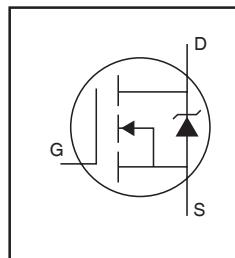


Features

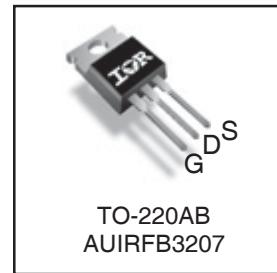
- Advanced Process Technology
- Ultra Low On-Resistance
- 175°C Operating Temperature
- Fast Switching
- Repetitive Avalanche Allowed up to T_{jmax}
- Lead-Free, RoHS Compliant
- Automotive Qualified *



$V_{(BR)DSS}$	75V
$R_{DS(on)}$	typ. 3.6mΩ
	max. 4.5mΩ
I_D (Silicon Limited)	170A ①
I_D (Package Limited)	75A

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

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 otherwise specified.

	Parameter	Max.	Units
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$ (Silicon Limited)	170①	A
I_D @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$ (Silicon Limited)	120①	
I_D @ $T_C = 25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$ (Package Limited)	75	
I_{DM}	Pulsed Drain Current ②	720	
$P_D @ T_C = 25^\circ\text{C}$	Maximum Power Dissipation	300	W
	Linear Derating Factor	2.0	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy (Thermally limited) ③	910	mJ
I_{AR}	Avalanche Current ②	See Fig. 14, 15, 16a, 16b,	A
E_{AR}	Repetitive Avalanche Energy		mJ
dV/dt	Peak Diode Recovery ④	5.8	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	10lb·in (1.1N·m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{θJC}$	Junction-to-Case ⑤	—	0.50	°C/W
$R_{θCS}$	Case-to-Sink, Flat Greased Surface, TO-220	0.50	—	
$R_{θJA}$	Junction-to-Ambient, TO-220	—	62	

HEXFET® is a registered trademark of International Rectifier.

*Qualification standards can be found at <http://www.irf.com/>

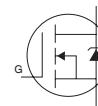
Static Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(\text{BR})\text{DSS}}$	Drain-to-Source Breakdown Voltage	75	—	—	V	$V_{\text{GS}} = 0\text{V}$, $I_D = 250\mu\text{A}$
$\Delta V_{(\text{BR})\text{DSS}}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.069	—	V/ $^\circ\text{C}$	Reference to 25°C , $I_D = 1\text{mA}$ ②
$R_{\text{DS}(\text{on})}$	Static Drain-to-Source On-Resistance	—	3.6	4.5	$\text{m}\Omega$	$V_{\text{GS}} = 10\text{V}$, $I_D = 75\text{A}$ ⑤
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{\text{DS}} = V_{\text{GS}}$, $I_D = 250\mu\text{A}$
g_{fs}	Forward Transconductance	150	—	—	S	$V_{\text{DS}} = 50\text{V}$, $I_D = 75\text{A}$
R_G	Gate Input Resistance	—	1.2	—	Ω	$f = 1\text{MHz}$, open drain
I_{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	$V_{\text{DS}} = 75\text{V}$, $V_{\text{GS}} = 0\text{V}$
		—	—	250		$V_{\text{DS}} = 75\text{V}$, $V_{\text{GS}} = 0\text{V}$, $T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	200	nA	$V_{\text{GS}} = 20\text{V}$
	Gate-to-Source Reverse Leakage	—	—	-200		$V_{\text{GS}} = -20\text{V}$

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge	—	180	260	nC	$I_D = 75\text{A}$
Q_{gs}	Gate-to-Source Charge	—	48	—		$V_{\text{DS}} = 60\text{V}$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	68	—		$V_{\text{GS}} = 10\text{V}$ ⑤
$t_{\text{d}(\text{on})}$	Turn-On Delay Time	—	29	—	ns	$V_{\text{DD}} = 48\text{V}$
t_r	Rise Time	—	120	—		$I_D = 75\text{A}$
$t_{\text{d}(\text{off})}$	Turn-Off Delay Time	—	68	—		$R_G = 2.6\Omega$
t_f	Fall Time	—	74	—		$V_{\text{GS}} = 10\text{V}$ ⑤
C_{iss}	Input Capacitance	—	7600	—	pF	$V_{\text{GS}} = 0\text{V}$
C_{oss}	Output Capacitance	—	710	—		$V_{\text{DS}} = 50\text{V}$
C_{rss}	Reverse Transfer Capacitance	—	390	—		$f = 1.0\text{MHz}$
C_{oss} eff. (ER)	Effective Output Capacitance (Energy Related) ⑦	—	920	—		$V_{\text{GS}} = 0\text{V}$, $V_{\text{DS}} = 0\text{V}$ to 60V , See Fig.11
C_{oss} eff. (TR)	Effective Output Capacitance (Time Related) ⑥	—	1010	—		$V_{\text{GS}} = 0\text{V}$, $V_{\text{DS}} = 0\text{V}$ to 60V , See Fig. 5

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_s	Continuous Source Current (Body Diode)	—	—	170 ①	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ②⑦	—	—	720		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}$, $I_s = 75\text{A}$, $V_{\text{GS}} = 0\text{V}$ ⑤
t_{rr}	Reverse Recovery Time	—	42	63		$T_J = 25^\circ\text{C}$ $V_R = 64\text{V}$,
		—	49	74		$T_J = 125^\circ\text{C}$ $I_F = 75\text{A}$
Q_{rr}	Reverse Recovery Charge	—	65	98	nC	$T_J = 25^\circ\text{C}$ $\text{di}/\text{dt} = 100\text{A}/\mu\text{s}$ ⑤
		—	92	140		$T_J = 125^\circ\text{C}$
I_{RRM}	Reverse Recovery Current	—	2.6	—	A	$T_J = 25^\circ\text{C}$
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

① Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A.

