

N-Channel NexFET™ Power MOSFET

Check for Samples: [CSD16413Q5A](#)

FEATURES

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

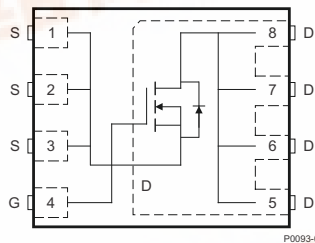
APPLICATIONS

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

DESCRIPTION

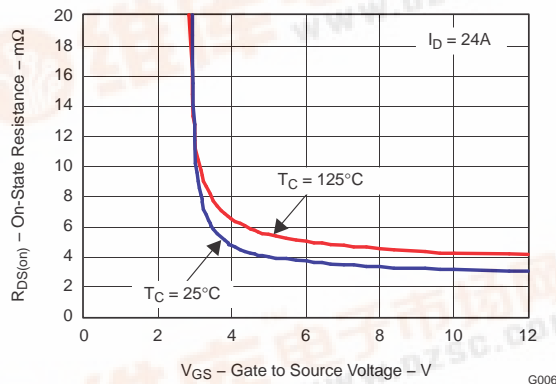
The NexFET™ power MOSFET has been designed to minimize losses in power conversion applications.

Top View



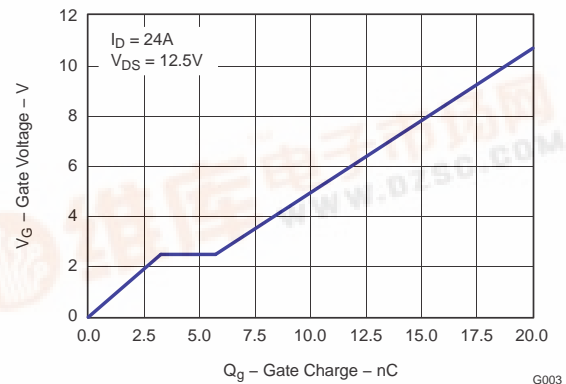
P0093-01

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



G006

Gate Charge



G003

PRODUCT SUMMARY

| | | | |
|---------------------|-------------------------------|------------------------|--------|
| V _{DS} | Drain to Source Voltage | 25 | V |
| Q _g | Gate Charge Total (4.5V) | 9 | nC |
| Q _{gd} | Gate Charge Gate to Drain | 2.5 | nC |
| R _{DS(on)} | Drain to Source On Resistance | V _{GS} = 4.5V | 4.1 mΩ |
| | | V _{GS} = 10V | 3.1 mΩ |
| V _{GS(th)} | Threshold Voltage | 1.6 | V |

ORDERING INFORMATION

| Device | Package | Media | Qty | Ship |
|-------------|---------------------------|--------------|------|---------------|
| CSD16413Q5A | SON 5 × 6 Plastic Package | 13-inch reel | 2500 | Tape and Reel |

ABSOLUTE MAXIMUM RATINGS

| T _A = 25°C unless otherwise stated | | VALUE | UNIT |
|---|---|------------|------|
| V _{DS} | Drain to Source Voltage | 25 | V |
| V _{GS} | Gate to Source Voltage | +16 / -12 | V |
| I _D | Continuous Drain Current, T _C = 25°C | 100 | A |
| | Continuous Drain Current ⁽¹⁾ | 24 | A |
| I _{DM} | Pulsed Drain Current, T _A = 25°C ⁽²⁾ | 156 | 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 = 46A, L = 0.1mH, R _G = 25Ω | 106 | mJ |

(1) R_{θJA} = 41°C/W on 1in² Cu (2 oz.) on 0.060" thick FR4 PCB.

