CSD87501L 30-V Dual Common Drain N-Channel NexFET™ Power MOSFET

1 Features

- Low on-resistance
- Small footprint of 3.37 mm × 1.47 mm
- Ultra-low profile – 0.2-mm high
- Lead free
- RoHS compliant
- Halogen free
- Gate ESD protection

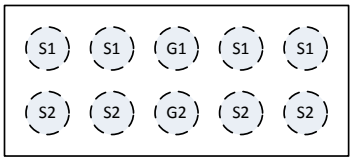
2 Applications

- Battery management
- Battery protection
- USB Type-C / PD

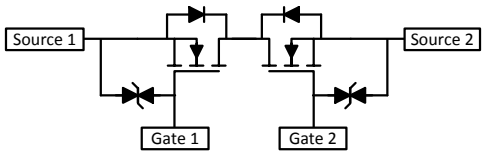
3 Description

This 30-V, 6.6-mΩ, 3.37-mm × 1.47-mm LGA Dual NexFET™ power MOSFET is designed to minimize resistance and gate charge in a small footprint. Its small size and common drain configuration make the device ideal for multi-cell battery pack applications and small handheld devices.

Top View



Configuration



Product Summary

T_A = 25°C		TYPICAL VALUE		UNIT
V_{S1S2}	Source-to-Source Voltage	30		V
Q_g	Gate Charge Total (4.5 V)	15		nC
Q_{gd}	Gate Charge Gate-to-Drain	6.0		nC
$R_{S1S2(on)}$	Source-to-Source On-Resistance	V_{GS} = 4.5 V	9.3	mΩ
		V_{GS} = 10 V	6.6	
$V_{GS(th)}$	Threshold Voltage	1.8		V

Device Information(1)

DEVICE	MEDIA	QTY	PACKAGE	SHIP
CSD87501L	7-Inch Reel	3000	3.37 mm × 1.47 mm Land Grid Array Package	Tape and Reel
CSD87501LT	7-Inch Reel	250		

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

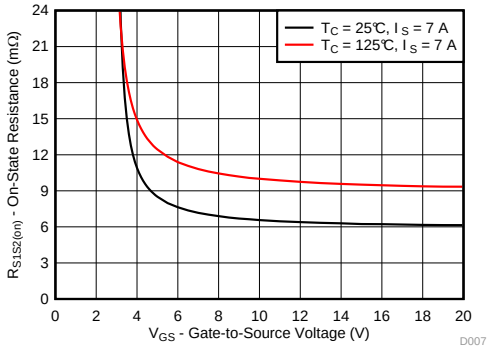
Absolute Maximum Ratings

T_A = 25°C		VALUE	UNIT
V_{S1S2}	Source-to-Source Voltage	30	V
V_{GS}	Gate-to-Source Voltage	±20	V
I_S	Continuous Source Current(1)	14	A
I_{SM}	Pulsed Source Current(2)	72	A
P_D	Power Dissipation	2.5	W
$V_{(ESD)}$	Human-Body Model (HBM)	2	kV
T_J, T_{stg}	Operating Junction, Storage Temperature	–55 to 150	°C

(1) Typical $R_{\theta JA}$ = 50°C/W on a 1-in^2, 2-oz Cu pad on a 0.06-in thick FR4 PCB.

(2) Typical min Cu $R_{\theta JA}$ = 135°C/W, pulse duration ≤ 100 µs, duty cycle ≤ 1%.

$R_{S1S2(on)}$ vs V_{GS}



Gate Charge

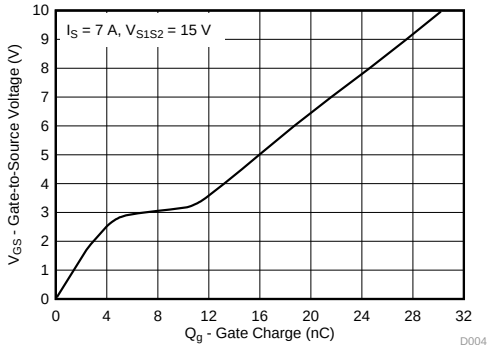


Table of Contents

4 Revision History

Changes from Revision A (April 2015) to Revision B **Page**

- Added *Receiving Notification of Documentation Updates* section and *Community Resources* section 7
- Added Pin Configuration table in the *Mechanical, Packaging, and Orderable Information* section 8