② Repetitive rating; pulse width limited by max. junction temperature.

③ Limited by T_{Jmax} , starting $T_J = 25^\circ\text{C}$, $L = 0.33\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 75\text{A}$, $V_{\text{GS}} = 10\text{V}$. Part not recommended for use above this value.

④ $I_{SD} \leq 75\text{A}$, $\text{di}/\text{dt} \leq 500\text{A}/\mu\text{s}$, $V_{\text{DD}} \leq V_{(\text{BR})\text{DSS}}$, $T_J \leq 175^\circ\text{C}$.

⑤ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.

⑥ C_{oss} 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} .

⑦ C_{oss} 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} .

⑧ R_θ is measured at T_J approximately 90°C .

Qualification Information[†]

Qualification Level		Automotive (per AEC-Q101) ^{††}
Comments: This part number(s) passed Automotive qualification. IR's Industrial and Consumer qualification level is granted by extension of the higher Automotive level.		
Moisture Sensitivity Level	3L-TO-220	N/A
ESD	Machine Model	Class M4(425V) (per AEC-Q101-002)
	Human Body Model	Class H2(4000V) (per AEC-Q101-001)
	Charged Device Model	Class C5 (1125V) (per AEC-Q101-005)
RoHS Compliant	Yes	

[†] Qualification standards can be found at International Rectifier's web site: <http://www.irf.com/>

^{††} Exceptions to AEC-Q101 requirements are noted in the qualification report.

