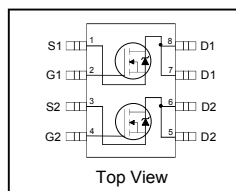


## Features

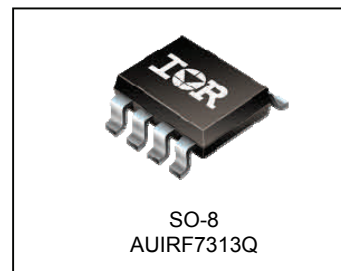
- Advanced Planar Technology
- Dual N Channel MOSFET
- Low On-Resistance
- Logic Level Gate Drive
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Lead-Free, RoHS Compliant
- Automotive Qualified \*



|                   |             |
|-------------------|-------------|
| $V_{DS}$          | <b>30V</b>  |
| $R_{DS(on)}$ typ. | <b>23mΩ</b> |
| max.              | <b>29mΩ</b> |
| $I_D$             | <b>6.9A</b> |

## Description

Specifically designed for Automotive applications, this cellular design of HEXFET® Power MOSFETs utilizes the latest processing techniques to achieve low on-resistance per silicon area. This benefit combined with the fast switching speed and ruggedized device design that HEXFET power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in Automotive and a wide variety of other applications.



|          |          |          |
|----------|----------|----------|
| <b>G</b> | <b>D</b> | <b>S</b> |
| Gate     | Drain    | Source   |

| Base part number | Package Type | Standard Pack |          | Orderable Part Number |
|------------------|--------------|---------------|----------|-----------------------|
|                  |              | Form          | Quantity |                       |
| AUIRF7313Q       | SO-8         | Tape and Reel | 4000     | AUIRF7313QTR          |

## Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only; and functional operation of the device at these or any other condition beyond those indicated in the specifications is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions. Ambient temperature (TA) is 25°C, unless otherwise specified.

| Symbol                         | Parameter                                           | Max.         | Units |
|--------------------------------|-----------------------------------------------------|--------------|-------|
| $V_{DS}$                       | Drain-Source Voltage                                | 30           | V     |
| $I_D @ T_A = 25^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10\text{V}$     | 6.9          | A     |
| $I_D @ T_A = 70^\circ\text{C}$ | Continuous Drain Current, $V_{GS} @ 10\text{V}$     | 5.8          |       |
| $I_{DM}$                       | Pulsed Drain Current ①                              | 58           |       |
| $P_D @ T_A = 25^\circ\text{C}$ | Maximum Power Dissipation                           | 2.4          | W     |
|                                | Linear Derating Factor                              | 0.02         | W/°C  |
| $V_{GS}$                       | Gate-to-Source Voltage                              | ± 20         | V     |
| $E_{AS}$                       | Single Pulse Avalanche Energy (Thermally Limited) ② | 450          | mJ    |
| dv/dt                          | Peak Diode Recovery dv/dt ③                         | 3.6          | V/ns  |
| $T_J$<br>$T_{STG}$             | Operating Junction and<br>Storage Temperature Range | -55 to + 175 | °C    |

## Thermal Resistance

| Symbol          | Parameter              | Typ. | Max. | Units |
|-----------------|------------------------|------|------|-------|
| $R_{\theta JL}$ | Junction-to-Drain Lead | —    | 20   | °C/W  |
| $R_{\theta JA}$ | Junction-to-Ambient ⑤⑥ | —    | 62.5 |       |

HEXFET® is a registered trademark of Infineon.

\*Qualification standards can be found at [www.infineon.com](http://www.infineon.com)

