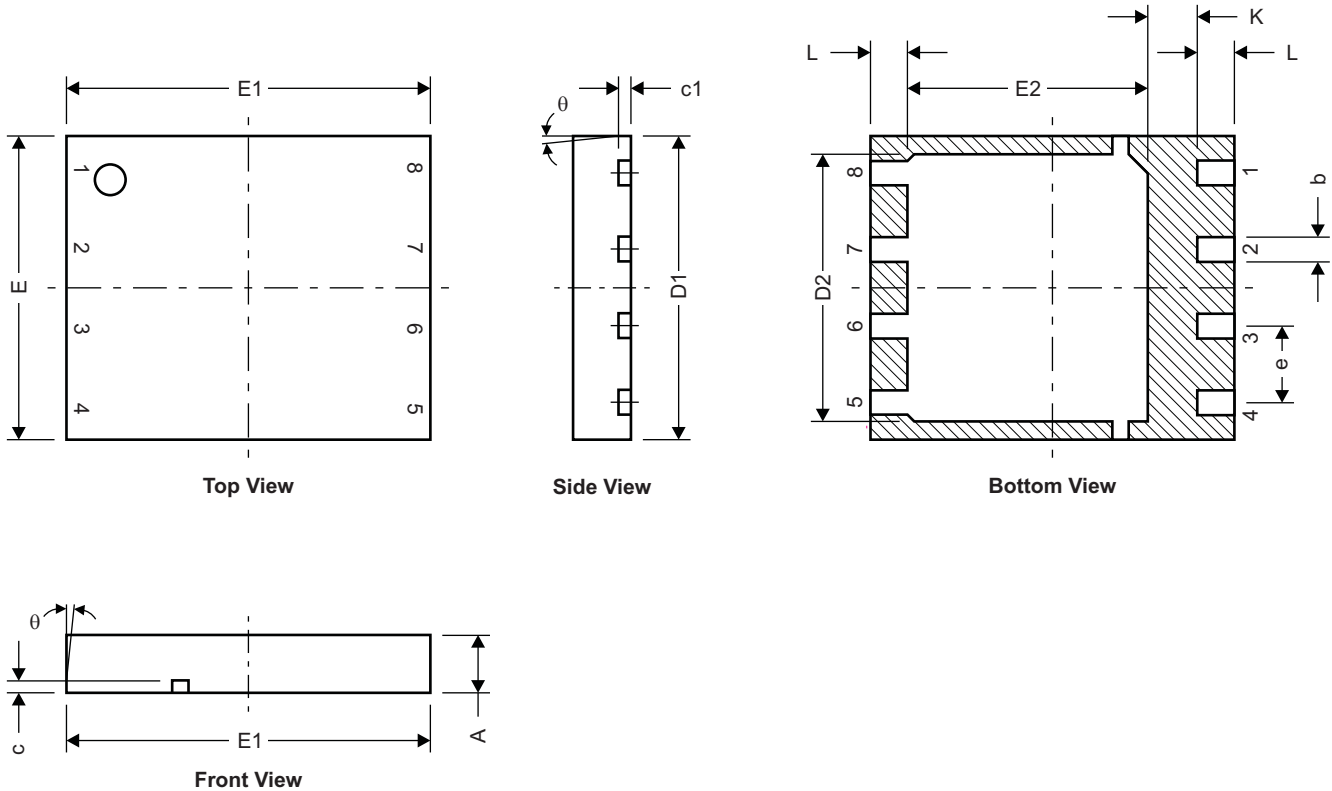


Figure 12. Maximum Drain Current vs. Temperature

MECHANICAL DATA

Q5 Package Dimensions



M0140-01

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	0.950	1.050	0.037	0.039
b	0.360	0.460	0.014	0.018
c	0.150	0.250	0.006	0.010
c1	0.150	0.250	0.006	0.010
D1	4.900	5.100	0.193	0.201
D2	4.320	4.520	0.170	0.178
E	4.900	5.100	0.193	0.201
E1	5.900	6.100	0.232	0.240
E2	3.920	4.12	0.154	0.162
e	1.27 TYP		0.050	
K	0.760		0.030	
L	0.510	0.710	0.020	0.028
theta	0.00			

REVISION HISTORY

Changes from Revision Original (August 2009) to Revision A	Page
• Deleted environmental bullets from Features list	1
• Deleted <i>Package Marking Information</i> section at the end of the data sheet	7

TAPE AND REEL INFORMATION



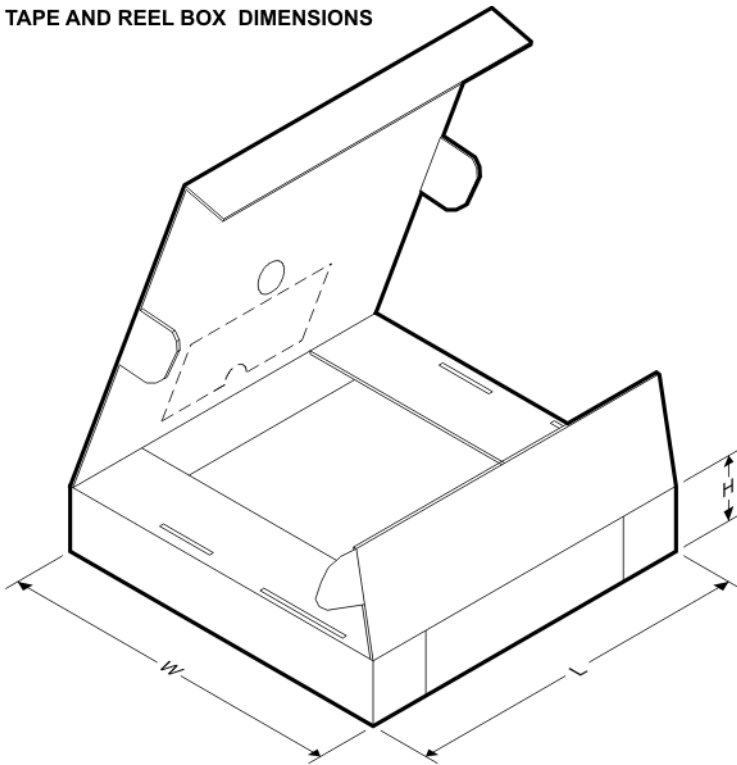
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
CSD16401Q5	SON	DQH	8	2500	330.0	12.8	6.5	5.3	1.4	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CSD16401Q5	SON	DQH	8	2500	335.0	335.0	32.0

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