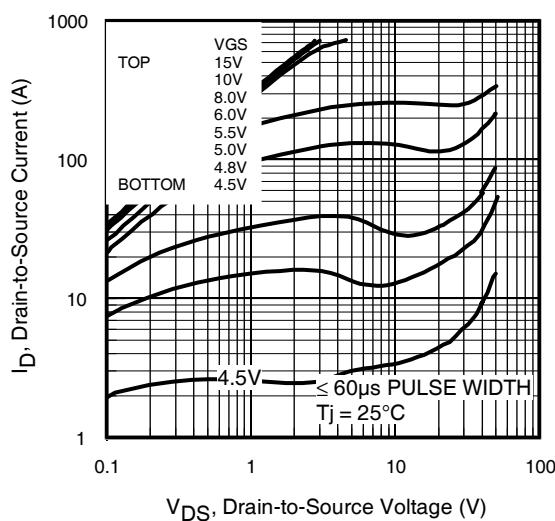


Fig 1. Typical Output Characteristics

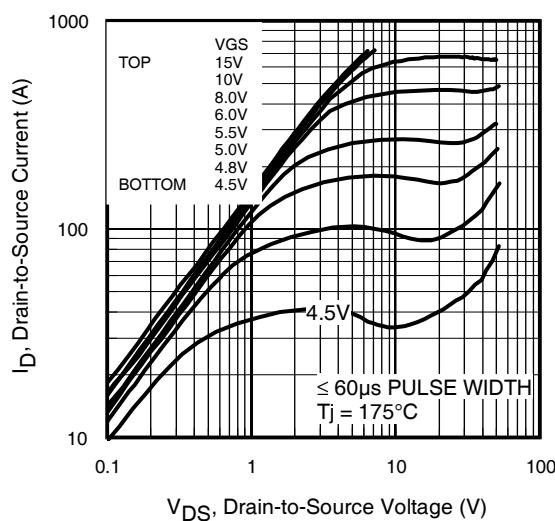


Fig 2. Typical Output Characteristics

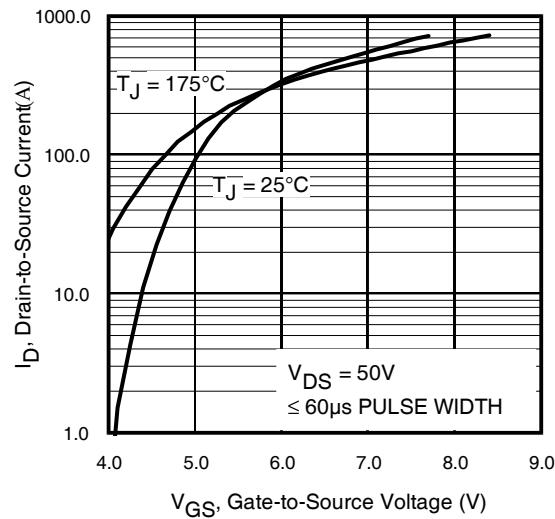


Fig 3. Typical Transfer Characteristics

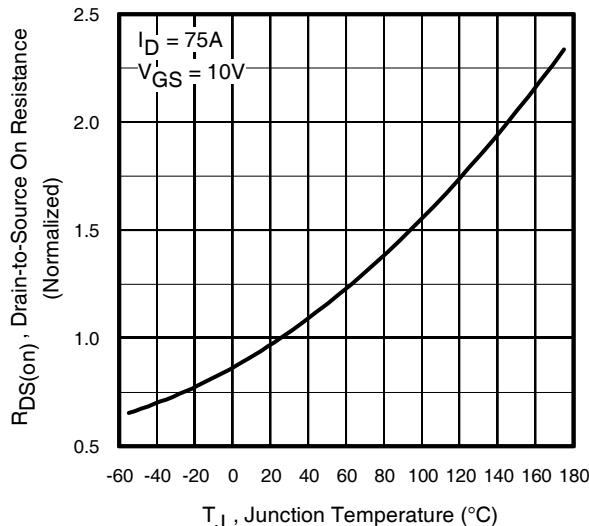


Fig 4. Normalized On-Resistance vs. Temperature

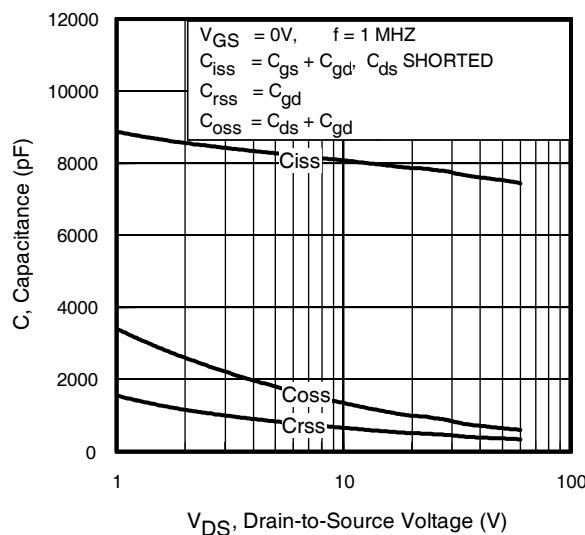


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

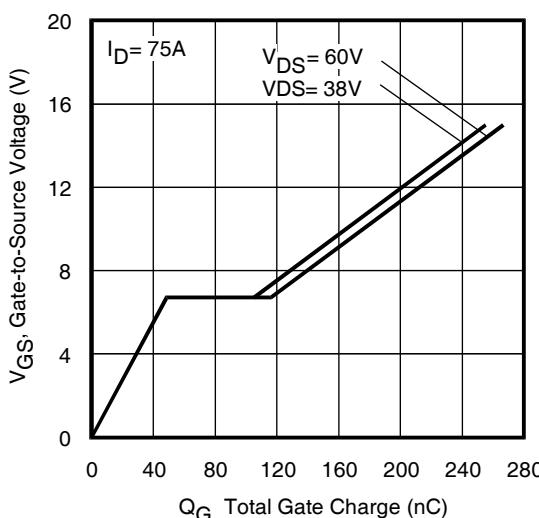


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

