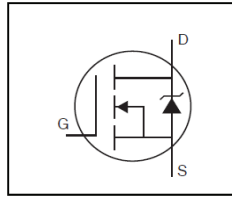


## Features

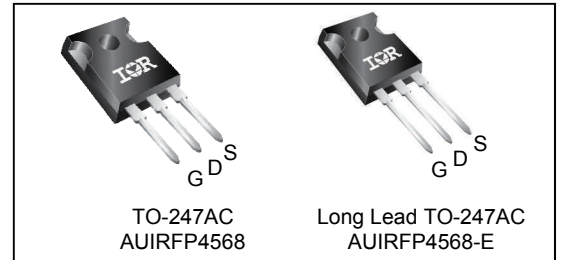
- Advanced Planar Technology
- Ultra Low On-Resistance
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Repetitive Avalanche Allowed up to  $T_{jmax}$
- Lead-Free, RoHS Compliant
- Automotive Qualified \*



$V_{DSS}$	150V
$R_{DS(on)}$ typ.	4.8mΩ
max.	5.9mΩ
$I_D$	171A

## 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	
AUIRFP4568	TO-247AC	Tube	25	AUIRFP4568
AUIRFP4568-E	Long Lead TO-247AC	Tube	25	AUIRFP4568-E

## 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 ( $T_A$ ) is 25°C, unless

Symbol	Parameter	Max.	Units
$I_D @ T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	171	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	121	
$I_{DM}$	Pulsed Drain Current ①	684	
$P_D @ T_C = 25^\circ\text{C}$	Maximum Power Dissipation	517	W
	Linear Derating Factor	3.45	W/°C
$V_{GS}$	Gate-to-Source Voltage	± 30	V
$E_{AS}$	Single Pulse Avalanche Energy (Thermally Limited) ②	763	mJ
$I_{AR}$	Avalanche Current ①	See Fig.14,15, 22a, 22b	A
$E_{AR}$	Repetitive Avalanche Energy ④		mJ
dv/dt	Peak Diode Recovery dv/dt③	18.5	V/ns
$T_J$	Operating Junction and	-55 to + 175	°C
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature, for 10 seconds (1.6mm from case)		
	Mounting torque, 6-32 or M3 screw		

## Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ⑦	—	0.29	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.24	—	
$R_{\theta JA}$	Junction-to-Ambient	—	40	

HEXFET® is a registered trademark of Infineon.

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

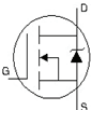
**Static @ T<sub>J</sub> = 25°C (unless otherwise specified)**

	Parameter	Min.	Typ.	Max.	Units	Conditions
V <sub>(BR)DSS</sub>	Drain-to-Source Breakdown Voltage	150	—	—	V	V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA
ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub>	Breakdown Voltage Temp. Coefficient	—	0.17	—	V/°C	Reference to 25°C, I <sub>D</sub> = 5mA ①
R <sub>DS(on)</sub>	Static Drain-to-Source On-Resistance	—	4.8	5.9	mΩ	V <sub>GS</sub> = 10V, I <sub>D</sub> = 103A ④
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	162	—	—	S	V <sub>DS</sub> = 50V, I <sub>D</sub> = 103A
R <sub>G</sub>	Internal Gate Resistance	—	1.0	—	Ω	
I <sub>DSS</sub>	Drain-to-Source Leakage Current	—	—	20	μA	V <sub>DS</sub> = 150V, V <sub>GS</sub> = 0V
		—	—	250	μA	V <sub>DS</sub> = 150V, 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	nA	V <sub>GS</sub> = -20V

