

30V N-Channel NexFET™ Power MOSFETs

Check for Samples: [CSD17556Q5B](#)

FEATURES

- Extremely Low Resistance
- Ultralow Q_g and Q_{gd}
- Low Thermal Resistance
- Avalanche Rated
- Pb Free Terminal Plating
- RoHS Compliant
- Halogen Free
- SON 5-mm × 6-mm Plastic Package

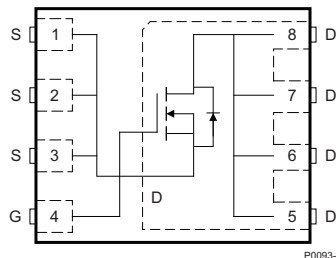
APPLICATIONS

- Point-of-Load Synchronous Buck in Networking, Telecom, and Computing Systems
- Synchronous Rectification
- Active ORing and Hotswap Applications

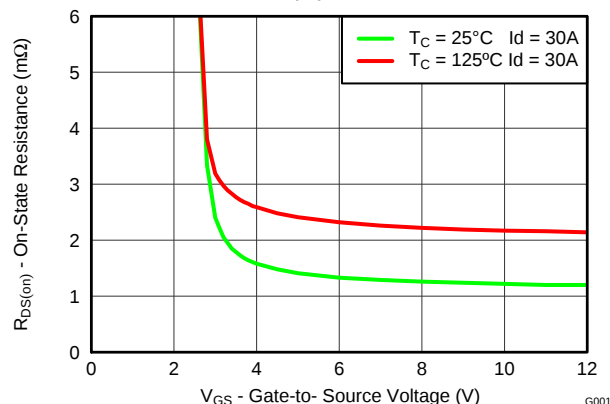
DESCRIPTION

The NexFET™ power MOSFET has been designed to minimize losses in synchronous rectification and other power conversion applications.

Top View



P0093-01

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


G001

PRODUCT SUMMARY

$T_A = 25^\circ\text{C}$ unless otherwise stated		TYPICAL VALUE	UNIT
V_{DS}	Drain to Source Voltage	30	V
Q_g	Gate Charge Total (4.5V)	30	nC
Q_{gd}	Gate Charge Gate to Drain	7.5	nC
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 4.5\text{V}$	1.5 mΩ
		$V_{GS} = 10\text{V}$	1.2 mΩ
$V_{GS(th)}$	Threshold Voltage	1.4	V

ORDERING INFORMATION

Device	Package	Media	Qty	Ship
CSD17556Q5B	SON 5-mm × 6-mm Plastic Package	13-Inch Reel	2500	Tape and Reel

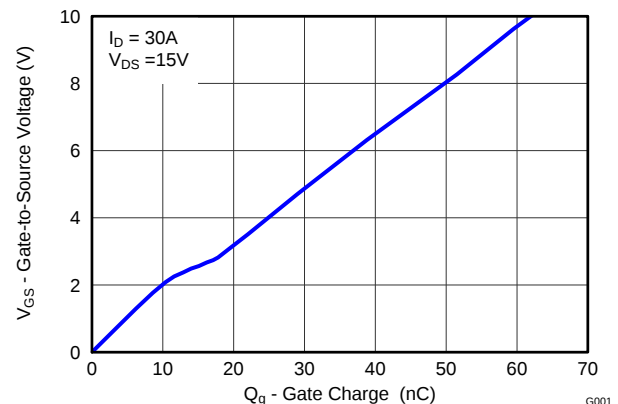
ABSOLUTE MAXIMUM RATINGS

$T_A = 25^\circ\text{C}$ unless otherwise stated		VALUE	UNIT
V_{DS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Continuous Drain Current (Package limited), $T_C = 25^\circ\text{C}$	100	A
	Continuous Drain Current (Silicon limited), $T_C = 25^\circ\text{C}$	215	
	Continuous Drain Current ⁽¹⁾	34	A
I_{DM}	Pulsed Drain Current, $T_A = 25^\circ\text{C}^{(1)(2)}$	214	A
P_D	Power Dissipation ⁽¹⁾	3.1	W
T_J , T_{STG}	Operating Junction and Storage Temperature Range	–55 to 150	°C
E_{AS}	Avalanche Energy, single pulse $I_D = 100\text{A}$, $L = 0.1\text{mH}$, $R_G = 25\Omega$	500	mJ

(1) Typical $R_{\theta JA} = 42^\circ\text{C/W}$ on 1-inch² (6.45-cm²), 2-oz. (0.071-mm thick) Cu pad on a 0.06-inch (1.52-mm) thick FR4 PCB.