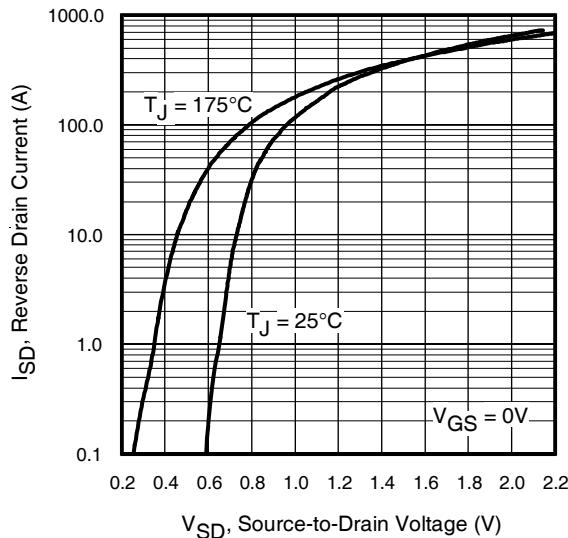


Fig 7. Typical Source-Drain Diode Forward Voltage

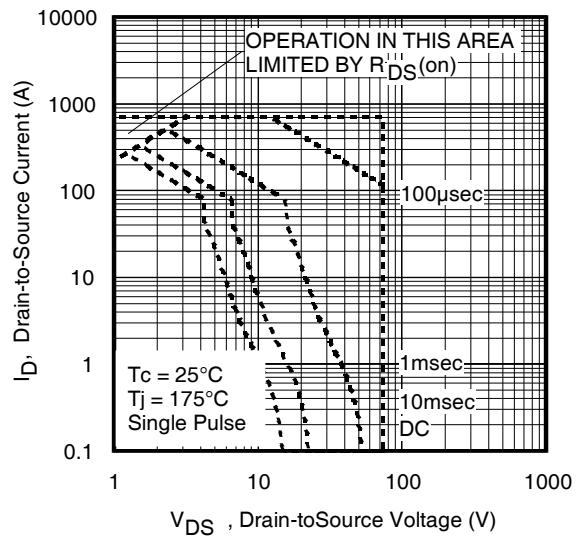


Fig 8. Maximum Safe Operating Area

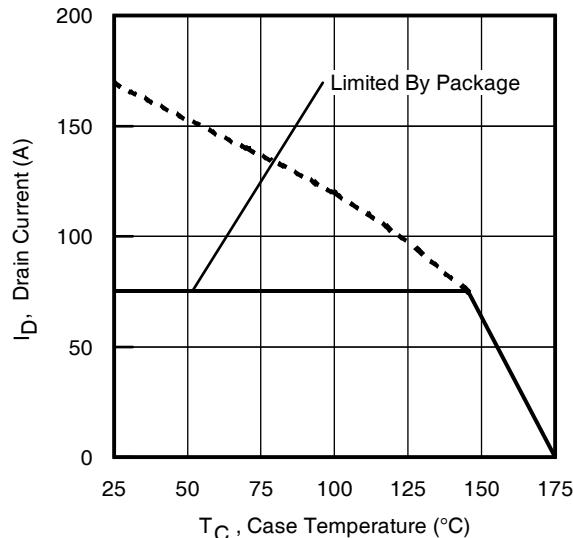


Fig 9. Maximum Drain Current vs. Case Temperature

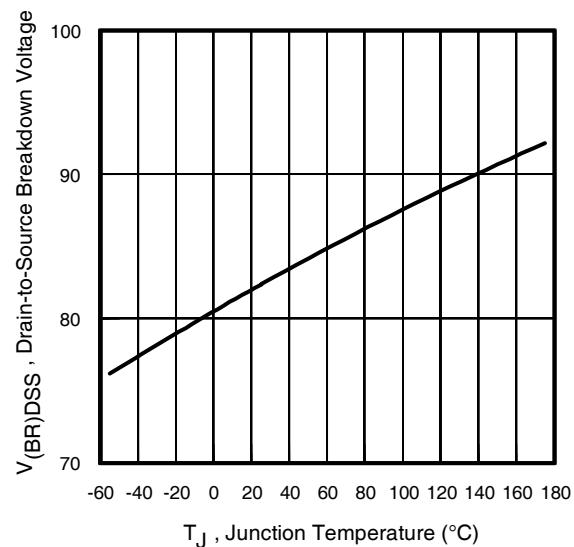


Fig 10. Drain-to-Source Breakdown Voltage

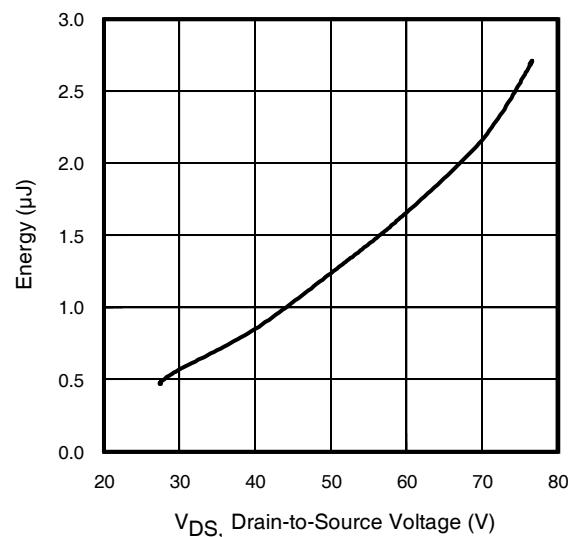


Fig 11. Typical C_{oss} Stored Energy

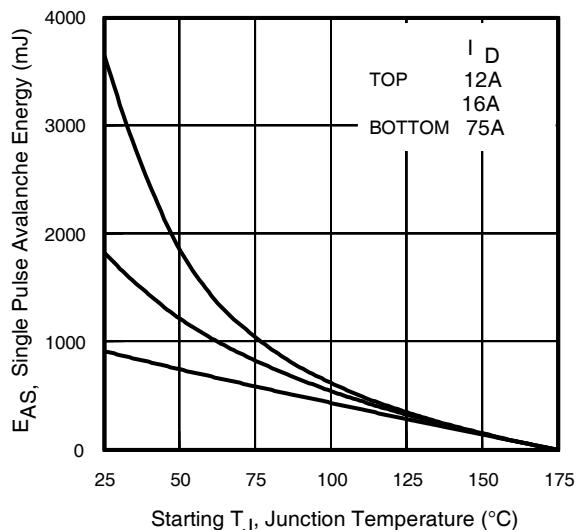


Fig 12. Maximum Avalanche Energy Vs. Drain Current

