

## 30-V, N-Channel NexFET™ Power MOSFETs

Check for Samples: [CSD17552Q5A](#)

### FEATURES

- Ultra Low Qg and Qgd
- Low Thermal Resistance
- Avalanche Rated
- Pb Free Terminal Plating
- RoHS Compliant
- Halogen Free
- SON 5-mm × 6-mm Plastic Package

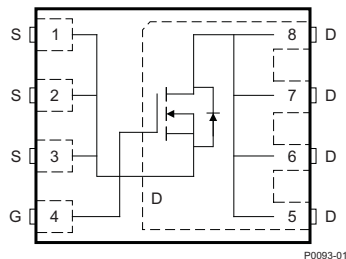
### APPLICATIONS

- Point of load Synchronous Buck in Networking, Telecom and Computing Systems
- Optimized for Control FET Applications

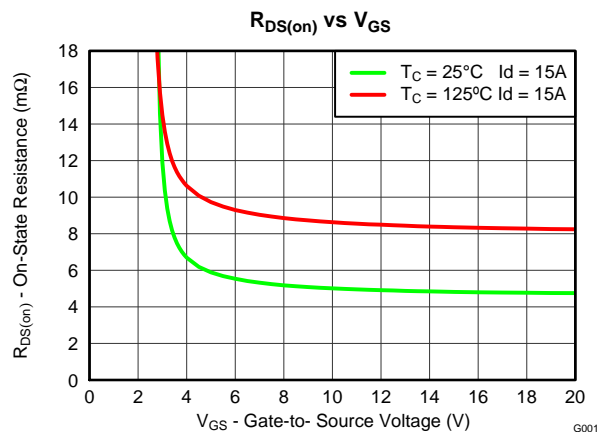
### DESCRIPTION

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

Figure 1. Top View



P0093-01



G001

### PRODUCT SUMMARY

|              |                               |                 |        |
|--------------|-------------------------------|-----------------|--------|
| $V_{DS}$     | Drain to Source Voltage       | 30              | V      |
| $Q_g$        | Gate Charge Total (4.5V)      | 9.0             | nC     |
| $Q_{gd}$     | Gate Charge Gate to Drain     | 2.0             | nC     |
| $R_{DS(on)}$ | Drain to Source On Resistance | $V_{GS} = 4.5V$ | 6.1 mΩ |
|              |                               | $V_{GS} = 10V$  | 5.1 mΩ |
| $V_{GS(th)}$ | Threshold Voltage             | 1.5             | V      |

### ORDERING INFORMATION

| Device      | Package                         | Media        | Qty  | Ship          |
|-------------|---------------------------------|--------------|------|---------------|
| CSD17552Q5A | SON 5-mm × 6-mm Plastic Package | 13-Inch Reel | 2500 | Tape and Reel |

