

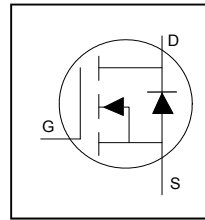
**Features**

- Advanced Process Technology
- Ultra Low On-Resistance
- 175°C Operating Temperature
- Fast Switching
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free, RoHS Compliant
- Automotive Qualified \*

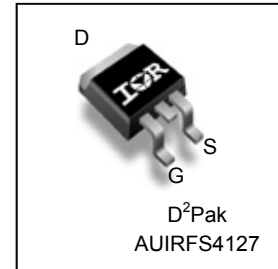
**Description**

Specifically designed for Automotive applications, this HEXFET® Power MOSFET utilizes the latest processing techniques to achieve extremely low on-resistance per silicon area. Additional features of this design are a 175°C junction operating temperature, fast switching speed and improved repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in Automotive applications and a wide variety of other applications.

HEXFET® Power MOSFET



<b>V<sub>DSS</sub></b>	<b>200V</b>
<b>R<sub>DS(on)</sub> typ.</b>	<b>18.6mΩ</b>
	<b>max</b>
<b>I<sub>D</sub></b>	<b>72A</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	
AUIRFS4127	D <sup>2</sup> -Pak	Tube	50	AUIRFS4127
		Tape and Reel Left	800	AUIRFS4127TRL

**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.

	Parameter	Max.	Units
I <sub>D</sub> @ T <sub>C</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	72	A
I <sub>D</sub> @ T <sub>C</sub> = 100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	51	
I <sub>DM</sub>	Pulsed Drain Current ①	300	
P <sub>D</sub> @ T <sub>C</sub> = 25°C	Power Dissipation	375	W
	Linear Derating Factor	2.5	W/°C
V <sub>GS</sub>	Gate-to-Source Voltage	± 20	V
dv/dt	Peak Diode Recovery ③	57	V/ns
E <sub>AS</sub>	Single Pulse Avalanche Energy (Thermally limited) ②	250	mJ
I <sub>AR</sub>	Avalanche Current ①	See Fig. 14, 15, 22a, 22b	A
E <sub>AR</sub>	Repetitive Avalanche Energy ④		mJ
T <sub>J</sub>	Operating Junction and	-55 to + 175	°C
T <sub>STG</sub>	Storage Temperature Range		
	Soldering Temperature for 10 seconds	300(1.6mm from case)	

**Thermal Resistance**

Symbol	Parameter	Typ.	Max.	Units
R <sub>θJC</sub>	Junction-to-Case ⑧⑨	—	0.4	°C/W
R <sub>θJA</sub>	Junction-to-Ambient ⑦	—	40	

HEXFET® is a registered trademark of Infineon.

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

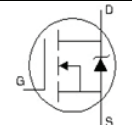
**Static Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)**

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	200	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.23	—	V/°C	Reference to 25°C, I <sub>D</sub> = 5mA <sup>①</sup>
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	18.6	22	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 44A <sup>④</sup>
V <sub>GS(th)</sub>	Gate Threshold Voltage	3.0	—	5.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
g <sub>fs</sub>	Forward Trans conductance	79	—	—	S	V <sub>DS</sub> = 50V, I <sub>D</sub> = 44A
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	20	μA	V <sub>DS</sub> = 200V, V <sub>GS</sub> = 0V
		—	—	250		V <sub>DS</sub> = 200V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	100	nA	V <sub>GS</sub> = 20V
	Gate-to-Source Reverse Leakage	—	—	-100		V <sub>GS</sub> = -20V
R <sub>G</sub>	Internal Gate Resistance	—	3.0	—	Ω	

