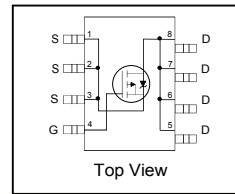


**Features**

- Advanced Process Technology
- Low On-Resistance
- Logic Level Gate Drive
- P Channel MOSFET
- Dynamic dv/dt Rating
- 150°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Lead-Free, RoHS Compliant
- Automotive Qualified \*

**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.



$V_{DSS}$	<b>-30V</b>
$R_{DS(on)}$ max.	<b>0.02Ω</b>
$I_D$	<b>-10A</b>



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

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
AUIRF7416Q	SO-8	Tape and Reel	4000	AUIRF7416QTR

**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
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V$	-10	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -10V$	-7.1	
$I_{DM}$	Pulsed Drain Current ①	-45	
$P_D @ T_A = 25^\circ C$	Maximum Power Dissipation	2.5	W
	Linear Derating Factor	0.02	mW/°C
$V_{GS}$	Gate-to-Source Voltage	± 20	V
$E_{AS}$	Single Pulse Avalanche Energy (Thermally Limited) ②	370	mJ
dv/dt	Peak Diode Recovery dv/dt ③	-5.0	V/ns
$T_J$ $T_{STG}$	Operating Junction and Storage Temperature Range	-55 to + 150	°C

**Thermal Resistance**

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-Ambient ⑤	—	50	°C/W

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\*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	—	-0.024	—	V/ $^\circ\text{C}$	Reference to $25^\circ\text{C}$ , $I_D = -1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.020	$\Omega$	$V_{GS} = -10V, I_D = -5.6A$ ④
		—	—	0.035		$V_{GS} = -4.5V, I_D = -2.8A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	-1.0	—	-2.04	V	$V_{DS} = V_{GS}, I_D = -250\mu A$
$g_{fs}$	Forward Trans conductance	5.6	—	—	S	$V_{DS} = -10V, I_D = -2.8A$
$I_{DSS}$	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)**