**Static @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

|                                 | Parameter                            | Min. | Typ. | Max. | Units               | Conditions                                           |
|---------------------------------|--------------------------------------|------|------|------|---------------------|------------------------------------------------------|
| $V_{(BR)DSS}$                   | Drain-to-Source Breakdown Voltage    | 30   | —    | —    | V                   | $V_{GS} = 0V, I_D = 250\mu A$                        |
| $\Delta V_{(BR)DSS}/\Delta T_J$ | Breakdown Voltage Temp. Coefficient  | —    | 0.03 | —    | V/ $^\circ\text{C}$ | Reference to $25^\circ\text{C}$ , $I_D = 1\text{mA}$ |
| $R_{DS(on)}$                    | Static Drain-to-Source On-Resistance | —    | 23   | 29   | $m\Omega$           | $V_{GS} = 10V, I_D = 6.9A$ ④                         |
|                                 |                                      | —    | 32   | 46   |                     | $V_{GS} = 4.5V, I_D = 5.5A$ ④                        |
| $V_{GS(th)}$                    | Gate Threshold Voltage               | 1.0  | —    | 3.0  | V                   | $V_{DS} = V_{GS}, I_D = 250\mu A$                    |
| $g_{fs}$                        | Forward Trans conductance            | 7.5  | —    | —    | S                   | $V_{DS} = 15V, I_D = 3.5A$                           |
| $I_{DSS}$                       | Drain-to-Source Leakage Current      | —    | —    | 1.0  | $\mu A$             | $V_{DS} = 24V, V_{GS} = 0V$                          |
|                                 |                                      | —    | —    | 25   |                     | $V_{DS} = 24V, V_{GS} = 0V, T_J = 125^\circ\text{C}$ |
| $I_{GSS}$                       | Gate-to-Source Forward Leakage       | —    | —    | 100  | nA                  | $V_{GS} = 20V$                                       |
|                                 | Gate-to-Source Reverse Leakage       | —    | —    | -100 |                     | $V_{GS} = -20V$                                      |

