CSD17318Q2 30-V N-Channel NexFET™ Power MOSFET

1 Features

- Optimized for 5-V Gate Drive
- Low Capacitance and Charge
- Low $R_{DS(ON)}$
- Low-Thermal Resistance
- Lead Free
- RoHS Compliant
- Halogen Free
- SON 2-mm × 2-mm Plastic Package

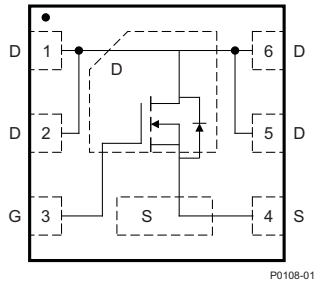
2 Applications

- Storage, Tablets, and Handheld Devices
- Optimized for Load Switch Applications
- DC-DC Converters
- Battery and Load Management Applications

3 Description

This 30-V, 12.6-mΩ, 2-mm × 2-mm SON NexFET™ power MOSFET is designed to minimize losses in power conversion applications and optimized for 5-V gate drive applications. The 2-mm × 2-mm SON offers excellent thermal performance for the size of the package.

Top View



Product Summary

T_A = 25°C		TYPICAL VALUE		UNIT
V_{DS}	Drain-to-Source Voltage	30		V
Q_g	Gate Charge Total (4.5 V)	6.0		nC
Q_{gd}	Gate Charge Gate-to-Drain	1.3		nC
$R_{DS(on)}$	Drain-to-Source On-Resistance	V_{GS} = 2.5 V	20	mΩ
		V_{GS} = 4.5 V	13.9	
		V_{GS} = 8 V	12.6	
$V_{GS(th)}$	Threshold Voltage	0.9		V

Device Information(1)

PART NUMBER	QTY	MEDIA	PACKAGE	SHIP
CSD17318Q2	3000	7-Inch Reel	SON 2.00-mm × 2.00-mm Plastic Package	Tape and Reel
CSD17318Q2T	250			

(1) For all available packages, see the orderable addendum at the end of the data sheet.

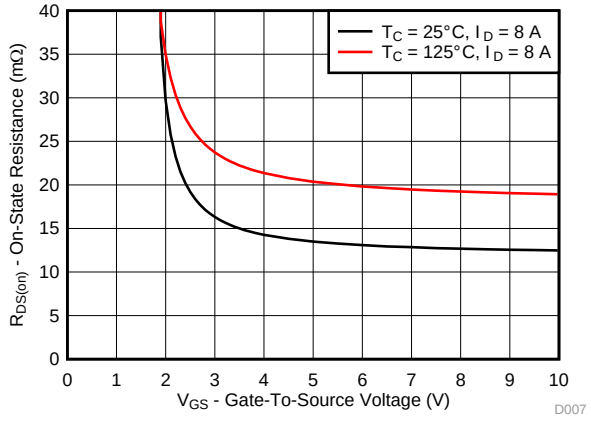
Absolute Maximum Ratings

T_A = 25°C		VALUE	UNIT
V_{DS}	Drain-to-Source Voltage	30	V
V_{GS}	Gate-to-Source Voltage	±10	V
I_D	Continuous Drain Current (Package Limited)	21.5	A
	Continuous Drain Current (Silicon Limited), T_C = 25°C	25	
	Continuous Drain Current(1)	10	
I_{DM}	Pulsed Drain Current, T_A = 25°C(2)	68	A
P_D	Power Dissipation(1)	2.5	W
	Power Dissipation, T_C = 25°C	16	
T_J, T_{STG}	Operating Junction, Storage Temperature	–55 to 150	°C
E_{AS}	Avalanche Energy, Single Pulse, I_D = 12.4 A, L = 0.1 mH, R_G = 25 Ω	7.7	mJ

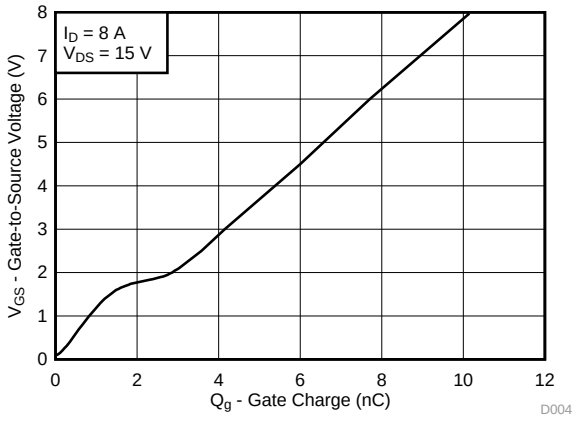
(1) Typical $R_{\theta JA}$ = 55°C/W on a 1-in^2, 2-oz Cu pad on a 0.06-in thick FR4 PCB.

(2) Max $R_{\theta JC}$ = 7°C/W, pulse duration ≤ 100 µs, duty cycle ≤ 1%.