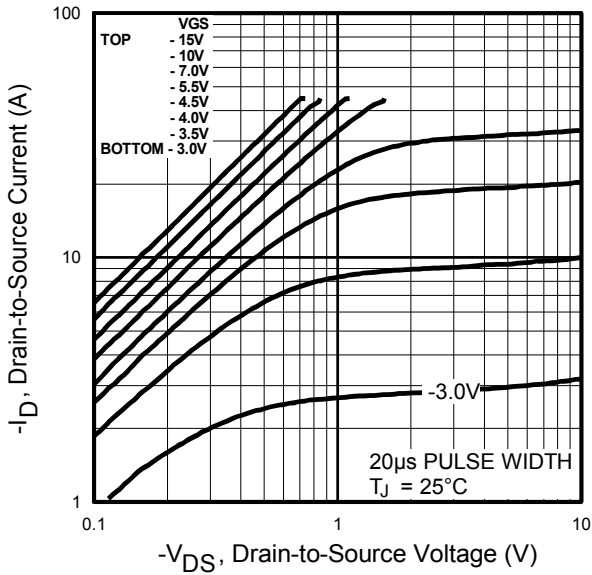
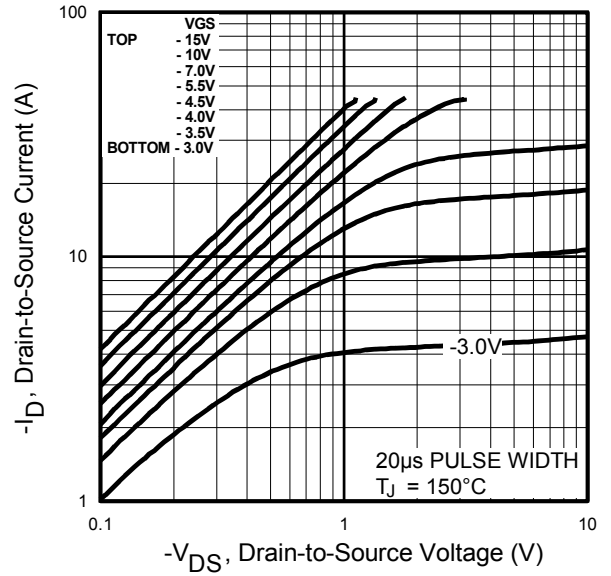
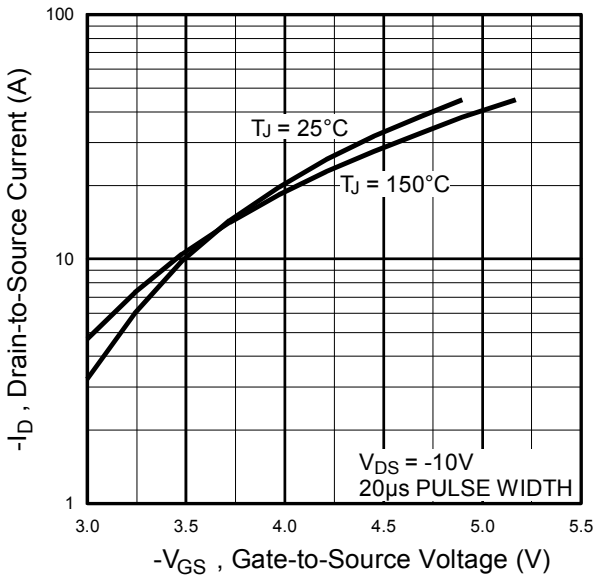
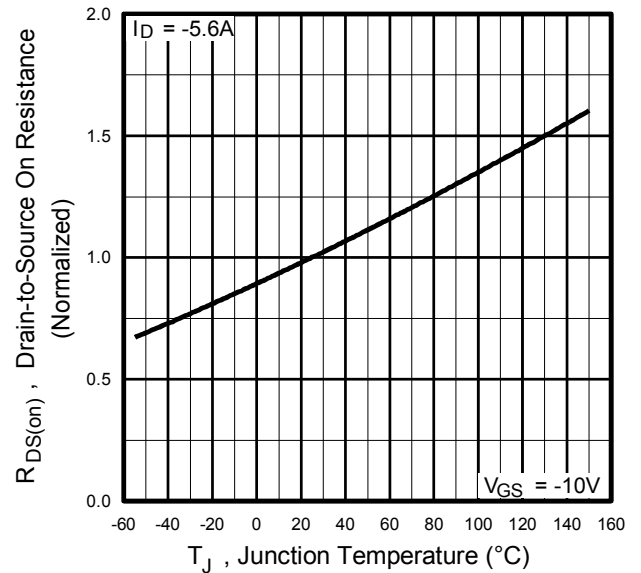
$Q_g$	Total Gate Charge	—	61	92	nC	$I_D = -5.6A$
$Q_{gs}$	Gate-to-Source Charge	—	8.0	12		$V_{DS} = -24V$
$Q_{gd}$	Gate-to-Drain Charge	—	22	32		$V_{GS} = -10V$ , See Fig.6 & 9 ④
$t_{d(on)}$	Turn-On Delay Time	—	18	—	ns	$V_{DD} = -15V$
$t_r$	Rise Time	—	49	—		$I_D = -5.6A$
$t_{d(off)}$	Turn-Off Delay Time	—	59	—		$R_G = 6.2\Omega$
$t_f$	Fall Time	—	60	—		$R_D = 2.7\Omega$ , See Fig.10 ④
$C_{iss}$	Input Capacitance	—	1700	—	pF	$V_{GS} = 0V$
$C_{oss}$	Output Capacitance	—	890	—		$V_{DS} = -25V$
$C_{riss}$	Reverse Transfer Capacitance	—	410	—		$f = 1.0\text{MHz}$ , See Fig.5