Changes from Original (February 2015) to Revision A **Page**

- Extended Y axis in Figure 9 down to 0.01 A 4

5 Specifications

5.1 Electrical Characteristics

T_A = 25°C unless otherwise stated

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
STATIC CHARACTERISTICS						
BV_{S1S2}	Source-to-source voltage	V_{GS} = 0 V, I_S = 250 µA	30			V
I_{S1S2}	Source-to-source leakage current	V_{GS} = 0 V, V_{S1S2} = 24 V			1	µA
I_{GSS}	Gate-to-source leakage current	V_{S1S2} = 0 V, V_{GS} = 20 V			10	µA
$V_{GS(th)}$	Gate-to-source threshold voltage	V_{S1S2} = V_{GS}, I_S = 250 µA	1.3	1.8	2.3	V
$R_{S1S2(on)}$	Source-to-source on-resistance	V_{GS} = 4.5 V, I_S = 7 A		9.3	11.0	mΩ
		V_{GS} = 10 V, I_S = 7 A		6.6	7.8	
g_{fs}	Transconductance	V_{S1S2} = 3 V, I_S = 7 A		48		S
DYNAMIC CHARACTERISTICS(1)						
C_{iss}	Input capacitance	V_{GS} = 0 V, V_{S1S2} = 15 V, f = 1 MHz		1620	2110	pF
C_{oss}	Output capacitance			189	246	pF
C_{rss}	Reverse transfer capacitance			152	198	pF
R_G	Series gate resistance			300	450	Ω
Q_g	Gate charge total (4.5 V)	V_{S1S2} = 15 V, I_S = 7 A		15	20	nC
Q_g	Gate charge total (10 V)			31	40	nC
Q_{gd}	Gate charge gate-to-drain			6.0		nC
Q_{gs}	Gate charge gate-to-source			5.0		nC
$Q_{g(th)}$	Gate charge at V_{th}			2.5		nC
Q_{oss}	Output charge	V_{S1S2} = 15 V, V_{GS} = 0 V		7.6		nC
$t_{d(on)}$	Turn on delay time	V_{S1S2} = 15 V, V_{GS} = 10 V, I_{S1S2} = 7 A, R_G = 0 Ω		164		ns
t_r	Rise time			260		ns
$t_{d(off)}$	Turn off delay time			709		ns
t_f	Fall time			712		ns

(1) Dynamic characteristics values specified are per single FET.

5.2 Thermal Information

T_A = 25°C unless otherwise stated

THERMAL METRIC		MIN	TYP	MAX	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance(1)		135		°C/W
	Junction-to-ambient thermal resistance(2)		50		

(1) Device mounted on FR4 material with minimum Cu mounting area.
(2) Device mounted on FR4 material with 1-in^2 (6.45-cm^2), 2-oz (0.071-mm thick) Cu.