On-State Resistance vs Gate to Source Voltage



Gate Charge



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4 Revision History

Changes from Original (February 2017) to Revision A **Page**

- Updated the *Mechanical Data* drawings ... 8

5 Specifications

5.1 Electrical Characteristics

T_A = 25°C (unless otherwise noted)

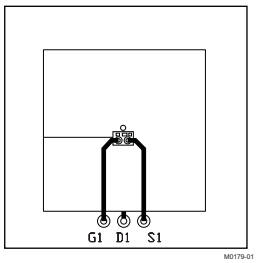
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
STATIC CHARACTERISTICS						
BV_{DSS}	Drain-to-source voltage	V_{GS} = 0 V, I_D = 250 µA	30			V
I_{DSS}	Drain-to-source leakage	V_{GS} = 0 V, V_{DS} = 24 V			1	µA
I_{GSS}	Gate-to-source leakage	V_{DS} = 0 V, V_{GS} = 10 V			100	nA
$V_{GS(th)}$	Gate-to-source threshold voltage	V_{DS} = V_{GS}, I_D = 250 µA	0.6	0.9	1.2	V
$R_{DS(on)}$	Drain-to-source on-resistance	V_{GS} = 2.5 V, I_D = 8 A		20	30	mΩ
		V_{GS} = 4.5 V, I_D = 8 A		13.9	16.9	
		V_{GS} = 8 V, I_D = 8 A		12.6	15.1	
g_{fs}	Transconductance	V_{DS} = 3 V, I_D = 8 A		42		S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input capacitance	V_{GS} = 0 V, V_{DS} = 15 V, f = 1 MHz		676	879	pF
C_{oss}	Output capacitance			71	92	pF
C_{rss}	Reverse transfer capacitance			39	51	pF
R_G	Series gate resistance			1.0	2.0	Ω
Q_g	Gate charge total (4.5 V)	V_{DS} = 15 V, I_D = 8 A		6.0		nC
Q_{gd}	Gate charge gate-to-drain			1.3		nC
Q_{gs}	Gate charge gate-to-source			1.5		nC
$Q_{g(th)}$	Gate charge at Vth			0.7		nC
Q_{oss}	Output charge	V_{DS} = 15 V, V_{GS} = 0 V		2.7		nC
$t_{d(on)}$	Turnon delay time	V_{DS} = 15 V, V_{GS} = 4.5 V, I_D = 8 A, R_G = 2 Ω		5		ns
t_r	Rise time			16		ns
$t_{d(off)}$	Turnoff delay time			13		ns
t_f	Fall time			4		ns
DIODE CHARACTERISTICS						
V_{SD}	Diode forward voltage	I_{SD} = 8 A, V_{GS} = 0 V		0.8	1.0	V
Q_{rr}	Reverse recovery charge	V_{DD}= 15 V, I_F = 8 A, di/dt = 300 A/µs		2.9		nC
t_{rr}	Reverse recovery time			12		ns

5.2 Thermal Characteristics

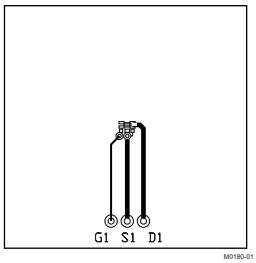
T_A = 25°C (unless otherwise noted)

PARAMETER		MIN	TYP	MAX	UNIT
$R_{\theta JC}$	Thermal resistance junction-to-case(1)			7.9	°C/W
$R_{\theta JA}$	Thermal resistance junction-to-ambient(1)(2)			65	°C/W

(1) $R_{\theta JC}$ is determined with the device mounted on a 1-in^2 (6.45-cm^2), 2-oz (0.071-mm) thick Cu pad on a 1.5-in × 1.5-inch (3.81-cm × 3.81-cm), 0.06-in (1.52-mm) thick FR4 PCB. $R_{\theta JC}$ is specified by design, whereas $R_{\theta JA}$ is determined by the user's board design.
(2) Device mounted on FR4 material with 1-in^2 (6.45-cm^2), 2-oz (0.071-mm) thick Cu.



Max $R_{\theta JA}$ = 65°C/W when mounted on 1 in^2 (6.45 cm^2) of 2-oz (0.071-mm) thick Cu.



Max $R_{\theta JA}$ = 250°C/W when mounted on a minimum pad area of 2-oz (0.071-mm) thick Cu.

5.3 Typical MOSFET Characteristics

T_A = 25°C (unless otherwise noted)

