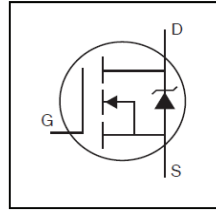
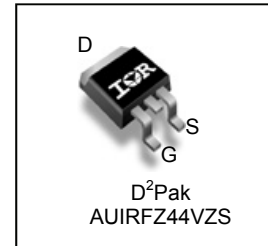


**Features**

- 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 \*



<b>V<sub>DSS</sub></b>	<b>60V</b>
<b>R<sub>DS(on)</sub> typ.</b>	<b>9.6mΩ</b>
<b>max.</b>	<b>12mΩ</b>
<b>I<sub>D</sub></b>	<b>57A</b>



**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

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

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
AUIRFZ44VZS	D <sup>2</sup> -Pak	Tube	50	AUIRFZ44VZS
		Tape and Reel Left	800	AUIRFZ44VZSTRL

**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 <sub>D</sub> @ T <sub>C</sub> = 25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	57	A
I <sub>D</sub> @ T <sub>C</sub> = 100°C	Continuous Drain Current, V <sub>GS</sub> @ 10V	40	
I <sub>DM</sub>	Pulsed Drain Current ①	230	
P <sub>D</sub> @ T <sub>C</sub> = 25°C	Maximum Power Dissipation	92	W
	Linear Derating Factor	0.61	W/°C
V <sub>GS</sub>	Gate-to-Source Voltage	± 20	V
E <sub>AS</sub> (Thermally Limited)	Single Pulse Avalanche Energy (Thermally Limited) ②	73	mJ
E <sub>AS</sub> (Tested)	Single Pulse Avalanche Energy (Tested Limited) ③	110	
I <sub>AR</sub>	Avalanche Current ④	See Fig. 12a, 12b, 15, 16	A
E <sub>AR</sub>	Repetitive Avalanche Energy ⑤		mJ
T <sub>J</sub>	Operating Junction and	-55 to + 175	°C
T <sub>STG</sub>	Storage Temperature Range		
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	

**Thermal Resistance**

Symbol	Parameter	Typ.	Max.	Units
R <sub>θJC</sub>	Junction-to-Case	—	1.64	°C/W
R <sub>θJA</sub>	Junction-to-Ambient (PCB Mount), D <sup>2</sup> Pak ⑦	—	40	

HEXFET® is a registered trademark of Infineon.

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

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	60	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.061	—	V/°C	Reference to 25°C, I <sub>D</sub> = 1mA
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	9.6	12	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 34A ③
V <sub>GS(th)</sub>	Gate Threshold Voltage	2.0	—	4.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA
g <sub>fs</sub>	Forward Trans conductance	25	—	—	S	V <sub>DS</sub> = 25V, I <sub>D</sub> = 34A
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	20	μA	V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V
		—	—	250		V <sub>DS</sub> = 60V, V <sub>GS</sub> = 0V, T <sub>J</sub> = 125°C
I <sub>GSS</sub>	Gate-to-Source Forward Leakage	—	—	200	nA	V <sub>GS</sub> = 20V
	Gate-to-Source Reverse Leakage	—	—	-200		V <sub>GS</sub> = -20V