**Dynamic Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise specified)**

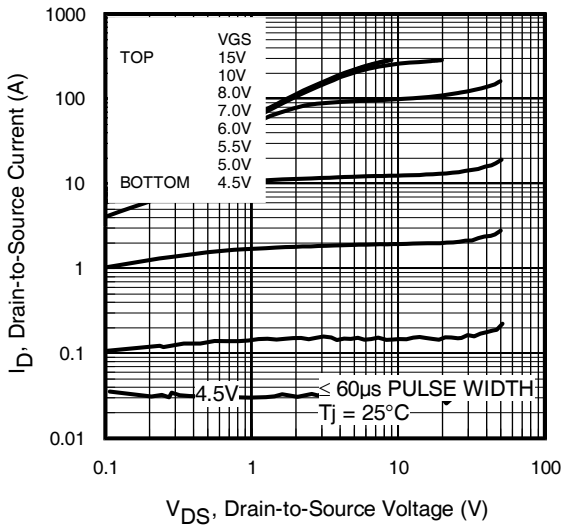
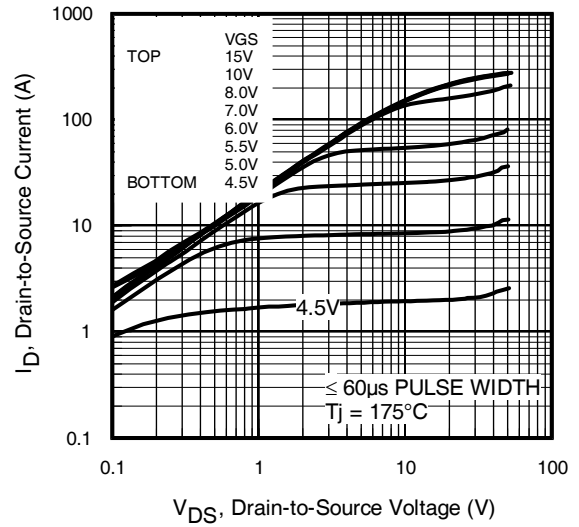
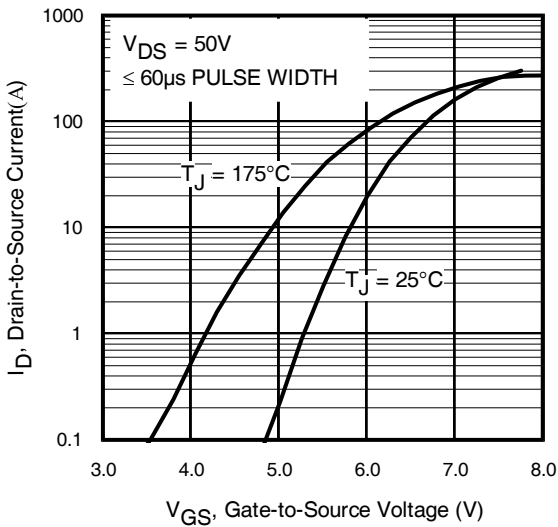
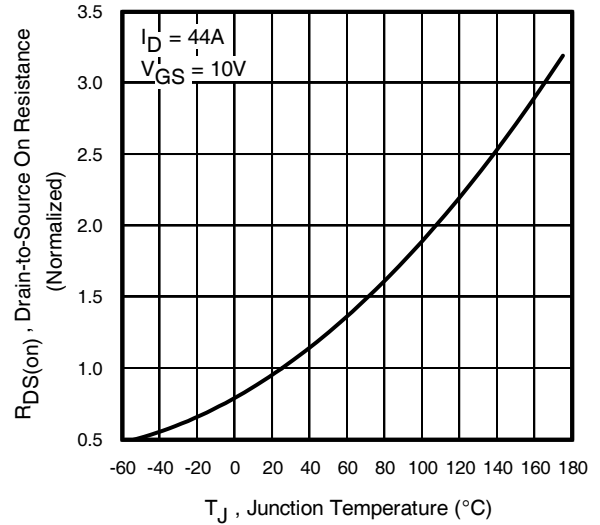
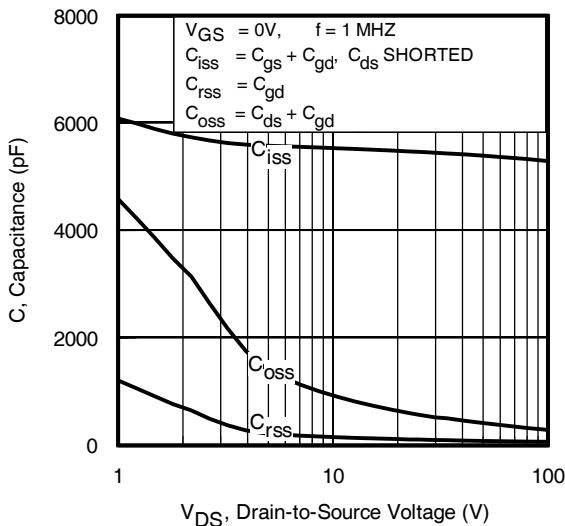
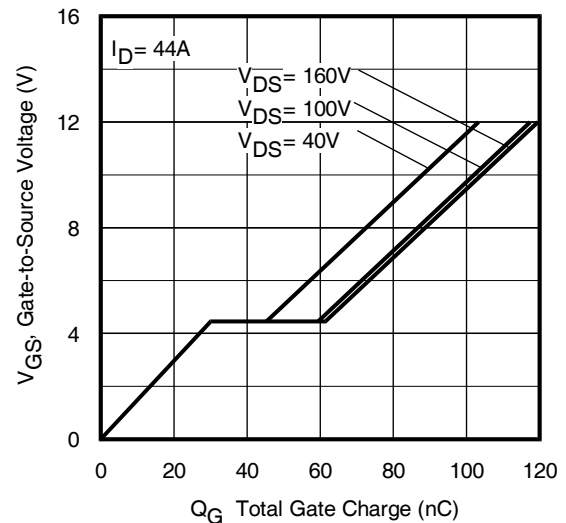
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
Q <sub>g</sub>	Total Gate Charge	—	100	150	nC	I <sub>D</sub> = 44A V <sub>DS</sub> = 100V V <sub>GS</sub> = 10V <sup>④</sup>
Q <sub>gs</sub>	Gate-to-Source Charge	—	30	—		
Q <sub>gd</sub>	Gate-to-Drain ("Miller") Charge	—	31	—		
Q <sub>sync</sub>	Total Gate Charge Sync. (Q <sub>g</sub> - Q <sub>gd</sub> )	—	69	—		
t <sub>d(on)</sub>	Turn-On Delay Time	—	17	—	ns	V <sub>DD</sub> = 130V I <sub>D</sub> = 44A R <sub>G</sub> = 2.7Ω V <sub>GS</sub> = 10V <sup>④</sup>
t <sub>r</sub>	Rise Time	—	18	—		
t <sub>d(off)</sub>	Turn-Off Delay Time	—	56	—		
t <sub>f</sub>	Fall Time	—	22	—		
C <sub>iss</sub>	Input Capacitance	—	5380	—	pF	V <sub>GS</sub> = 0V V <sub>DS</sub> = 50V f = 1.0 MHz (See Fig. 5) V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 160V <sup>⑥</sup> V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 160V <sup>⑤</sup>
C <sub>oss</sub>	Output Capacitance	—	410	—		
C <sub>rss</sub>	Reverse Transfer Capacitance	—	86	—		
C <sub>oss</sub> eff. (ER)	Effective Output Capacitance (Energy Related)	—	360	—		
C <sub>oss</sub> eff. (TR)	Effective Output Capacitance (Time Related)	—	590	—		