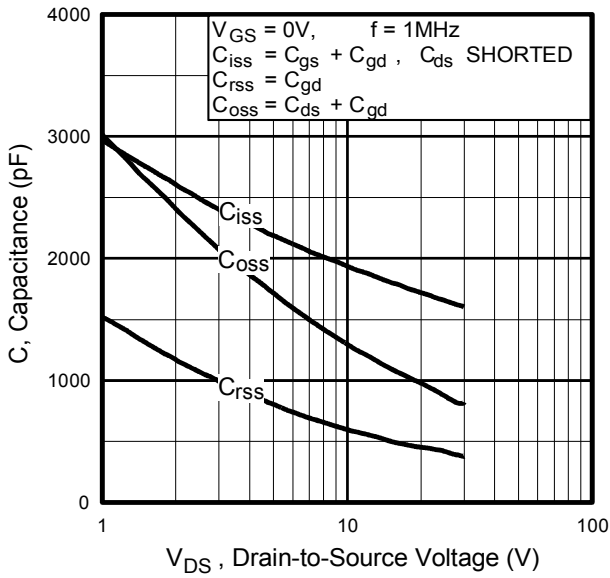
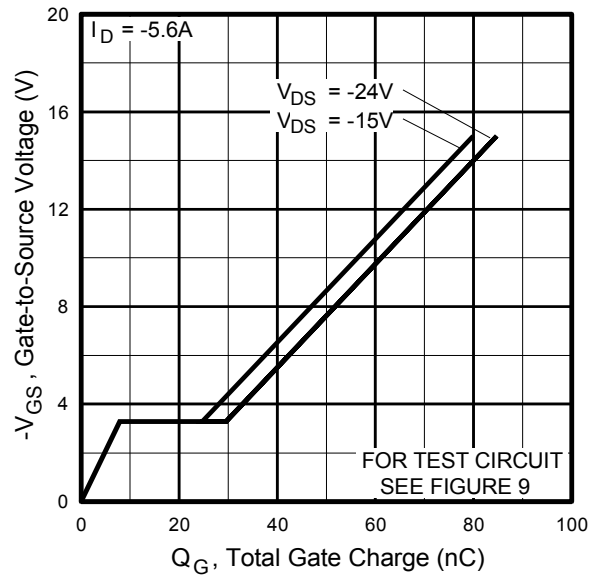
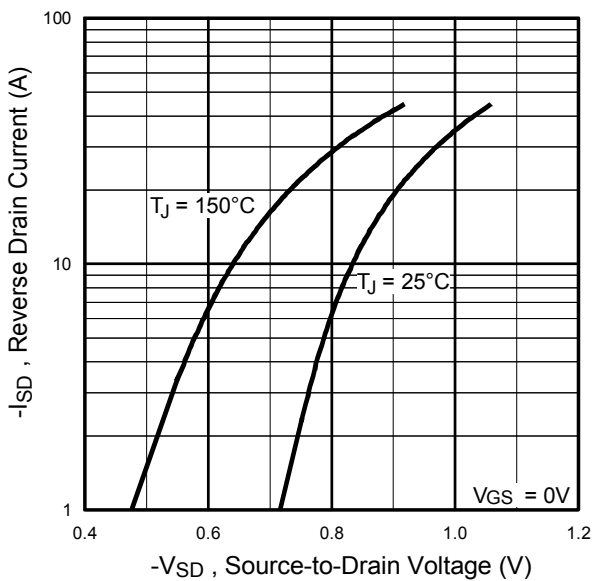
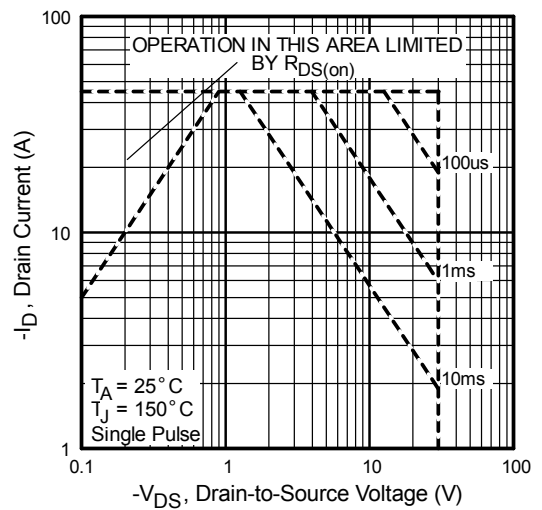
**Diode Characteristics**