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

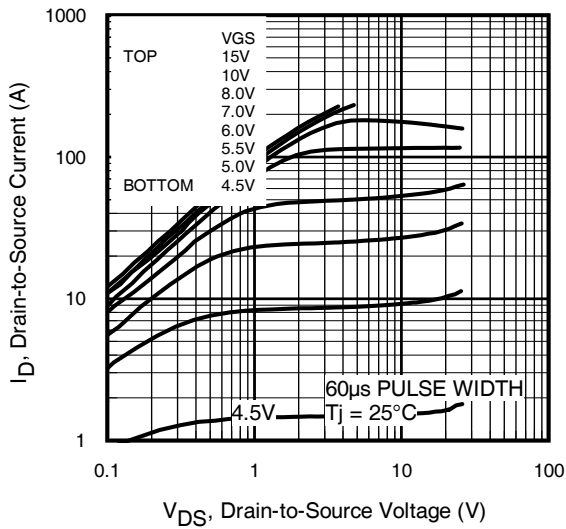
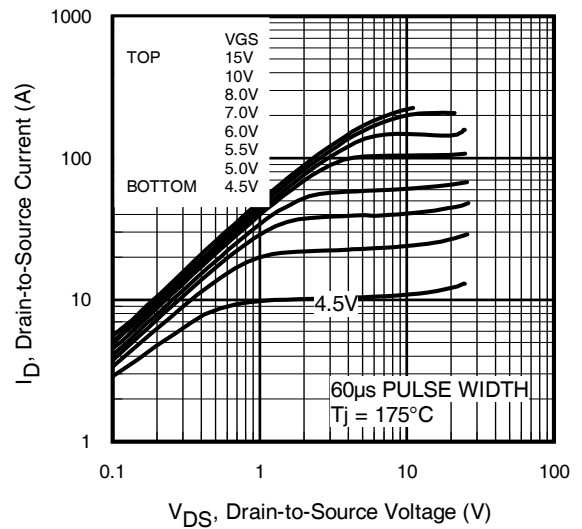
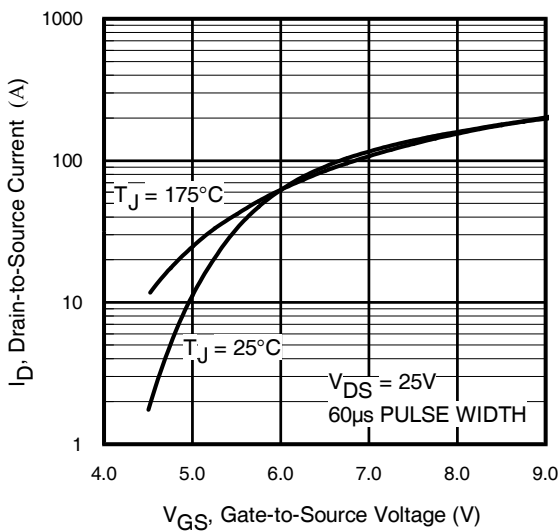
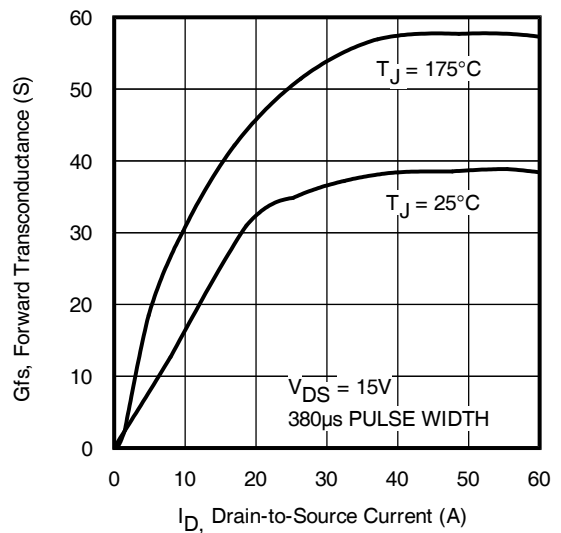
Q <sub>g</sub>	Total Gate Charge	—	43	65	nC	I <sub>D</sub> = 34A
Q <sub>gs</sub>	Gate-to-Source Charge	—	11	—		V <sub>DS</sub> = 48V
Q <sub>gd</sub>	Gate-to-Drain Charge	—	18	—		V <sub>GS</sub> = 10V ③
t <sub>d(on)</sub>	Turn-On Delay Time	—	14	—	ns	V <sub>DD</sub> = 30V
t <sub>r</sub>	Rise Time	—	62	—		I <sub>D</sub> = 34A
t <sub>d(off)</sub>	Turn-Off Delay Time	—	35	—		R <sub>G</sub> = 12Ω
t <sub>f</sub>	Fall Time	—	38	—		V <sub>GS</sub> = 10V ③
L <sub>D</sub>	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L <sub>S</sub>	Internal Source Inductance	—	7.5	—		
C <sub>iss</sub>	Input Capacitance	—	1690	—	pF	V <sub>GS</sub> = 0V
C <sub>oss</sub>	Output Capacitance	—	270	—		V <sub>DS</sub> = 25V
C <sub>rss</sub>	Reverse Transfer Capacitance	—	130	—		f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	1870	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 1.0V, f = 1.0MHz
C <sub>oss</sub>	Output Capacitance	—	260	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 48V, f = 1.0MHz
C <sub>oss eff.</sub>	Effective Output Capacitance	—	510	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 48V④