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

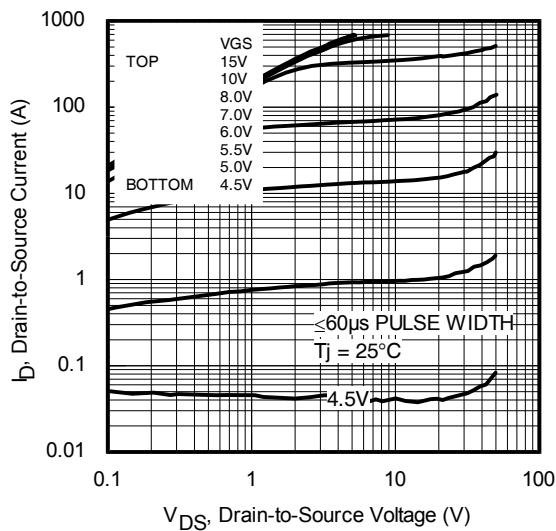
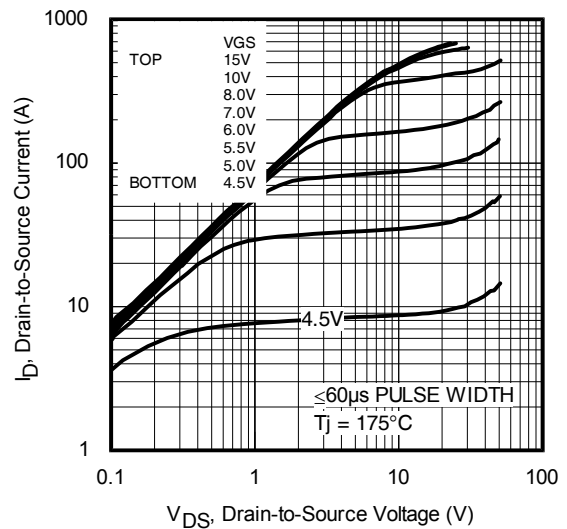
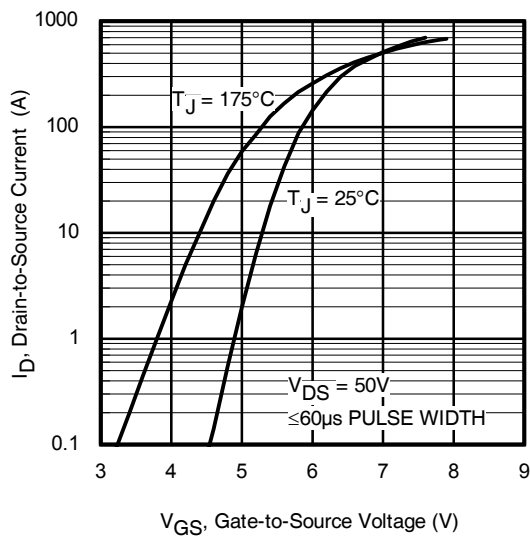
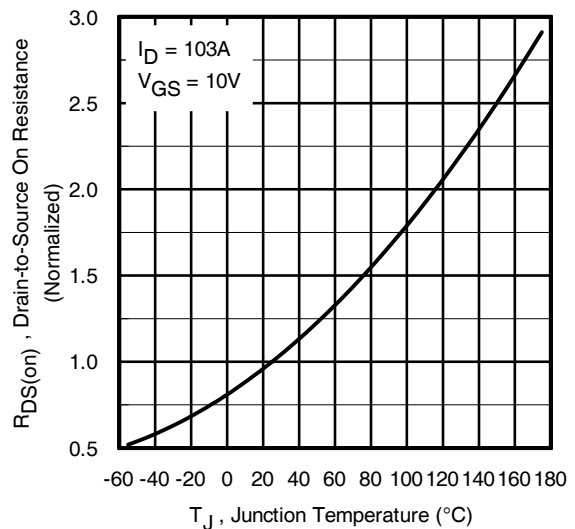
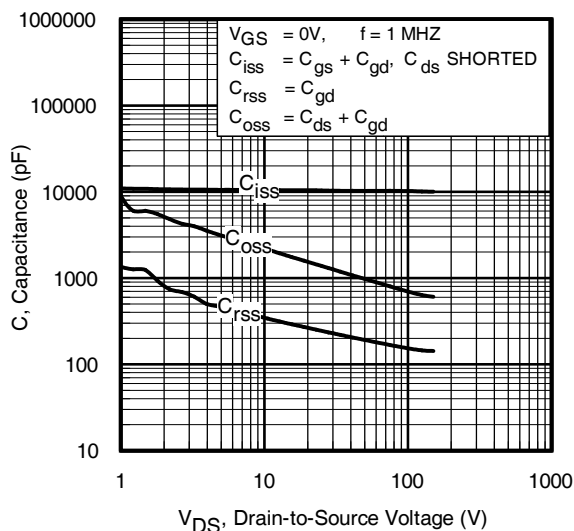
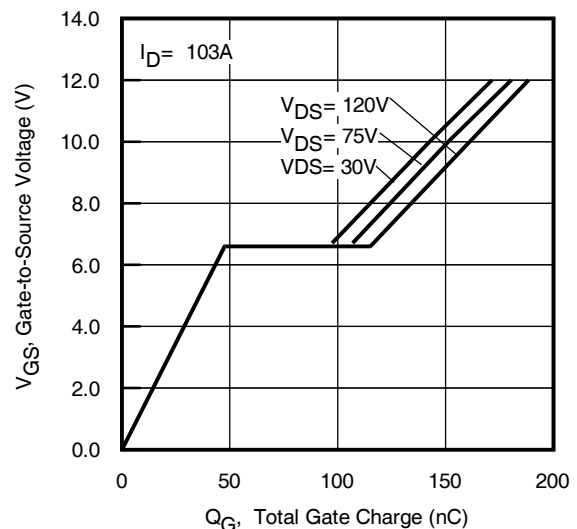
Q <sub>g</sub>	Total Gate Charge	—	151	227	nC	I <sub>D</sub> = 103A V <sub>DS</sub> = 75V V <sub>GS</sub> = 10V ④
Q <sub>gs</sub>	Gate-to-Source Charge	—	52	—		
Q <sub>gd</sub>	Gate-to-Drain Charge	—	55	—		
Q <sub>sync</sub>	Total Gate Charge Sync. (Q <sub>g</sub> – Q <sub>gd</sub> )	—	96	—		
t <sub>d(on)</sub>	Turn-On Delay Time	—	27	—	ns	V <sub>DD</sub> = 98V I <sub>D</sub> = 103A R <sub>G</sub> = 1.0Ω V <sub>GS</sub> = 10V ④
t <sub>r</sub>	Rise Time	—	119	—		
t <sub>d(off)</sub>	Turn-Off Delay Time	—	47	—		
t <sub>f</sub>	Fall Time	—	84	—		
C <sub>iss</sub>	Input Capacitance	—	10470	—	pF	V <sub>GS</sub> = 0V V <sub>DS</sub> = 50V f = 1.0MHz, See Fig. 5 V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 120V (see fig.11) ⑥
C <sub>oss</sub>	Output Capacitance	—	977	—		
C <sub>rss</sub>	Reverse Transfer Capacitance	—	203	—		
C <sub>oss eff. (ER)</sub>	Effective Output Capacitance (Energy Related)	—	897	—		
C <sub>oss eff. (TR)</sub>	Effective Output Capacitance (Time Related)	—	1272	—		V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V to 120V ⑤