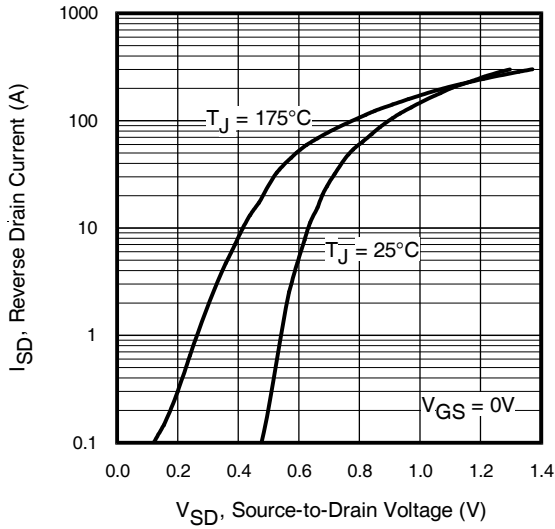
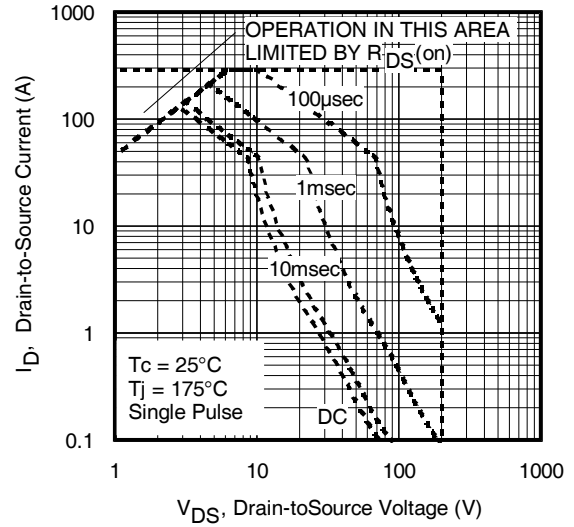
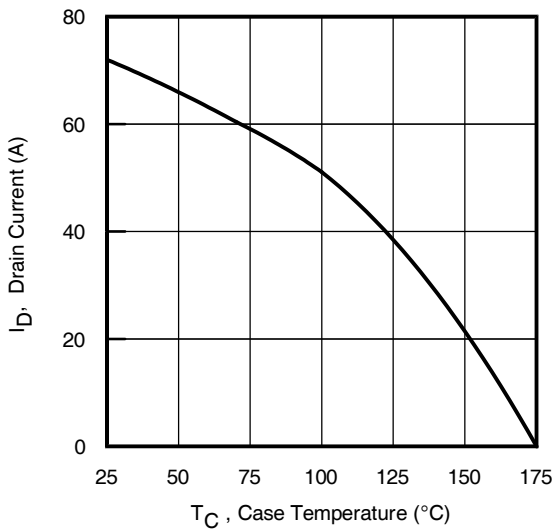
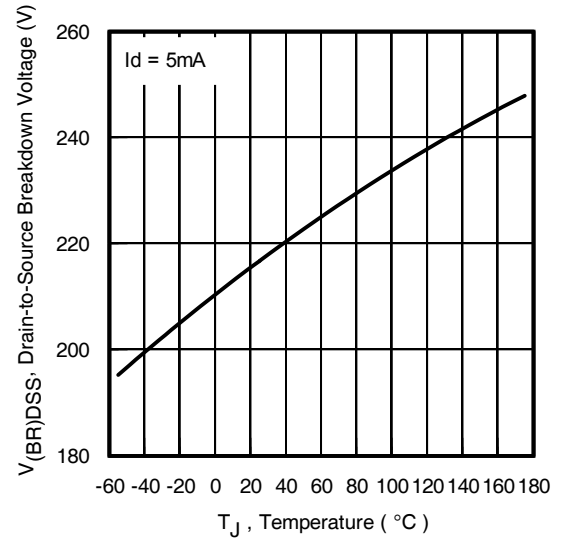
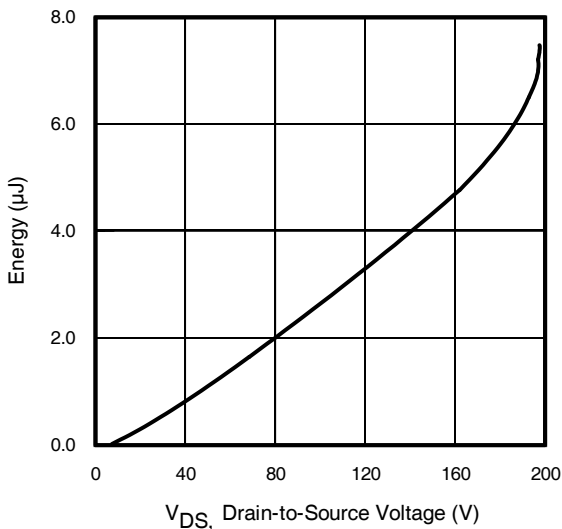
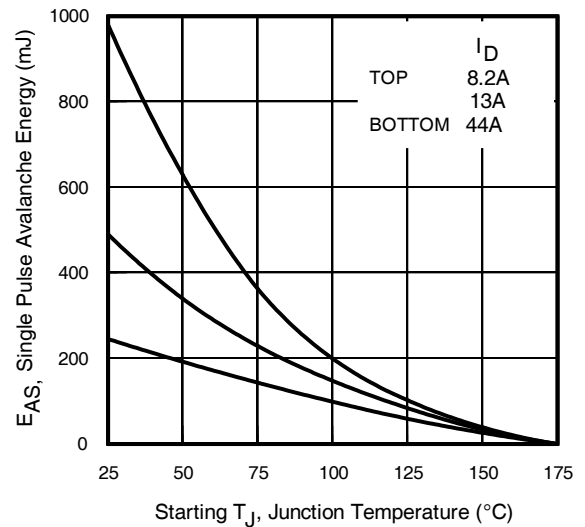
**Diode Characteristics**