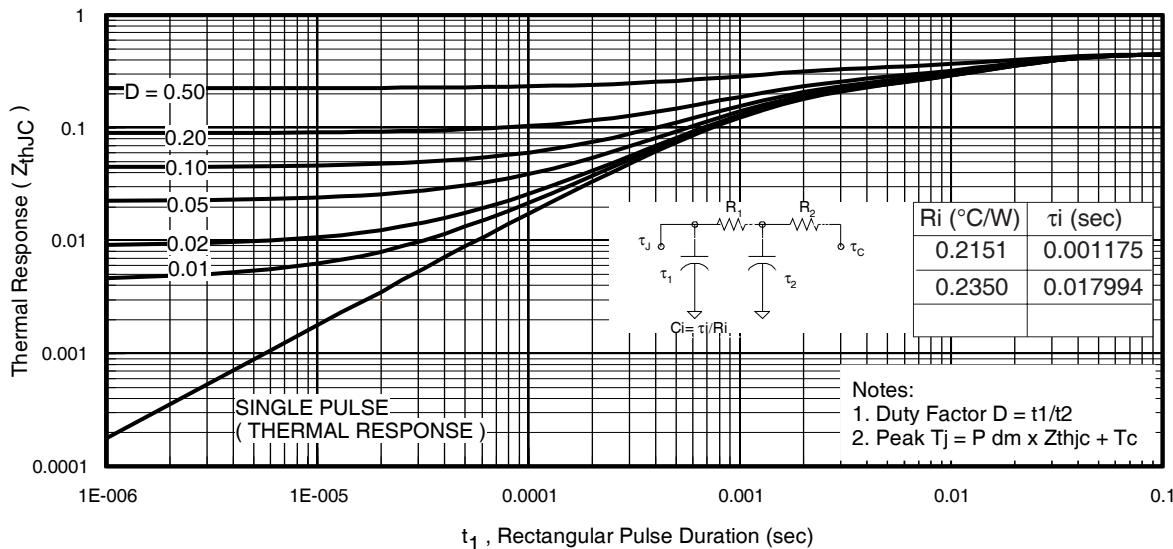


Fig 13. Maximum Effective Transient Thermal Impedance, Junction-to-Case

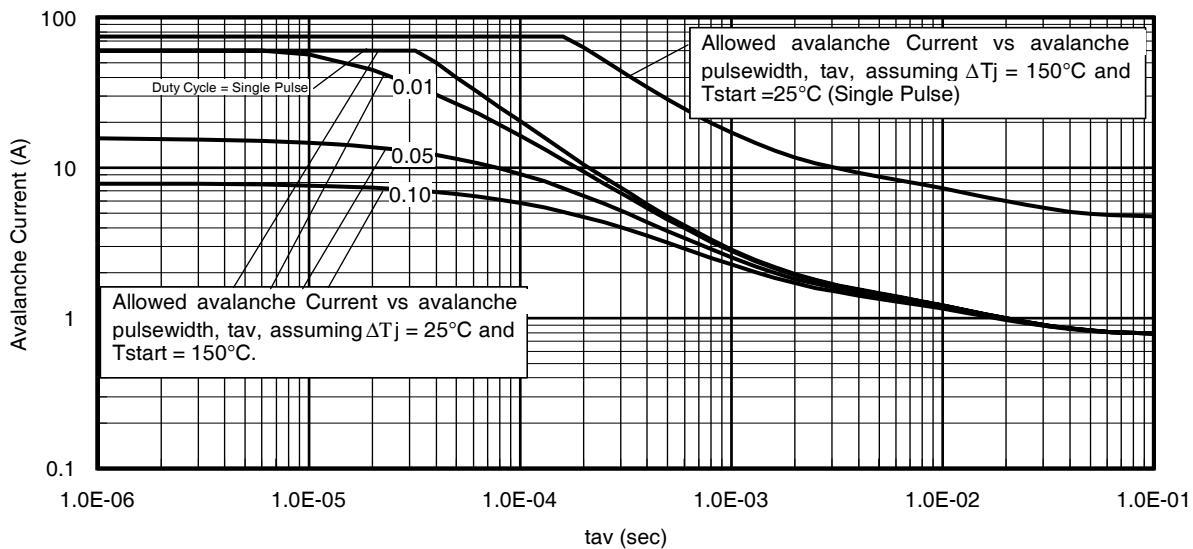


Fig 14. Typical Avalanche Current vs. Pulsewidth

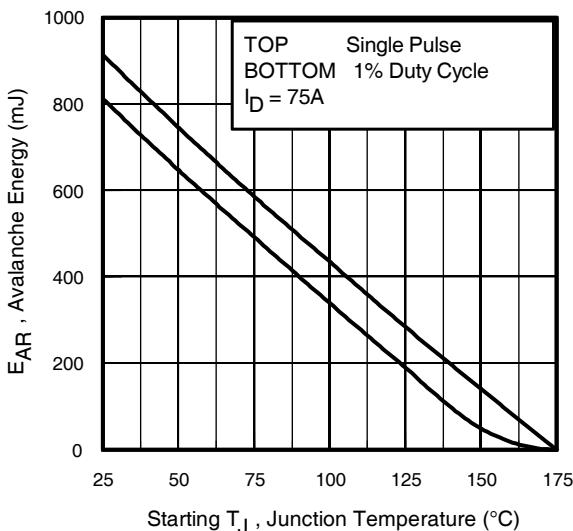


Fig 15. Maximum Avalanche Energy vs. Temperature

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 neither T_{jmax} nor I_{av} (max) is exceeded.
3. Equation below based on circuit and waveforms shown in Figures 22a, 22b.
4. $P_D(\text{ave})$ = 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)