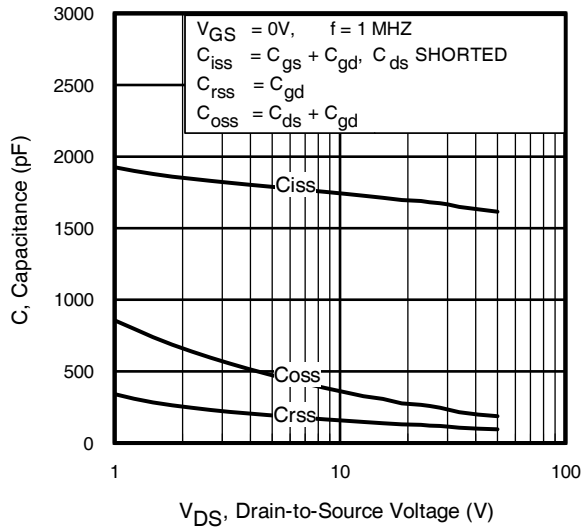
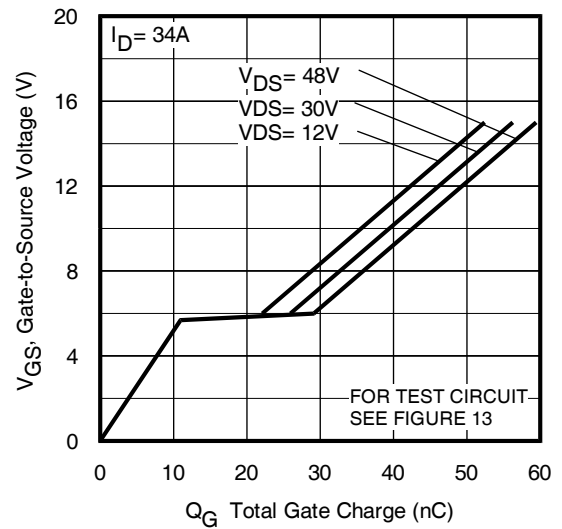
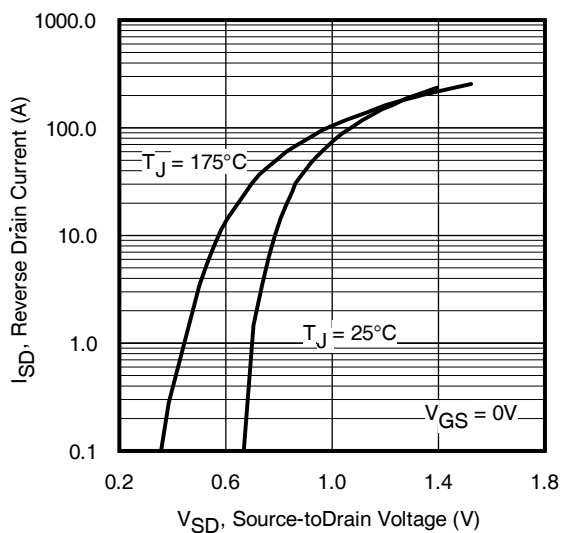
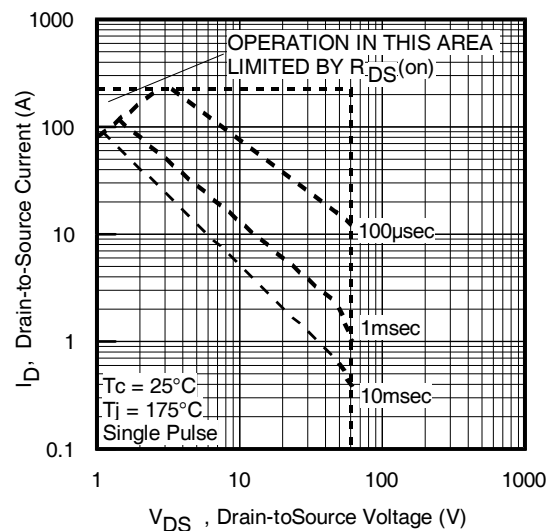
**Diode Characteristics**

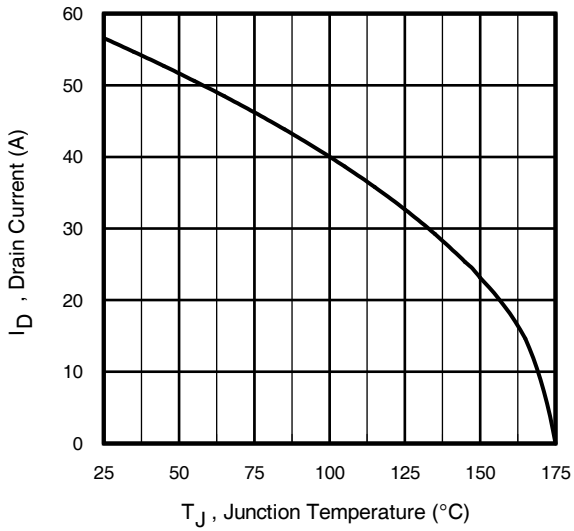
	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	57	A	MOSFET symbol showing the integral reverse p-n junction diode.
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	230		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.3	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 34A, V <sub>GS</sub> = 0V ③
t <sub>rr</sub>	Reverse Recovery Time	—	23	35	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 34A, V <sub>DD</sub> = 30V
Q <sub>rr</sub>	Reverse Recovery Charge	—	17	26	nC	di/dt = 100A/μs ③
t <sub>on</sub>	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by L <sub>S</sub> +L <sub>D</sub> )				