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



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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)

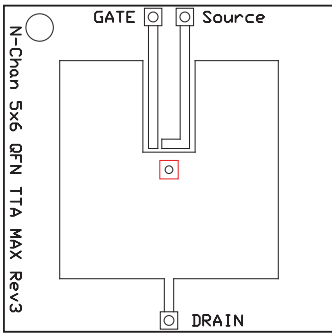
| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|--------------------------------|----------------------------------|---|-----|------|------|------|
| Static Characteristics | | | | | | |
| B _V DSS | Drain to Source Voltage | V _{GS} = 0V, I _D = 250μA | 25 | | | V |
| I _{DSS} | Drain to Source Leakage Current | V _{GS} = 0V, V _{DS} = 20V | | | 1 | μA |
| I _{GSS} | Gate to Source Leakage Current | V _{DS} = 0V, V _{GS} = +16/-12V | | | 100 | nA |
| V _{GS(th)} | Gate to Source Threshold Voltage | V _{DS} = V _{GS} , I _D = 250μA | 1.2 | 1.6 | 1.9 | V |
| R _{DS(on)} | Drain to Source On Resistance | V _{GS} = 4.5V, I _D = 24A | | 4.1 | 5.6 | mΩ |
| | | V _{GS} = 10V, I _D = 24A | | 3.1 | 3.9 | mΩ |
| g _{fs} | Transconductance | V _{DS} = 15V, I _D = 24A | | 95 | | S |
| Dynamic Characteristics | | | | | | |
| C _{ISS} | Input Capacitance | V _{GS} = 0V, V _{DS} = 12.5V f = 1MHz | | 1370 | 1780 | pF |
| C _{OSS} | Output Capacitance | | | 1060 | 1380 | pF |
| C _{RSS} | Reverse Transfer Capacitance | | | 84 | 109 | pF |
| R _g | Series Gate Resistance | | | 0.9 | 1.8 | Ω |
| Q _g | Gate Charge Total (4.5V) | V _{DS} = 12.5V, I _D = 24A | | 9 | 11.7 | nC |
| Q _{gd} | Gate Charge Gate to Drain | | | 2.5 | | nC |
| Q _{gs} | Gate Charge Gate to Source | | | 3.5 | | nC |
| Q _{g(th)} | Gate Charge at V _{th} | | | 2.2 | | nC |
| Q _{OSS} | Output Charge | V _{DS} = 13.1V, V _{GS} = 0V | | 21 | | nC |
| t _{d(on)} | Turn On Delay Time | V _{DS} = 12.5V, V _{GS} = 4.5V I _D = 24A R _G = 5Ω | | 9.1 | | ns |
| t _r | Rise Time | | | 15.9 | | ns |
| t _{d(off)} | Turn Off Delay Time | | | 10.7 | | ns |
| t _f | Fall Time | | | 5.7 | | ns |
| Diode Characteristics | | | | | | |
| V _{SD} | Diode Forward Voltage | I _S = 24A, V _{GS} = 0V | | 0.85 | 1 | V |
| Q _{rr} | Reverse Recovery Charge | V _{DD} = 13.1V, I _F = 24A, di/dt = 300A/μs | | 32 | | nC |
| t _{rr} | Reverse Recovery Time | V _{DD} = 13.1V, I _F = 24A, di/dt = 300A/μs | | 28 | | ns |

THERMAL CHARACTERISTICS

(T_A = 25°C unless otherwise stated)

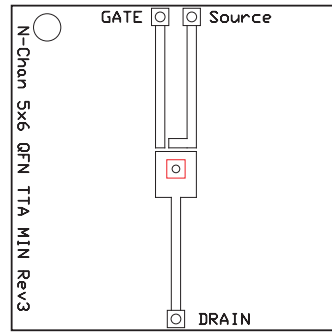
| PARAMETER | | MIN | TYP | MAX | UNIT |
|------------------|---|-----|-----|-----|------|
| R _{θJC} | Thermal Resistance Junction to Case ⁽¹⁾ | | | 2.6 | °C/W |
| R _{θJA} | Thermal Resistance Junction to Ambient ^{(1) (2)} | | | 51 | °C/W |

- (1) R_{θJC} is determined with the device mounted on a 1 inch square 2 oz. Cu pad on a 1.5 × 1.5 in .060 inch thick FR4 board. R_{θJC} is specified by design while R_{θJA} is determined by the user's board design.
- (2) Device mounted on FR4 Material with 1 inch² of 2 oz. Cu.



M0137-01

Max $R_{\theta JA} = 51^{\circ}\text{C/W}$
when mounted on 1
 inch^2 of 2 oz. Cu.