(2) Pulse duration ≤300μs, duty cycle ≤2%

GATE CHARGE



G001



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These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

ELECTRICAL CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

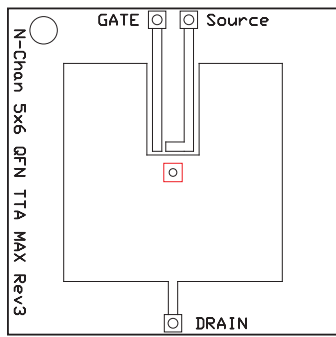
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
Static Characteristics						
BV _{DSS}	Drain to Source Voltage	V _{GS} = 0V, I _{DS} = 250μA	30			V
I _{DSS}	Drain to Source Leakage Current	V _{GS} = 0V, V _{DS} = 24V			1	μA
I _{GSS}	Gate to Source Leakage Current	V _{DS} = 0V, V _{GS} = 20V			100	nA
V _{GS(th)}	Gate to Source Threshold Voltage	V _{DS} = V _{GS} , I _{DS} = 250μA	1.15	1.4	1.65	V
R _{DS(on)}	Drain to Source On Resistance	V _{GS} = 4.5V, I _{DS} = 40A	1.5		1.8	mΩ
		V _{GS} = 10V, I _{DS} = 40A	1.2		1.4	mΩ
g _{fs}	Transconductance	V _{DS} = 15V, I _{DS} = 40A	197			S
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{GS} = 0V, V _{DS} = 15V, f = 1MHz	5400		7020	pF
C _{oss}	Output Capacitance		1770		2310	pF
C _{rss}	Reverse Transfer Capacitance		68		88	pF
R _G	Series Gate Resistance	V _{DS} = 15V, I _{DS} = 40A	0.7		1.4	Ω
Q _g	Gate Charge Total (4.5V)		30		39	nC
Q _{gd}	Gate Charge Gate to Drain		7.5			nC
Q _{gs}	Gate Charge Gate to Source		11			nC
Q _{g(th)}	Gate Charge at V _{th}		6.1			nC
Q _{oss}	Output Charge	V _{DS} = 15V, V _{GS} = 0V	48			nC
t _{d(on)}	Turn On Delay Time	V _{DS} = 15V, V _{GS} = 4.5V, I _{DS} = 40A,R _G = 2Ω	14			ns
t _r	Rise Time		26			ns
t _{d(off)}	Turn Off Delay Time		27			ns
t _f	Fall Time		12			ns
Diode Characteristics						
V _{SD}	Diode Forward Voltage	I _{SD} = 40A, V _{GS} = 0V	0.8		1	V
Q _{rr}	Reverse Recovery Charge	V _{DD} = 15V, I _F = 40A, di/dt = 300A/μs	68			nC
t _{rr}	Reverse Recovery Time		36			ns

THERMAL CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

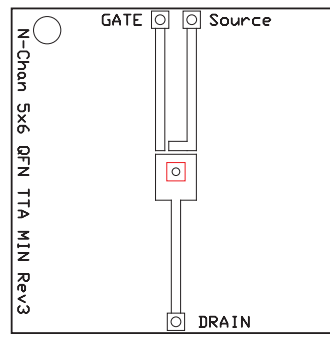
PARAMETER		MIN	TYP	MAX	UNIT
R _{θJC}	Thermal Resistance Junction to Case ⁽¹⁾			1.3	°C/W
R _{θJA}	Thermal Resistance Junction to Ambient ⁽¹⁾⁽²⁾			50	°C/W

- (1) R_{θJC} is determined with the device mounted on a 1-inch² (6.45-cm²), 2-oz. (0.071-mm thick) Cu pad on a 1.5-inch × 1.5-inch (3.81-cm × 3.81-cm), 0.06-inch (1.52-mm) thick FR4 PCB. 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), 2-oz. (0.071-mm thick) Cu.



M0137-01

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.



M0137-02

Max $R_{\theta JA} = 125^{\circ}\text{C/W}$
when mounted on a
minimum pad area of
2-oz. (0.071-mm thick)
Cu.