**Dynamic Electrical Characteristics @  $T_J = 25^\circ\text{C}$  (unless otherwise specified)**

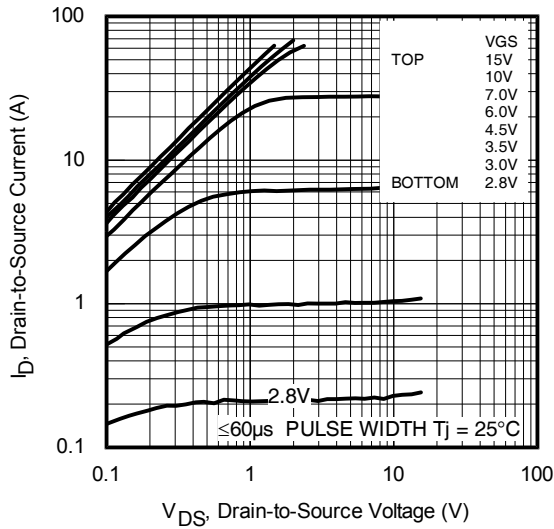
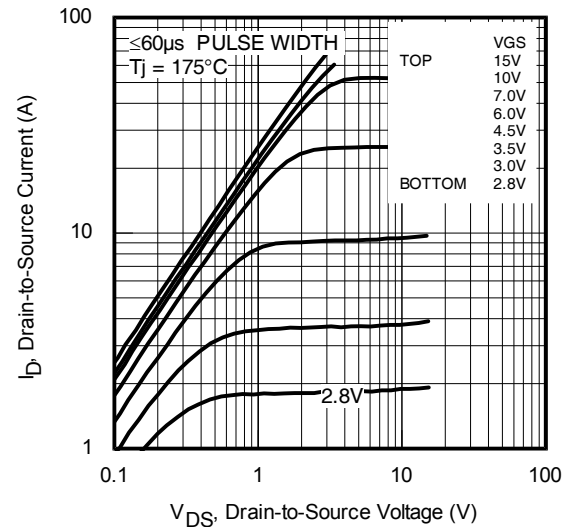
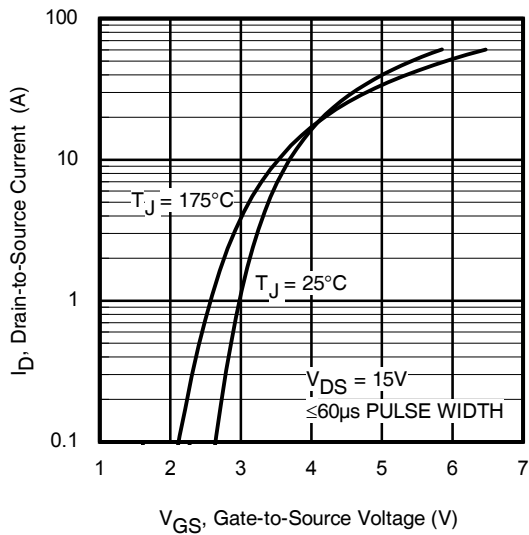
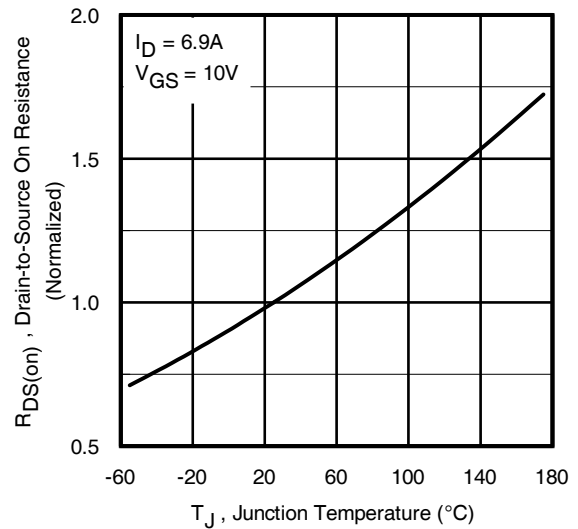
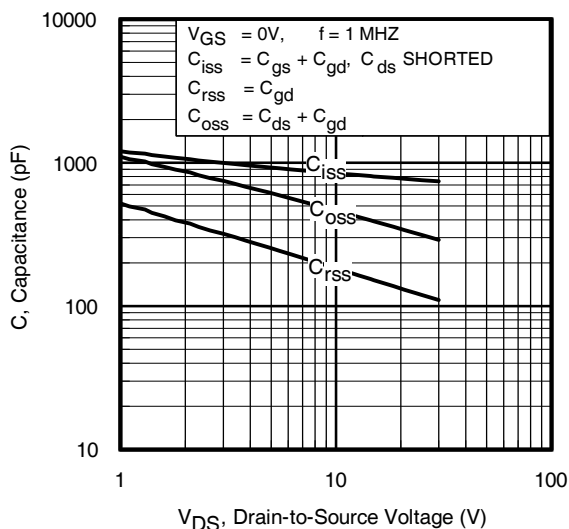
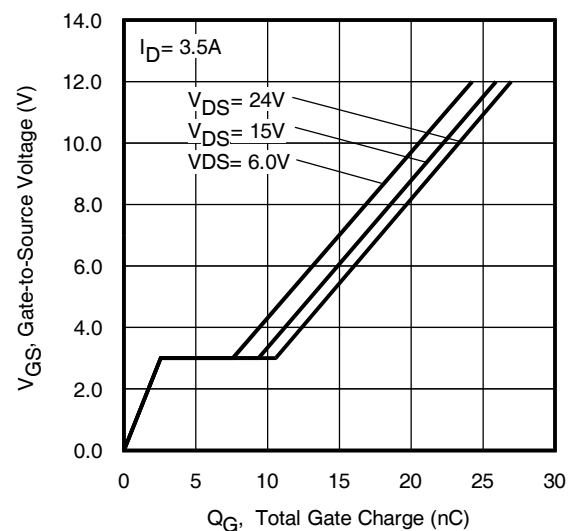
|              |                              |   |     |     |    |                     |
|--------------|------------------------------|---|-----|-----|----|---------------------|
| $Q_g$        | Total Gate Charge            | — | 22  | 33  | nC | $I_D = 3.5A$        |
| $Q_{gs}$     | Gate-to-Source Charge        | — | 2.6 | 3.9 |    | $V_{DS} = 15V$      |
| $Q_{gd}$     | Gate-to-Drain Charge         | — | 6.8 | 10  |    | $V_{GS} = 10V$ ④    |
| $t_{d(on)}$  | Turn-On Delay Time           | — | 3.7 | —   | ns | $V_{DD} = 15V$      |
| $t_r$        | Rise Time                    | — | 7.3 | —   |    | $I_D = 3.5A$        |
| $t_{d(off)}$ | Turn-Off Delay Time          | — | 21  | —   |    | $R_G = 6.8\Omega$   |
| $t_f$        | Fall Time                    | — | 11  | —   |    | $V_{GS} = 10V$ ④    |
| $C_{iss}$    | Input Capacitance            | — | 755 | —   | pF | $V_{GS} = 0V$       |
| $C_{oss}$    | Output Capacitance           | — | 310 | —   |    | $V_{DS} = 25V$      |
| $C_{rss}$    | Reverse Transfer Capacitance | — | 120 | —   |    | $f = 1.0\text{MHz}$ |