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

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

$$E_{AS(AR)} = P_D(\text{ave}) \cdot t_{av}$$

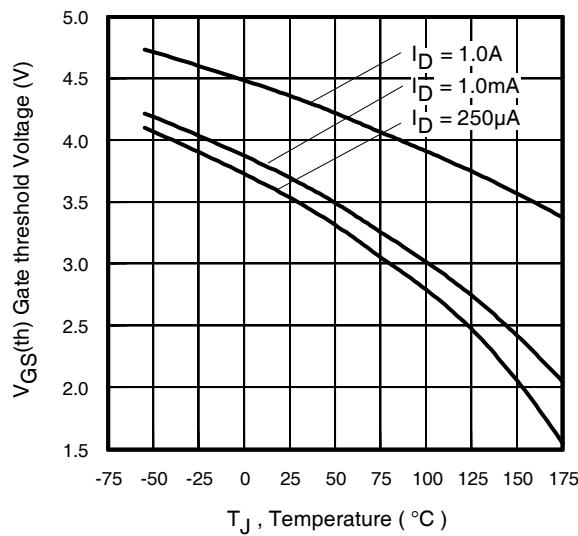


Fig. 16. Threshold Voltage Vs. Temperature

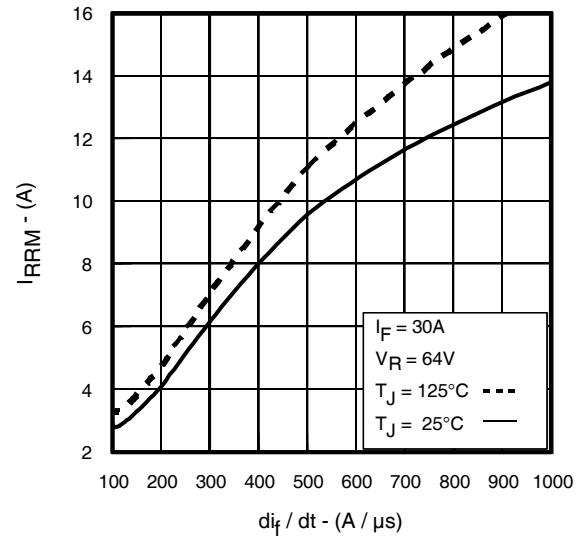


Fig. 17 - Typical Recovery Current vs. di_f/dt

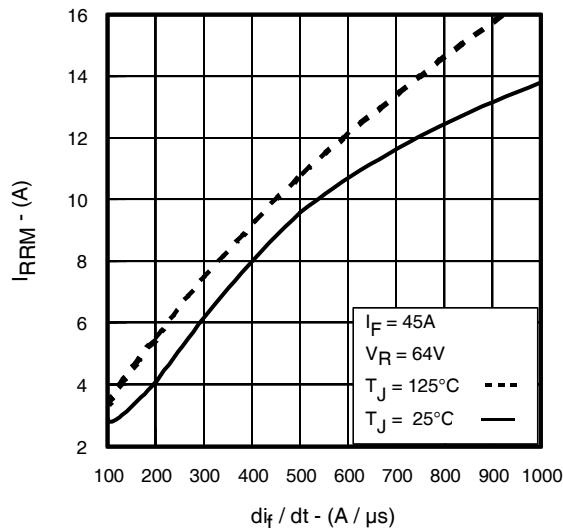


Fig. 18 - Typical Recovery Current vs. di_f/dt

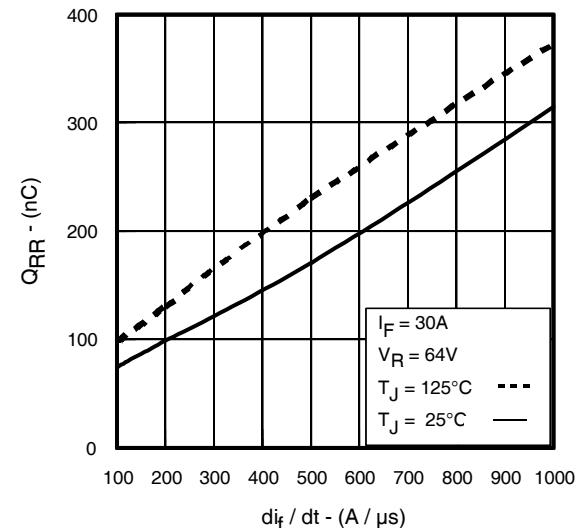


Fig. 19 - Typical Stored Charge vs. di_f/dt

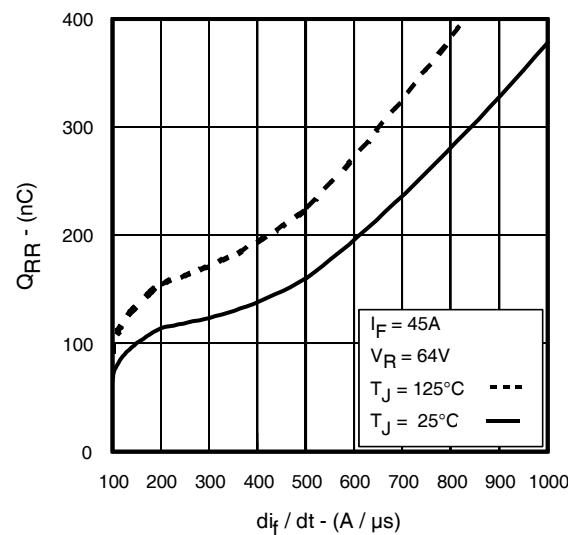


Fig. 20 - Typical Stored Charge vs. di_f/dt