TYPICAL MOSFET CHARACTERISTICS

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

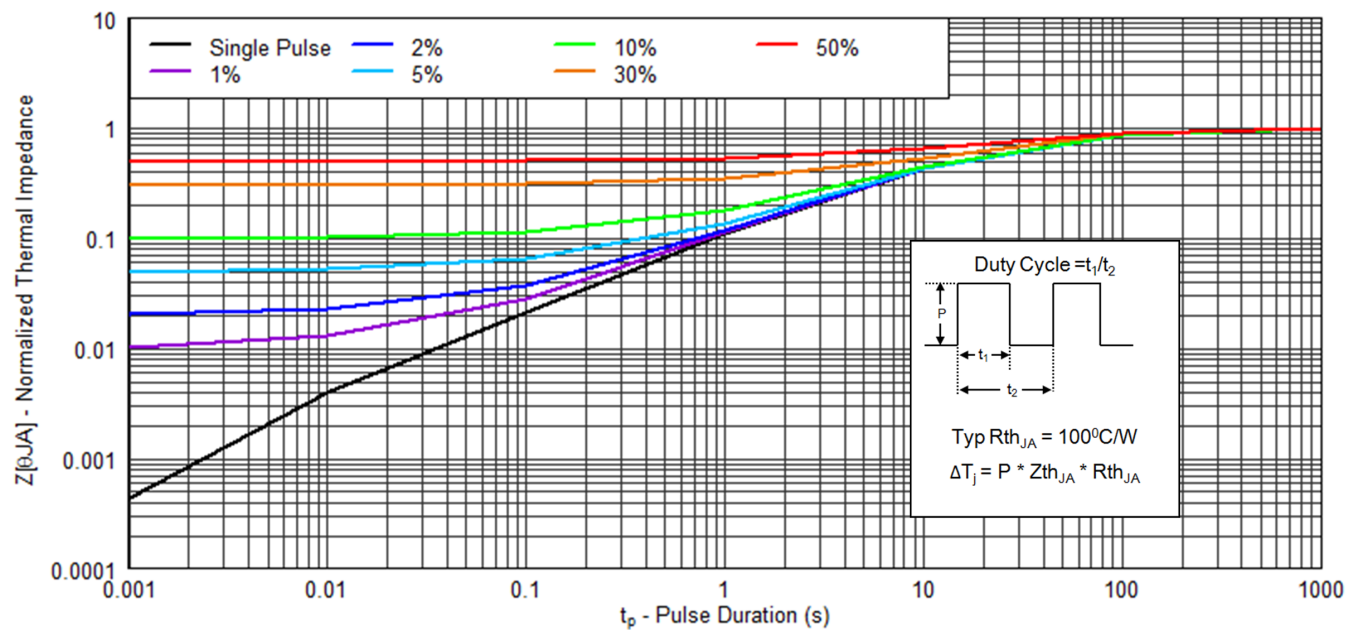
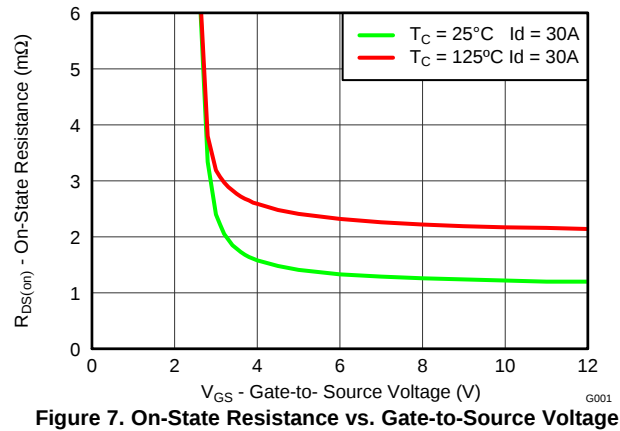
