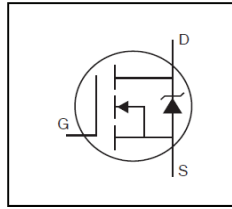


Features

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



V_{DS}	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.

G	D	S
Gate	Drain	Source

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
AUIRFP4568	TO-247AC	Tube	25	AUIRFP4568

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
$I_D @ T_C = 25^\circ\text{C}$	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	300 10 lbf•in (1.1N•m)	

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

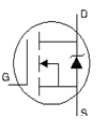
Static @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	150	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.17	—	V/ $^\circ\text{C}$	Reference to 25°C , $I_D = 5mA$ ①
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	4.8	5.9	m Ω	$V_{GS} = 10V, I_D = 103A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	3.0	—	5.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
g_{fs}	Forward Trans conductance	162	—	—	S	$V_{DS} = 50V, I_D = 103A$
R_G	Internal Gate Resistance	—	1.0	—	Ω	
I_{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	$V_{DS} = 150V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 150V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
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)

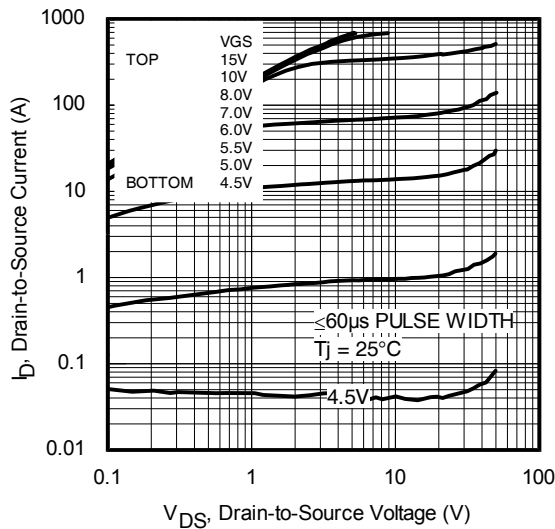
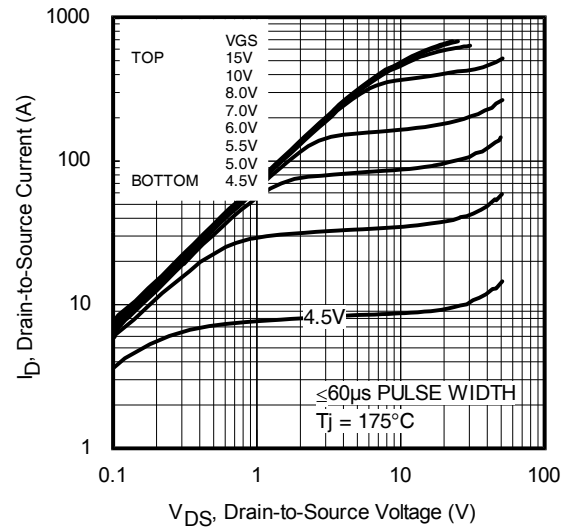
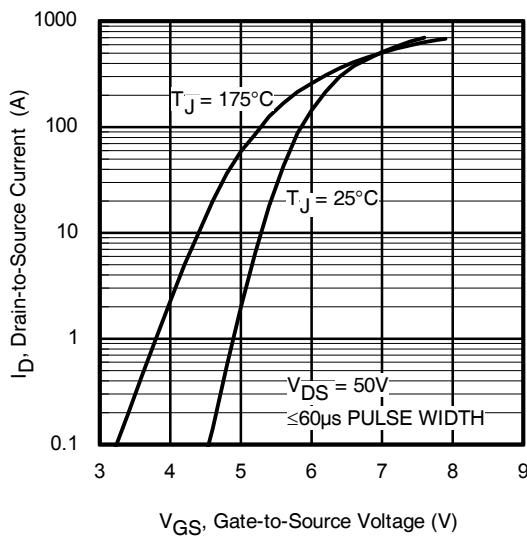
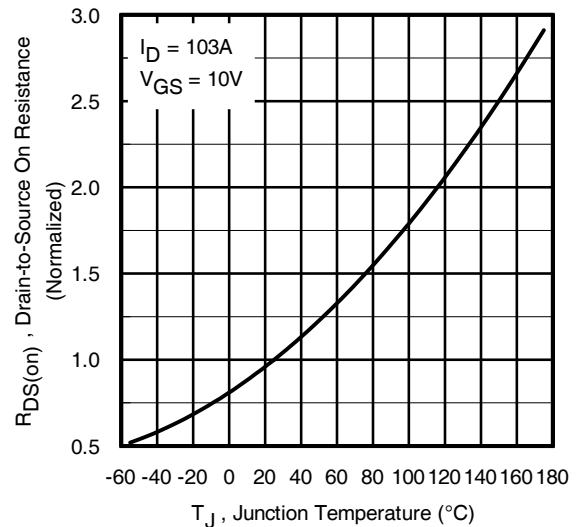
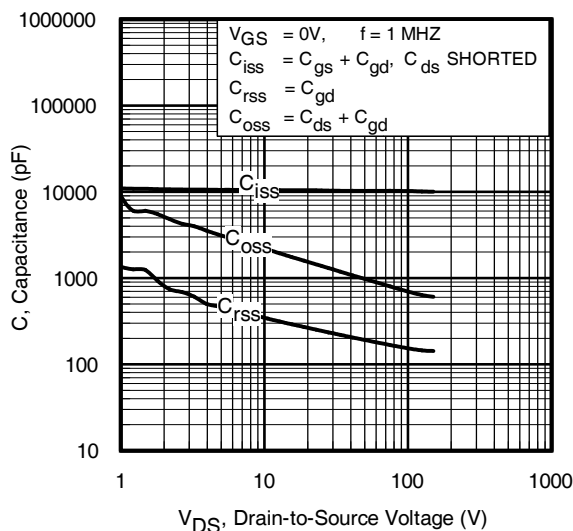
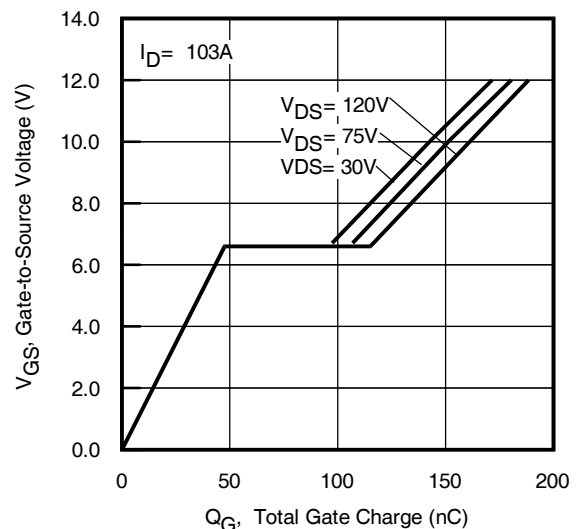
Q_g	Total Gate Charge	—	151	227	nC	$I_D = 103A$ $V_{DS} = 75V$ $V_{GS} = 10V$ ④
Q_{gs}	Gate-to-Source Charge	—	52	—		
Q_{gd}	Gate-to-Drain Charge	—	55	—		
Q_{sync}	Total Gate Charge Sync. ($Q_g - Q_{gd}$)	—	96	—		
$t_{d(on)}$	Turn-On Delay Time	—	27	—	ns	$V_{DD} = 98V$ $I_D = 103A$ $R_G = 1.0\Omega$ $V_{GS} = 10V$ ④
t_r	Rise Time	—	119	—		
$t_{d(off)}$	Turn-Off Delay Time	—	47	—		
t_f	Fall Time	—	84	—		
C_{iss}	Input Capacitance	—	10470	—	pF	$V_{GS} = 0V$ $V_{DS} = 50V$ $f = 1.0MHz$, See Fig. 5 $V_{GS}=0V, V_{DS}=0V$ to $120V$ (see fig.11) ⑥
C_{oss}	Output Capacitance	—	977	—		
C_{rss}	Reverse Transfer Capacitance	—	203	—		
$C_{oss \text{ eff. (ER)}}$	Effective Output Capacitance (Energy Related)	—	897	—		
$C_{oss \text{ eff. (TR)}}$	Effective Output Capacitance (Time Related)	—	1272	—		$V_{GS} = 0V, V_{DS} = 0V$ to $120V$ ⑤