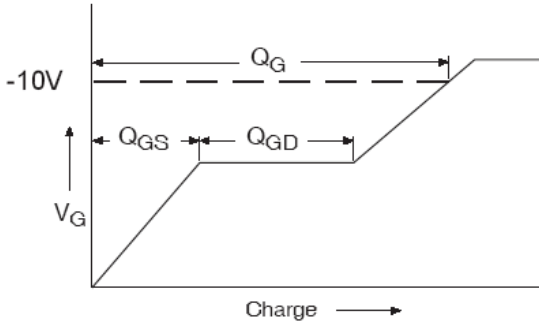
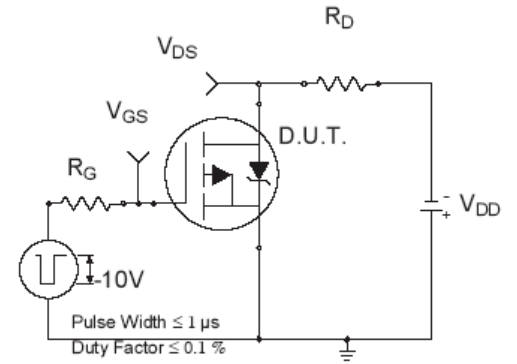
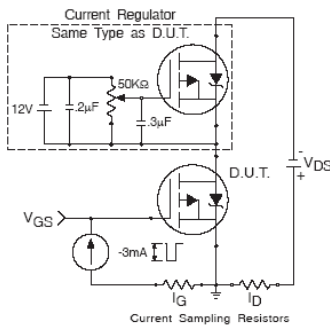
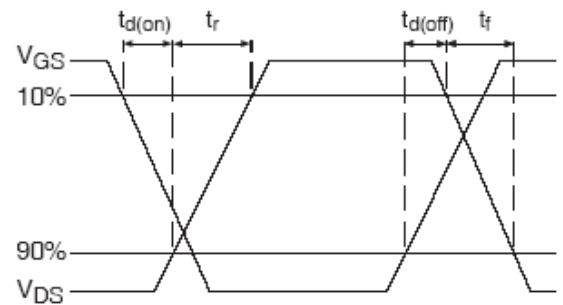
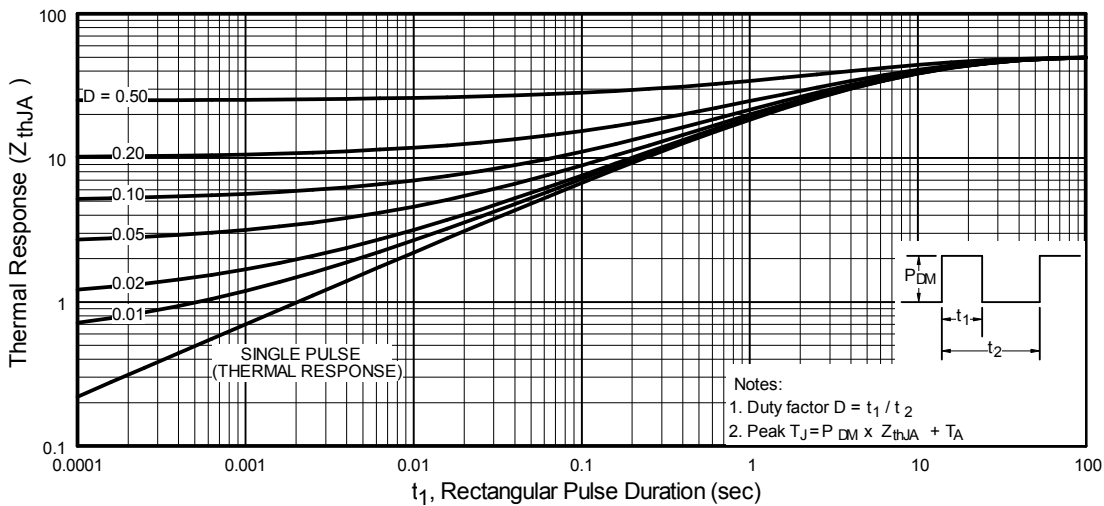
	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	-3.1	A	MOSFET symbol showing the integral reverse p-n junction diode. 
$I_{SM}$	Pulsed Source Current (Body Diode) ①	—	—	-45		
$V_{SD}$	Diode Forward Voltage	—	—	-1.0	V	$T_J = 25^\circ\text{C}, I_S = -5.6A, V_{GS} = 0V$ ④
$t_{rr}$	Reverse Recovery Time	—	56	85	ns	$T_J = 25^\circ\text{C}, I_F = -5.6A$ ,
$Q_{rr}$	Reverse Recovery Charge	—	99	150	nC	$di/dt = 100A/\mu s$ ④