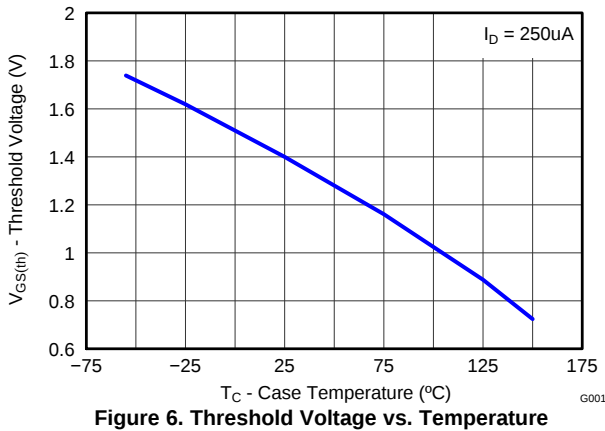
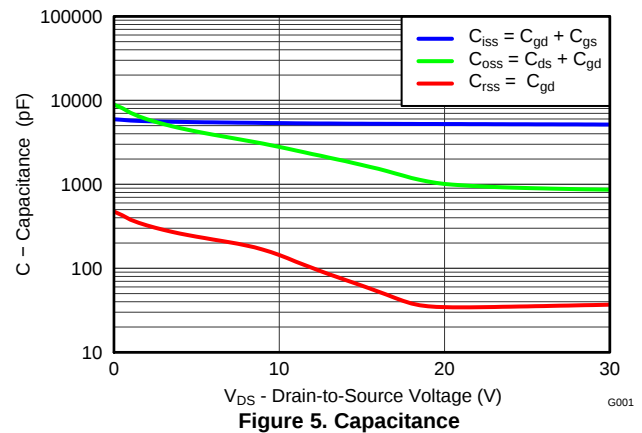
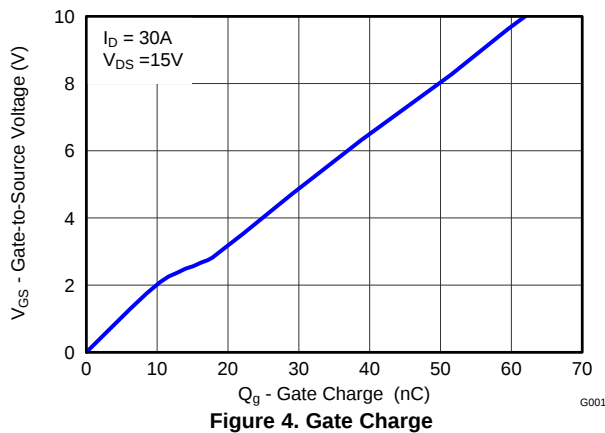
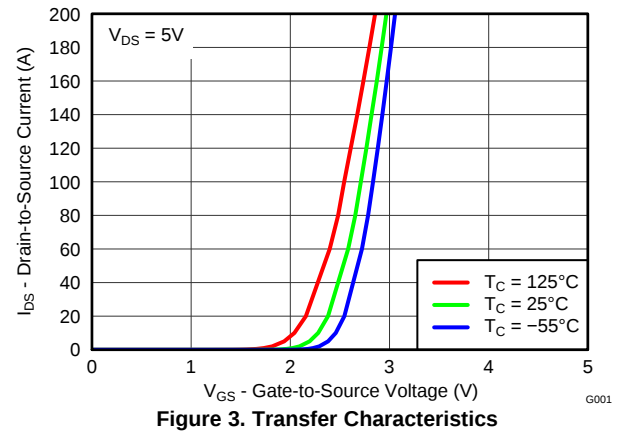
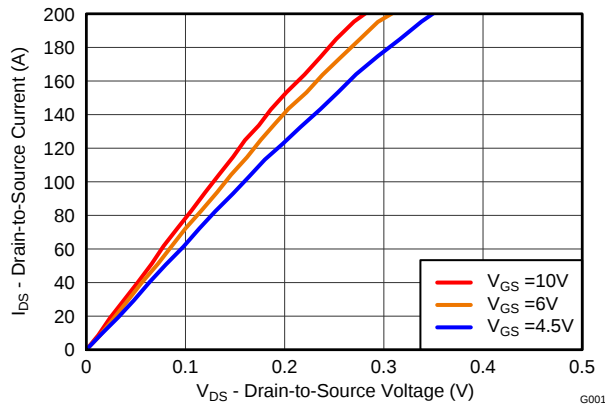