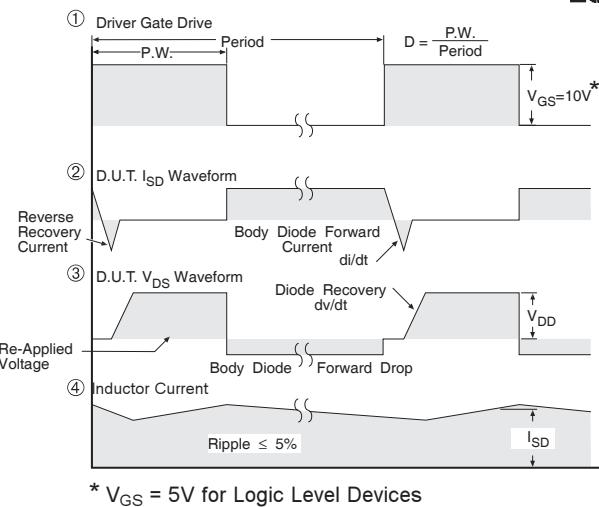
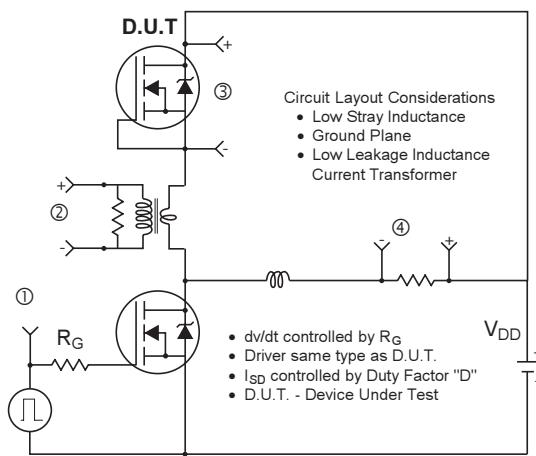


Fig 21. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

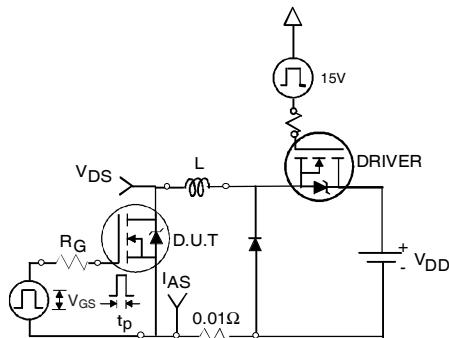


Fig 22a. Unclamped Inductive Test Circuit

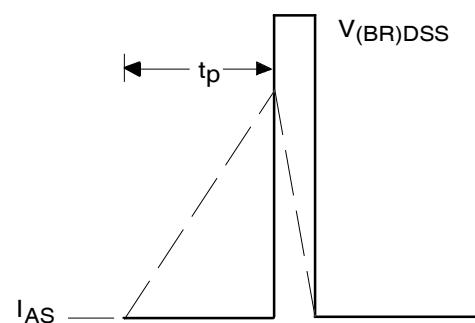


Fig 22b. Unclamped Inductive Waveforms

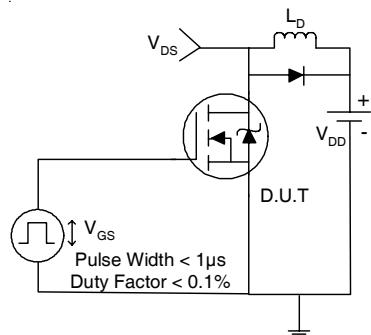


Fig 23a. Switching Time Test Circuit

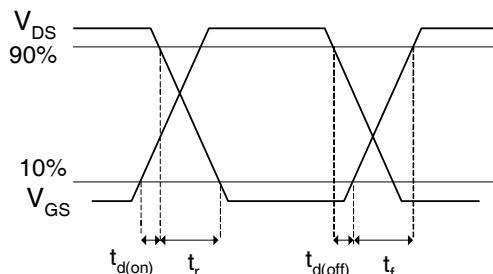


Fig 23b. Switching Time Waveforms

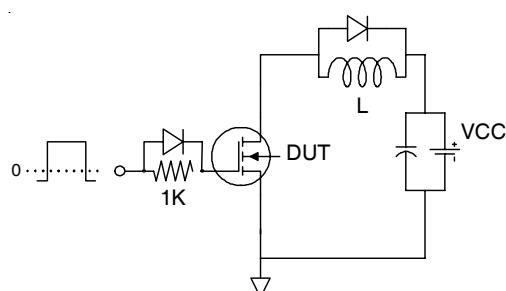


Fig 24a. Gate Charge Test Circuit

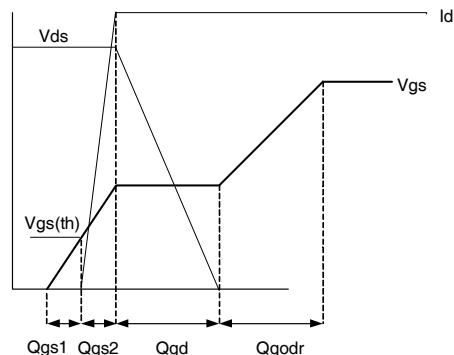
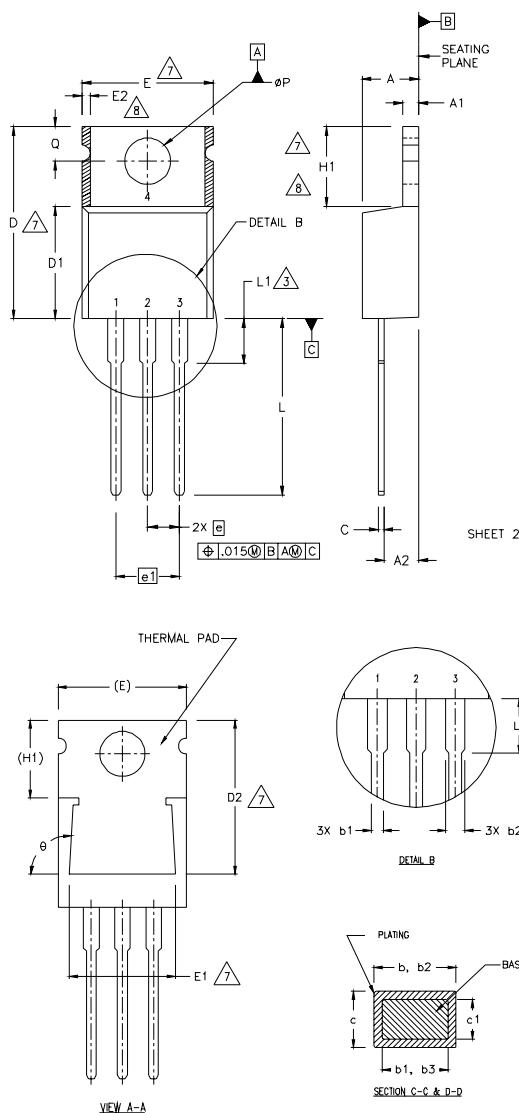