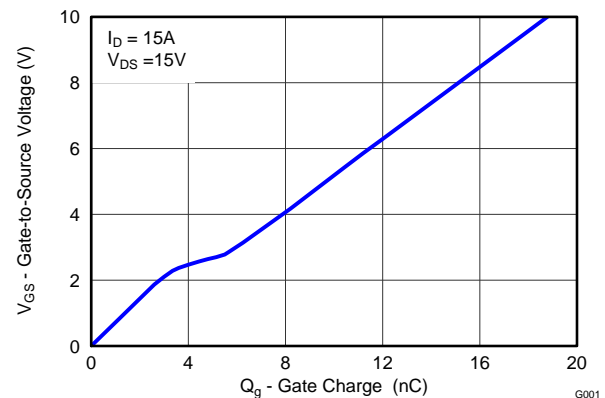
### ABSOLUTE MAXIMUM RATINGS

| $T_A = 25^\circ\text{C}$ unless otherwise stated |  | VALUE          | UNIT             |
|--|--|----------------|------------------|
| $V_{DS}$   | Drain to Source Voltage  | 30             | V                |
| $V_{GS}$   | Gate to Source Voltage   | $\pm 20$       | V                |
| $I_D$  | Continuous Drain Current, $T_C = 25^\circ\text{C}$                             | 60             | A                |
|  | Continuous Drain Current, Silicon Limited                                      | 88             | A                |
|  | Continuous Drain Current, $T_A = 25^\circ\text{C}^{(1)}$                       | 17             | A                |
| $I_{DM}$   | Pulsed Drain Current, $T_A = 25^\circ\text{C}^{(2)}$                           | 106            | A                |
| $P_D$  | Power Dissipation <sup>(1)</sup>   | 3.0            | W                |
| $T_J$ ,<br>$T_{STG}$                             | Operating Junction and Storage Temperature Range                               | $-55$ to $150$ | $^\circ\text{C}$ |
| $E_{AS}$   | Avalanche Energy, single pulse<br>$I_D = 30A$ , $L = 0.1mH$ , $R_G = 25\Omega$ | 45             | mJ               |

(1) Typical  $R_{\theta JA} = 40^\circ\text{C/W}$  on a 1-inch<sup>2</sup> (6.45-cm<sup>2</sup>), 2-oz. (0.071-mm thick) Cu pad on a 0.06-inch (1.52-mm) thick FR4 PCB.

(2) Pulse duration  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$

### GATE CHARGE



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Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.



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<sub>A</sub> = 25°C unless otherwise stated)

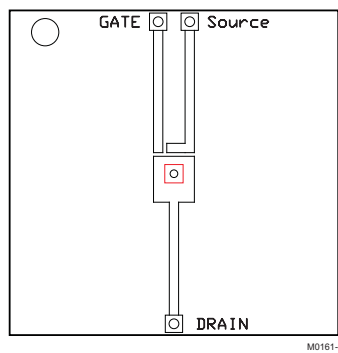
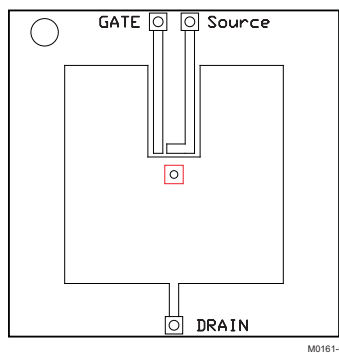
| PARAMETER               |                                  | TEST CONDITIONS  | MIN | TYP  | MAX  | UNIT |
|-------------------------|----------------------------------|--|-----|------|------|------|
| Static Characteristics  |                                  |  |     |      |      |      |
| BV <sub>DSS</sub>       | Drain to Source Voltage          | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA   | 30  |      |      | V    |
| I <sub>DSS</sub>        | Drain to Source Leakage Current  | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 24V  |     |      | 1    | μA   |
| I <sub>GSS</sub>        | Gate to Source Leakage Current   | V <sub>DS</sub> = 0V, V <sub>GS</sub> = 20V  |     |      | 100  | nA   |
| V <sub>GS(th)</sub>     | Gate to Source Threshold Voltage | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                                   | 1.1 | 1.5  | 1.9  | V    |
| R <sub>DS(on)</sub>     | Drain to Source On Resistance    | V <sub>GS</sub> = 4.5V, I <sub>D</sub> = 15A   |     | 6.1  | 7.5  | mΩ   |
|                         |                                  | V <sub>GS</sub> = 10V, I <sub>D</sub> = 15A  |     | 5.1  | 6.2  | mΩ   |
| g <sub>fs</sub>         | Transconductance                 | V <sub>DS</sub> = 15V, I <sub>D</sub> = 15A  |     | 77   |      | S    |
| Dynamic Characteristics |                                  |  |     |      |      |      |
| C <sub>iss</sub>        | Input Capacitance                | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 15V, f = 1MHz  |     | 1580 | 2050 | pF   |
| C <sub>oss</sub>        | Output Capacitance               |  |     | 385  | 500  | pF   |
| C <sub>rss</sub>        | Reverse Transfer Capacitance     |  |     | 28   | 36   | pF   |
| R <sub>G</sub>          | Series Gate Resistance           |  |     | 0.9  | 1.8  | Ω    |
| Q <sub>g</sub>          | Gate Charge Total (4.5V)         | V <sub>DS</sub> = 15V, I <sub>D</sub> = 15A  |     | 9.0  | 12   | nC   |
| Q <sub>gd</sub>         | Gate Charge Gate to Drain        |  |     | 2.0  |      | nC   |
| Q <sub>gs</sub>         | Gate Charge Gate to Source       |  |     | 3.6  |      | nC   |
| Q <sub>g(th)</sub>      | Gate Charge at V <sub>th</sub>   |  |     | 2.1  |      | nC   |
| Q <sub>oss</sub>        | Output Charge                    | V <sub>DS</sub> = 15V, V <sub>GS</sub> = 0V  |     | 11   |      | nC   |
| t <sub>d(on)</sub>      | Turn On Delay Time               | V <sub>DS</sub> = 15V, V <sub>GS</sub> = 4.5V,<br>I <sub>DS</sub> = 15A, R <sub>G</sub> = 2Ω |     | 7.6  |      | ns   |
| t <sub>r</sub>          | Rise Time                        |  |     | 11.4 |      | ns   |
| t <sub>d(off)</sub>     | Turn Off Delay Time              |  |     | 12.2 |      | ns   |
| t <sub>f</sub>          | Fall Time                        |  |     | 3.6  |      | ns   |
| Diode Characteristics   |                                  |  |     |      |      |      |
| V <sub>SD</sub>         | Diode Forward Voltage            | I <sub>SD</sub> = 11A, V <sub>GS</sub> = 0V  |     | 0.8  | 1    | V    |
| Q <sub>rr</sub>         | Reverse Recovery Charge          | V <sub>DS</sub> = 13V, I <sub>F</sub> = 15A,<br>di/dt = 300A/μs                              |     | 20   |      | nC   |
| t <sub>rr</sub>         | Reverse Recovery Time            |  |     | 18   |      | ns   |