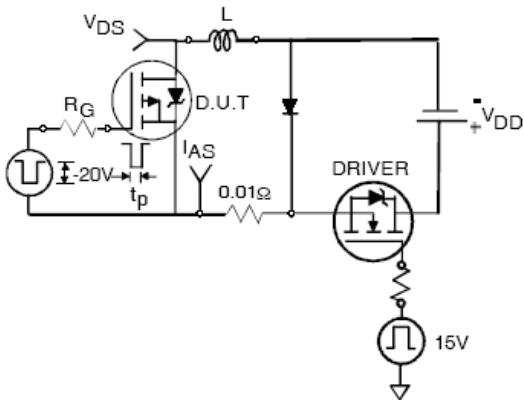
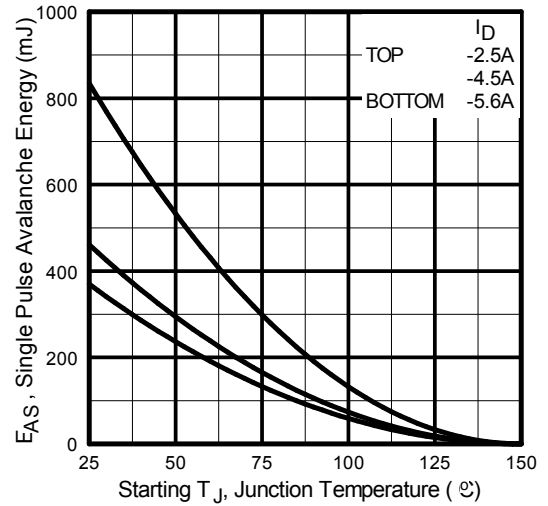
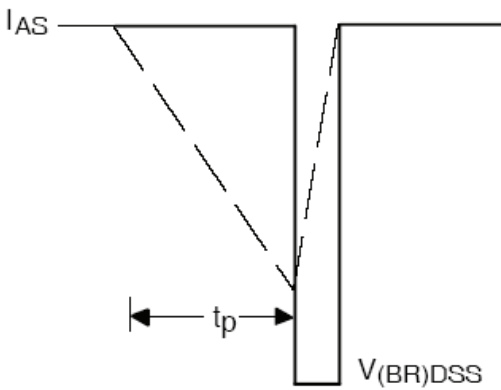
**Notes:**

- ① Repetitive rating; pulse width limited by max. junction temperature. (See Fig. 11)
- ② Starting  $T_J = 25^\circ\text{C}$ ,  $L = 25\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = -5.6A$ . (See Fig. 12)
- ③  $I_{SD} \leq -5.6A$ ,  $di/dt \leq 100A/\mu s$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_J \leq 150^\circ\text{C}$ .
- ④ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
- ⑤ Surface mounted on FR-4 board,  $t \leq 10\text{sec}$ .