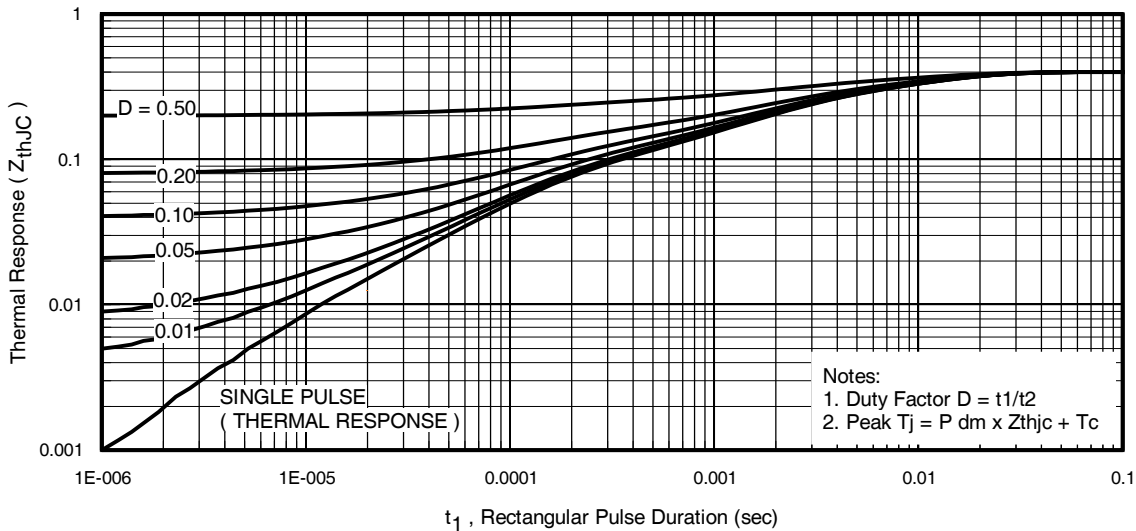
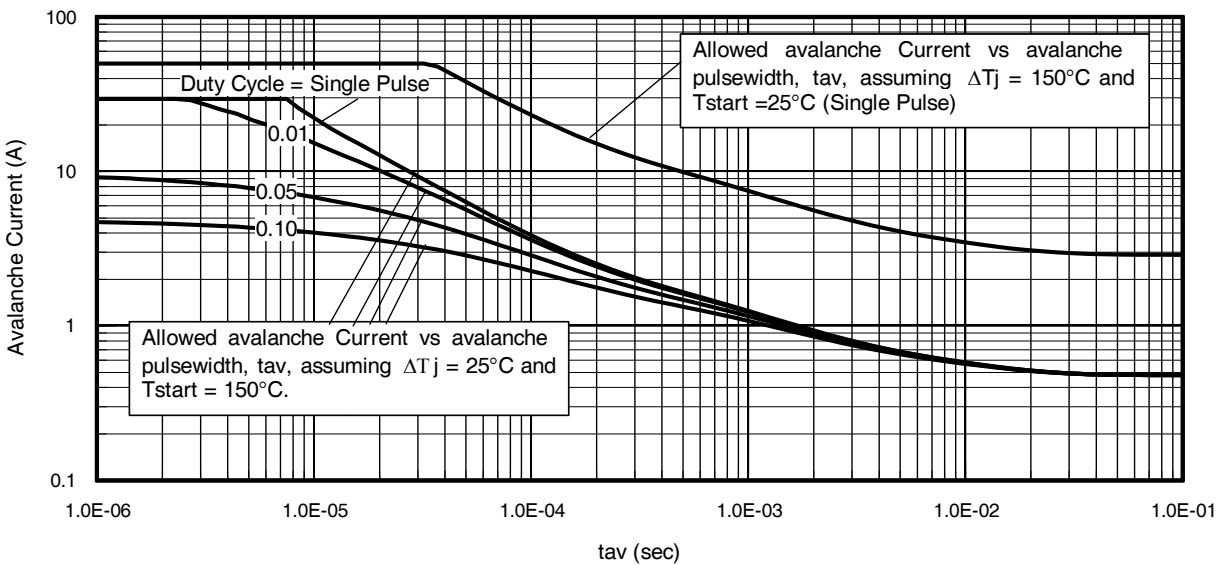
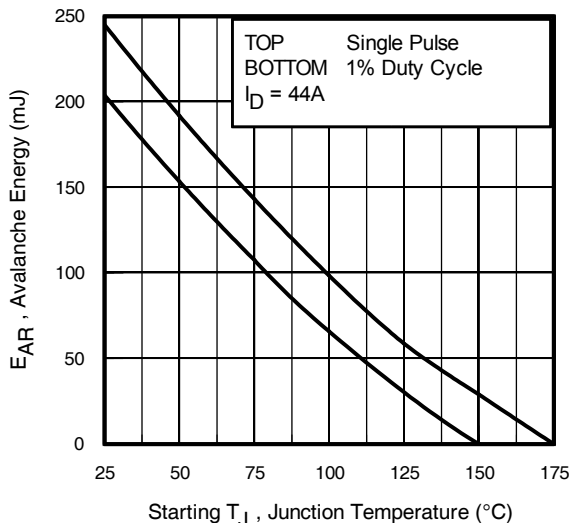
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	72	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) <sup>①</sup>	—	—	300		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.3	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 44A, V <sub>GS</sub> = 0V <sup>④</sup>
t <sub>rr</sub>	Reverse Recovery Time	—	136	—	ns	T <sub>J</sub> = 25°C V <sub>R</sub> = 100V, T <sub>J</sub> = 125°C I <sub>F</sub> = 44A
Q <sub>rr</sub>	Reverse Recovery Charge	—	458	—		
I <sub>R</sub> RM	Reverse Recovery Current	—	8.3	—	A	T <sub>J</sub> = 25°C