## THERMAL CHARACTERISTICS

(T<sub>A</sub> = 25°C unless otherwise stated)

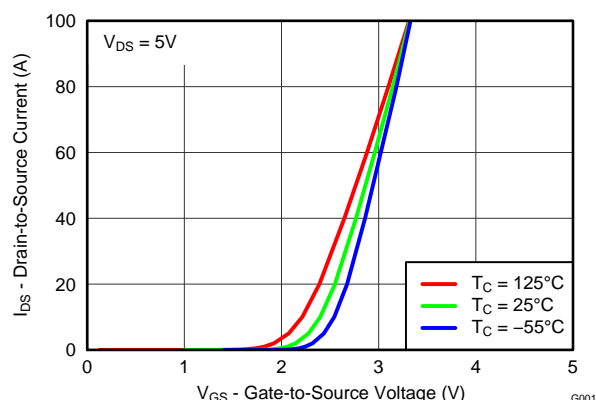
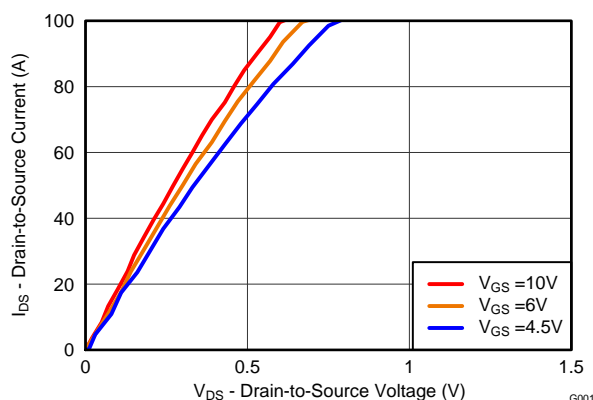
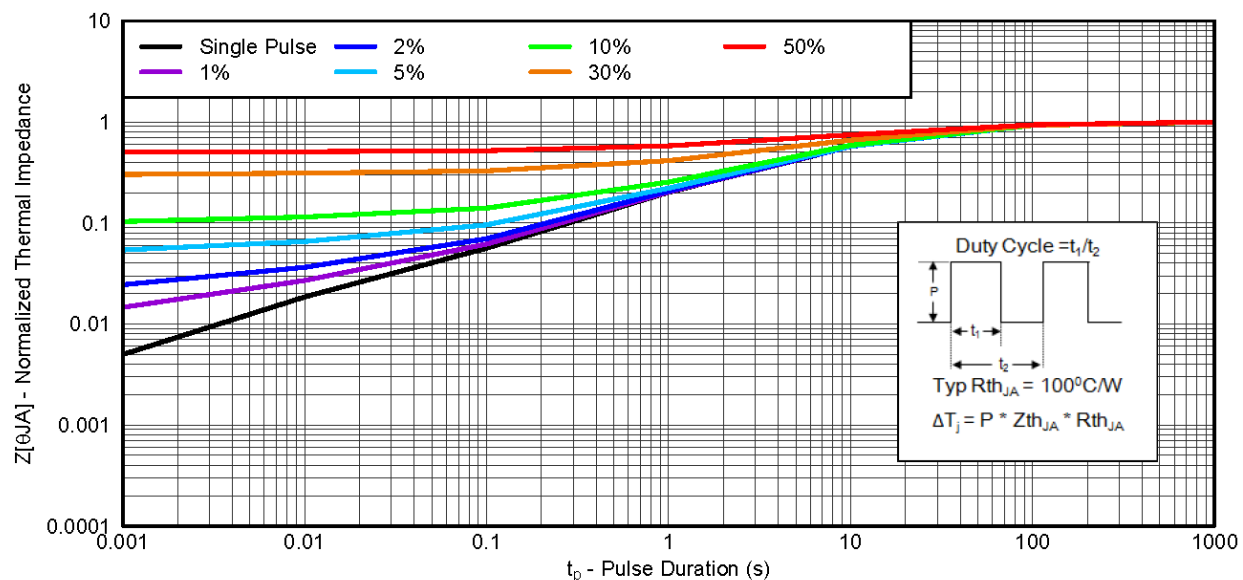
| PARAMETER        |  | MIN | TYP | MAX | UNIT |
|------------------|--|-----|-----|-----|------|
| R <sub>θJC</sub> | Thermal Resistance Junction to Case <sup>(1)</sup>       |     |     | 1.8 | °C/W |
| R <sub>θJA</sub> | Thermal Resistance Junction to Ambient <sup>(1)(2)</sup> |     |     | 50  | °C/W |