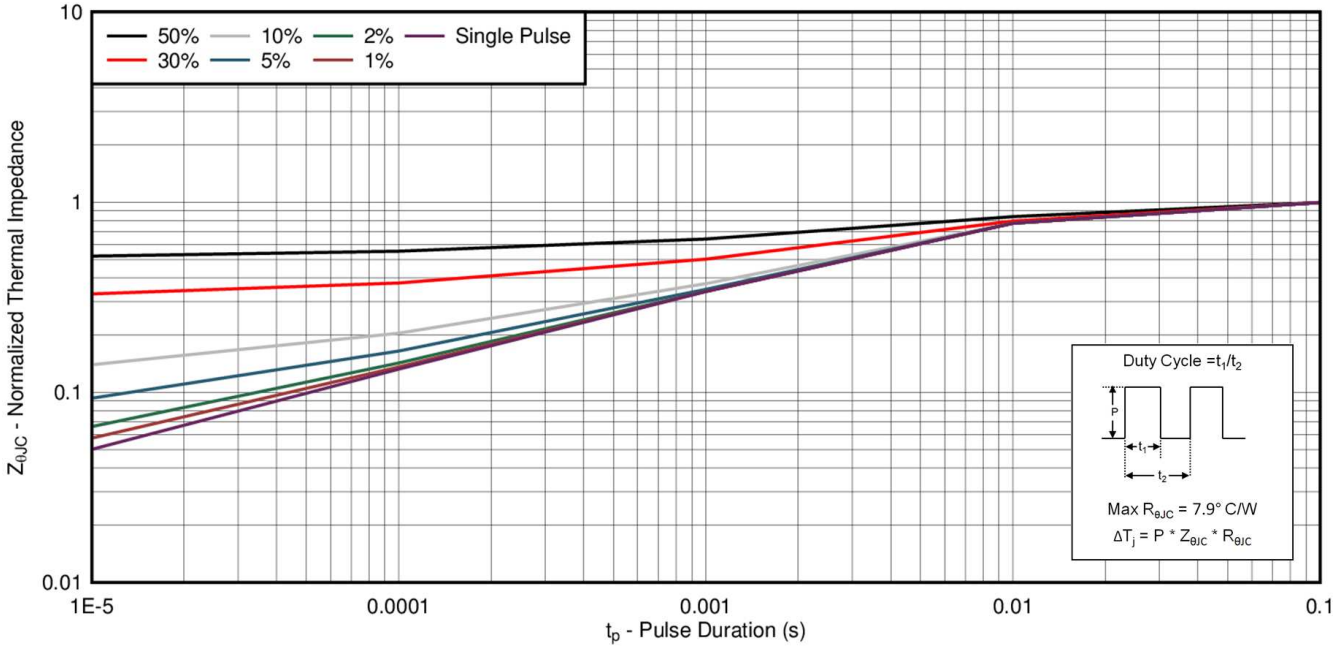


Figure 1. Transient Thermal Impedance

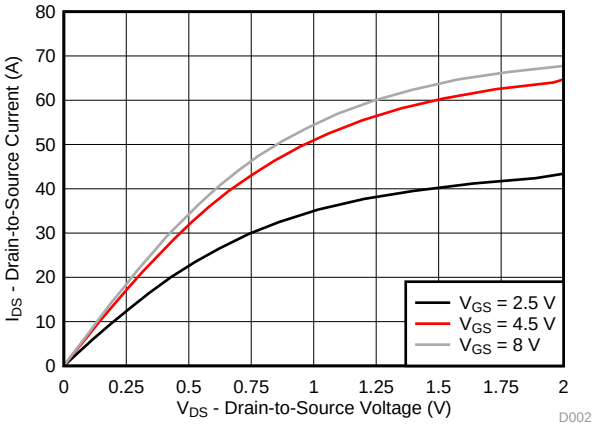


Figure 2. Saturation Characteristics

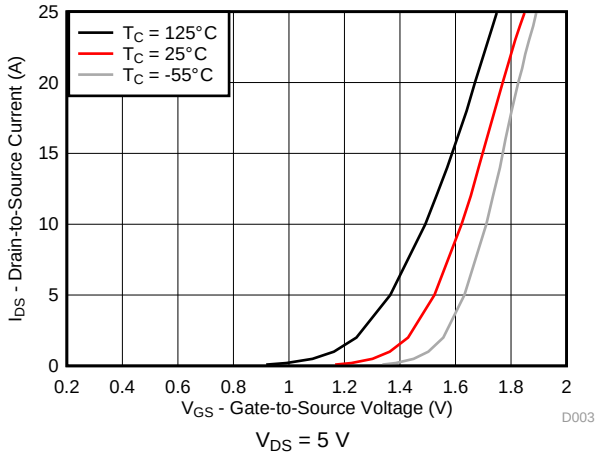


Figure 3. Transfer Characteristics

Typical MOSFET Characteristics (continued)

T_A = 25°C (unless otherwise noted)