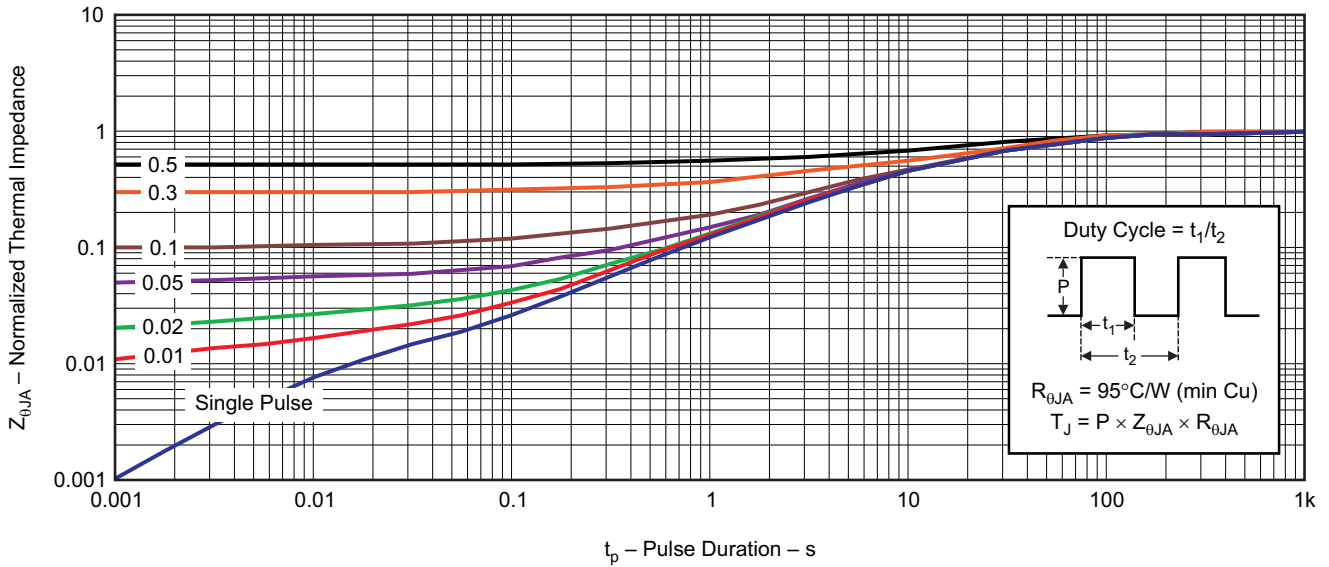


M0137-02

Max $R_{\theta JA} = 118^{\circ}\text{C/W}$
when mounted on
minimum pad area of 2
oz. Cu.

TYPICAL MOSFET CHARACTERISTICS

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



G012

Figure 1. Transient Thermal Impedance

TYPICAL MOSFET CHARACTERISTICS (continued)