- (1) R<sub>θJC</sub> is determined with the device mounted on a 1-inch<sup>2</sup> (6.45-cm<sup>2</sup>), 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<sub>θJC</sub> is specified by design, whereas R<sub>θJA</sub> is determined by the user's board design.
- (2) Device mounted on FR4 material with 1-inch<sup>2</sup> (6.45-cm<sup>2</sup>), 2-oz. (0.071-mm thick) Cu.



## TYPICAL MOSFET CHARACTERISTICS

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



## TYPICAL MOSFET CHARACTERISTICS (continued)

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

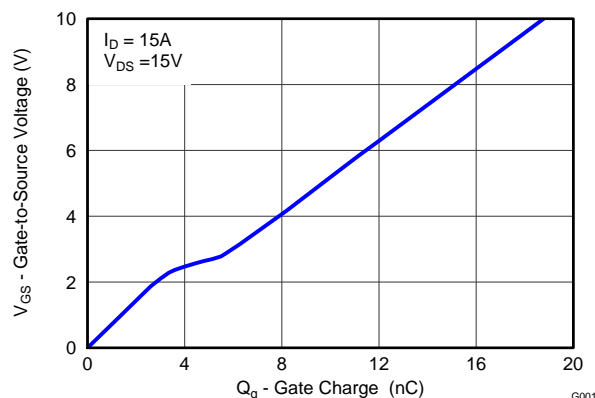


Figure 5. Gate Charge

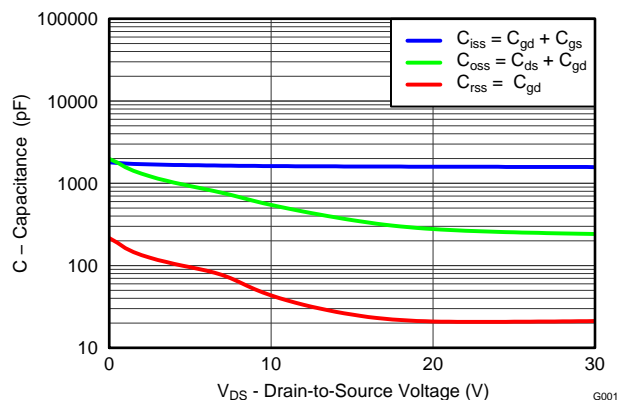


Figure 6. Capacitance

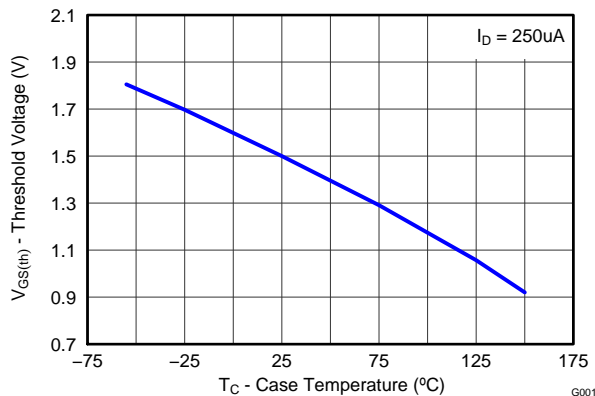


Figure 7. Threshold Voltage vs. Temperature

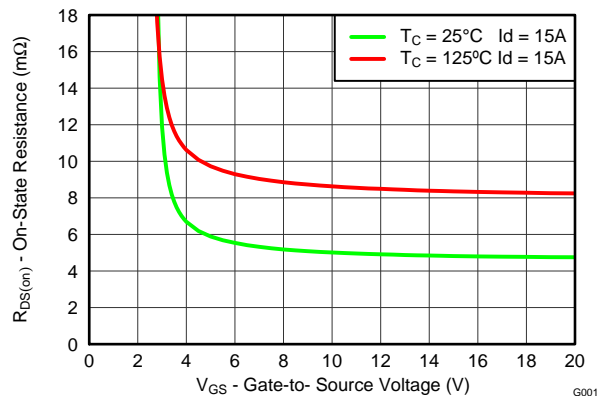


Figure 8. On-State Resistance vs. Gate-to-Source Voltage

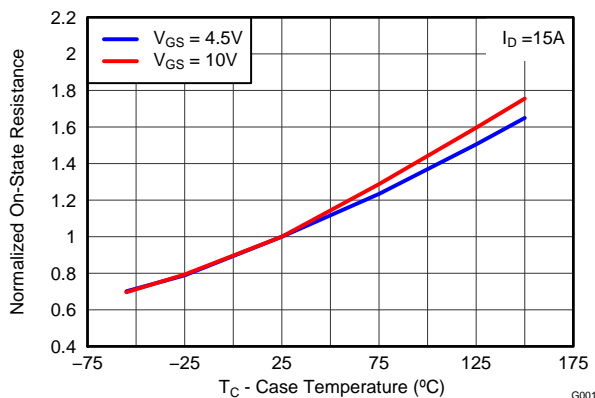