Figure 1. Transient Thermal Impedance

TYPICAL MOSFET CHARACTERISTICS (continued)

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



TYPICAL MOSFET CHARACTERISTICS (continued)

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

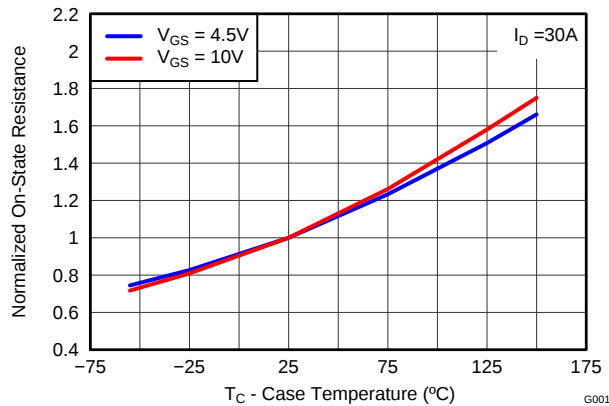


Figure 8. Normalized On-State Resistance vs. Temperature

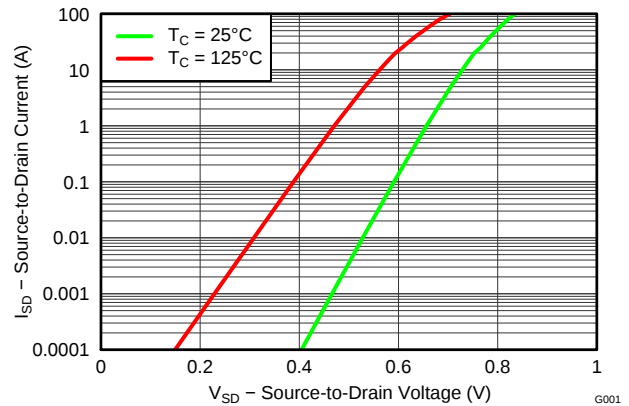


Figure 9. Typical Diode Forward Voltage

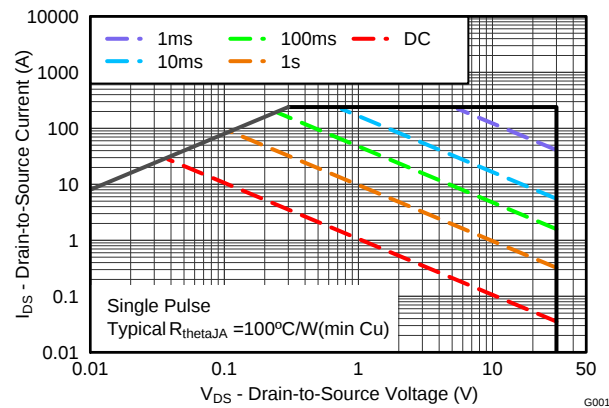


Figure 10. Maximum Safe Operating Area

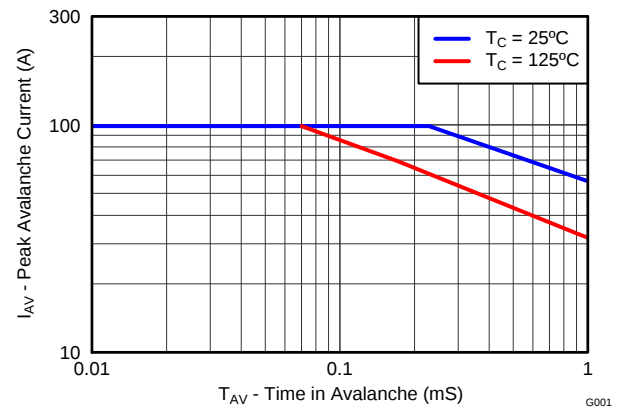


Figure 11. Single Pulse Unclamped Inductive Switching

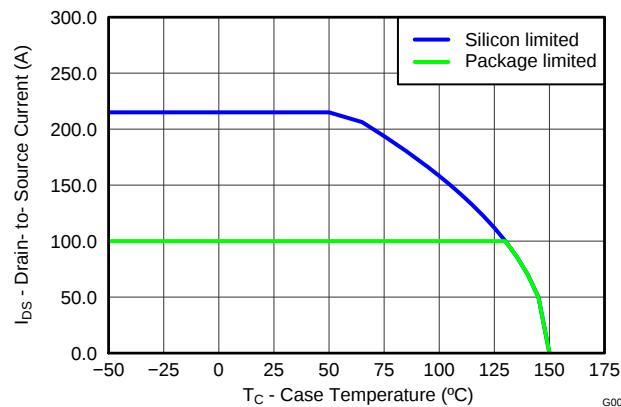
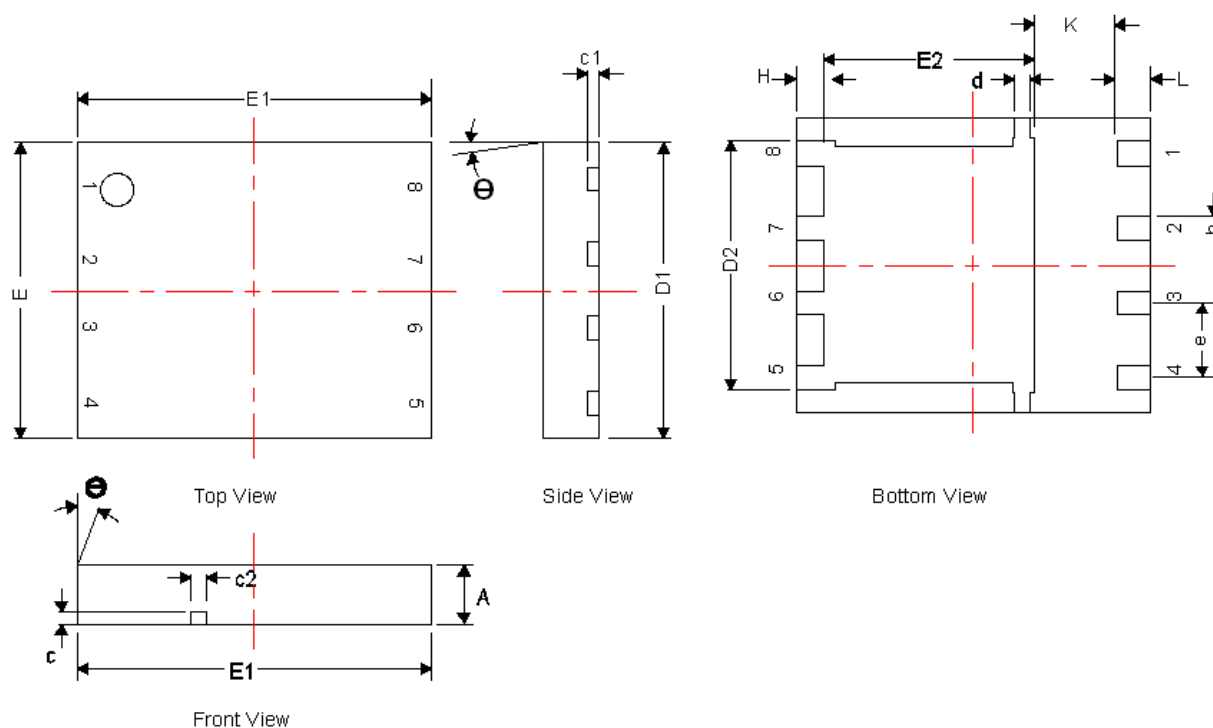