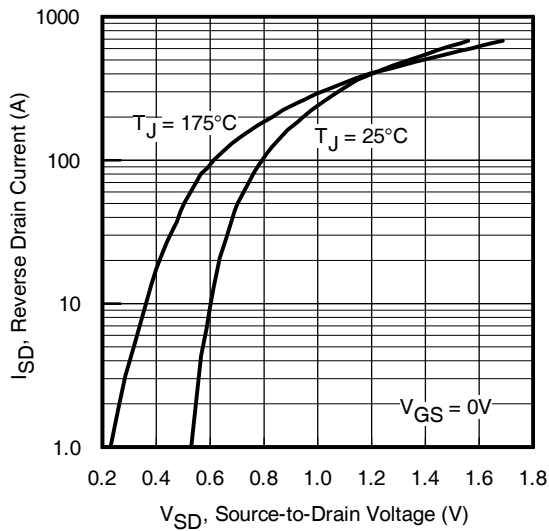
**Diode Characteristics**

	Parameter	Min.	Typ.	Max.	Units	Conditions
I <sub>S</sub>	Continuous Source Current (Body Diode)	—	—	171	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I <sub>SM</sub>	Pulsed Source Current (Body Diode) ①	—	—	684		
V <sub>SD</sub>	Diode Forward Voltage	—	—	1.3	V	T <sub>J</sub> = 25°C, I <sub>S</sub> = 103A, V <sub>GS</sub> = 0V ④
t <sub>rr</sub>	Reverse Recovery Time	—	110	—	ns	T <sub>J</sub> = 25°C T <sub>J</sub> = 125°C V <sub>R</sub> = 100V
		—	133	—		
Q <sub>rr</sub>	Reverse Recovery Charge	—	515	—	nC	T <sub>J</sub> = 25°C T <sub>J</sub> = 125°C I <sub>F</sub> = 103A di/dt = 100A/μs ④
		—	758	—		
I <sub>RRM</sub>	Reverse Recovery Current	—	8.8	—	A	T <sub>J</sub> = 25°C
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> )				

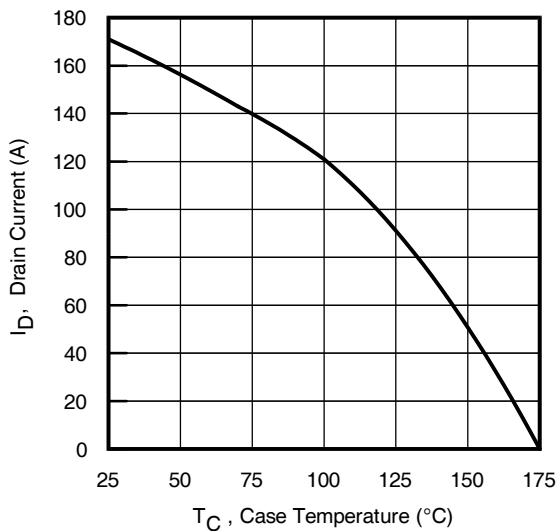
**Notes:**

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Limited by T<sub>Jmax</sub>, starting T<sub>J</sub> = 25°C, L = 0.144mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 103A, V<sub>GS</sub> = 10V. Part not recommended for use above this value.
- ③ I<sub>SD</sub> ≤ 103A, di/dt ≤ 360A/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 eff. (TR)</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>.
- ⑥ C<sub>oss eff. (ER)</sub> 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 R<sub>θ</sub> is measured at T<sub>J</sub> of approximately 90°C.

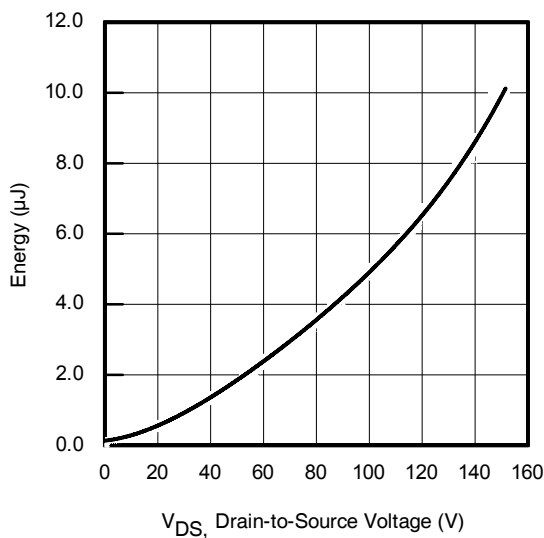

**Fig. 1** Typical Output Characteristics

**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



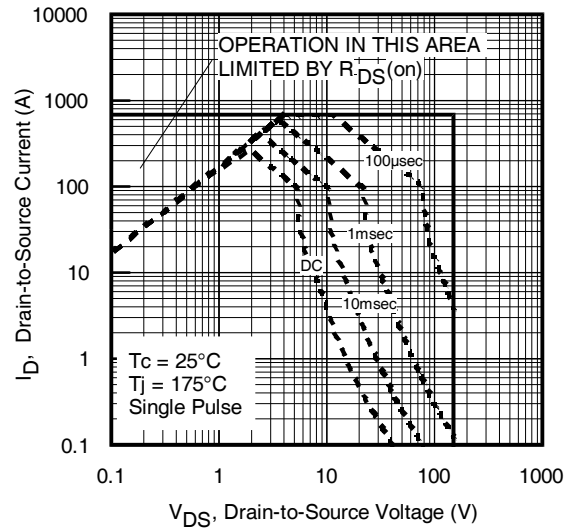
**Fig. 7** Typical Source-to-Drain Diode Forward Voltage



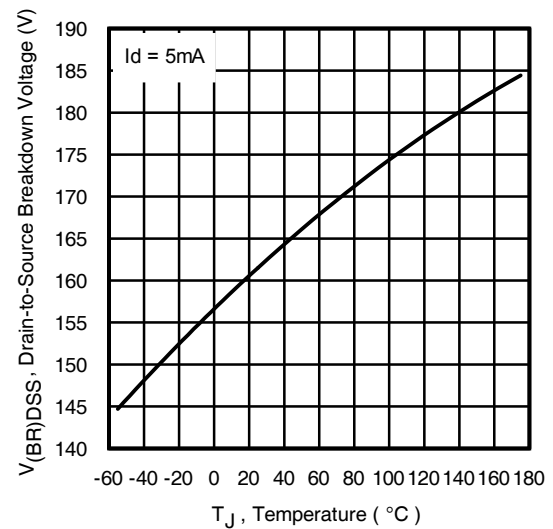
**Fig. 9.** Maximum Drain Current vs. Case Temperature