5.3 Typical MOSFET Characteristics

T_A = 25°C unless otherwise stated

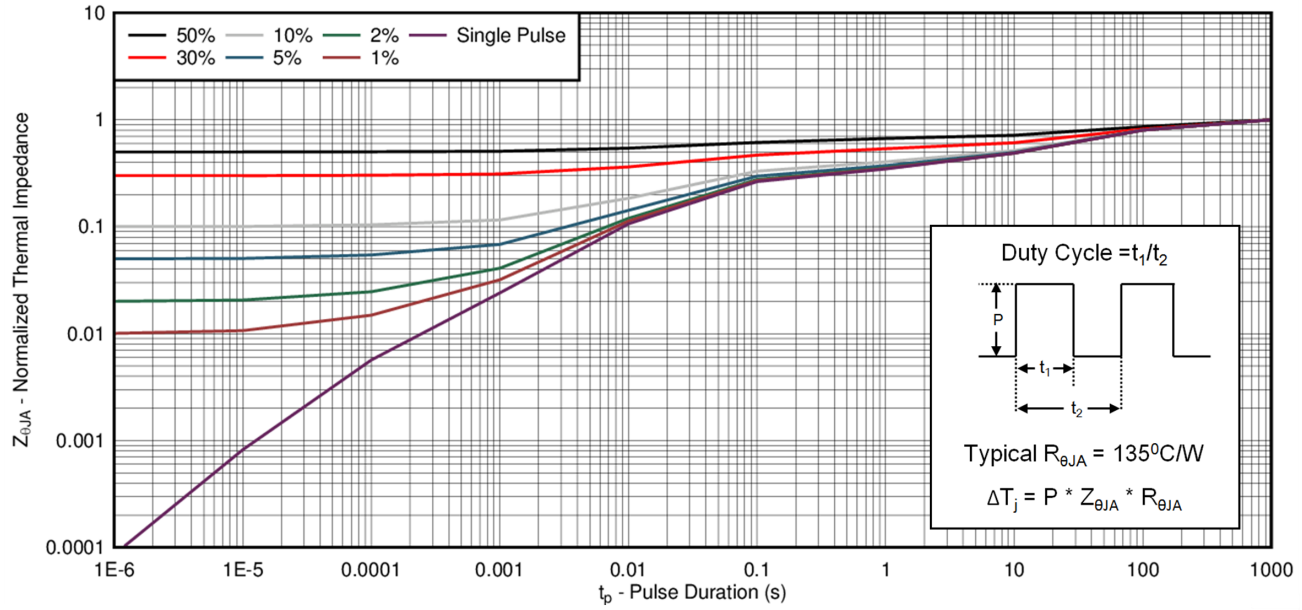


Figure 1. Transient Thermal Impedance

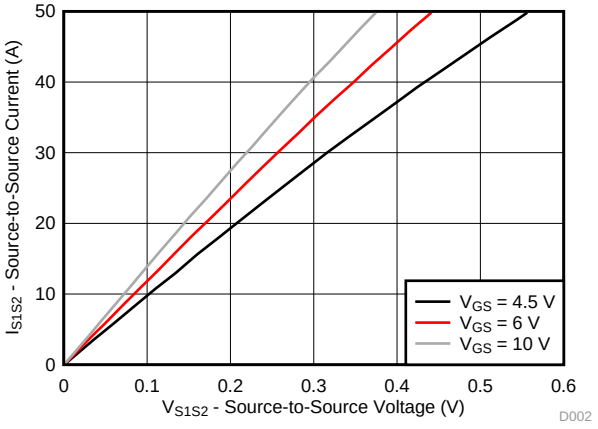


Figure 2. Saturation Characteristics

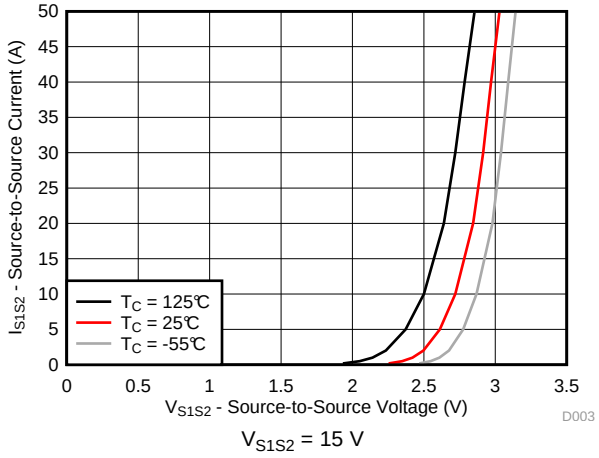


Figure 3. Transfer Characteristics

Typical MOSFET Characteristics (continued)