Figure 9. Normalized On-State Resistance vs. Temperature

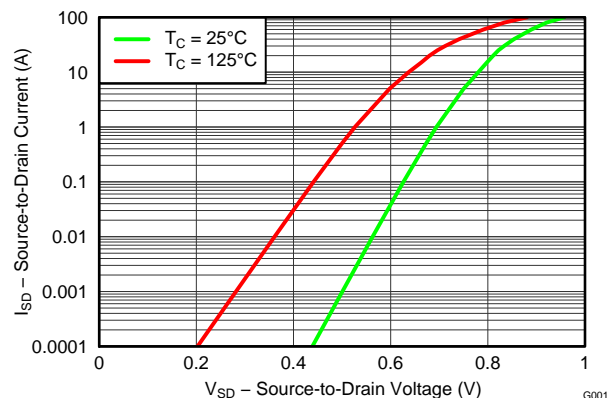


Figure 10. Typical Diode Forward Voltage

## TYPICAL MOSFET CHARACTERISTICS (continued)

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

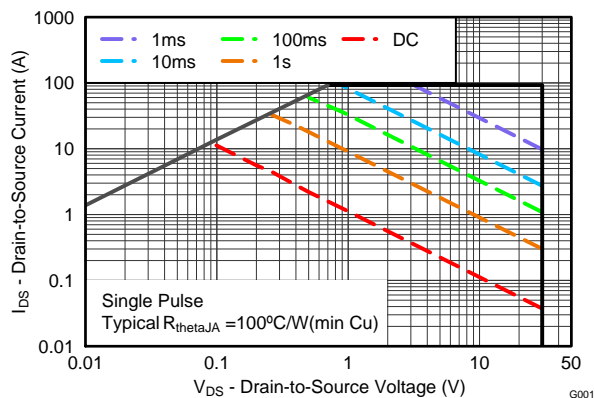


Figure 11. Maximum Safe Operating Area

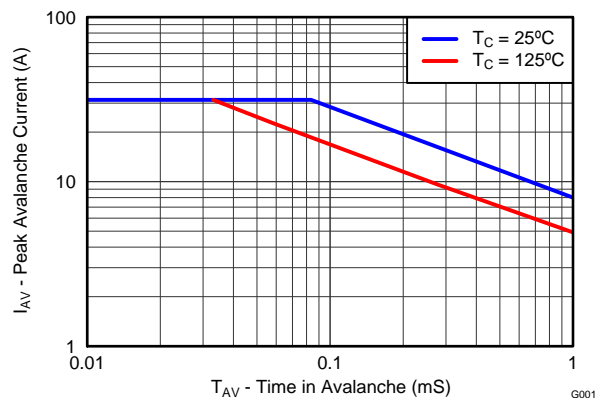


Figure 12. Single Pulse Unclamped Inductive Switching

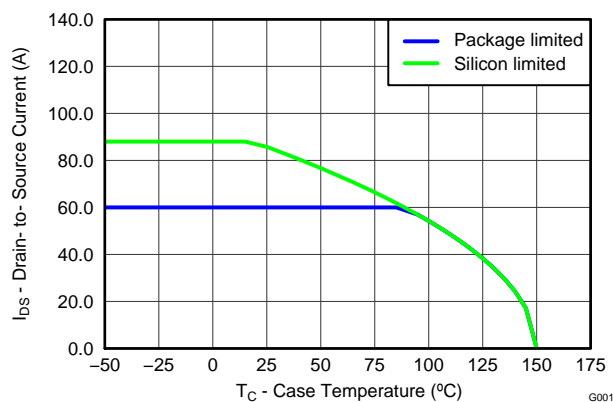
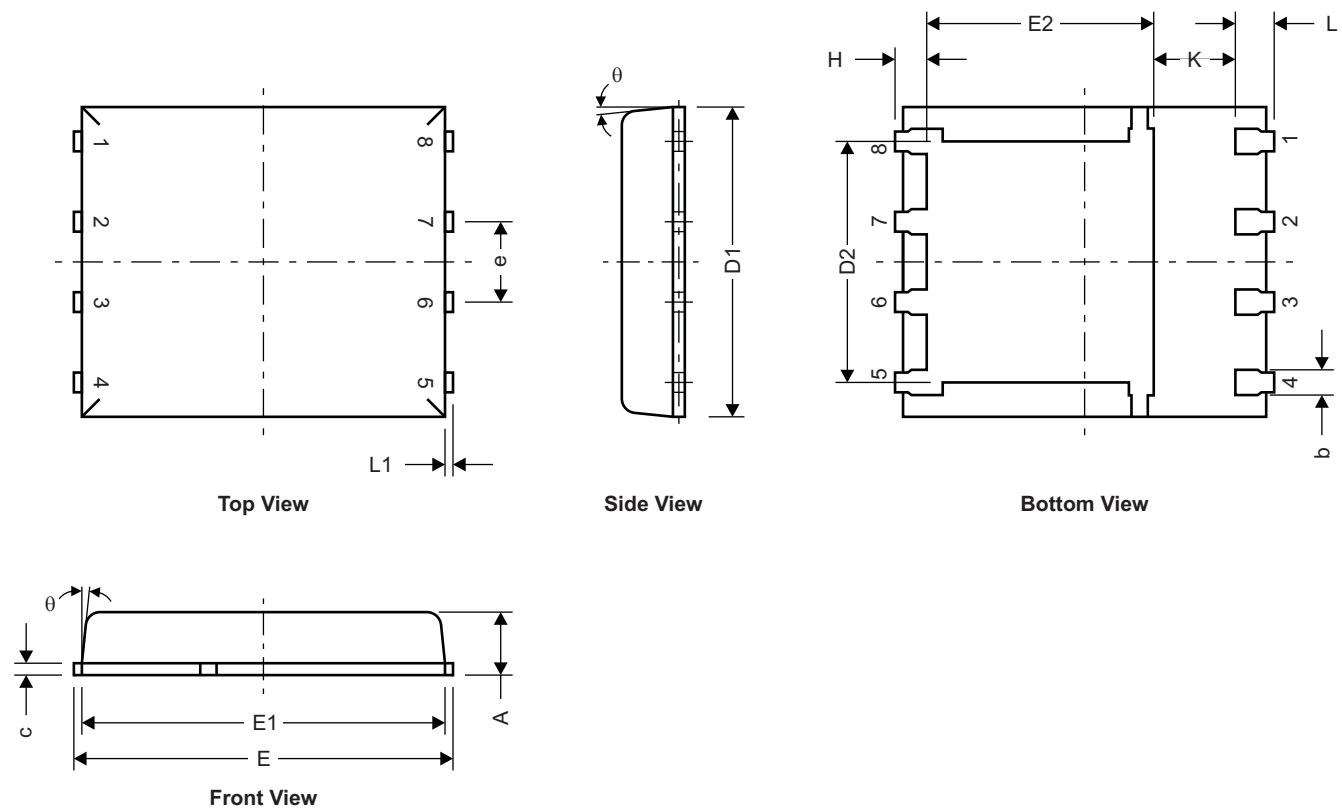