Figure 12. Maximum Drain Current vs. Temperature

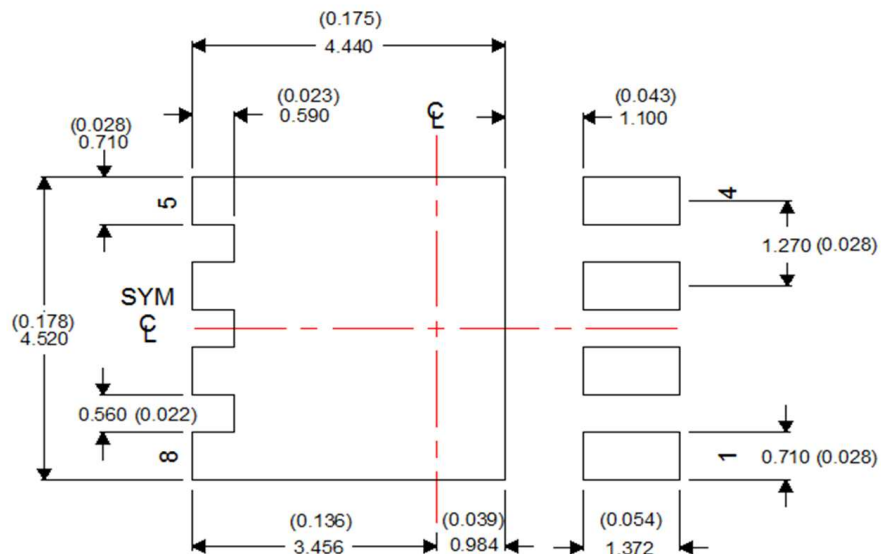
MECHANICAL DATA

Q5B Package Dimensions



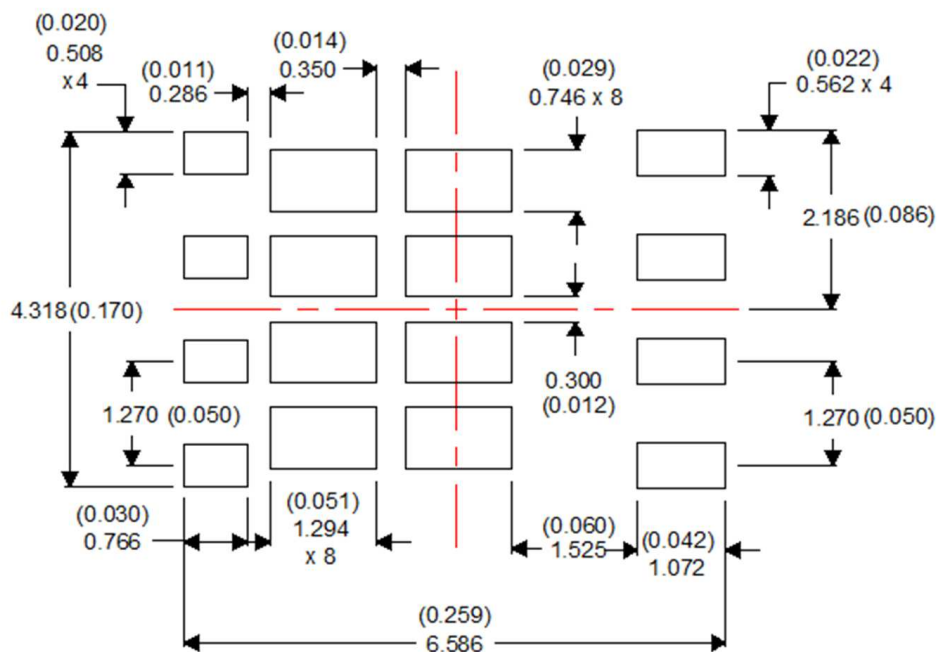
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.95	1.00	1.05
b	0.36	0.41	0.46
c	0.15	0.20	0.25
c1	0.15	0.20	0.25
c2	0.20	0.25	0.30
D1	4.90	5.00	5.10
D2	4.12	4.22	4.32
d	0.20	0.25	0.30
E	4.90	5.00	5.10
E1	5.90	6.00	6.10
E2	3.48	3.58	3.68
e	1.27 TYP		
L	0.46	0.56	0.66
θ	0°	-	-
K	1.40 TYP		