T_A = 25°C unless otherwise stated

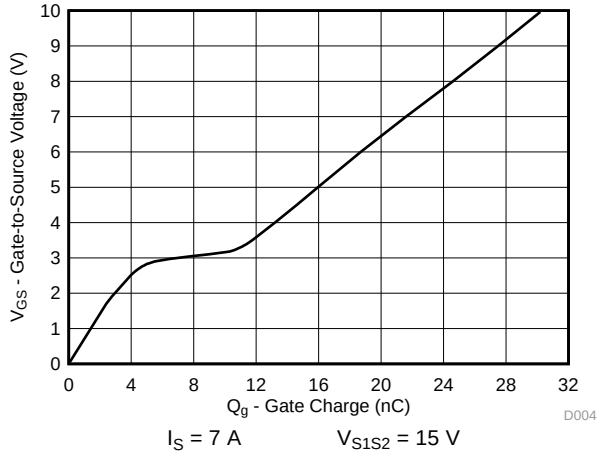


Figure 4. Gate Charge

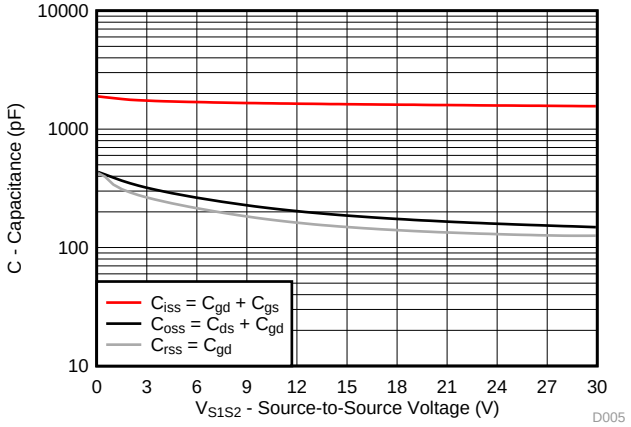


Figure 5. Capacitance

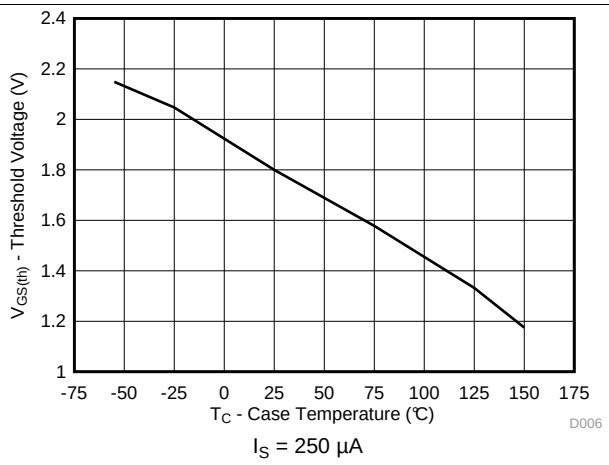


Figure 6. Threshold Voltage vs Temperature

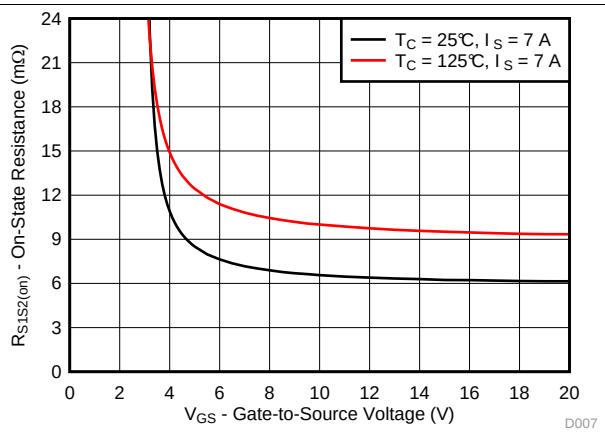


Figure 7. On-State Source-to-Source Resistance vs Gate-to-Source Voltage

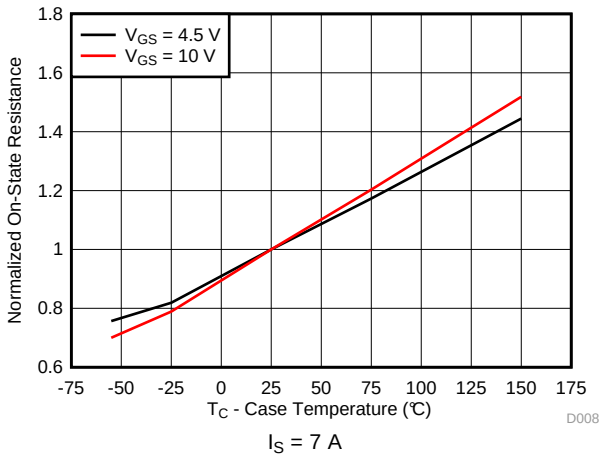


Figure 8. Normalized On-State Resistance vs Temperature