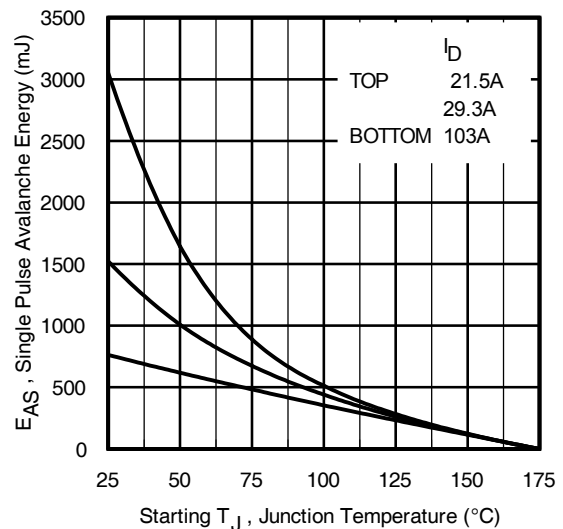
**Fig 11.** Typical Coss Stored Energy



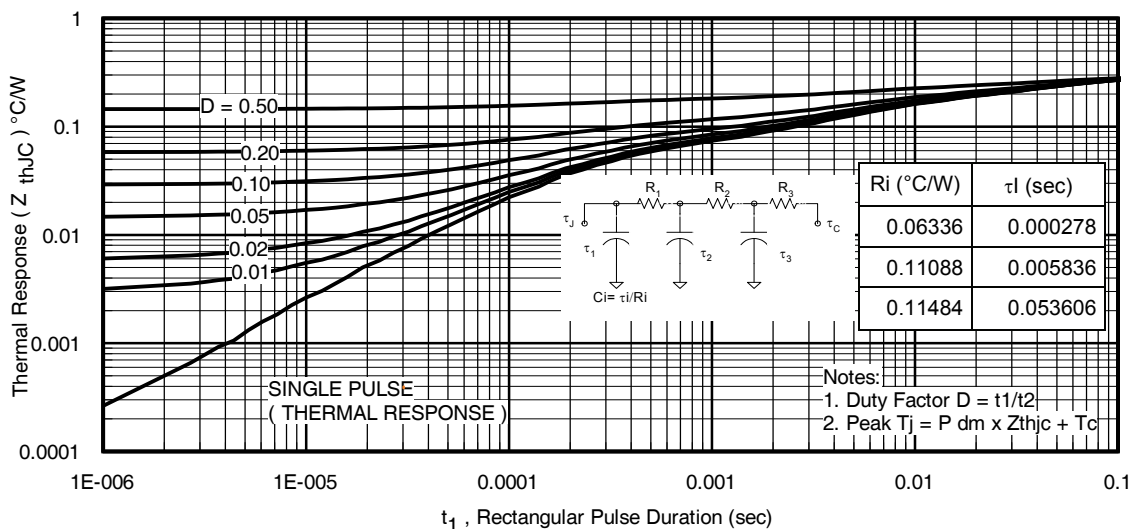
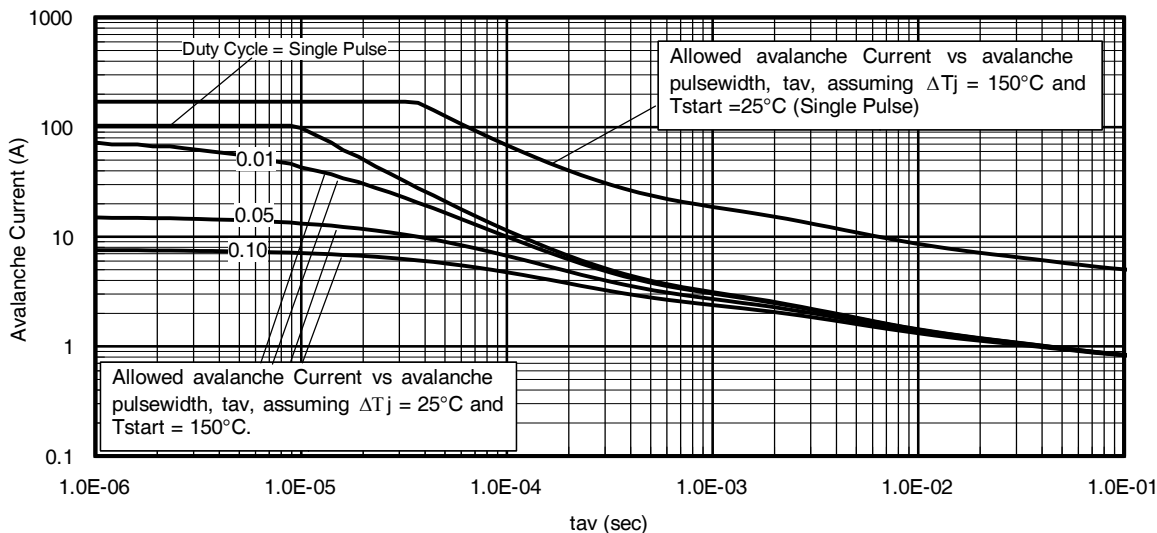
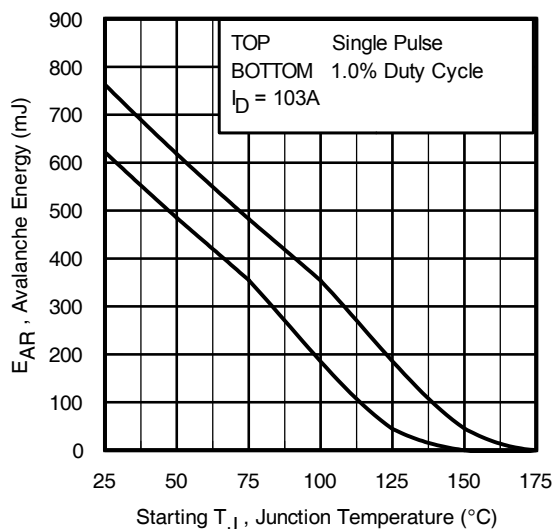
**Fig 8.** Maximum Safe Operating Area