**Notes:**

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Limited by T<sub>Jmax</sub>, starting T<sub>J</sub> = 25°C, L = 0.26mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 44A, V<sub>GS</sub> = 10V. Part not recommended for use above this value.
- ③ I<sub>SD</sub> ≤ 44A, di/dt ≤ 760A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>J</sub> ≤ 175°C.
- ④ Pulse width ≤ 400μs; duty cycle ≤ 2%.
- ⑤ C<sub>oss</sub> eff. (TR) is a fixed capacitance that gives the same charging time as C<sub>oss</sub> while V<sub>DS</sub> is rising from 0 to 80% V<sub>DSS</sub>.
- ⑥ C<sub>oss</sub> eff. (ER) is a fixed capacitance that gives the same energy as C<sub>oss</sub> while V<sub>DS</sub> is rising from 0 to 80% V<sub>DSS</sub>.
- ⑦ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.
- ⑧ R<sub>θ</sub> is measured at T<sub>J</sub> approximately 90°C.
- ⑨ R<sub>θJC</sub> value shown is at time zero.


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

**Fig 10.** Drain-to-Source Breakdown Voltage

**Fig 11.** Typical  $C_{oss}$  Stored Energy

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


**Fig 13. Maximum Effective Transient Thermal Impedance, Junction-to-Case**

**Fig 14. Avalanche Current vs. Pulse Width**

**Fig 15. Maximum Avalanche Energy vs. Temperature**
**Notes on Repetitive Avalanche Curves , Figures 14, 15:  
 (For further info, see AN-1005 at www.irf.com)**

1. Avalanche failures assumption:  
 Purely a thermal phenomenon and failure occurs at a temperature far in excess of  $T_{jmax}$ . This is validated for every part type.
2. Safe operation in Avalanche is allowed as long as  $T_{jmax}$  is not exceeded.
3. Equation below based on circuit and waveforms shown in Figures 22a, 22b.
4.  $P_{D(ave)}$  = Average power dissipation per single avalanche pulse.
5. BV = Rated breakdown voltage (1.3 factor accounts for voltage increase during avalanche).
6.  $I_{av}$  = Allowable avalanche current.
7.  $\Delta T$  = Allowable rise in junction temperature, not to exceed  $T_{jmax}$  (assumed as  $25^\circ C$  in Figure 14, 15).

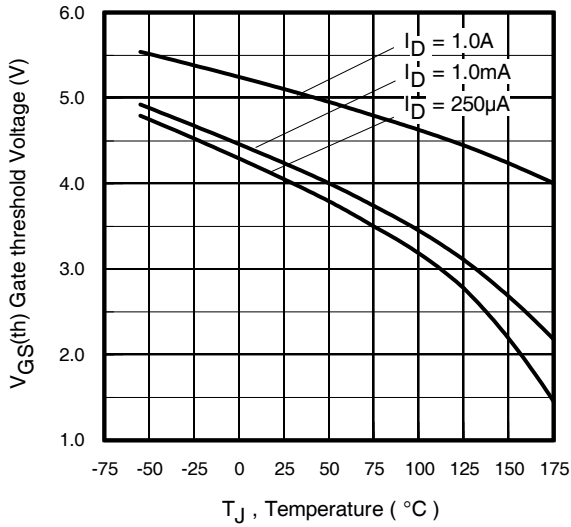
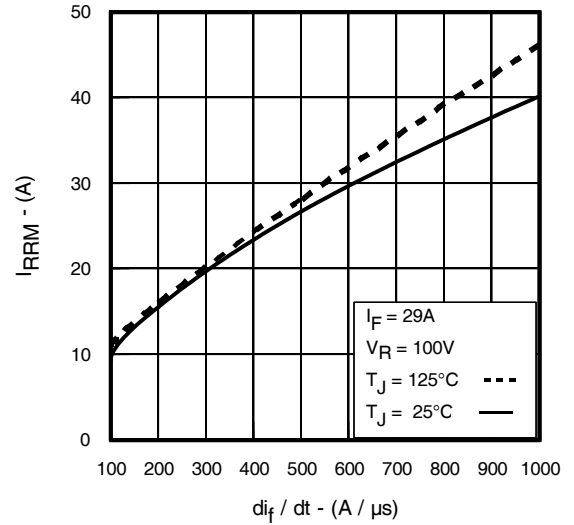
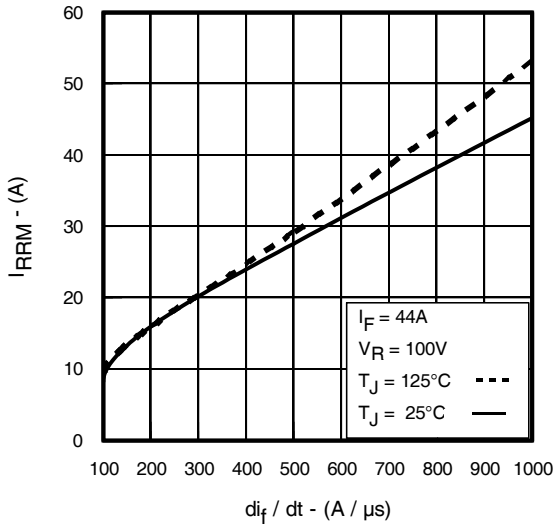
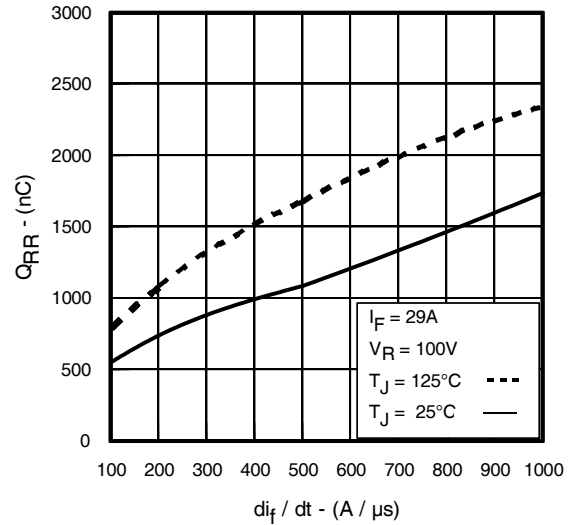
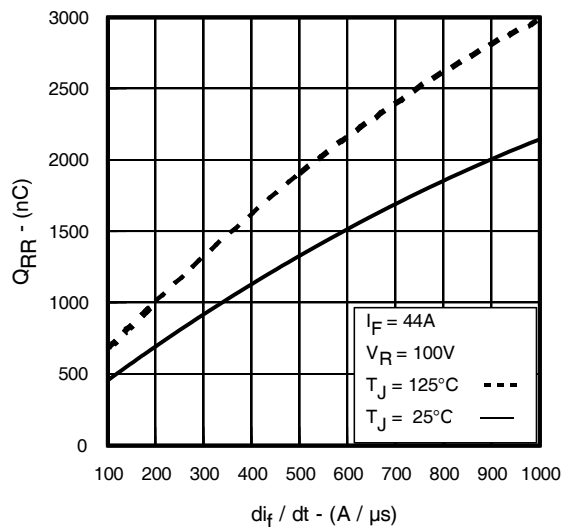
 $t_{av}$  = Average time in avalanche.