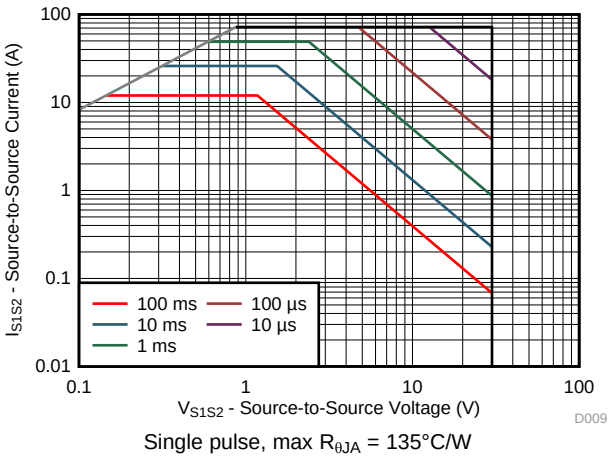


Figure 9. Maximum Safe Operating Area

Typical MOSFET Characteristics (continued)

T_A = 25°C unless otherwise stated

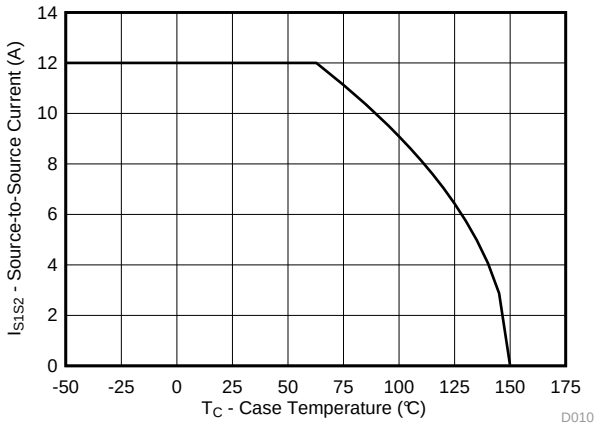


Figure 10. Maximum Source Current vs Temperature

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

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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

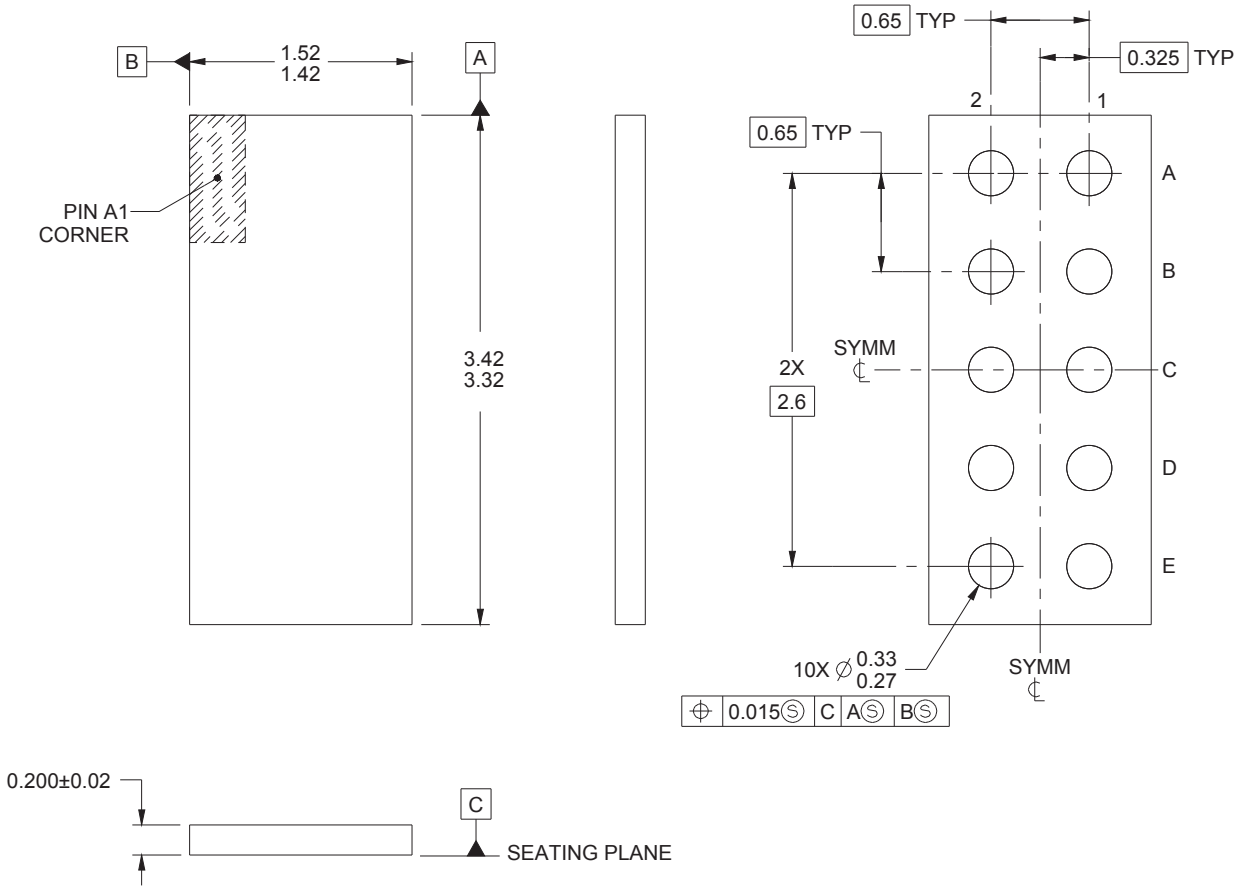
SLYZ022 — *TI Glossary*.