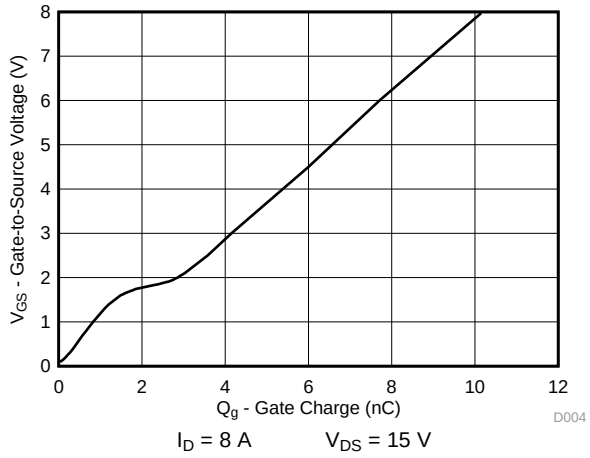


Figure 4. Gate Charge

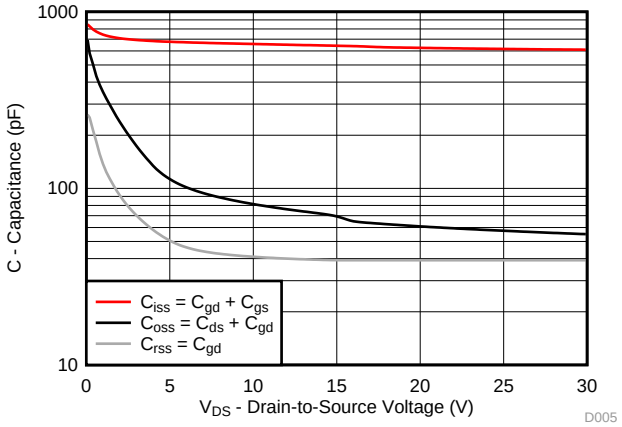


Figure 5. Capacitance

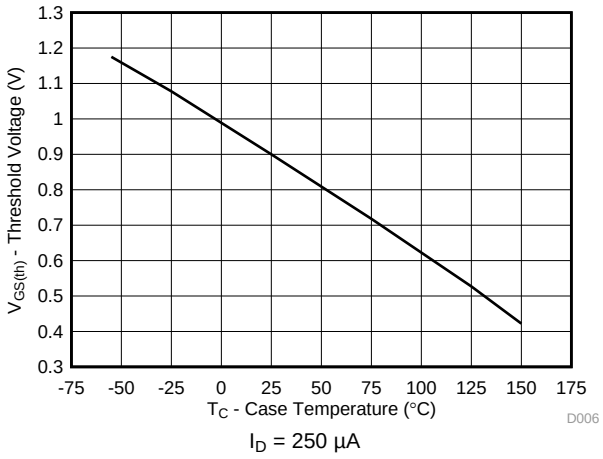


Figure 6. Threshold Voltage vs Temperature

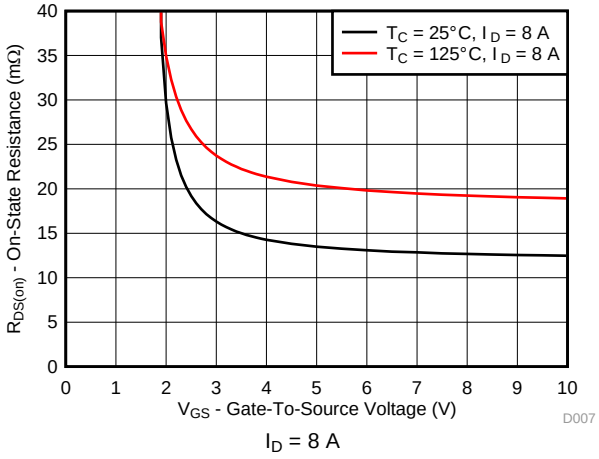


Figure 7. On-State Resistance vs Gate-to-Source Voltage

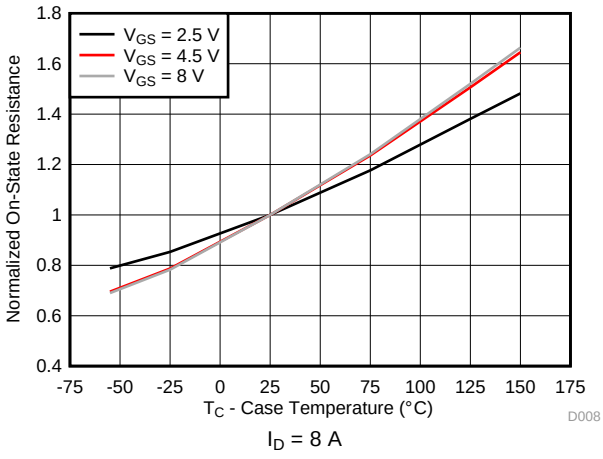


Figure 8. Normalized On-State Resistance vs Temperature

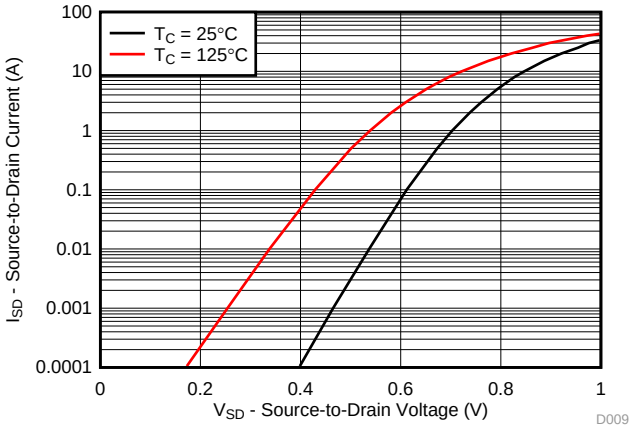


Figure 9. Typical Diode Forward Voltage

Typical MOSFET Characteristics (continued)