Recommended PCB Pattern

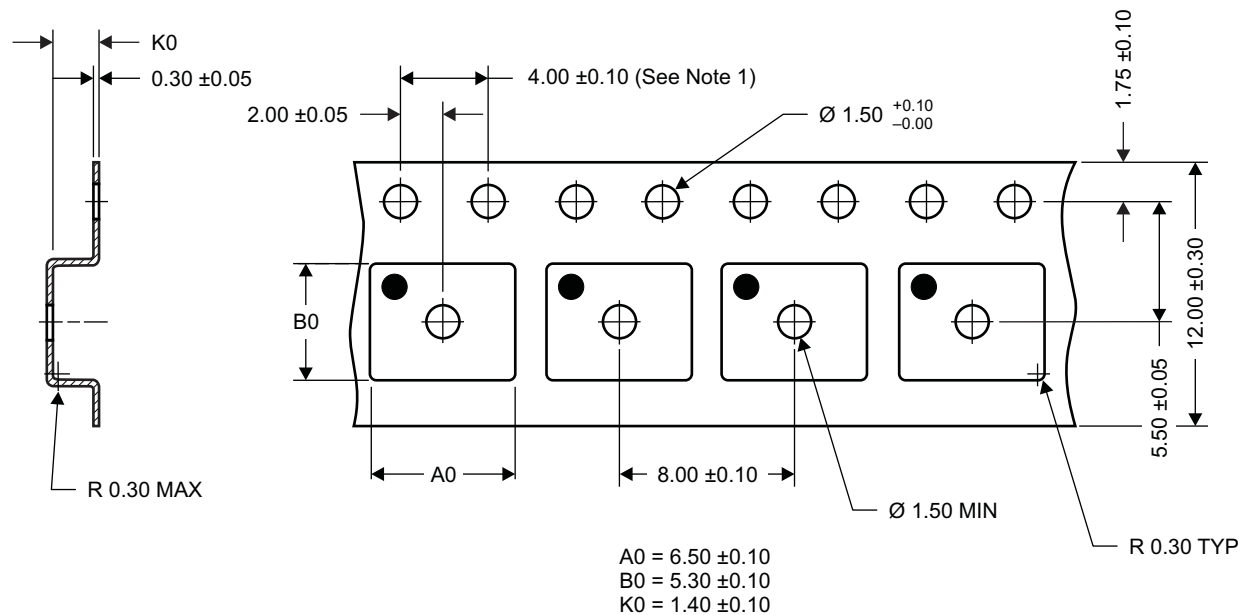


For recommended circuit layout for PCB designs, see application note [SLPA005 – Reducing Ringing Through PCB Layout Techniques](#).

Recommended Stencil Pattern



Q5B Tape and Reel Information



M0138-01

Notes:

- 10-sprocket hole-pitch cumulative tolerance ± 0.2
- Camber not to exceed 1mm in 100mm, noncumulative over 250mm
- Material: black static-dissipative polystyrene
- All dimensions are in mm (unless otherwise specified)
- $A0$ and $B0$ measured on a plane 0.3mm above the bottom of the pocket

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
CSD17556Q5B	ACTIVE	VSON	DNK	8	2500	Pb-Free (RoHS Exempt)	CU SN	Level-1-260C-UNLIM	-55 to 150	CSD17556	Samples