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

7 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

7.1 Package Dimensions

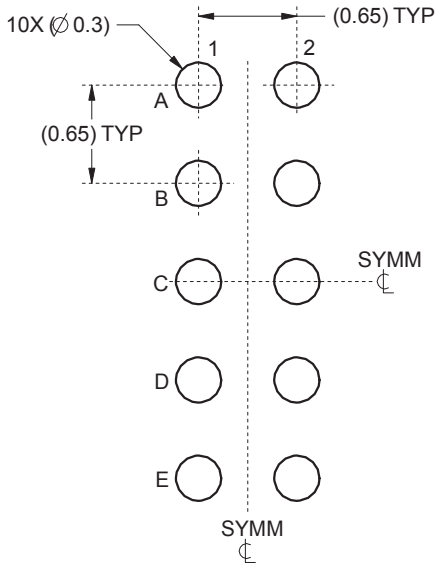


All dimensions in millimeters.

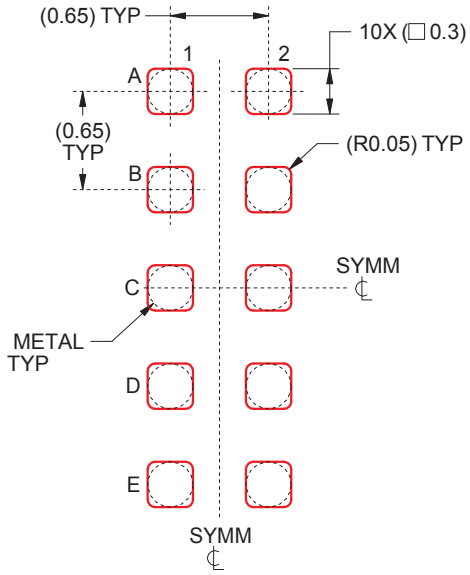
Table 1. Pin Configuration

Position	Designation
A1, B1, D1, E1	Source 1
C1	Gate 1
A2, B2, D2, E2	Source 2
C2	Gate 2

7.2 Recommended PCB Pattern



7.3 Recommended Stencil Pattern



All dimensions are in millimeters unless otherwise noted.

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
CSD87501L	Active	Production	PICOSTAR (YJG) | 10	3000 | LARGE T&R	Yes	NIAU	Level-1-260C-UNLIM	-	CSD87501
CSD87501L.B	Active	Production	PICOSTAR (YJG) | 10	3000 | LARGE T&R	Yes	NIAU	Level-1-260C-UNLIM	-55 to 150	CSD87501
CSD87501LT	Active	Production	PICOSTAR (YJG) | 10	250 | SMALL T&R	Yes	NIAU	Level-1-260C-UNLIM	-55 to 150	CSD87501
CSD87501LT.B	Active	Production	PICOSTAR (YJG) | 10	250 | SMALL T&R	Yes	NIAU	Level-1-260C-UNLIM	-55 to 150	CSD87501

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts 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.