T_A = 25°C (unless otherwise noted)

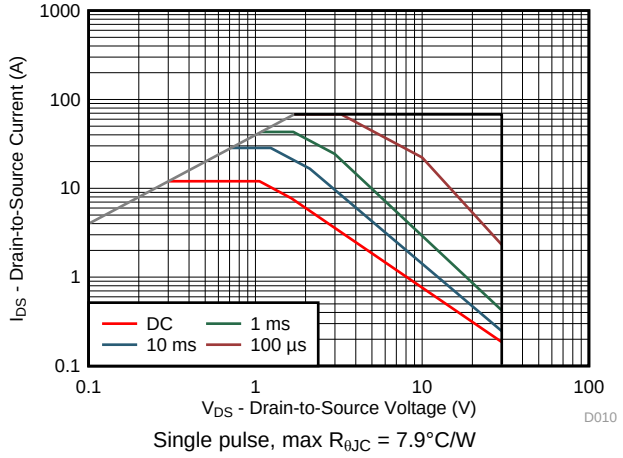


Figure 10. Maximum Safe Operating Area

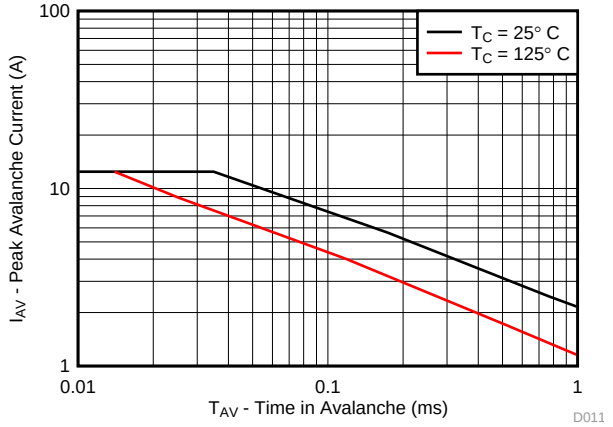


Figure 11. Single Pulse Unclamped Inductive Switching

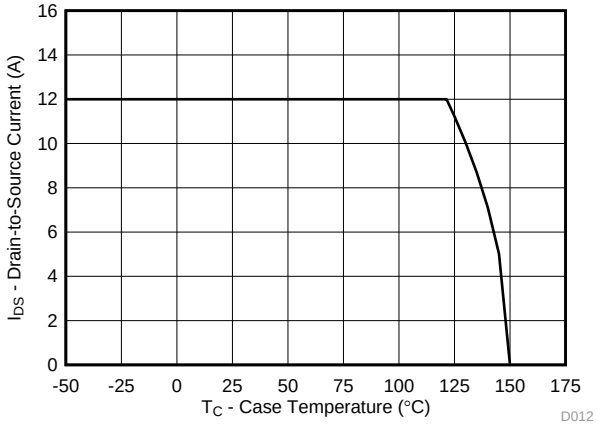


Figure 12. Maximum Drain Current vs Temperature

6 Device and Documentation Support

6.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

6.2 Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

TI E2E™ Online Community ***TI's Engineer-to-Engineer (E2E) Community.*** Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support ***TI's Design Support*** Quickly find helpful E2E forums along with design support tools and contact information for technical support.

6.3 Trademarks

NexFET, E2E are trademarks of Texas Instruments.
All other trademarks are the property of their respective owners.

6.4 Electrostatic Discharge Caution

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.