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

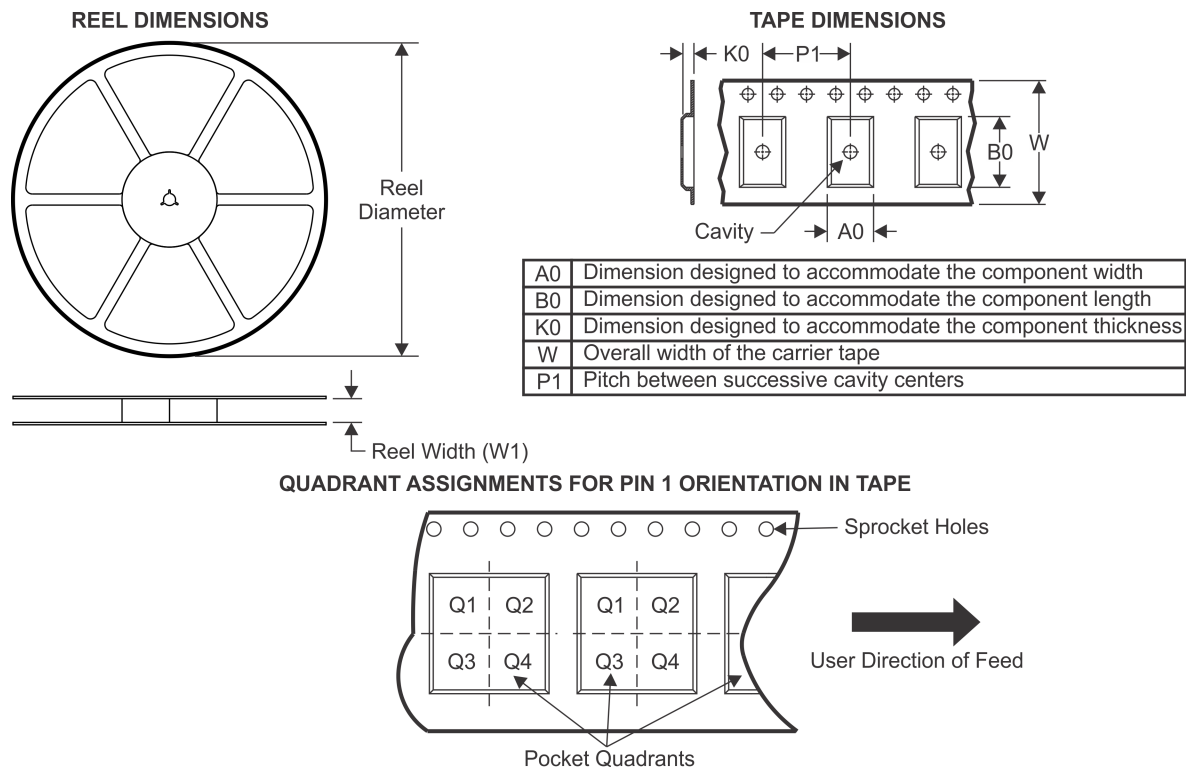
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

⁽⁴⁾ Only one of markings shown within the brackets will appear on the physical device.

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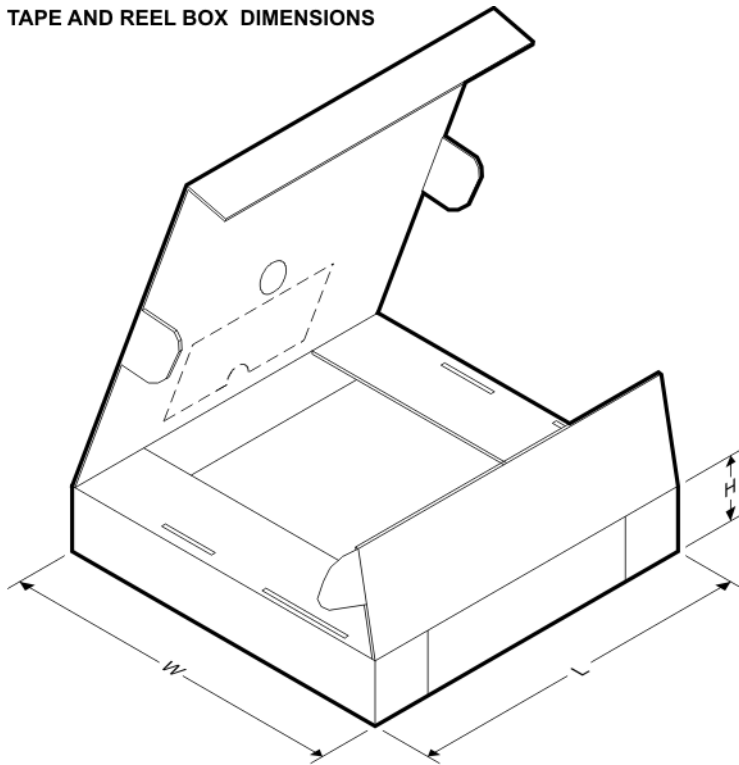
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TAPE AND REEL INFORMATION


*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
CSD17556Q5B	VSON	DNK	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)
CSD17556Q5B	VSON	DNK	8	2500	335.0	335.0	32.0

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