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



**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**

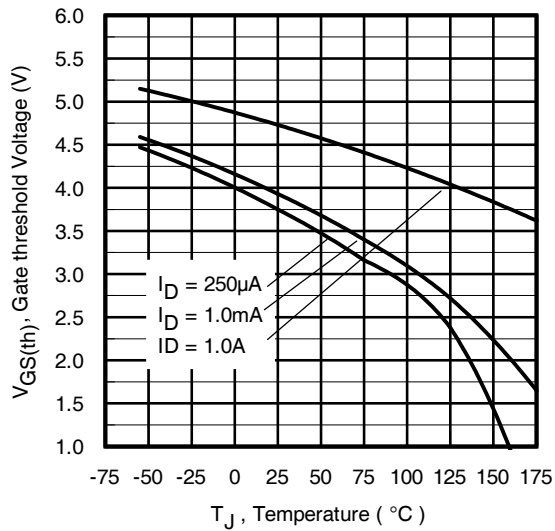
**Notes on Repetitive Avalanche Curves , Figures 14, 15:**  
 (For further info, see AN-1005 at [www.infineon.com](http://www.infineon.com))

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 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°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)

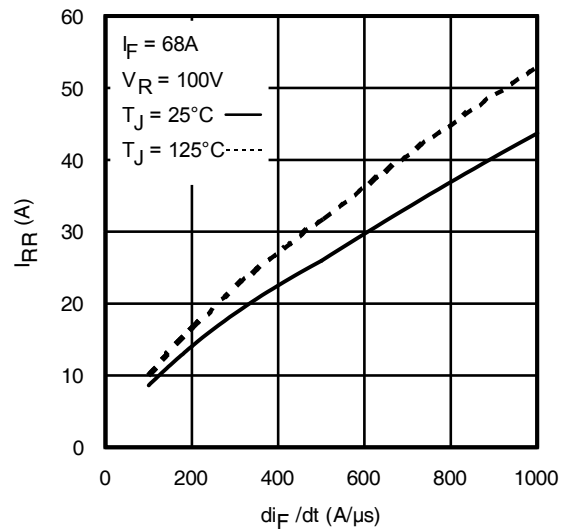
$$P_{D(ave)} = 1/2 (1.3 \cdot BV \cdot I_{av}) = \Delta T / Z_{thJC}$$

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

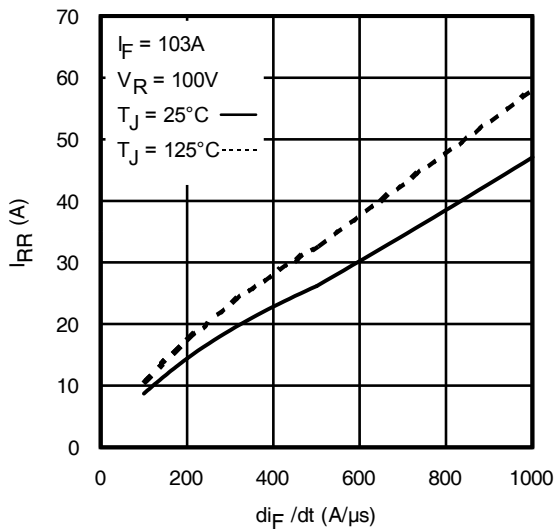
$$E_{AS(AR)} = P_{D(ave)} \cdot t_{av}$$



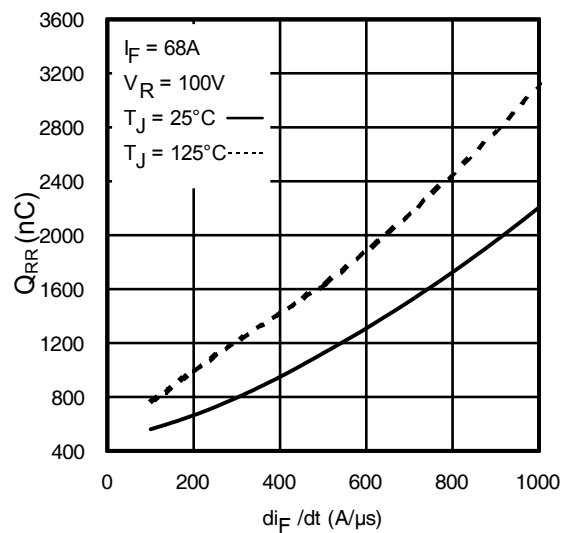
**Fig. 16.** Threshold Voltage vs. Temperature