Figure 13. Maximum Drain Current vs. Temperature

## MECHANICAL DATA

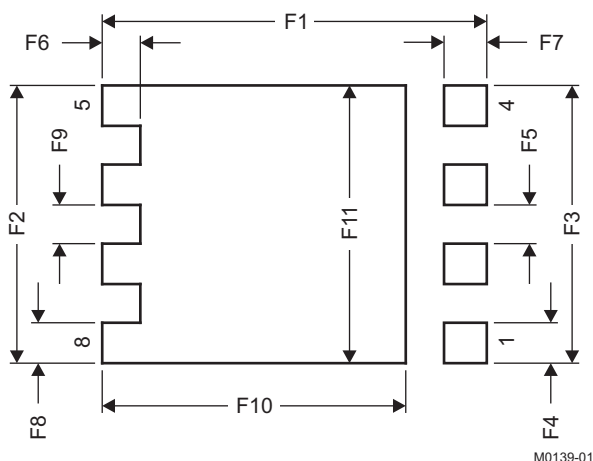
### Q5A Package Dimensions



M0135-01

| DIM      | MILLIMETERS |      |      |
|----------|-------------|------|------|
|          | MIN         | NOM  | MAX  |
| A        | 0.90        | 1.00 | 1.10 |
| b        | 0.33        | 0.41 | 0.51 |
| c        | 0.20        | 0.25 | 0.34 |
| D1       | 4.80        | 4.90 | 5.00 |
| D2       | 3.61        | 3.81 | 4.02 |
| E        | 5.90        | 6.00 | 6.10 |
| E1       | 5.70        | 5.75 | 5.80 |
| E2       | 3.38        | 3.58 | 3.78 |
| e        | 1.17        | 1.27 | 1.37 |
| H        | 0.41        | 0.56 | 0.71 |
| K        | 1.10        |      |      |
| L        | 0.51        | 0.61 | 0.71 |
| L1       | 0.06        | 0.13 | 0.20 |
| $\theta$ | 0°          |      | 12°  |