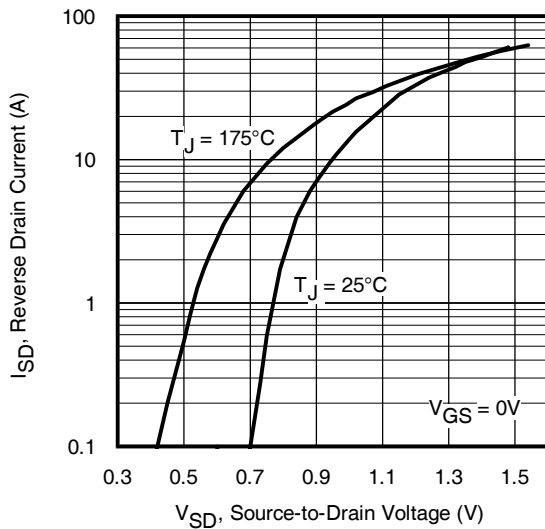
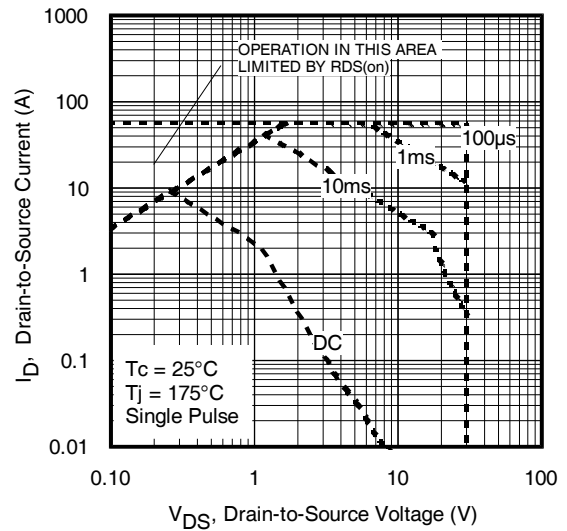
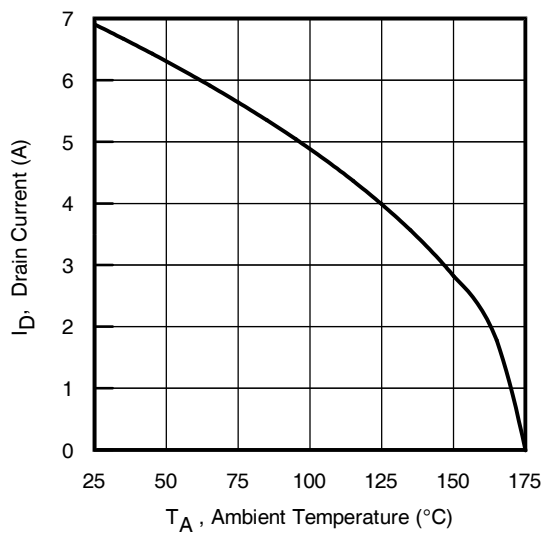
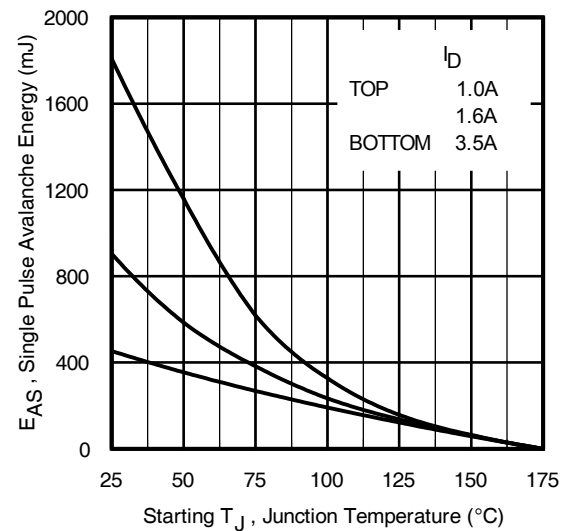
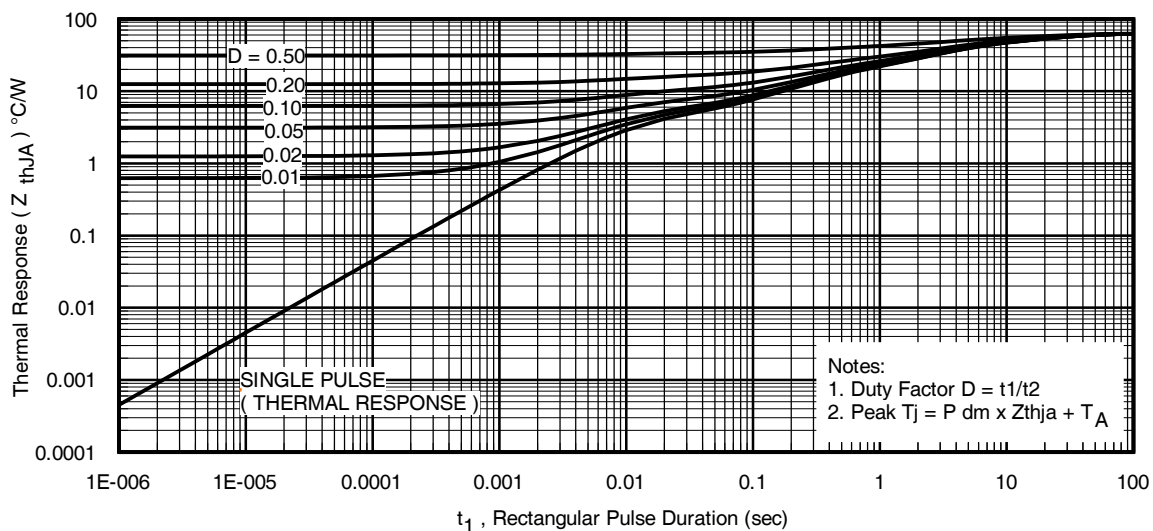
**Diode Characteristics**