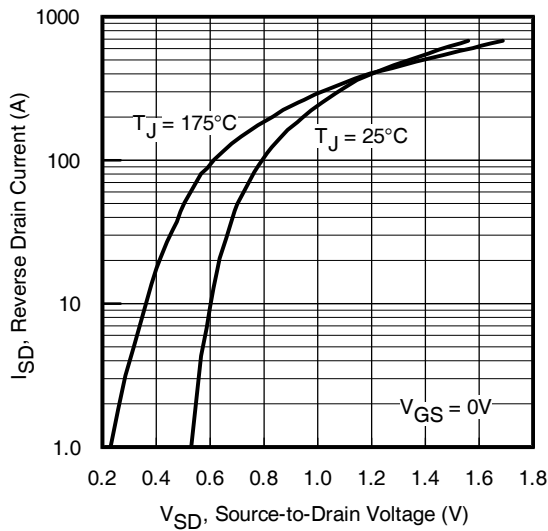
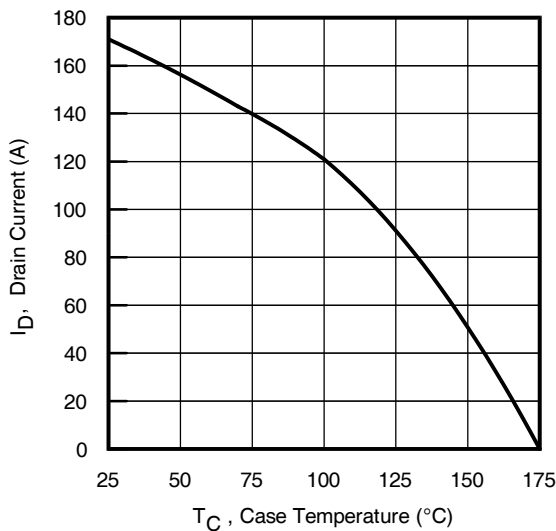
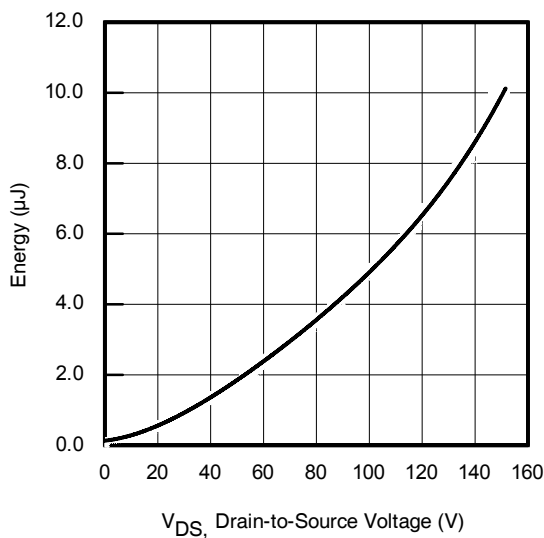
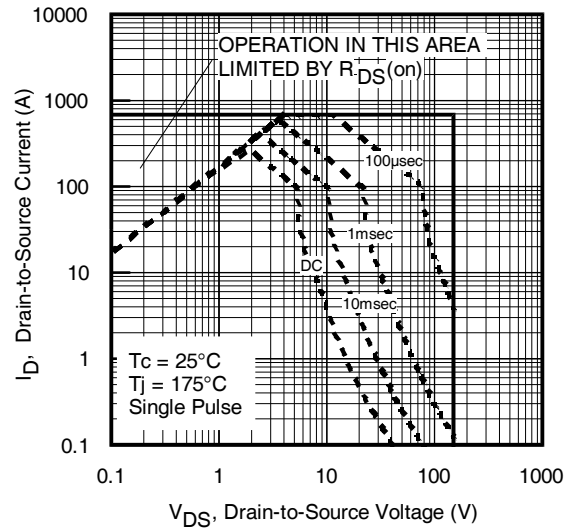
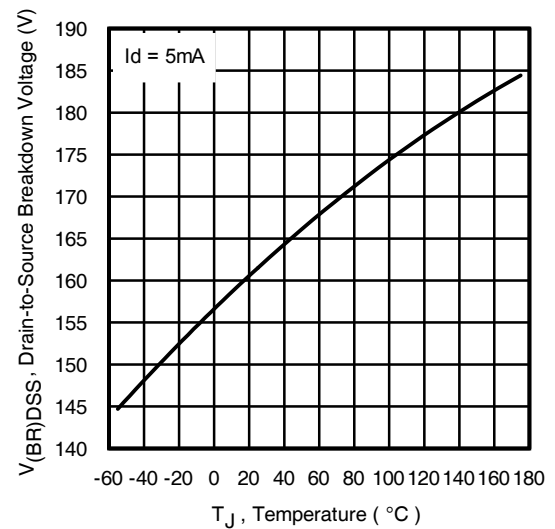
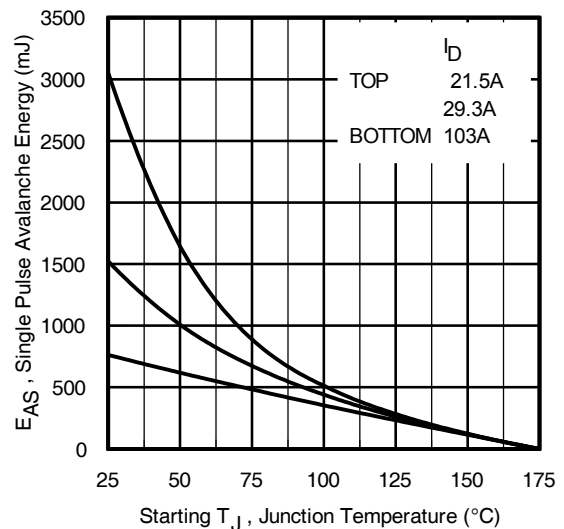
Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	171	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	684		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 103A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	110	—	ns	$T_J = 25^\circ\text{C}$
		—	133	—		$T_J = 125^\circ\text{C}$ $V_R = 100V$
Q_{rr}	Reverse Recovery Charge	—	515	—	nC	$T_J = 25^\circ\text{C}$ $I_F = 103A$
		—	758	—		$T_J = 125^\circ\text{C}$ $di/dt = 100A/\mu s$ ④
I_{RRM}	Reverse Recovery Current	—	8.8	—	A	$T_J = 25^\circ\text{C}$
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by $L_S + L_D$)				