**Notes:**

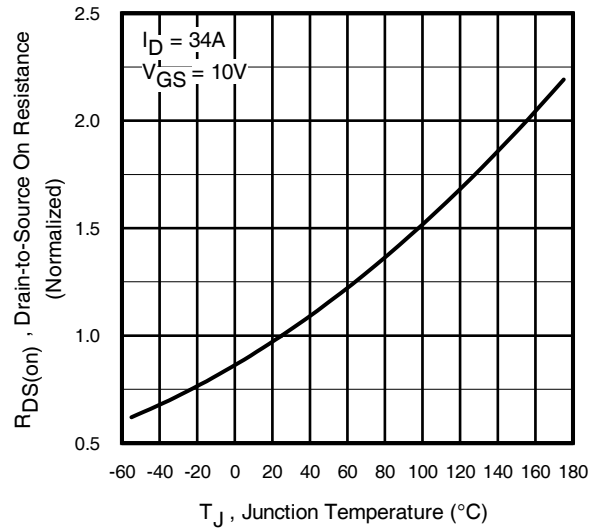
- ① Repetitive rating; pulse width limited by max. junction temperature. (See fig.11)
- ② Limited by T<sub>Jmax</sub>, starting T<sub>J</sub> = 25°C, L = 0.12mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 34A, V<sub>GS</sub> = 10V. Part not recommended for use above this value.
- ③ Pulse width ≤ 400μs; duty cycle ≤ 2%.
- ④ C<sub>oss eff.</sub> 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>.
- ⑤ Limited by T<sub>Jmax</sub>, see Fig.12a, 12b, 15, 16 for typical repetitive avalanche performance.
- ⑥ This value determined from sample failure population. 100% tested to this value in production, starting T<sub>J</sub> = 25°C, L = 0.12mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 34A, V<sub>GS</sub> = 10V.
- ⑦ This is applied to D<sup>2</sup>Pak, when mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994..