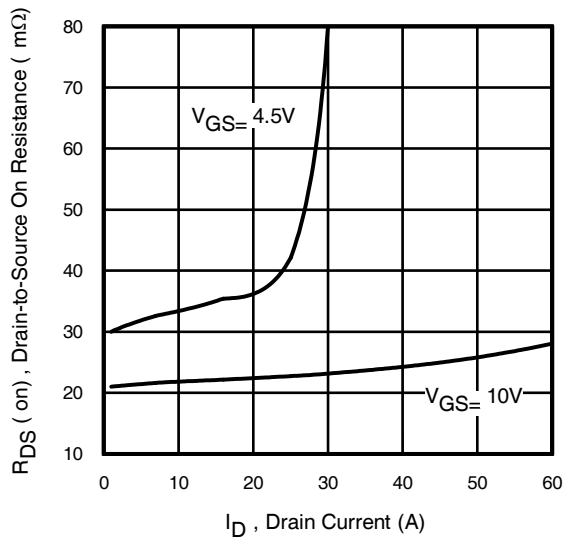
|          | Parameter                                 | Min. | Typ. | Max. | Units | Conditions                                                              |
|----------|-------------------------------------------|------|------|------|-------|-------------------------------------------------------------------------|
| $I_S$    | Continuous Source Current<br>(Body Diode) | —    | —    | 3.0  | A     | MOSFET symbol<br>showing the<br>integral reverse<br>p-n junction diode. |
| $I_{SM}$ | Pulsed Source Current<br>(Body Diode) ①   | —    | —    | 58   |       |                                                                         |
| $V_{SD}$ | Diode Forward Voltage                     | —    | —    | 1.0  | V     | $T_J = 25^\circ\text{C}, I_S = 3.5A, V_{GS} = 0V$ ④                     |
| $t_{rr}$ | Reverse Recovery Time                     | —    | 27   | 40   | ns    | $T_J = 25^\circ\text{C}, I_F = 3.5A,$                                   |
| $Q_{rr}$ | Reverse Recovery Charge                   | —    | 43   | 65   | nC    | $di/dt = 100A/\mu s$ ④                                                  |