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Limited by T_{Jmax} , starting $T_J = 25^\circ\text{C}$, $L = 0.144mH$, $R_G = 25\Omega$, $I_{AS} = 103A$, $V_{GS} = 10V$. Part not recommended for use above this value.
- ③ $I_{SD} \leq 103A$, $di/dt \leq 360A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 175^\circ\text{C}$.
- ④ Pulse width $\leq 400\mu s$; duty cycle $\leq 2\%$.
- ⑤ $C_{oss \text{ eff. (TR)}}$ is a fixed capacitance that gives the same charging time as C_{oss} while V_{DS} is rising from 0 to $80\% V_{DSS}$.
- ⑥ $C_{oss \text{ eff. (ER)}}$ is a fixed capacitance that gives the same energy as C_{oss} while V_{DS} is rising from 0 to $80\% V_{DSS}$.
- ⑦ R_{θ} is measured at T_J 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

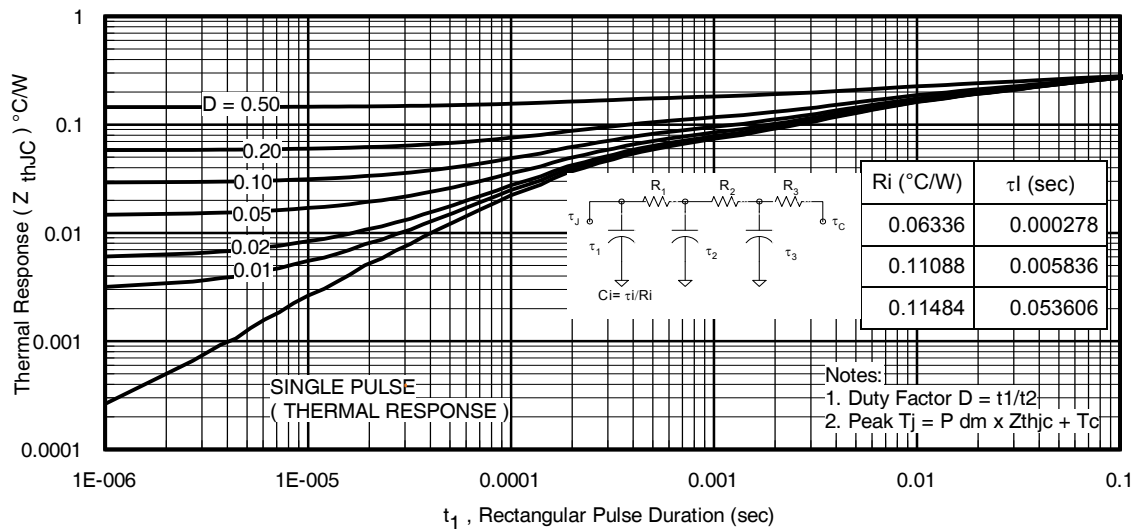


Fig 13. Maximum Effective Transient Thermal Impedance, Junction-to-Case

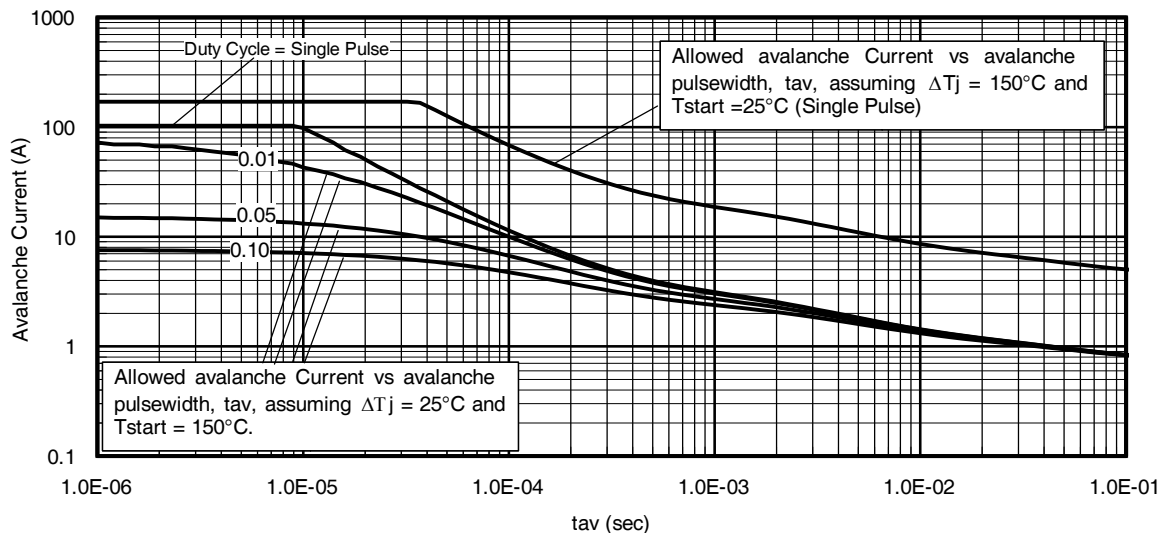


Fig 14. Avalanche Current vs. Pulse width

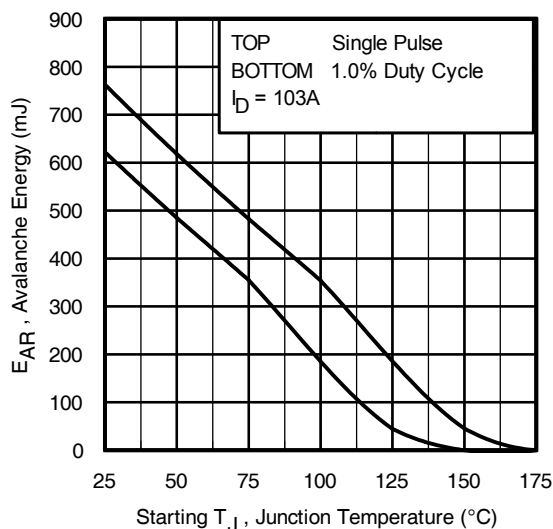


Fig 15. Maximum Avalanche Energy vs. Temperature

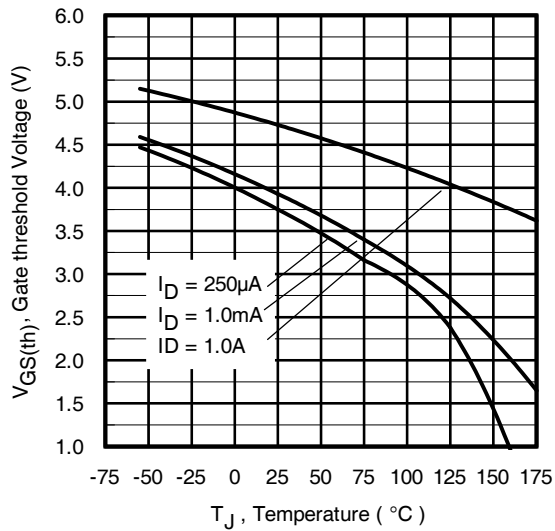
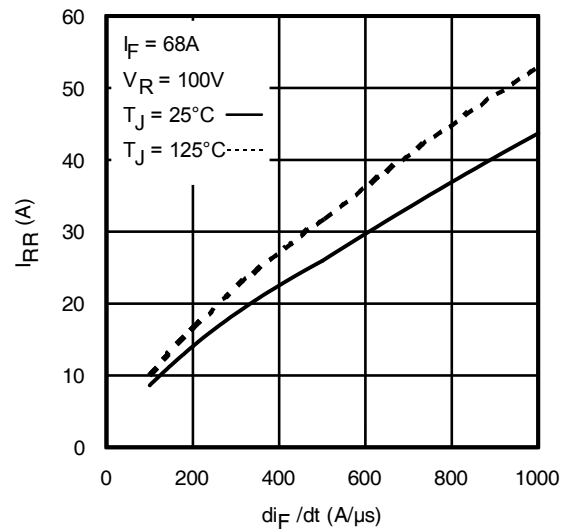
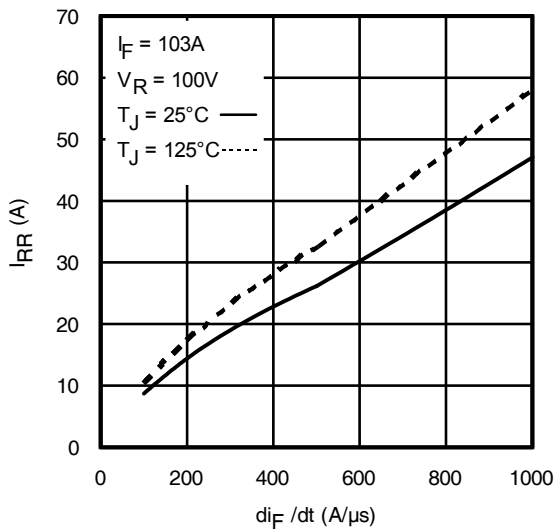
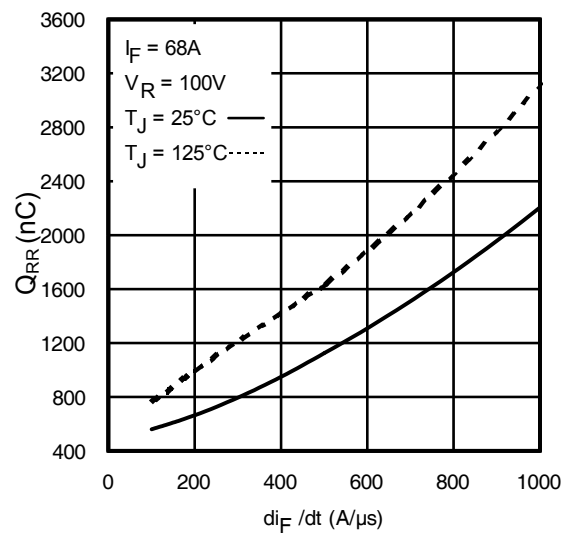
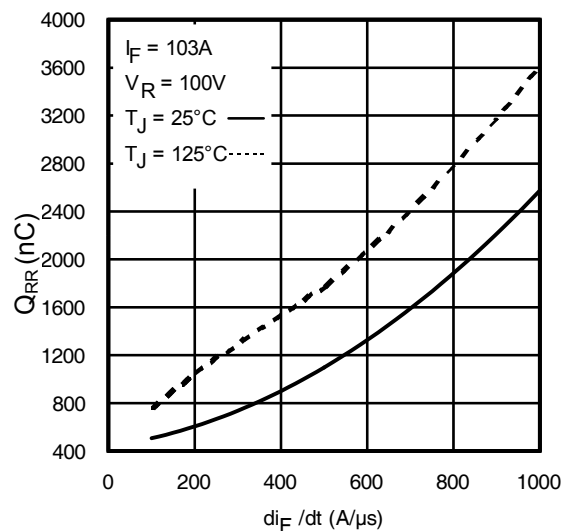
Notes on Repetitive Avalanche Curves , Figures 14, 15:
 (For further info, see AN-1005 at www.infineon.com)

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. ΔT = 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