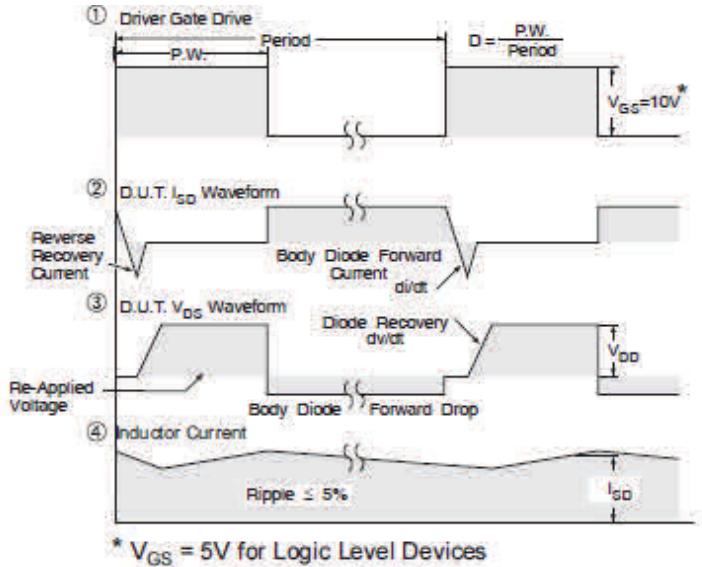
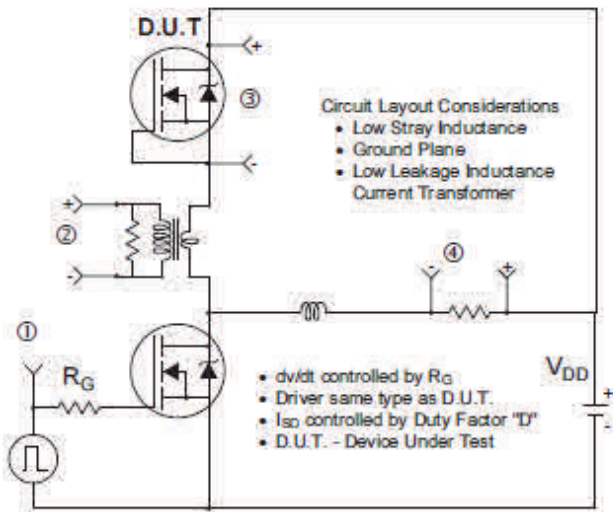
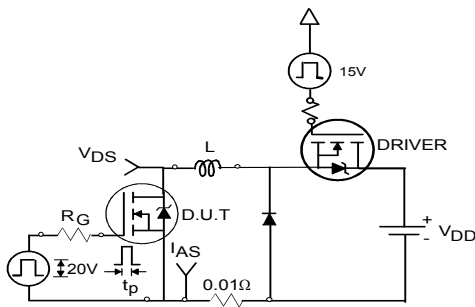
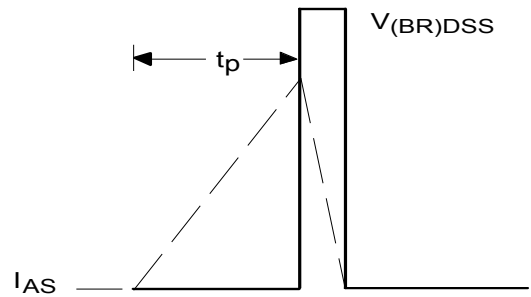
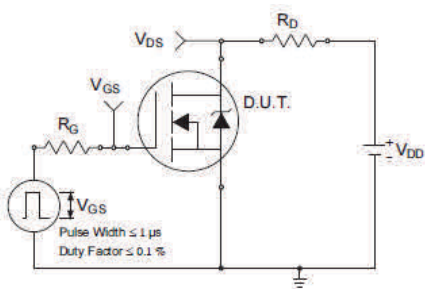
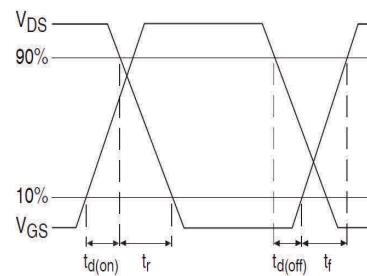
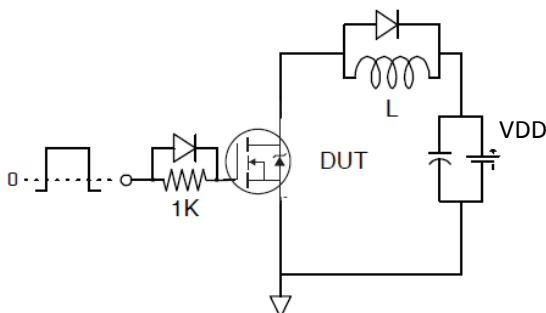
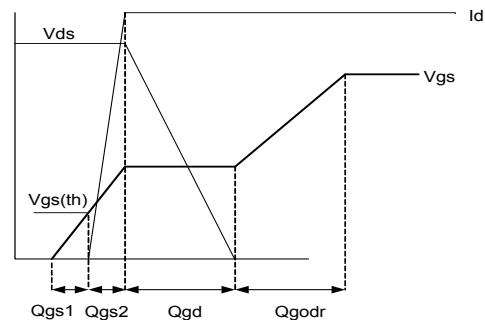
 $D$  = Duty cycle in avalanche =  $t_{av} \cdot f$ 
 $Z_{thJC}(D, t_{av})$  = Transient thermal resistance, see Figures 14)