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

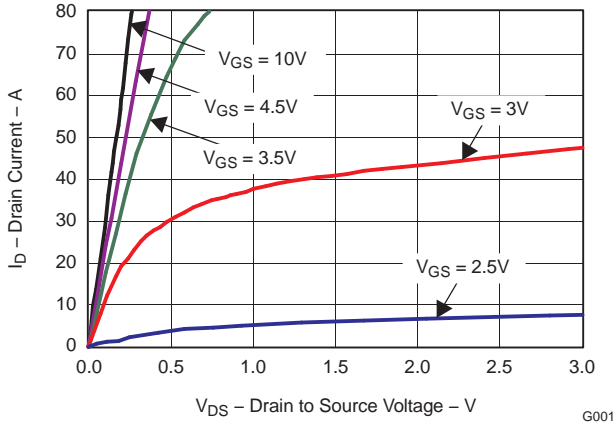


Figure 2. Saturation Characteristics

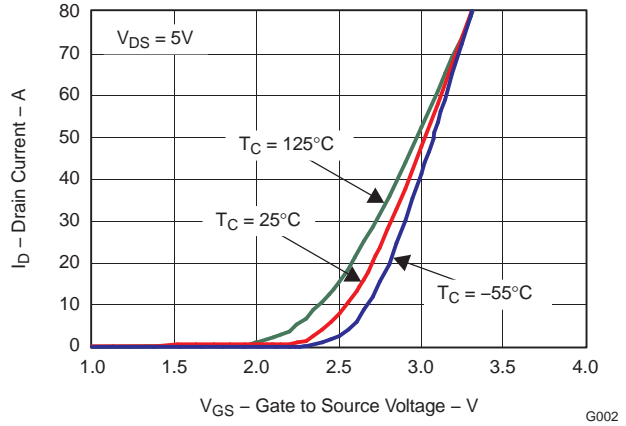


Figure 3. Transfer Characteristics

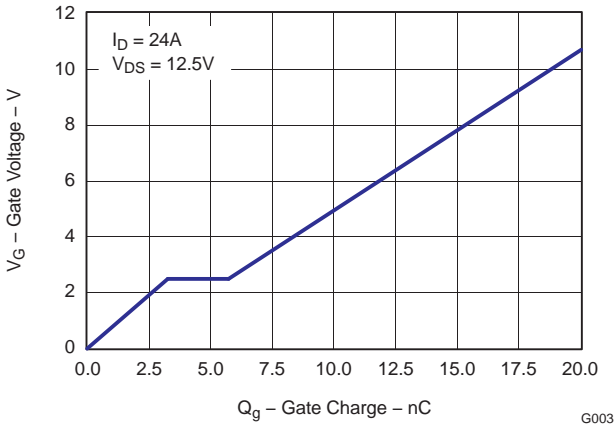


Figure 4. Gate Charge

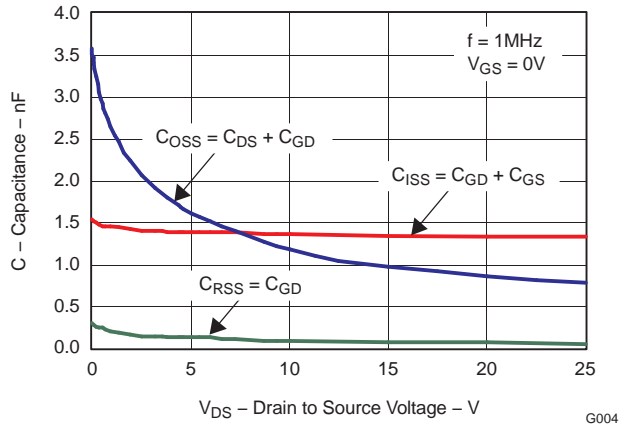


Figure 5. Capacitance

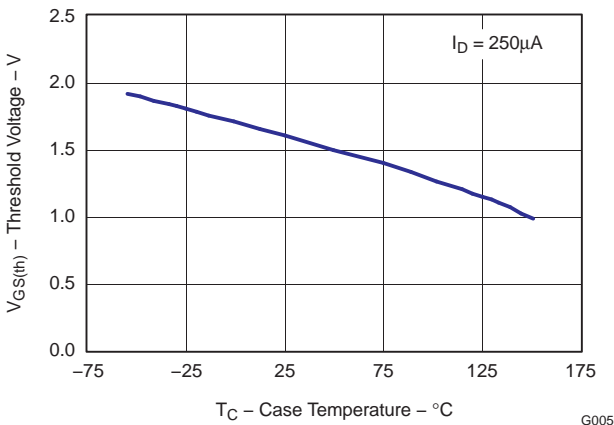


Figure 6. Threshold Voltage vs. Temperature

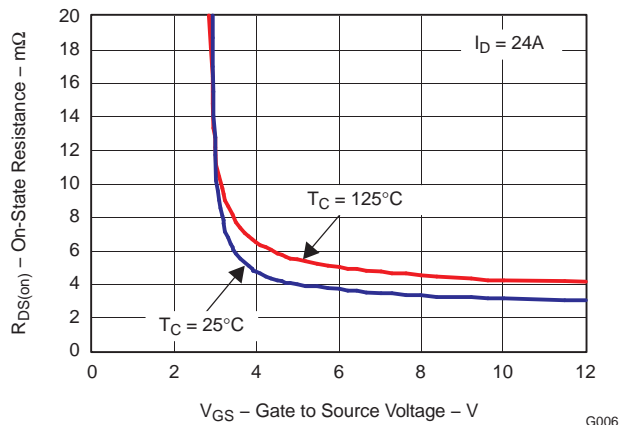


Figure 7. On Resistance vs. Gate Voltage

TYPICAL MOSFET CHARACTERISTICS (continued)