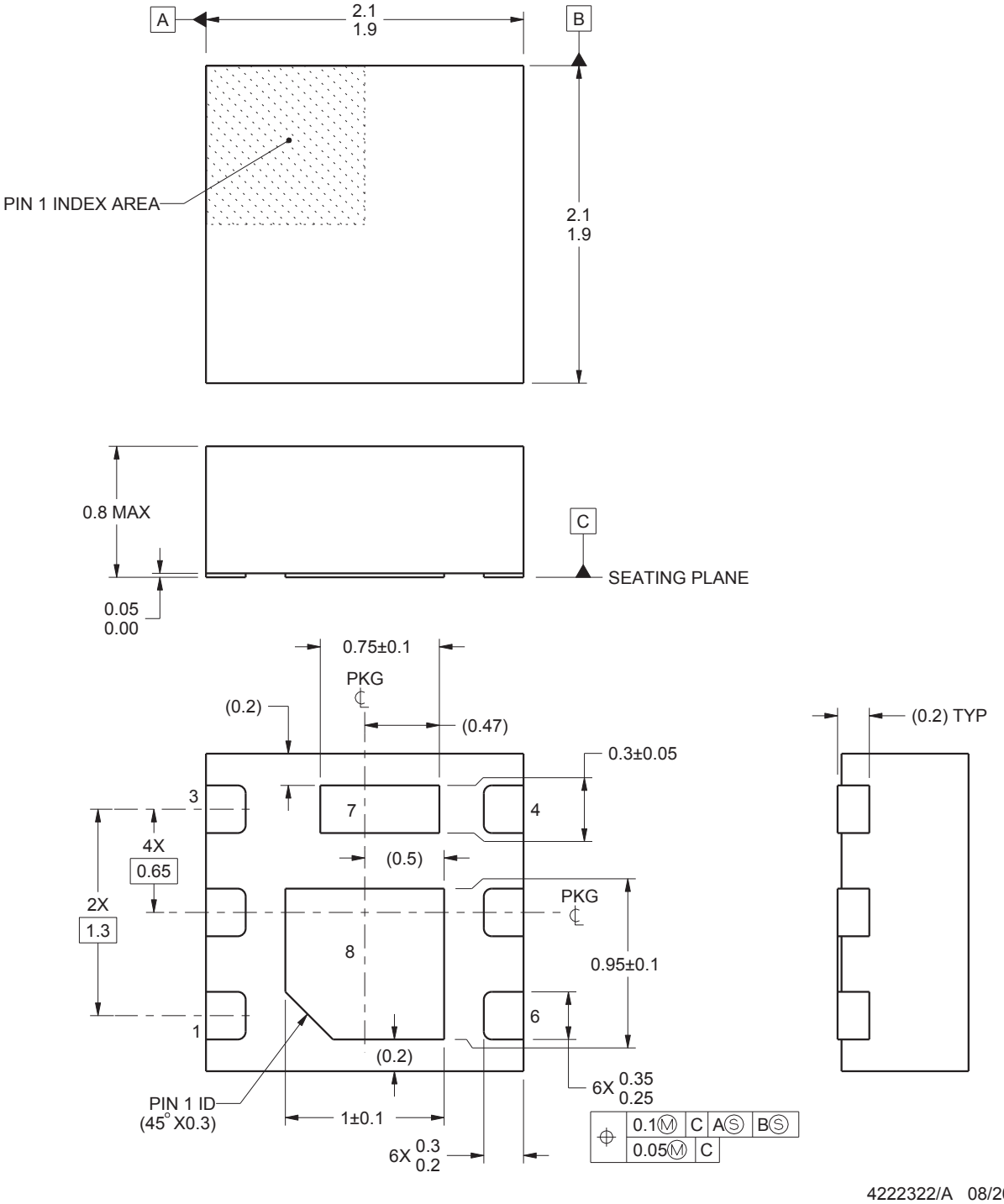
6.5 Glossary

SLYZ022 — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

7 Mechanical Data

7.1 Q2 Package Dimensions



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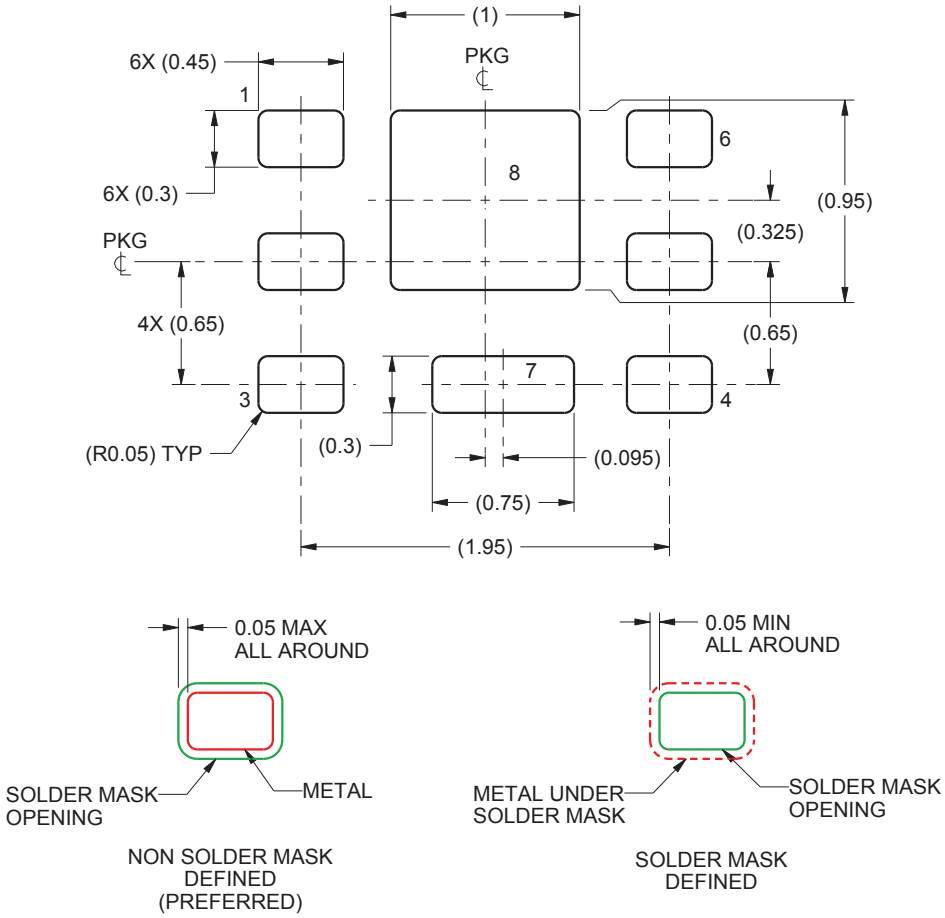
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pads must be soldered to the printed circuit board for thermal and mechanical performance.