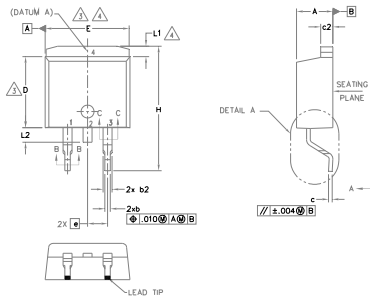
$$P_{D(ave)} = 1/2 ( 1.3 \cdot BV \cdot I_{av} ) = \Delta T / Z_{thJC}$$

$$I_{av} = 2\Delta T / [1.3 \cdot BV \cdot Z_{th}]$$

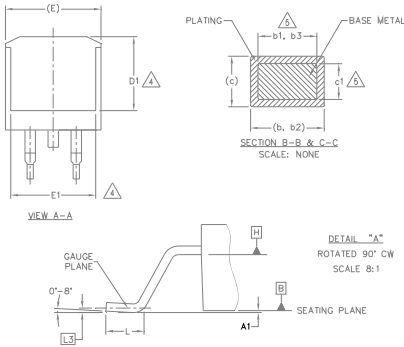
$$E_{AS(AR)} = P_{D(ave)} \cdot t_{av}$$


**Fig 16.** Threshold Voltage vs. Temperature

**Fig 17.** Typical Recovery Current vs. dif/dt

**Fig 18.** Typical Recovery Current vs. dif/dt

**Fig 19.** Typical Stored Charge vs. dif/dt

**Fig 20.** Typical Stored Charge vs. dif/dt


**Fig 21. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs**

**Fig 22a. Unclamped Inductive Test Circuit**

**Fig 22b. Unclamped Inductive Waveforms**

**Fig 23a. Switching Time Test Circuit**

**Fig 23b. Switching Time Waveforms**

**Fig 24a. Gate Charge Test Circuit**

**Fig 24b. Gate Charge Waveform**

**D<sup>2</sup>Pak (TO-263AB) Package Outline (Dimensions are shown in millimeters (inches))**


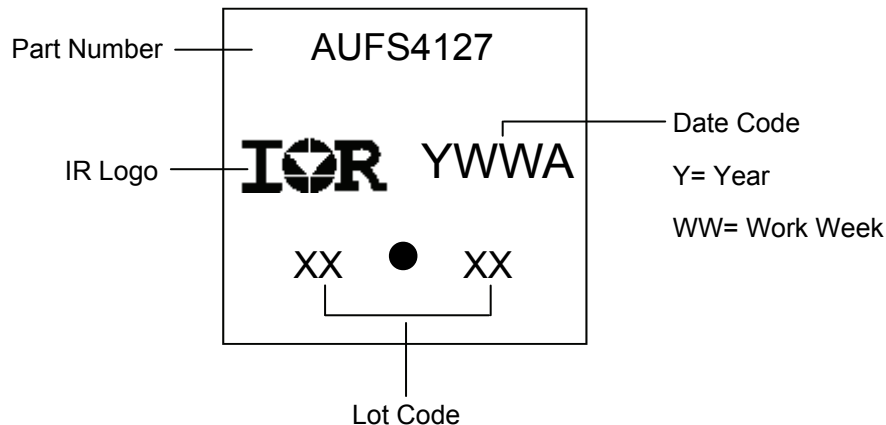
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
  2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
  3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [0.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
  4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
  5. DIMENSION b1, b3 AND c1 APPLY TO BASE METAL ONLY.
  6. DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
  7. CONTROLLING DIMENSION: INCH.
  8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-263AB.



SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	0.00	0.254	.000	.010	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	5
c2	1.14	1.65	.045	.065	
D	8.38	9.65	.330	.380	3
D1	6.86	—	.270	—	4
E	9.65	10.67	.380	.420	3,4
E1	6.22	—	.245	—	4
e	2.54 BSC		.100 BSC		
H	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	
L1	—	1.68	—	.066	4
L2	—	1.78	—	.070	
L3	0.25 BSC		.010 BSC		

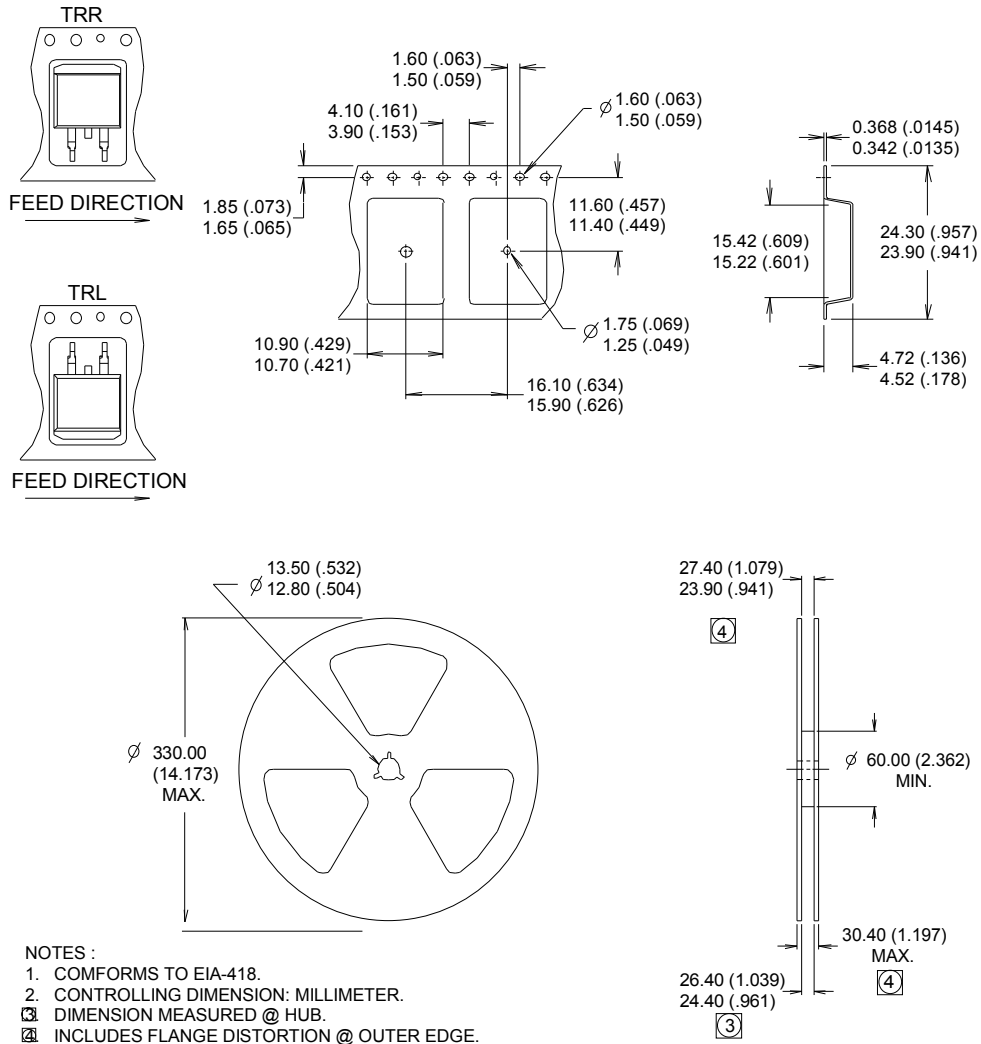
**LEAD ASSIGNMENTS**

- DIODES**
- 1.- ANODE (TWO DIE) / OPEN (ONE DIE)
  - 2.- CATHODE
  - 3.- ANODE
- HEXFET**
- 1.- GATE
  - 2.- DRAIN
  - 3.- SOURCE
- IGBTs, CoPACK**
- 1.- GATE
  - 2.- COLLECTOR
  - 3.- EMITTER

**D<sup>2</sup>Pak (TO-263AB) Part Marking Information**


Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>



**D<sup>2</sup>Pak (TO-263AB) Tape & Reel Information (Dimensions are shown in millimeters (inches))**


Note: For the most current drawing please refer to IR website at <http://www.irf.com/package/>

**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>		D <sup>2</sup> -Pak	MSL1
<b>ESD</b>	Human Body Model	Class H2 (+/- 4000V) <sup>†</sup> AEC-Q101-001	
	Charged Device Model	Class C5 (+/- 2000V) <sup>†</sup> AEC-Q101-005	
<b>RoHS Compliant</b>		Yes	

† Highest passing voltage.

**Revision History**

Date	Comments
10/27/2015	<ul style="list-style-type: none"> <li>Updated datasheet with corporate template</li> <li>Corrected ordering table on page 1.</li> </ul>
03/28/2017	<ul style="list-style-type: none"> <li>Removed TO-262 Pak "AUIRFS4127" this devices TO-262 Pak was never released and this part was erroneously added to the datasheet. –All pages</li> </ul>

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