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

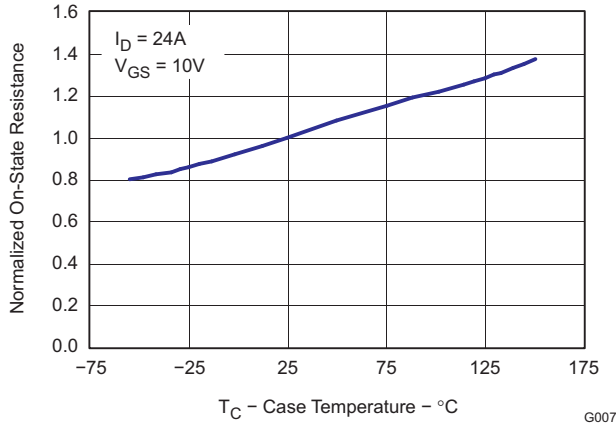


Figure 8. On Resistance vs. Temperature

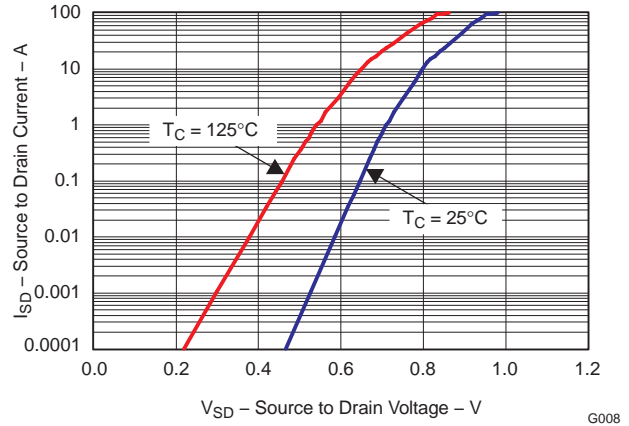


Figure 9. Typical Diode Forward Voltage