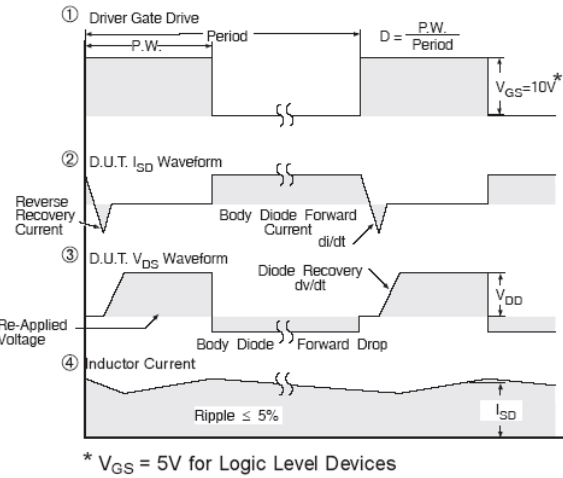
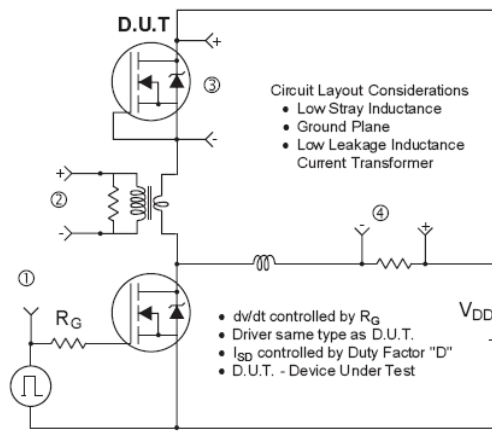