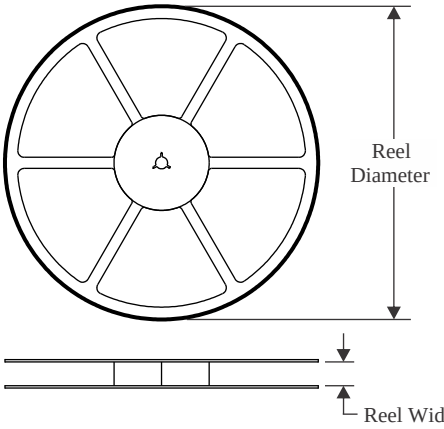
(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

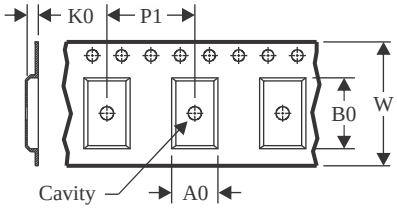
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

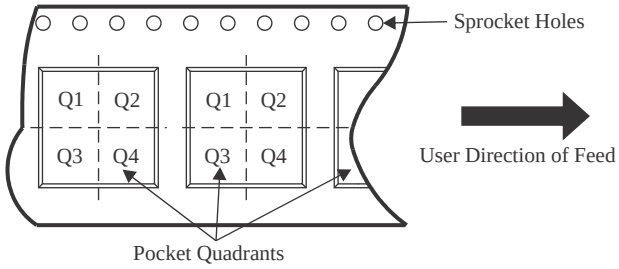


TAPE DIMENSIONS



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

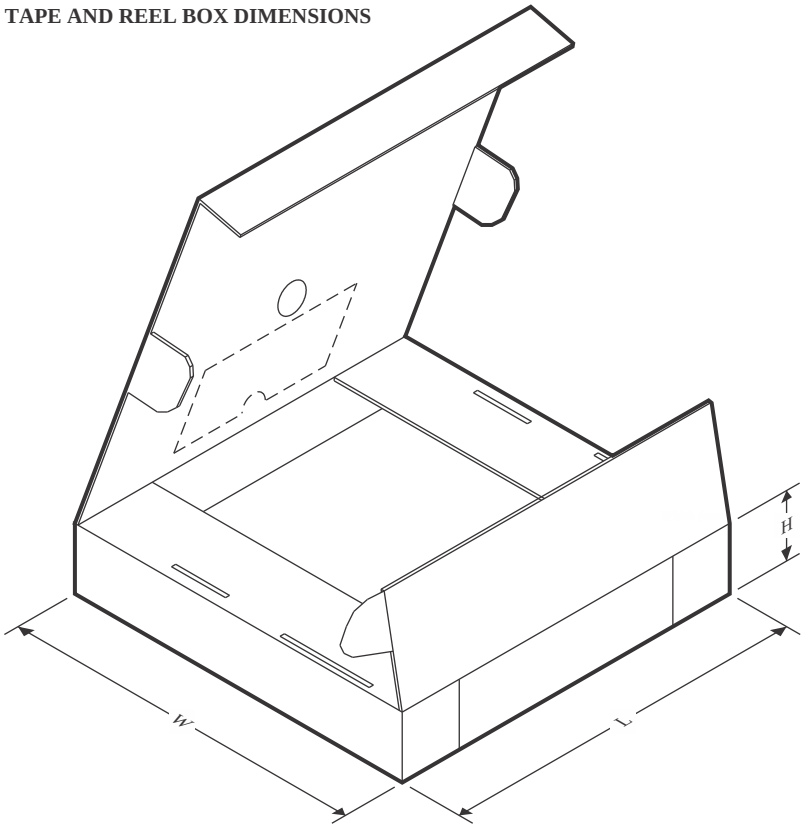
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
CSD87501LT	PICOSTAR	YJG	10	250	330.0	12.4	1.62	3.62	0.37	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)
CSD87501LT	PICOSTAR	YJG	10	250	335.0	335.0	25.0

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