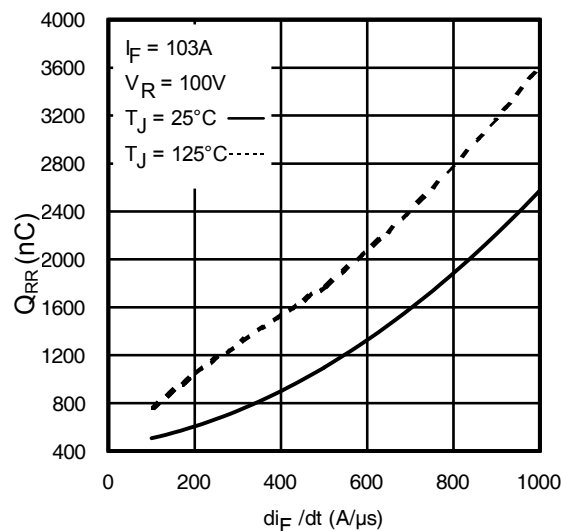
**Fig. 17 -** Typical Recovery Current vs.  $di/dt$



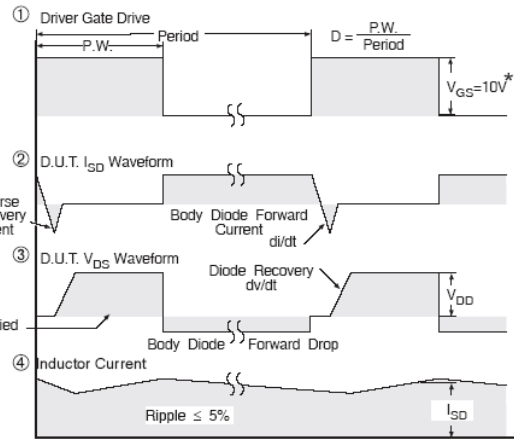
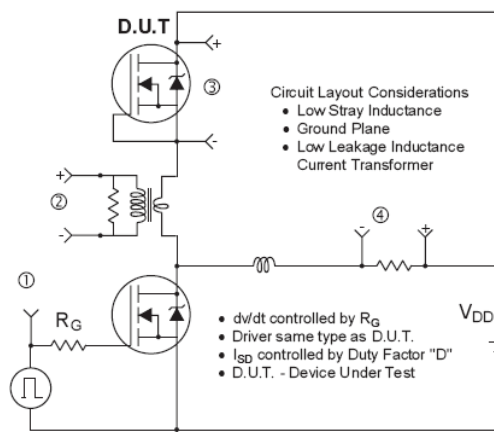
**Fig. 18 -** Typical Recovery Current vs.  $di/dt$



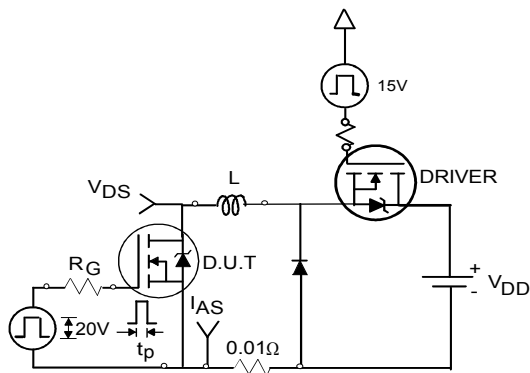
**Fig. 19 -** Typical Stored Charge vs.  $di/dt$



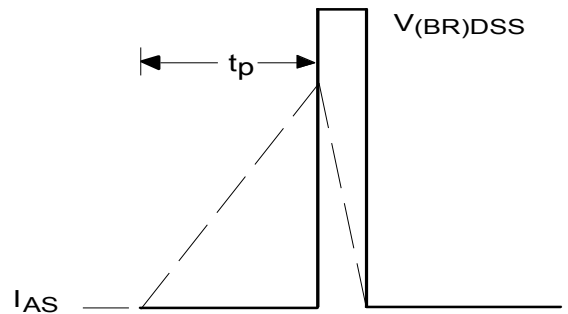
**Fig. 20 -** Typical Stored Charge vs.  $di/dt$



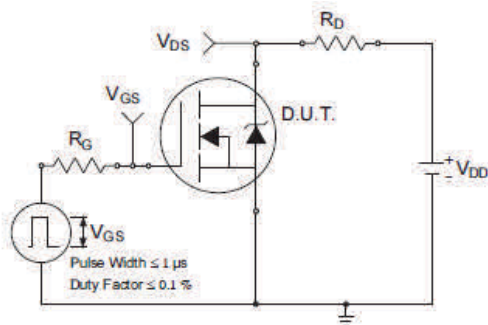
**Fig 21. Peak Diode Recovery  $dv/dt$  Test Circuit for N-Channel HEXFET® Power MOSFETs**



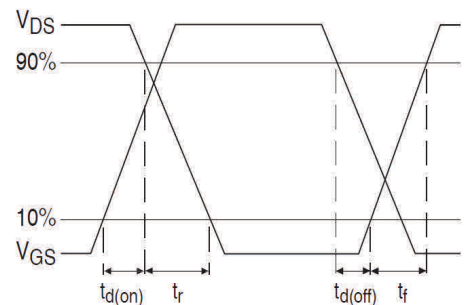
**Fig 22a. Unclamped Inductive Test Circuit**



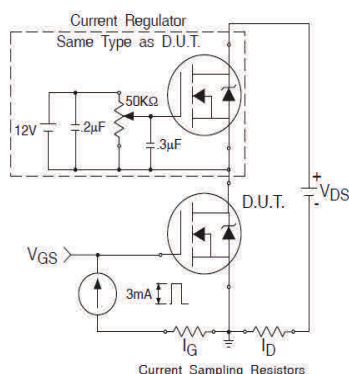
**Fig 22b. Unclamped Inductive Waveforms**