Fig 21. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

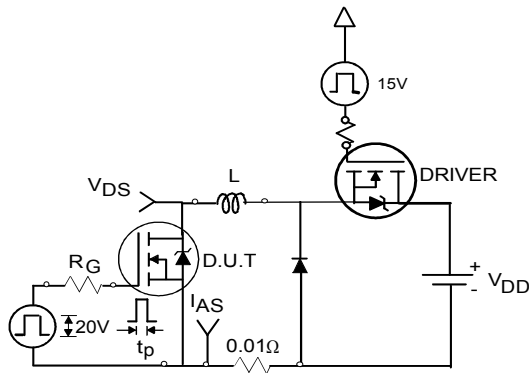


Fig 22a. Unclamped Inductive Test Circuit

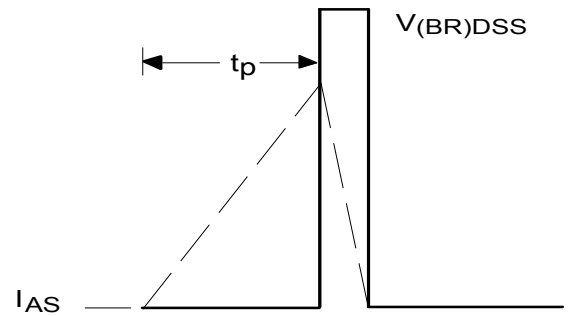


Fig 22b. Unclamped Inductive Waveforms

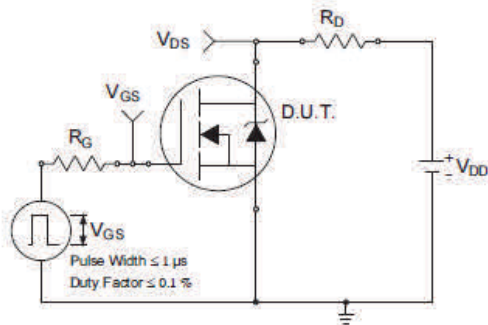


Fig 23a. Switching Time Test Circuit

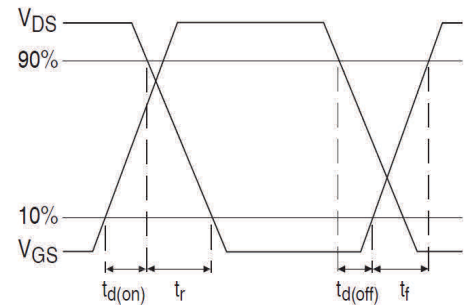


Fig 23b. Switching Time Waveforms

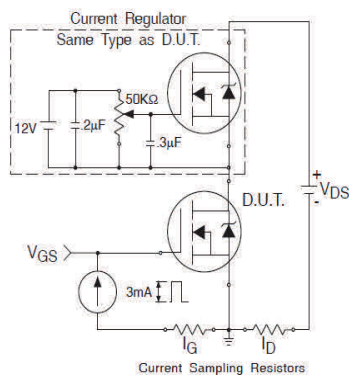


Fig 24a. Gate Charge Test Circuit

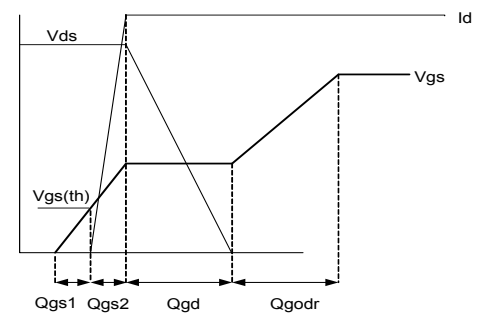
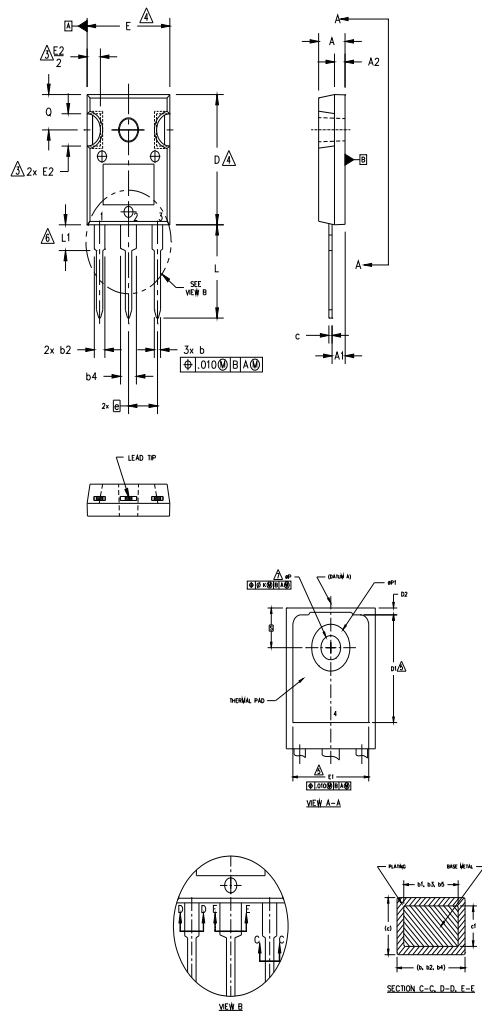


Fig 24b. Gate Charge Waveform

TO-247AC Package Outline (Dimensions are

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. ϕP 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	
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	4
D1	.515	—	13.08	—	5
D2	.020	.053	0.51	1.35	