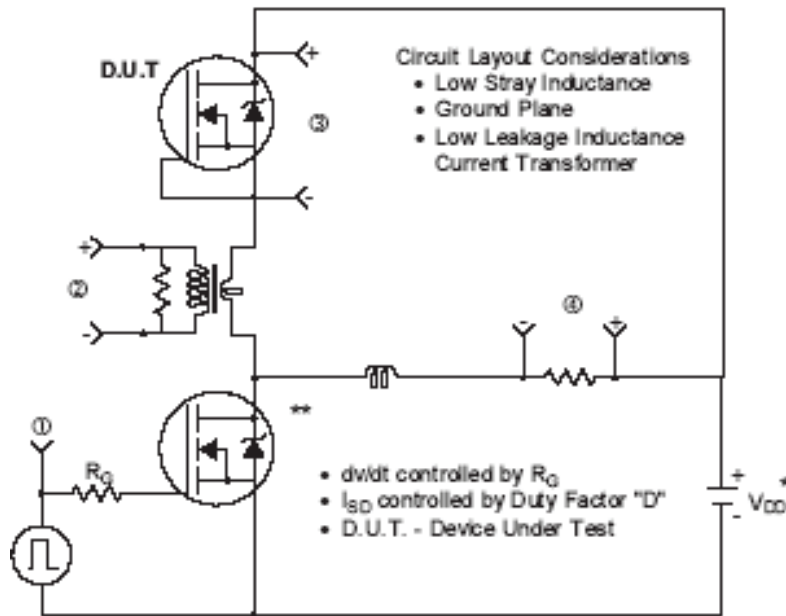

**Fig. 1** Typical Output Characteristics

**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-Drain Diode Forward Voltage

**Fig 8.** Maximum Safe Operating Area


**Fig 9a. Gate Charge Waveform**

**Fig 10a. Switching Time Test Circuit**

**Fig 9b. Gate Charge Test Circuit**

**Fig 10b. Switching Time Waveforms**

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

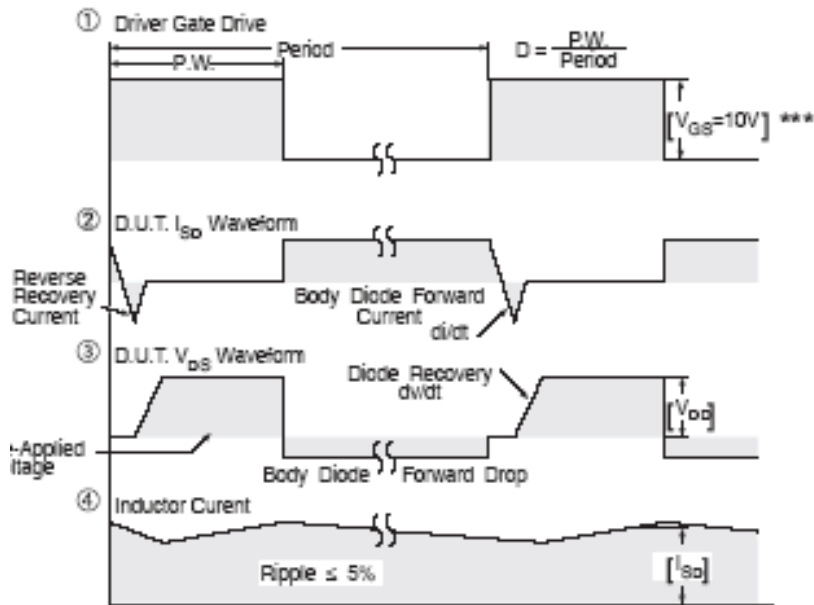

**Fig 12a.** Unclamped Inductive Test Circuit

**Fig 12c.** Maximum Avalanche Energy vs. Drain Current

**Fig 12b.** Unclamped Inductive Waveforms

### Peak Diode Recovery dv/dt Test Circuit



\* Reverse Polarity for P-Channel