Fig 24b. Gate Charge Waveform

International
IR Rectifier
TO-220AB Package Outline

Dimensions are shown in millimeters (inches)

AUIRFB3207



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5 M- 1994.
2. DIMENSIONS ARE SHOWN IN INCHES [MILLIMETERS].
3. LEAD DIMENSION AND FINISH UNCONTROLLED IN L1.
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. DIMENSION b1 & c1 APPLY TO BASE METAL ONLY.
6. CONTROLLING DIMENSION : INCHES.
7. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSIONS E,H1,D2 & E1
8. DIMENSION E2 X H1 DEFINE A ZONE WHERE STAMPING AND SINGULATION IRREGULARITIES ARE ALLOWED.

LEAD ASSIGNMENTS

HEXFET

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

IGBTs, CoPAC

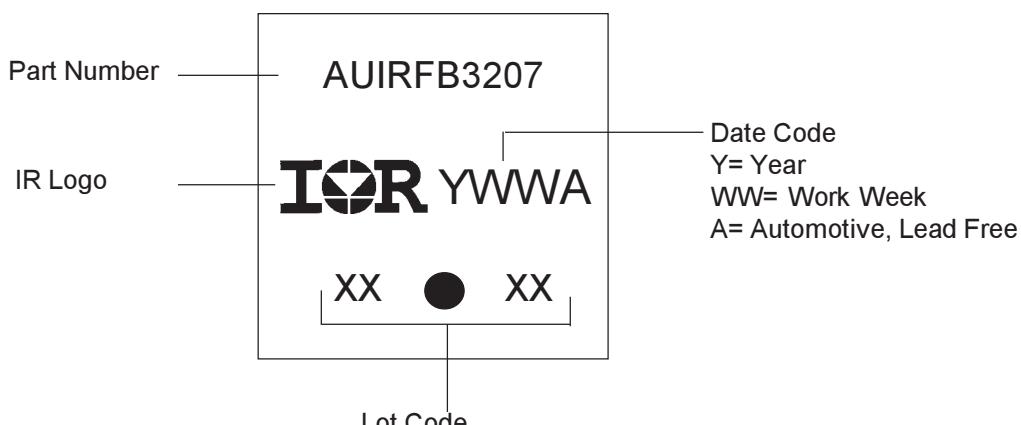
- 1.- GATE
- 2.- COLLECTOR
- 3.- Emitter

DIODES

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

SYMBOL	DIMENSIONS				NOTES	
	MILLIMETERS		INCHES			
	MIN.	MAX.	MIN.	MAX.		
A	3.56	4.82	.140	.190		
A1	0.51	1.40	.020	.055		
A2	2.04	2.92	.080	.115		
b	0.38	1.01	.015	.040		
b1	0.38	0.96	.015	.038	5	
b2	1.15	1.77	.045	.070		
b3	1.15	1.73	.045	.068		
c	0.36	0.61	.014	.024		
c1	0.36	0.56	.014	.022	5	
D	14.22	16.51	.560	.650	4	
D1	8.38	9.02	.330	.355		
D2	12.19	12.88	.480	.507	7	
E	9.66	10.66	.380	.420	4,7	
E1	8.38	8.89	.330	.350	7	
e	2.54 BSC		.100 BSC			
e1	5.08		.200 BSC			
H1	5.85	6.55	.230	.270	7,8	
L	12.70	14.73	.500	.580		
L1	—	6.35	—	.250	3	
øP	3.54	4.08	.139	.161		
Q	2.54	3.42	.100	.135		
ø	90°-93°		90°-93°			

TO-220AB Part Marking Information



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

Ordering Information

Base part	Package Type	Standard Pack		Complete Part Number
		Form	Quantity	
AUIRFB3207	TO-220	Tube	50	AUIRFB3207

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IR warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with IR's standard warranty. Testing and other quality control techniques are used to the extent IR deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

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IR products are neither designed nor intended for use in automotive applications or environments unless the specific IR products are designated by IR as compliant with ISO/TS 16949 requirements and bear a part number including the designation "AU". Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, IR will not be responsible for any failure to meet such requirements

For technical support, please contact IR's Technical Assistance Center

<http://www.irf.com/technical-info/>

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