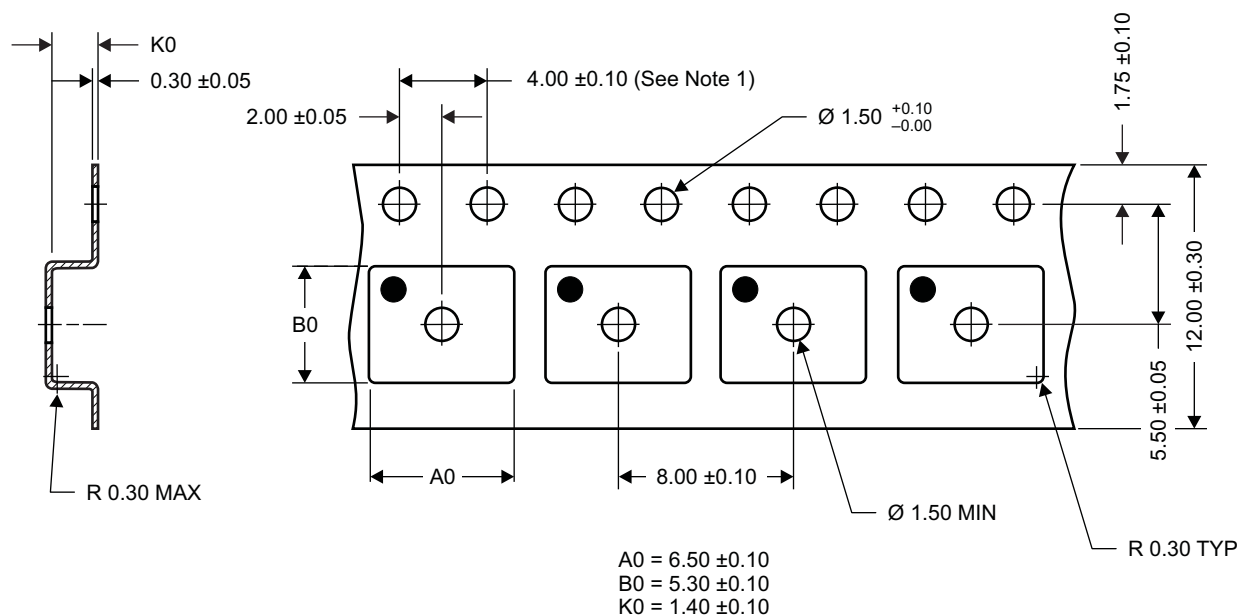
**Figure 14. Recommended PCB Pattern**



| DIM | MILLIMETERS |       | INCHES |       |
|-----|-------------|-------|--------|-------|
|     | MIN         | MAX   | MIN    | MAX   |
| F1  | 6.205       | 6.305 | 0.244  | 0.248 |
| F2  | 4.46        | 4.56  | 0.176  | 0.18  |
| F3  | 4.46        | 4.56  | 0.176  | 0.18  |
| F4  | 0.65        | 0.7   | 0.026  | 0.028 |
| F5  | 0.62        | 0.67  | 0.024  | 0.026 |
| F6  | 0.63        | 0.68  | 0.025  | 0.027 |
| F7  | 0.7         | 0.8   | 0.028  | 0.031 |
| F8  | 0.65        | 0.7   | 0.026  | 0.028 |
| F9  | 0.62        | 0.67  | 0.024  | 0.026 |
| F10 | 4.9         | 5     | 0.193  | 0.197 |
| F11 | 4.46        | 4.56  | 0.176  | 0.18  |

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

## Q5A Tape and Reel Information



### Notes:

- 10-sprocket hole-pitch cumulative tolerance  $\pm 0.2$
- 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 part number       | Status<br>(1) | Material type<br>(2) | Package   Pins  | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6) |
|-----------------------------|---------------|----------------------|-----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| <a href="#">CSD17552Q5A</a> | Active        | Production           | VSONP (DQJ)   8 | 2500   LARGE T&R      | ROHS Exempt | SN                                   | Level-1-260C-UNLIM                | -55 to 150   | CSD17552            |
| CSD17552Q5A.B               | Active        | Production           | VSONP (DQJ)   8 | 2500   LARGE T&R      | ROHS Exempt | SN                                   | Level-1-260C-UNLIM                | -55 to 150   | CSD17552            |

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **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.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **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.

<sup>(5)</sup> **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.

<sup>(6)</sup> **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.

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