**Fig. 1** Typical Output Characteristics

**Fig. 2** Typical Output Characteristics

**Fig. 3** Typical Transfer Characteristics

**Fig. 4** Typical Forward Trans conductance Vs. Drain Current

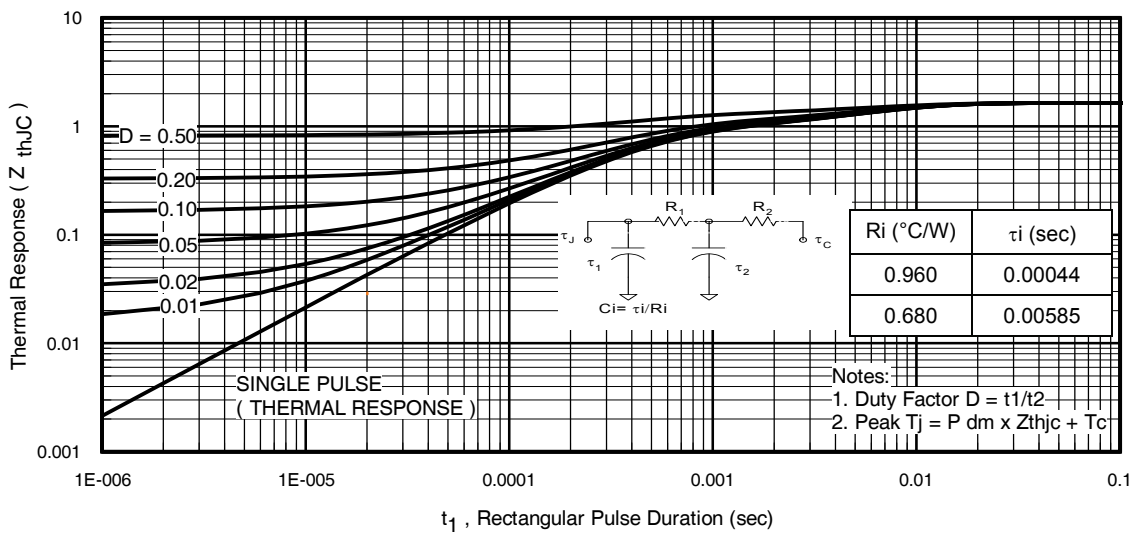

**Fig 5.** Typical Capacitance vs. Drain-to-Source Voltage

**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



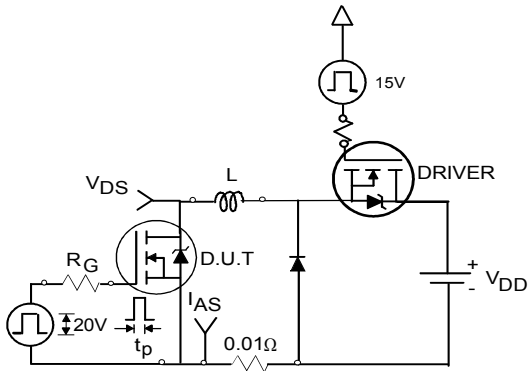
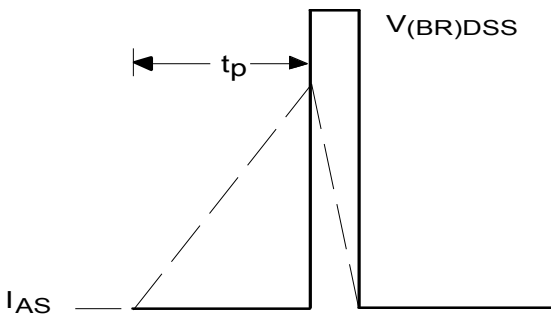
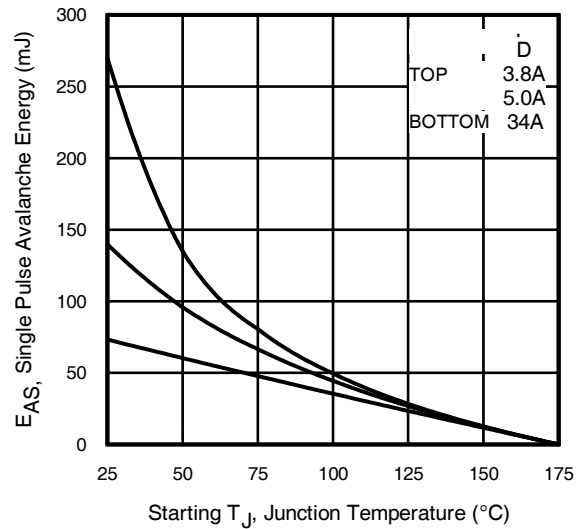
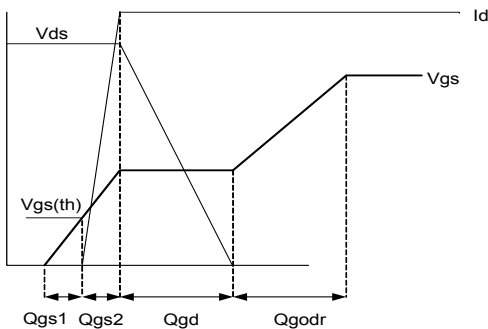
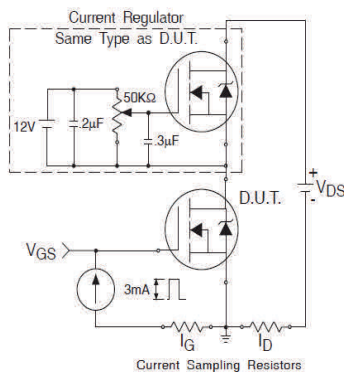
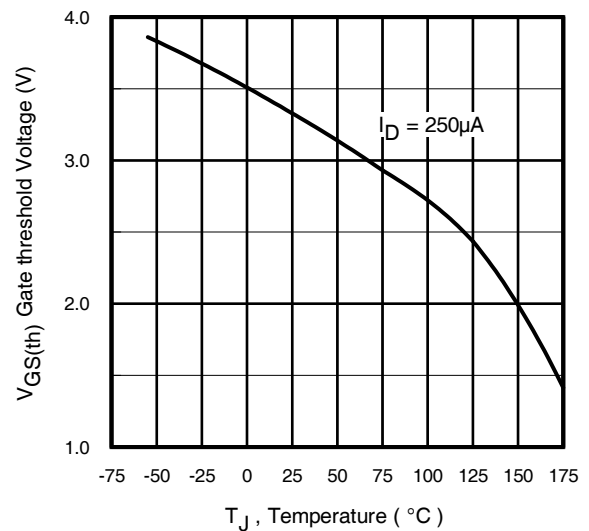
**Fig 9.** Maximum Drain Current Vs. Case Temperature