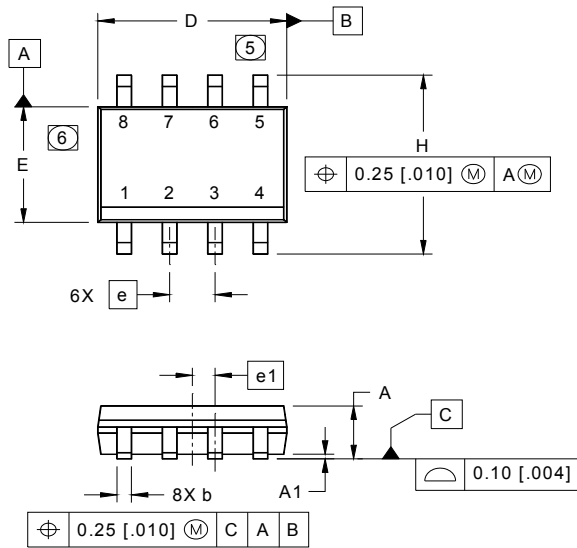
\*\* Use P-Channel Driver for P-Channel Measurements



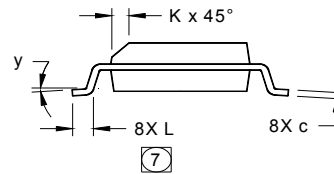
\*\*\*  $V_{GS} = 5.0V$  for Logic Level and 3V Drive Devices

**Fig 13.** Peak Diode Recovery dv/dt Test Circuit for P-Channel HEXFET® Power MOSFETs

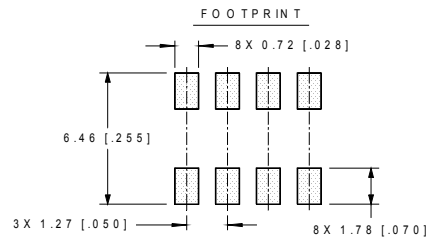
## SO-8 Package Outline (Dimensions are shown in millimeters (inches))



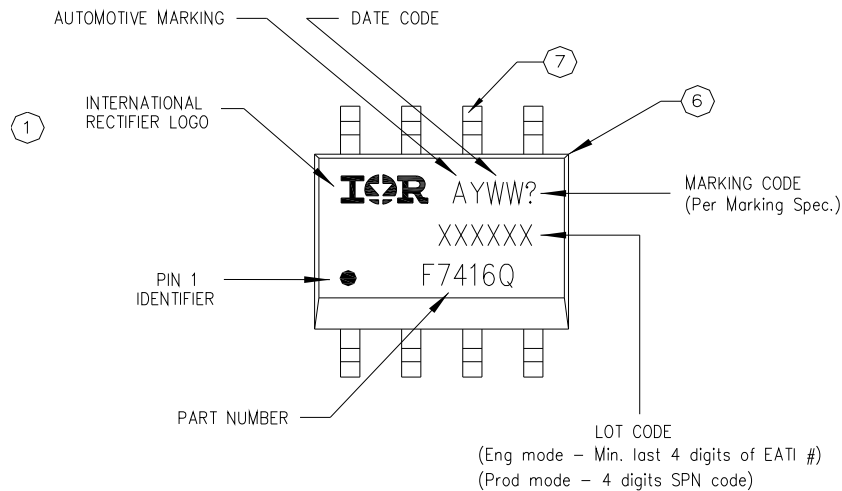
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
c	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
e	.050 BASIC		1.27 BASIC	
e 1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.0099	.0196	0.25	0.50
L	.016	.050	0.40	1.27
y	0°	8°	0°	8°