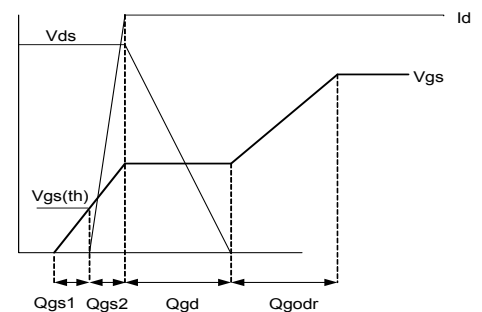
**Fig 23a. Switching Time Test Circuit**



**Fig 23b. Switching Time Waveforms**

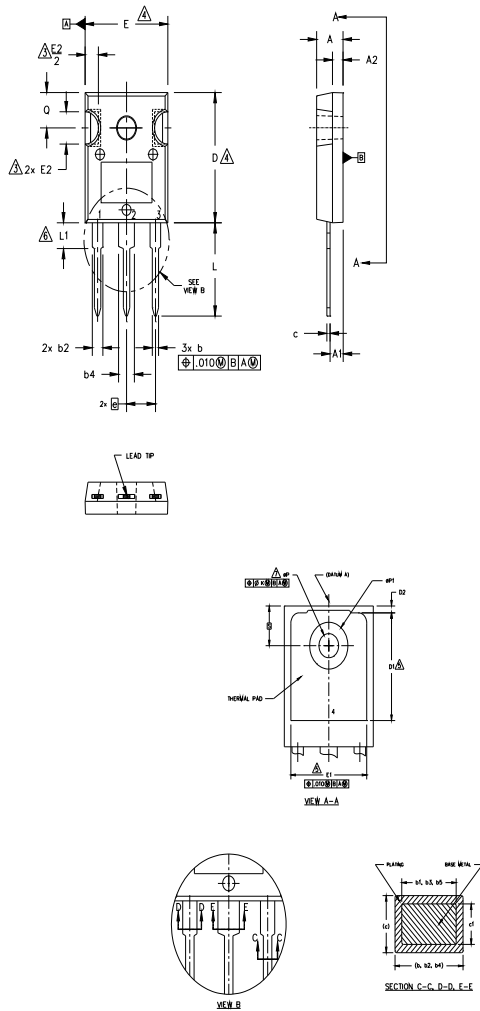


**Fig 24a. Gate Charge Test Circuit**



**Fig 24b. Gate Charge Waveform**

## TO-247AC Package Outline (Dimensions are shown in millimeters (inches))



### NOTES:

1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M 1994.
2. DIMENSIONS ARE SHOWN IN INCHES.
3. CONTOUR OF SLOT OPTIONAL.
4. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
5. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS D1 & E1.
6. LEAD FINISH UNCONTROLLED IN L1.
7. ØP TO HAVE A MAXIMUM DRAFT ANGLE OF 1.5 ° TO THE TOP OF THE PART WITH A MAXIMUM HOLE DIAMETER OF .154 INCH.
8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-247AC .

SYMBOL	DIMENSIONS				NOTES
	INCHES		MILLIMETERS		
	MIN.	MAX.	MIN.	MAX.	
A	.183	.209	4.65	5.31	4
A1	.087	.102	2.21	2.59	
A2	.059	.098	1.50	2.49	
b	.039	.055	0.99	1.40	
b1	.039	.053	0.99	1.35	
b2	.065	.094	1.65	2.39	
b3	.065	.092	1.65	2.34	
b4	.102	.135	2.59	3.43	
b5	.102	.133	2.59	3.38	
c	.015	.035	0.38	0.89	
c1	.015	.033	0.38	0.84	5
D	.776	.815	19.71	20.70	
D1	.515	—	13.08	—	
D2	.020	.053	0.51	1.35	
E	.602	.625	15.29	15.87	
E1	.530	—	13.46	—	
E2	.178	.216	4.52	5.49	
e	.215 BSC		5.46 BSC		
Øk	.010		0.25		
L	.559	.634	14.20	16.10	
L1	.146	.169	3.71	4.29	
ØP	.140	.144	3.56	3.66	
ØP1	—	.291	—	7.39	
Q	.209	.224	5.31	5.69	
S	.217 BSC		5.51 BSC		