**Notes:**

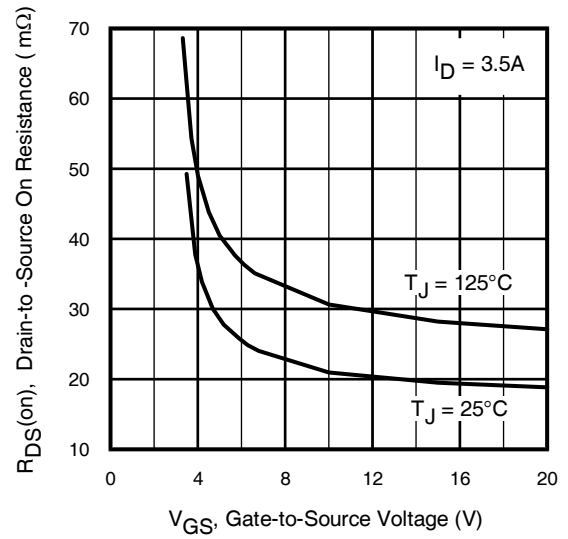
- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Limited by  $T_{Jmax}$ , Starting  $T_J = 25^\circ\text{C}$ ,  $L = 76\text{mH}$ ,  $R_G = 50\Omega$ ,  $I_{AS} = 3.5A$ ,  $V_{GS} = 10V$ . Part not recommended for use above this value.
- ③  $I_{SD} \leq 3.5A$ ,  $di/dt \leq 590A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 175^\circ\text{C}$ .
- ④ Pulse width  $\leq 400\mu s$ ; duty cycle  $\leq 2\%$ .
- ⑤ When mounted on 1 inch square copper board.
- ⑥  $R_\theta$  is measured at  $T_J$  of approximately  $90^\circ\text{C}$ .


**Fig. 1** Typical Output Characteristics

**Fig. 2** Typical Output Characteristics

**Fig. 3** Typical Transfer Characteristics

**Fig. 4** Normalized On-Resistance vs. Temperature

**Fig 5.** Typical Capacitance vs. Drain-to-Source Voltage

**Fig 6.** Typical Gate Charge vs. Gate-to-Source Voltage

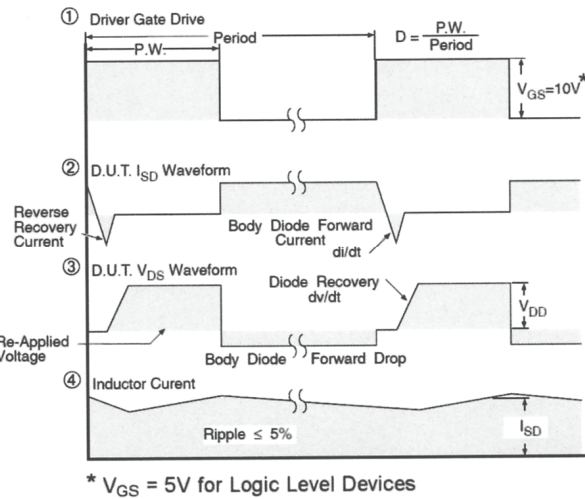
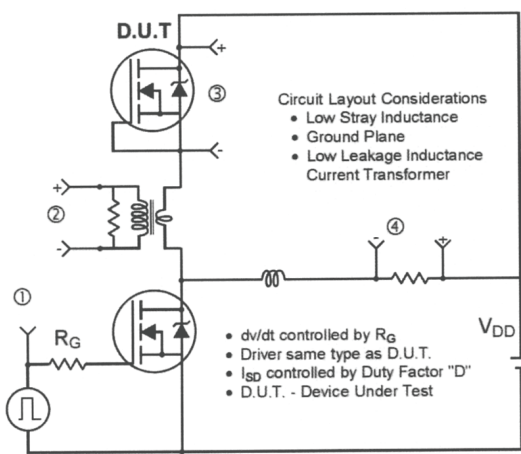

**Fig. 7** Typical Source-to-Drain Diode Forward Voltage

**Fig 8.** Maximum Safe Operating Area

**Fig 9.** Maximum Drain Current vs. Case Temperature

**Fig 10.** Maximum Avalanche Energy vs. Drain Current

**Fig 11.** Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



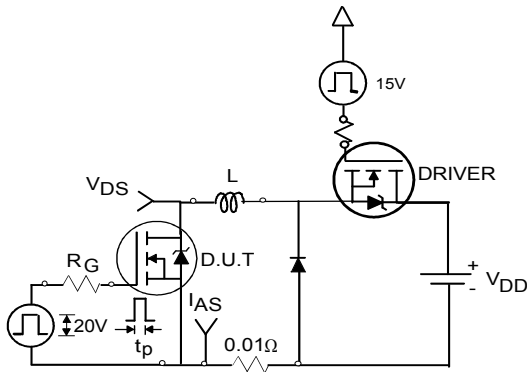
**Fig 12.** Typical On-Resistance Vs. Drain Current