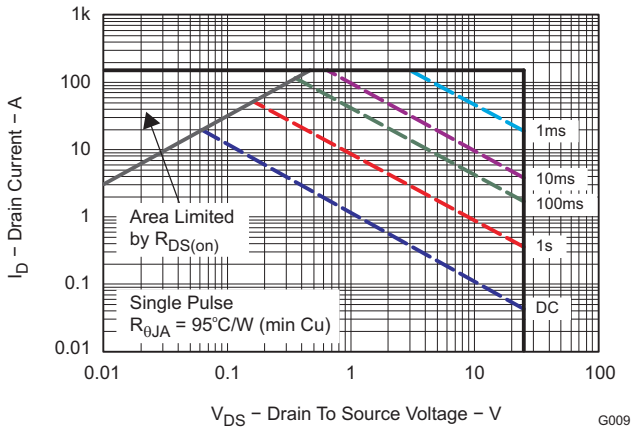


Figure 10. Maximum Safe Operating Area

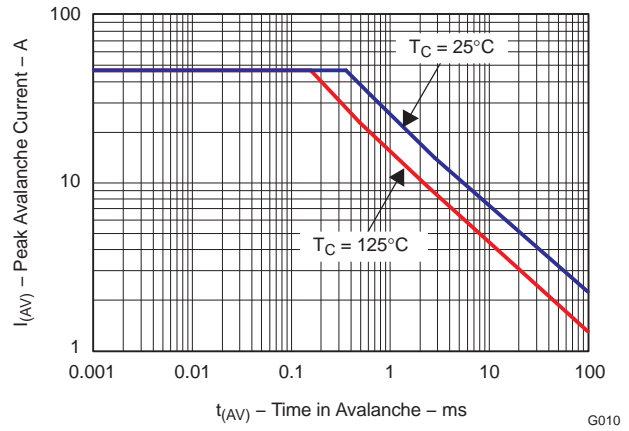


Figure 11. Single Pulse Unclamped Inductive Switching

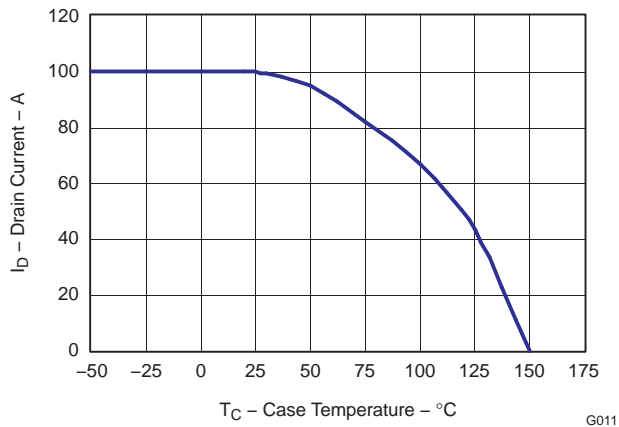
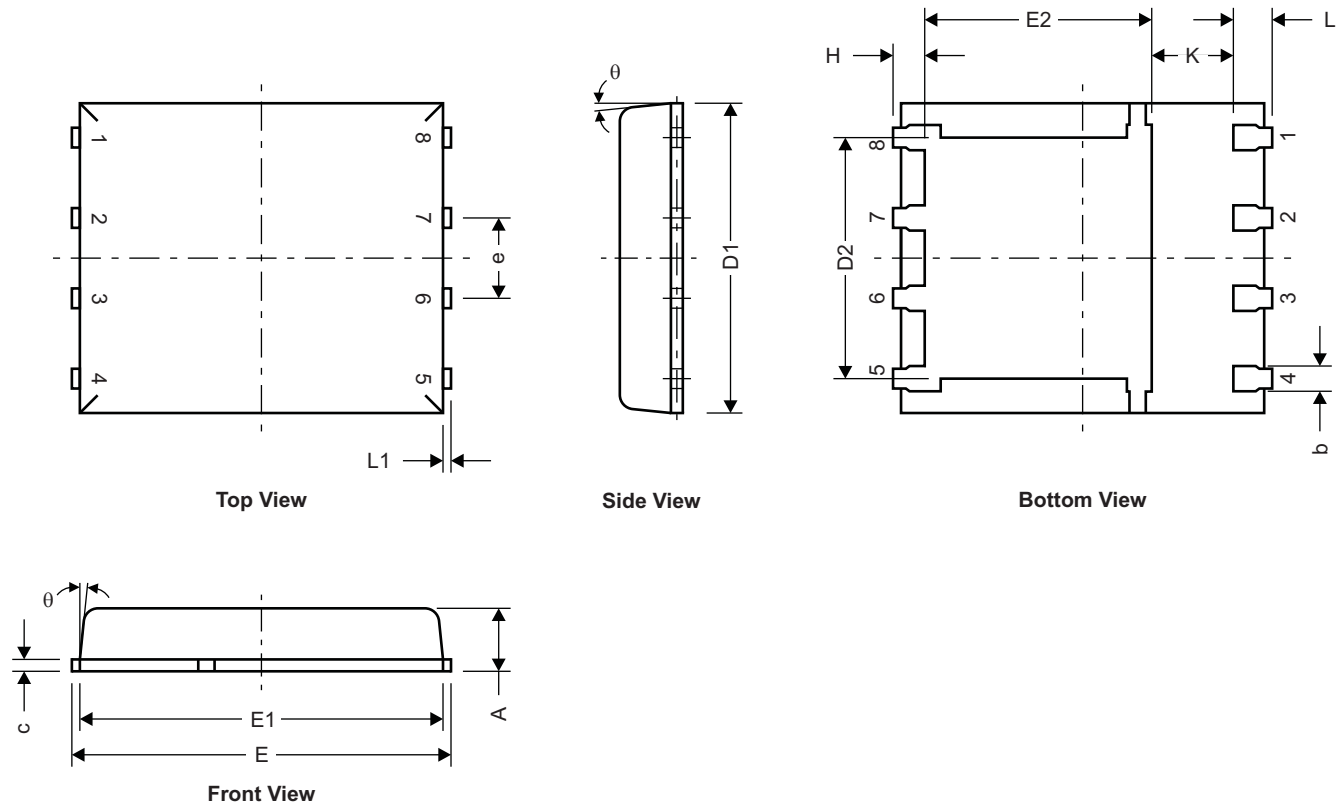