Q2 Package Dimensions (continued)

7.1.1 Recommended PCB Pattern

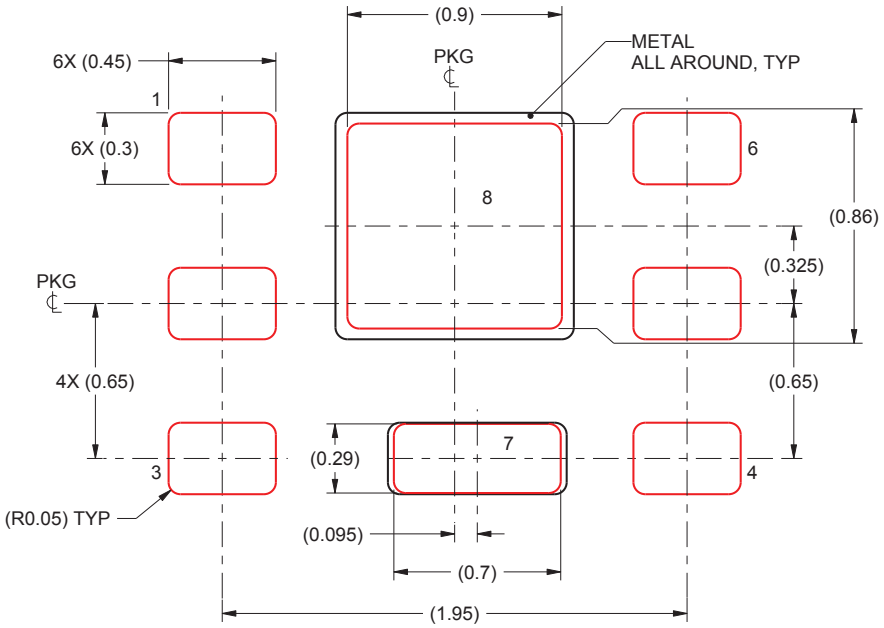


SOLDER MASK DETAILS

1. This package is designed to be soldered to a thermal pad on the board. For more information, see *QFN/SON PCB Attachment* (SLUA271).

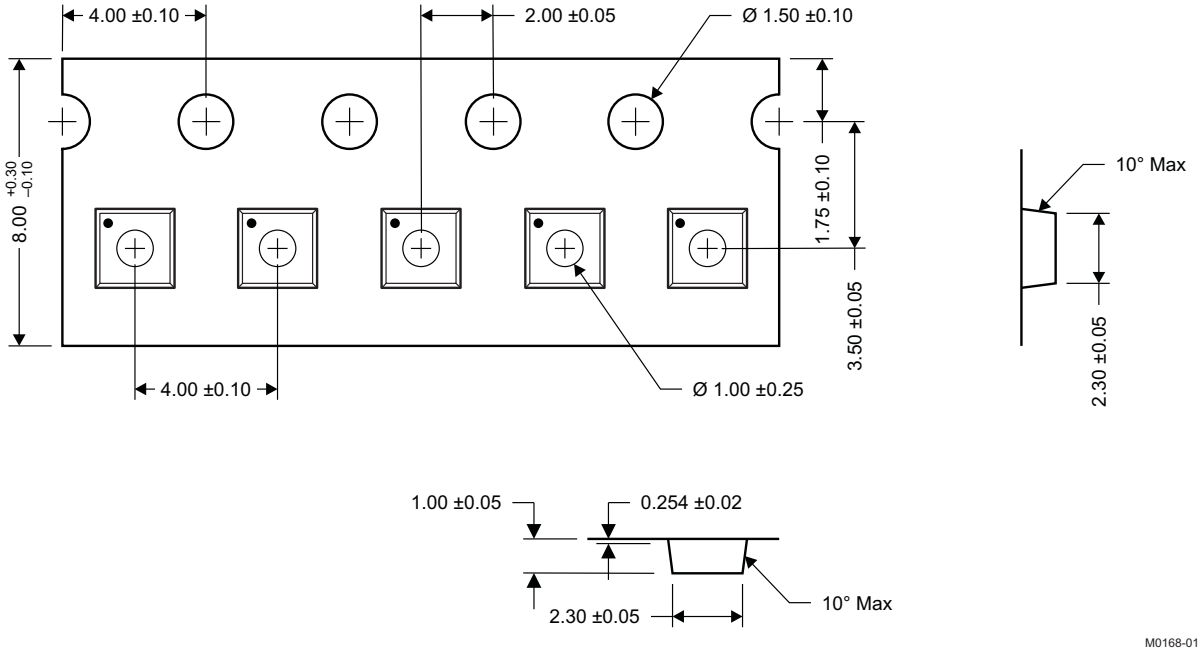
Q2 Package Dimensions (continued)