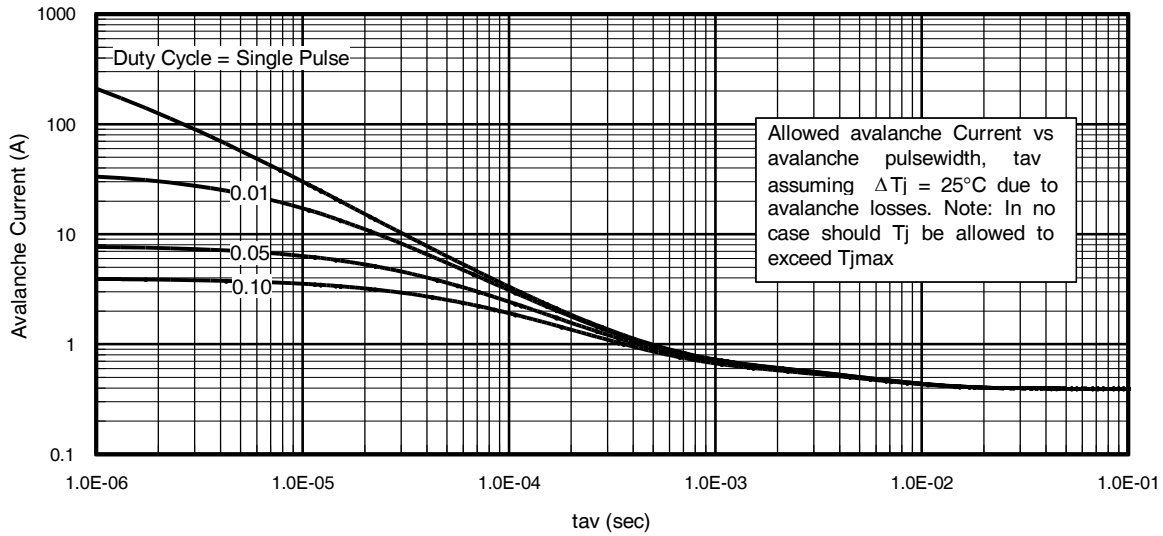
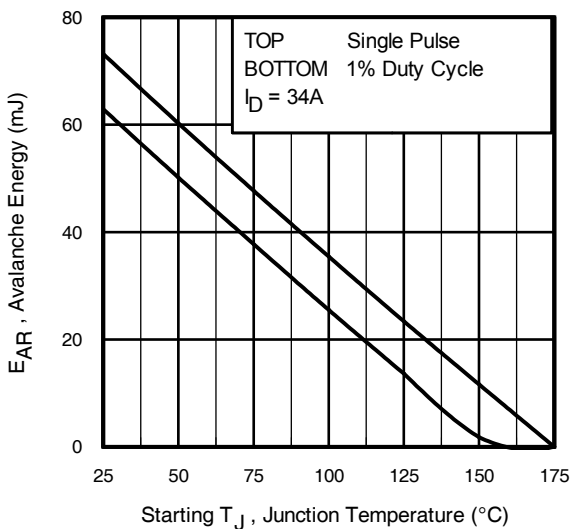