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	.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

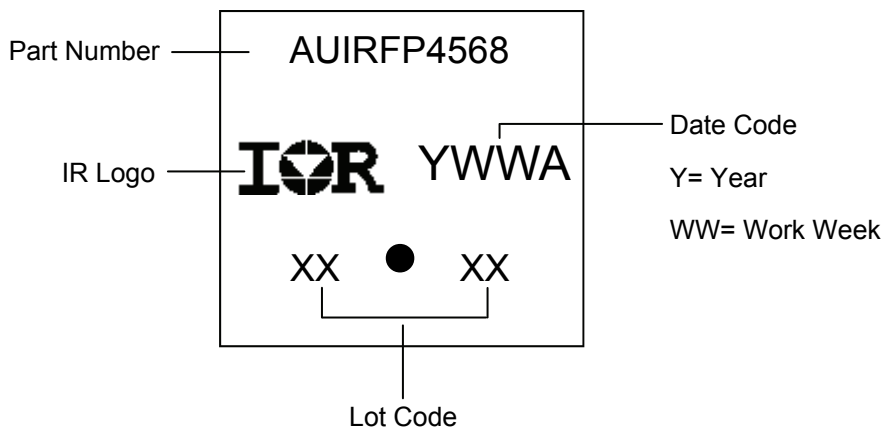
- 1.- GATE
- 2.- DRAIN
- 3.- SOURCE
- 4.- DRAIN

IGBTs, CoPACK

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

DIODES

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

TO-247AC Part Marking Information


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

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
ESD	Machine Model	Class M4 (+/- 800V) [†] AEC-Q101-002	
	Human Body Model	Class H3A (+/- 6000V) [†] AEC-Q101-001	
	Charged Device Model	Class C5 (+/- 2000V) [†] AEC-Q101-005	
RoHS Compliant		Yes	

† Highest passing voltage.

Revision History

Date	Comments
10/21/15	- Updated datasheet with corporate template - Removed obsolete parts "AUIRFP4568E" on all pages - Corrected ordering table on page 1.

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