7.1.2 Recommended Stencil Pattern



1. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

7.2 Q2 Tape and Reel Information



Notes:
1. Measured from centerline of sprocket hole to centerline of pocket.
2. Cumulative tolerance of 10 sprocket holes is ±0.20.
3. Other material available.
4. Typical SR of form tape Max 10^9 OHM/SQ.
5. All dimensions are in mm, unless otherwise specified.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
CSD17318Q2	ACTIVE	WSON	DQK	6	3000	RoHS & Green	NIPDAU | SN	Level-1-260C-UNLIM	-55 to 150	1718	Samples
CSD17318Q2T	ACTIVE	WSON	DQK	6	250	RoHS & Green	NIPDAU | SN	Level-1-260C-UNLIM	-55 to 150	1718	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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

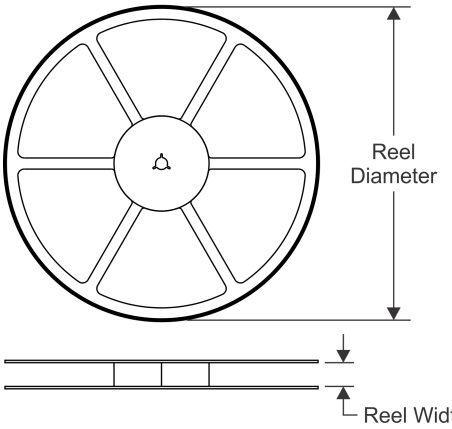
(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

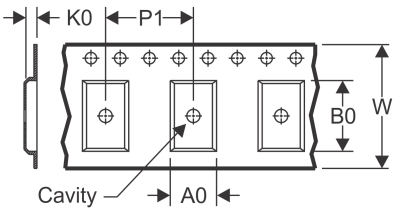
(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

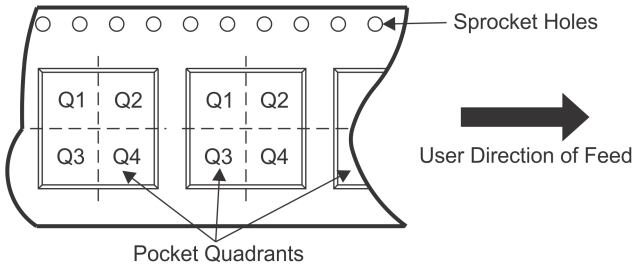


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

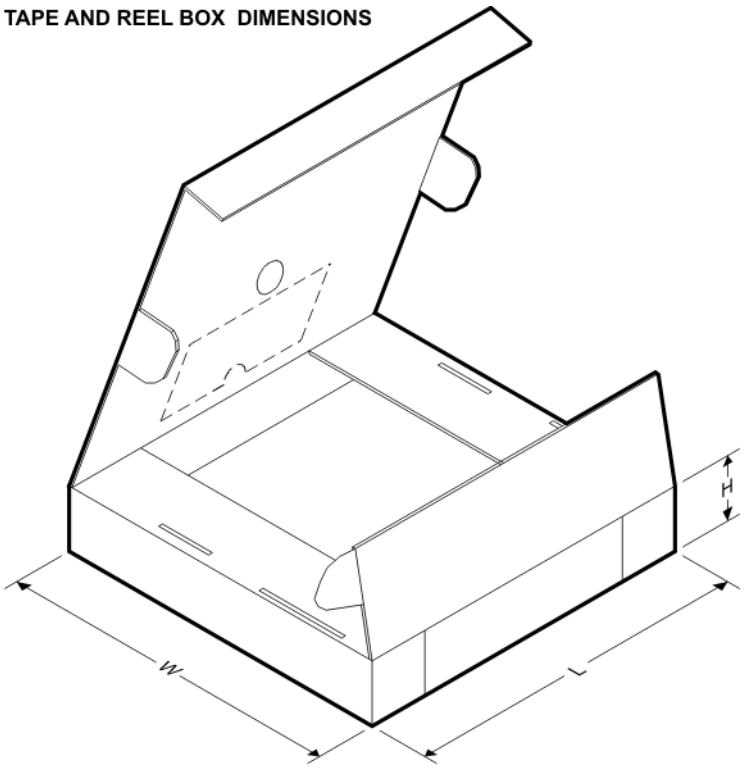
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
CSD17318Q2	WSON	DQK	6	3000	180.0	9.5	2.3	2.3	1.0	4.0	8.0	Q1
CSD17318Q2	WSON	DQK	6	3000	180.0	8.4	2.3	2.3	1.0	4.0	8.0	Q1
CSD17318Q2T	WSON	DQK	6	250	180.0	9.5	2.3	2.3	1.0	4.0	8.0	Q1
CSD17318Q2T	WSON	DQK	6	250	180.0	8.4	2.3	2.3	1.0	4.0	8.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CSD17318Q2	WSON	DQK	6	3000	189.0	185.0	36.0
CSD17318Q2	WSON	DQK	6	3000	550.0	455.0	55.0
CSD17318Q2T	WSON	DQK	6	250	189.0	185.0	36.0
CSD17318Q2T	WSON	DQK	6	250	550.0	455.0	55.0

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