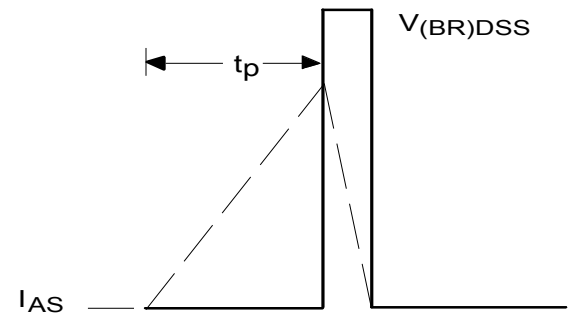
**Fig 13.** Typical On-Resistance Vs. Gate Voltage



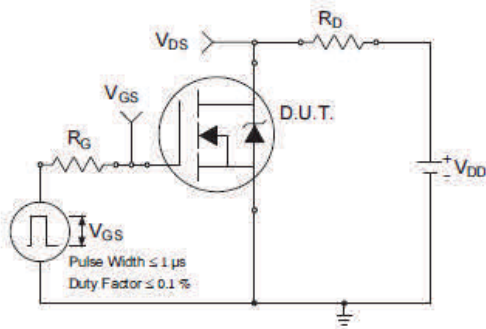
**Fig 14.** Peak Diode Recovery  $dv/dt$  Test Circuit for N-Channel HEXFET® Power MOSFETs



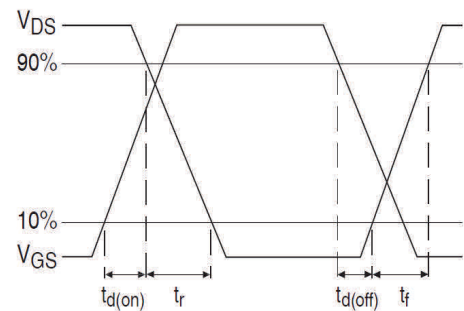
**Fig 15a.** Unclamped Inductive Test Circuit



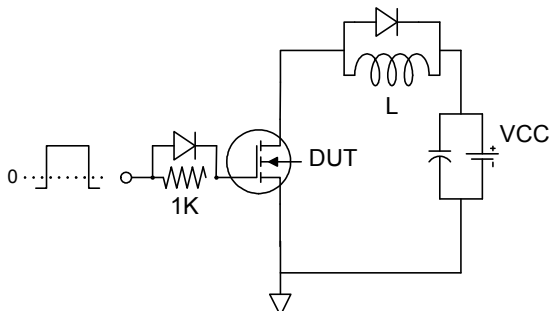
**Fig 15b.** Unclamped Inductive Waveforms



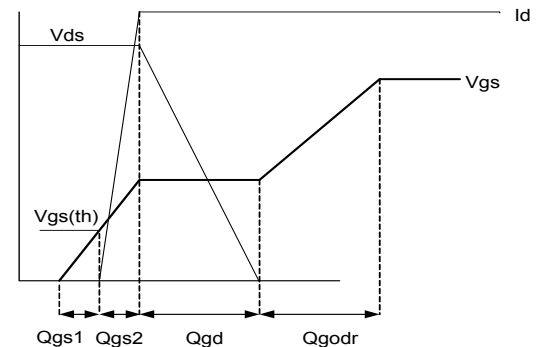
**Fig 16a.** Switching Time Test Circuit