### LEAD ASSIGNMENTS

#### HEXFET

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

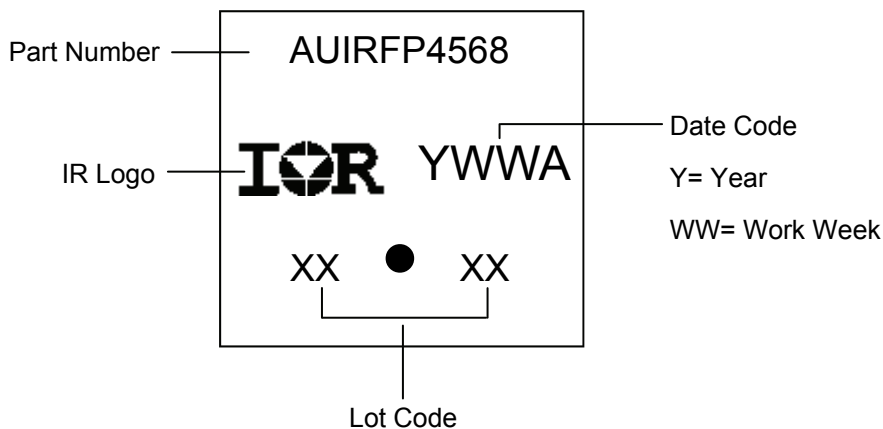
#### IGBTs, CoPACK

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

#### DIODES

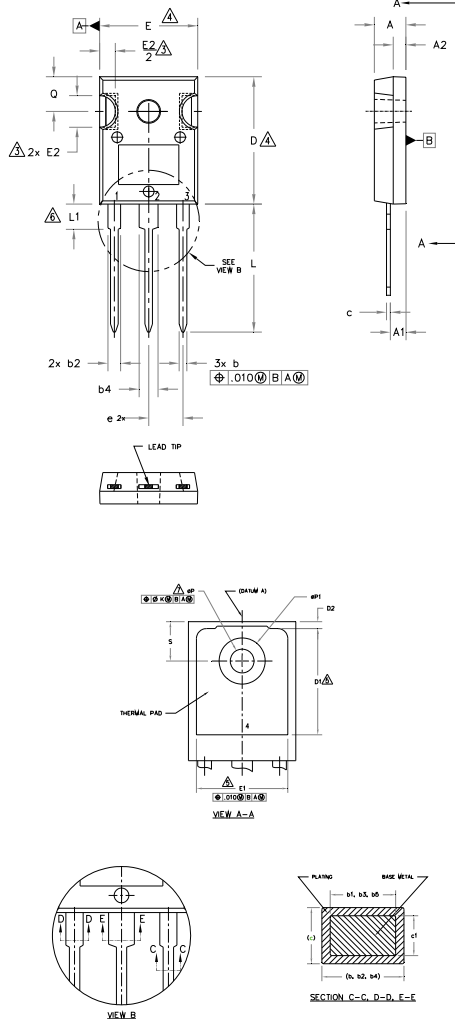
- 1.- ANODE/OPEN
- 2.- CATHODE
- 3.- ANODE

## TO-247AC Part Marking Information





## Long Lead TO-247AC Package Outline (Dimensions are shown in millimeters (inches))



### NOTES:

1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M 1994.
2. DIMENSIONS ARE SHOWN IN INCHES.
3. CONTOUR OF SLOT OPTIONAL.
4. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED .005" (0.127) PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY.
5. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS D1 & E1.
6. LEAD FINISH UNCONTROLLED IN L1.
7. ØP TO HAVE A MAXIMUM DRAFT ANGLE OF 1.5 ° TO THE TOP OF THE PART WITH A MAXIMUM HOLE DIAMETER OF .154 INCH.
8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-247AD.

SYMBOL	DIMENSIONS				NOTES
	INCHES		MILLIMETERS		
	MIN.	MAX.	MIN.	MAX.	
A	.190	.203	4.83	5.13	
A1	.087	.102	2.21	2.59	
A2	.059	.098	1.50	2.49	
b	.039	.055	0.99	1.40	
b1	.039	.053	0.99	1.35	
b2	.065	.094	1.65	2.39	
b3	.065	.092	1.65	2.34	
b4	.102	.135	2.59	3.43	
b5	.102	.133	2.59	3.38	
c	.015	.035	0.38	0.89	
c1	.015	.033	0.38	0.84	
D	.776	.815	19.71	20.70	
D1	.515	—	13.08	—	4
D2	.020	.053	0.51	1.35	5
E	.602	.625	15.29	15.87	4
E1	.530	—	13.46	—	
E2	.178	.216	4.52	5.49	
e	.215 BSC		5.46 BSC		
øk	.010		0.25		
L	.780	.827	19.57	21.00	
L1	.146	.169	3.71	4.29	
øP	.140	.144	3.56	3.66	
øP1	—	.291	—	7.39	
Q	.209	.224	5.31	5.69	
S	.217 BSC		5.51 BSC		

### LEAD ASSIGNMENTS

#### HEXFET

1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

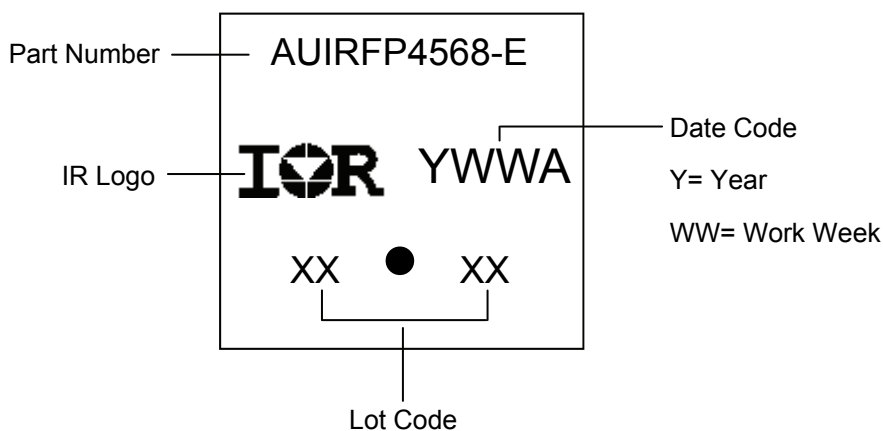
#### IGBTs, CoPACK

1. GATE
2. COLLECTOR
3. EMITTER
4. COLLECTOR

#### DIODES

1. ANODE/OPEN
2. CATHODE
3. ANODE

## Long Lead TO-247AC Part Marking Information



**Qualification Information**

Qualification Level		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.	
Moisture Sensitivity Level		TO-247AC	N/A
		Long Lead TO-247AC	
ESD	Machine Model	Class M4 (+/- 800V) <sup>†</sup> AEC-Q101-002	
	Human Body Model	Class H3A (+/- 6000V) <sup>†</sup> AEC-Q101-001	
	Charged Device Model	Class C5 (+/- 2000V) <sup>†</sup> AEC-Q101-005	
RoHS Compliant		Yes	

† Highest passing voltage.

**Revision History**

Date	Comments
10/21/2015	<ul style="list-style-type: none"> <li>Updated datasheet with corporate template</li> <li>Removed obsolete parts "AUIRFP4568E" on all pages</li> <li>Corrected ordering table on page 1.</li> </ul>
4/29/2019	<ul style="list-style-type: none"> <li>Added AUIRFP4568-E (Long Lead TO-247AC)package –all pages</li> </ul>

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