**Fig 10.** Normalized On-Resistance Vs. Temperature



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


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

**Fig 12b. Unclamped Inductive Waveforms**

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

**Fig 13a. Gate Charge Waveform**

**Fig 13b. Gate Charge Test Circuit**

**Fig 14. Threshold Voltage Vs. Temperature**


**Fig 15.** Typical Avalanche Current Vs. Pulse width

**Notes on Repetitive Avalanche Curves , Figures 15, 16:**  
**(For further info, see AN-1005 at www.infineon.com)**

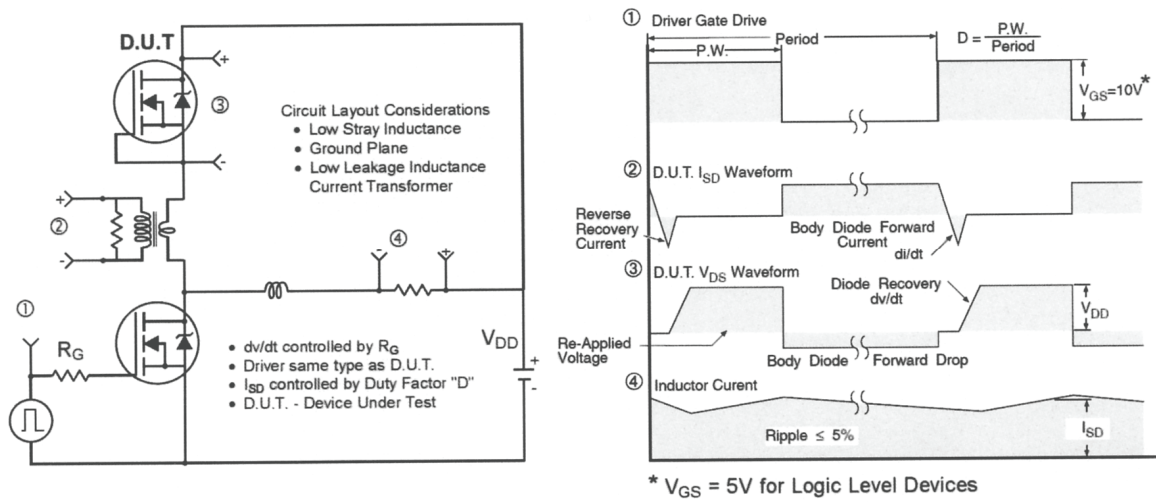
1. Avalanche failures assumption:  
Purely a thermal phenomenon and failure occurs at a temperature far in excess of  $T_{jmax}$ . This is validated for every part type.
2. Safe operation in Avalanche is allowed as long as  $T_{jmax}$  is not exceeded.
3. Equation below based on circuit and waveforms shown in Figures 12a, 12b.
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°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 13)

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

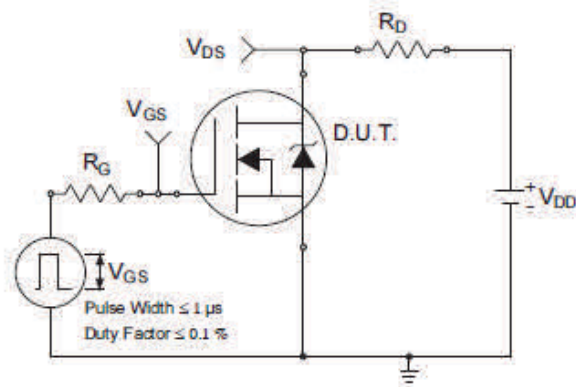
$$I_{av} = 2\Delta T / [ 1.3 \cdot BV \cdot Z_{th} ]$$

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

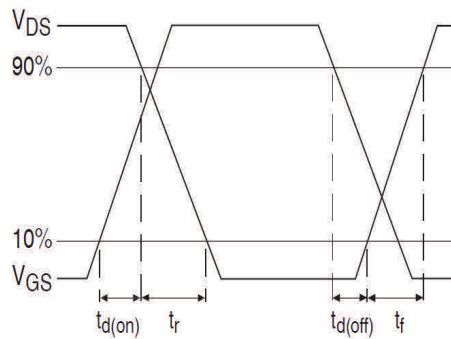
**Fig 16.** Maximum Avalanche Energy vs. Temperature



**Fig 17. Peak Diode Recovery  $dv/dt$  Test Circuit for N-Channel HEXFET® Power MOSFETs**



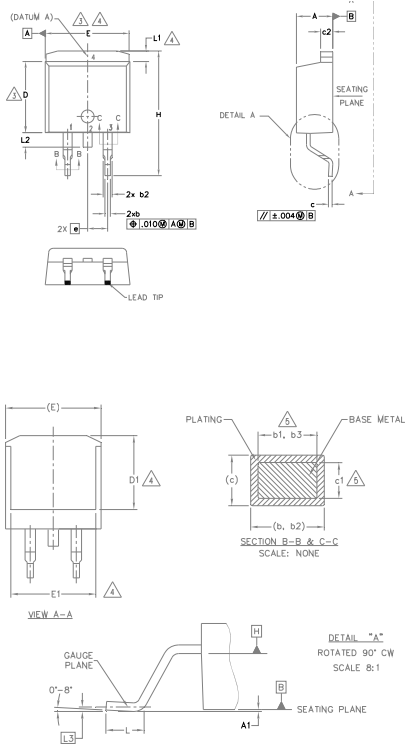
**Fig 18a. Switching Time Test Circuit**