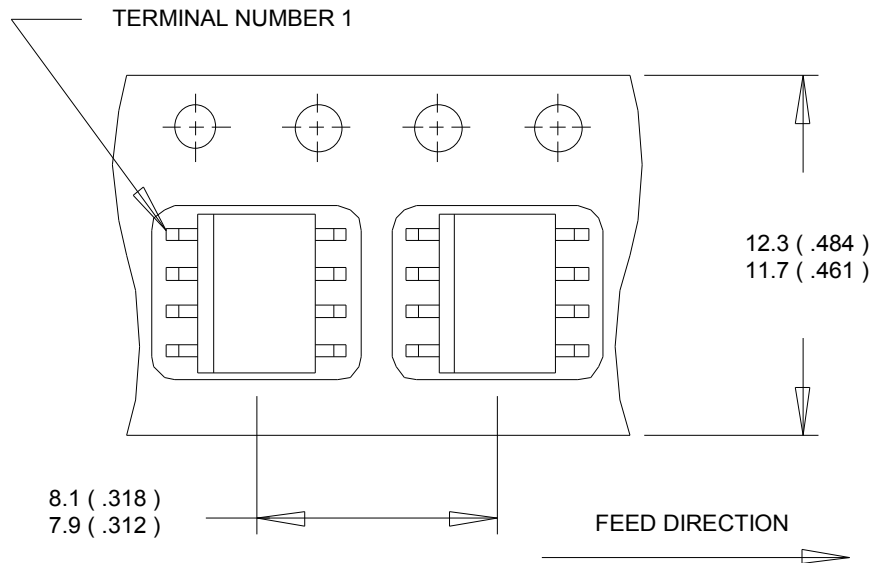
- NOTES:
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
  2. CONTROLLING DIMENSION: MILLIMETER
  3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
  4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
  5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [.006].
  6. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 [.010].
  7. DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.



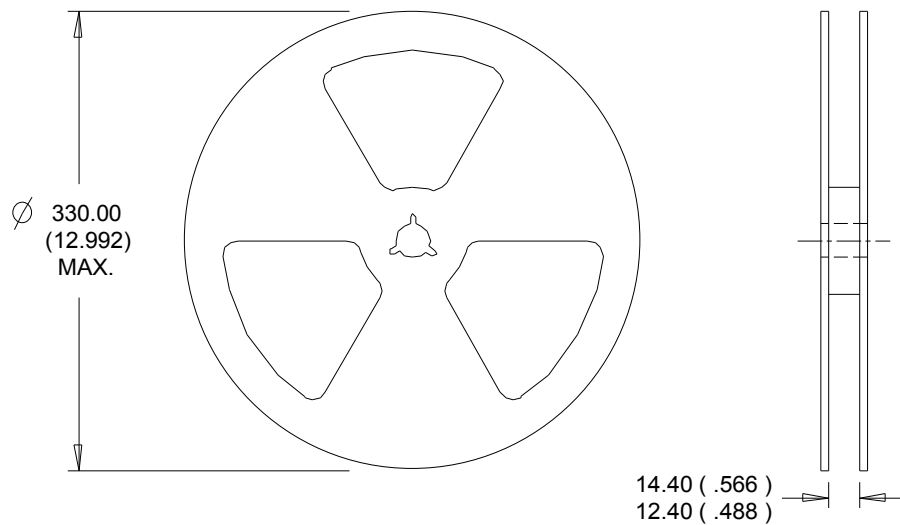
## SO-8 Part Marking Information





**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 (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 M4 (+/- 425V) <sup>†</sup> AEC-Q101-002	
	Human Body Model	Class H1B (+/- 1000V) <sup>†</sup> AEC-Q101-001	
	Charged Device Model	Class C5 (+/- 1125V) <sup>†</sup> 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 6.</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>

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