Figure 12. Maximum Drain Current vs. Temperature

[查询 CSD16413Q5A 供应商](#)

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 | 0.30 |
| D1 | 4.80 | 4.90 | 5.00 |
| D2 | 3.61 | 3.81 | 3.96 |
| E | 5.90 | 6.00 | 6.10 |
| E1 | 5.70 | 5.75 | 5.80 |
| E2 | 3.38 | 3.58 | 3.78 |
| e | 1.27 BSC | | |
| H | 0.41 | 0.51 | 0.61 |
| K | 1.10 | | |
| L | 0.51 | 0.61 | 0.71 |
| L1 | 0.06 | 0.13 | 0.20 |
| θ | 0° | | 12° |

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REVISION HISTORY

| Changes from Original (August 2009) to Revision A | Page |
|---|------|
| • Deleted the Package Marking Information section | 7 |



www.ti.com

PACKAG

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/ Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|-------------------|------------------------------|
| CSD16413Q5A | ACTIVE | SON | DQJ | 8 | 2500 | Pb-Free (RoHS Exempt) | CU SN | Level-1-260C |

⁽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> for more 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 RoHS materials, with the exception of 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 applications that require high temperature soldering 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 eutectic solder used between the leadframe and die. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

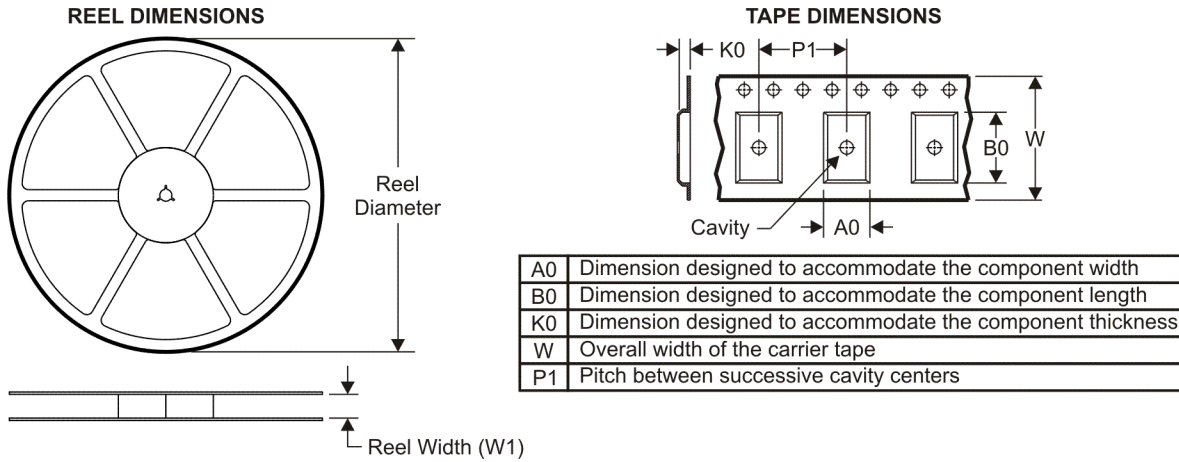
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (both of which are RoHS prohibited materials in homogeneous material).

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

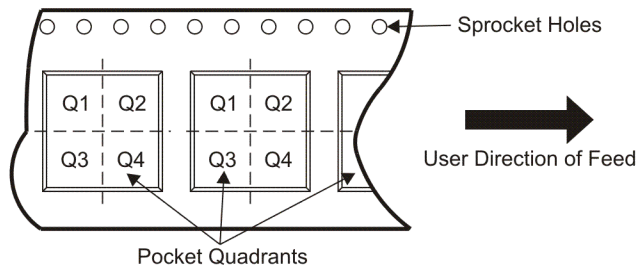
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TAPE AND REEL INFORMATION



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 |
|-------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CSD16413Q5A | SON | DQJ | 8 | 2500 | 330.2 | 12.4 | 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) |
|-------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CSD16413Q5A | SON | DQJ | 8 | 2500 | 347.0 | 342.0 | 55.0 |

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