**Fig 18b. Switching Time Waveforms**



## 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

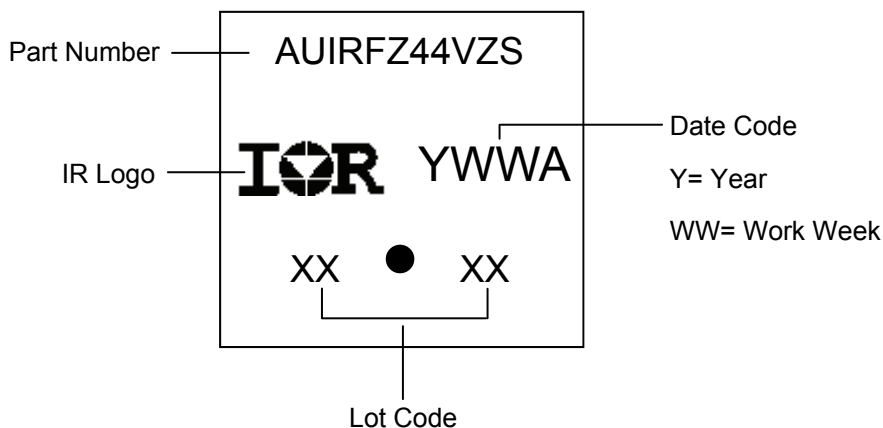
HEXFET

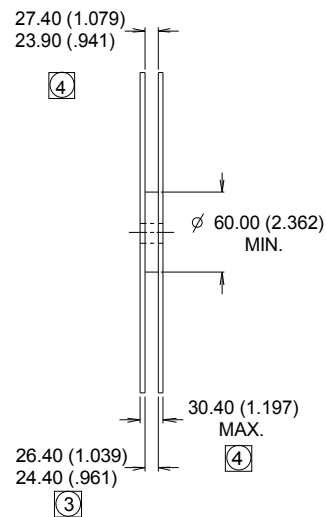
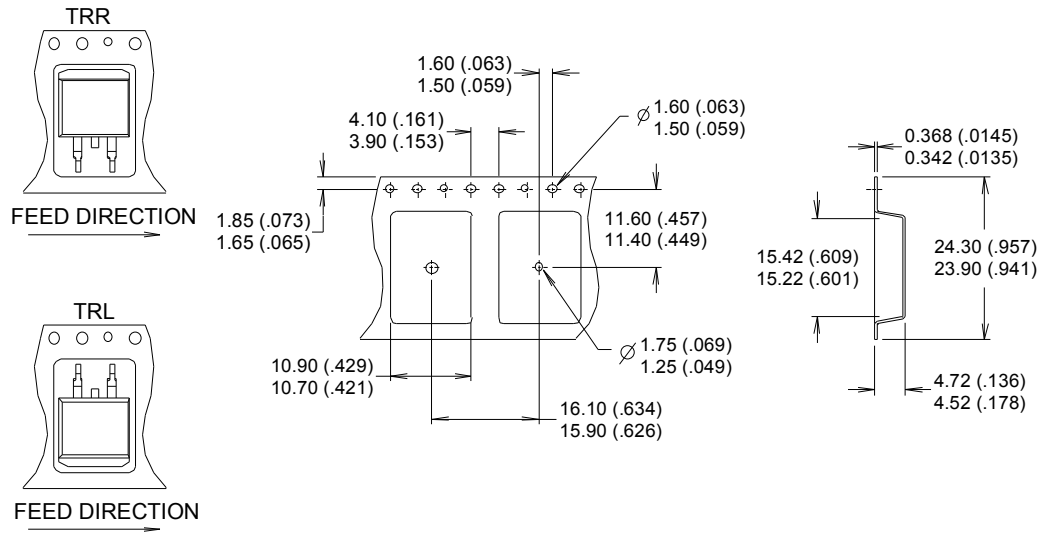
- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE

IGBTs, CoPACK

- 1.- GATE
- 2.- COLLECTOR
- 3.- EMITTER

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



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


- NOTES :
1. COMFORMS TO EIA-418.
  2. CONTROLLING DIMENSION: MILLIMETER.
  - ③ DIMENSION MEASURED @ HUB.
  - ④ INCLUDES FLANGE DISTORTION @ OUTER EDGE.

**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>	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
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>
10/13/2017	<ul style="list-style-type: none"> <li>Corrected typo error on part marking on page 9.</li> </ul>

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