**Fig 16b.** Switching Time Waveforms

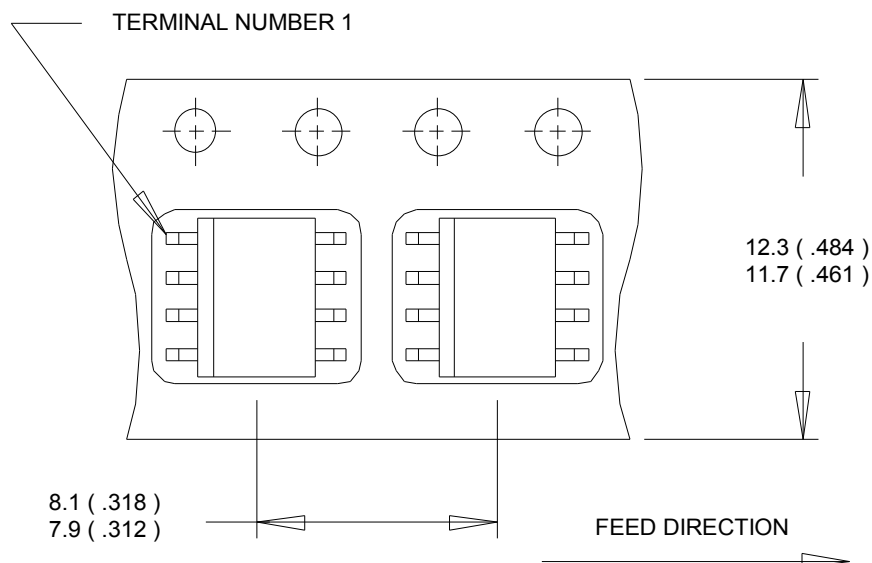


**Fig 17a.** Gate Charge Test Circuit

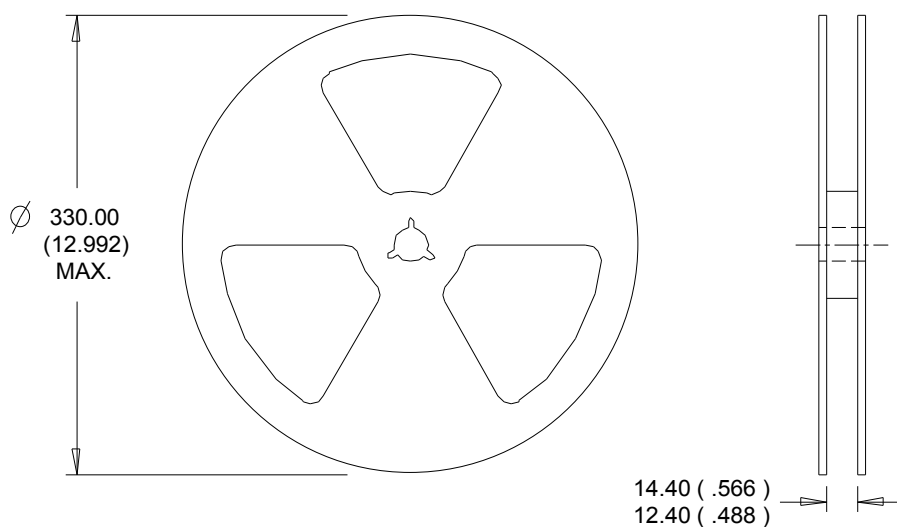


**Fig 17b.** Gate Charge Waveform



**SO-8 Tape and Reel** (Dimensions are shown in millimeters (inches))

**NOTES:**

1. CONTROLLING DIMENSION : MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS(INCHES).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.


**NOTES :**

1. CONTROLLING DIMENSION : MILLIMETER.
2. OUTLINE CONFORMS TO EIA-481 & EIA-541.



**Qualification Information**

|                                   |                      |                                                                                                                                                                               |      |
|-----------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <b>Qualification Level</b>        |                      | Automotive<br>(per AEC-Q101)                                                                                                                                                  |      |
|                                   |                      | Comments: This part number(s) passed Automotive qualification. Infineon's Industrial and Consumer qualification level is granted by extension of the higher Automotive level. |      |
| <b>Moisture Sensitivity Level</b> |                      | SO-8                                                                                                                                                                          | MSL1 |
| <b>ESD</b>                        | Machine Model        | Class M1B (+/- 100V) <sup>†</sup><br>AEC-Q101-002                                                                                                                             |      |
|                                   | Human Body Model     | Class H1A (+/- 500V) <sup>†</sup><br>AEC-Q101-001                                                                                                                             |      |
|                                   | Charged Device Model | Class C5 (+/- 2000V) <sup>†</sup><br>AEC-Q101-005                                                                                                                             |      |
| <b>RoHS Compliant</b>             |                      | Yes                                                                                                                                                                           |      |

† Highest passing voltage.

**Revision History**

| Date      | Comments                                                                                                                                                                                                                      |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3/27/2014 | <ul style="list-style-type: none"> <li>Added "Logic Level Gate Drive" bullet in the features section on page 1</li> <li>Updated part marking on page 7.</li> <li>Updated data sheet with new IR corporate template</li> </ul> |
| 9/30/2015 | <ul style="list-style-type: none"> <li>Updated datasheet with corporate template</li> <li>Corrected ordering table on page 1.</li> </ul>                                                                                      |

**Published by**  
**Infineon Technologies AG**  
**81726 München, Germany**  
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