

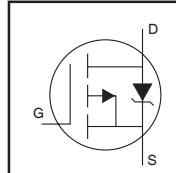
AUIRF6215

Features

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

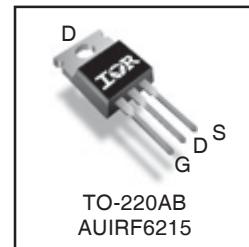
Description

Specifically designed for Automotive applications, this cellular design of HEXFET® Power MOSFETs utilizes the latest processing techniques to achieve low on-resistance per silicon area. This benefit combined with the fast switching speed and ruggedized device design that HEXFET power MOSFETs are well known for, provides the designer with an extremely efficient and reliable device for use in Automotive and a wide variety of other applications.



HEXFET® Power MOSFET

$V_{(BR)DSS}$	-150V
$R_{DS(on)}$ max.	0.29Ω
I_D	-13A



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, $V_{GS} @ 10\text{V}$	-13	
I_D @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 10\text{V}$	-9.0	A
I_{DM}	Pulsed Drain Current ①	-44	
P_D @ $T_C = 25^\circ\text{C}$	Power Dissipation	110	W
	Linear Derating Factor	0.71	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy (Thermally Limited) ②	310	mJ
I_{AR}	Avalanche Current ①	-6.6	A
E_{AR}	Repetitive Avalanche Energy ①	11	mJ
dv/dt	Peak Diode Recovery dv/dt ③	-5.0	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)	300	
	Mounting Torque, 6-32 or M3 screw	10 lbf·in (1.1 N·m)	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{θJC}$	Junction-to-Case ⑤	—	1.4	
$R_{θCS}$	Case-to-Sink, Flat, Greased Surface	0.50	—	°C/W
$R_{θJA}$	Junction-to-Ambient	—	62	

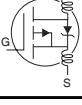
HEXFET® is a registered trademark of International Rectifier.

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

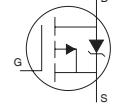
Static Electrical Characteristics @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(\text{BR})\text{DSS}}$	Drain-to-Source Breakdown Voltage	-150	—	—	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	—	-0.20	—	V/ $^\circ\text{C}$	Reference to 25°C , $I_D = -1\text{mA}$
$R_{\text{DS}(\text{on})}$	Static Drain-to-Source On-Resistance	—	—	0.29	Ω	$V_{\text{GS}} = -10\text{V}$, $I_D = -6.6\text{A}$ ④, $T_J = 25^\circ\text{C}$
		—	—	0.58		$V_{\text{GS}} = -10\text{V}$, $I_D = -6.6\text{A}$ ④, $T_J = 150^\circ\text{C}$
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage	-2.0	—	-4.0	V	$V_{\text{DS}} = V_{\text{GS}}$, $I_D = -250\mu\text{A}$
g_{fs}	Forward Transconductance	3.6	—	—	S	$V_{\text{DS}} = -50\text{V}$, $I_D = -6.6\text{A}$
I_{DSS}	Drain-to-Source Leakage Current	—	—	-25	μA	$V_{\text{DS}} = -150\text{V}$, $V_{\text{GS}} = 0\text{V}$
		—	—	-250		$V_{\text{DS}} = -120\text{V}$, $V_{\text{GS}} = 0\text{V}$, $T_J = 150^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{\text{GS}} = 20\text{V}$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{\text{GS}} = -20\text{V}$

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge	—	—	66	nC	$I_D = -6.6\text{A}$
Q_{gs}	Gate-to-Source Charge	—	—	8.1		$V_{\text{DS}} = -120\text{V}$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	35		$V_{\text{GS}} = -10\text{V}$, See Fig. 6 & 13 ④
$t_{\text{d}(\text{on})}$	Turn-On Delay Time	—	14	—	ns	$V_{\text{DD}} = -75\text{V}$
t_r	Rise Time	—	36	—		$I_D = -6.6\text{A}$
$t_{\text{d}(\text{off})}$	Turn-Off Delay Time	—	53	—		$R_G = 6.8 \Omega$
t_f	Fall Time	—	37	—		$R_D = 12 \Omega$, See Fig. 10
L_D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L_s	Internal Source Inductance	—	7.5	—		
C_{iss}	Input Capacitance	—	860	—	pF	$V_{\text{GS}} = 0\text{V}$
C_{oss}	Output Capacitance	—	220	—		$V_{\text{DS}} = -25\text{V}$
C_{rss}	Reverse Transfer Capacitance	—	130	—		$f = 1.0\text{MHz}$, See Fig. 5

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	-13	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	-44		
V_{SD}	Diode Forward Voltage	—	—	-1.6		$T_J = 25^\circ\text{C}$, $I_S = -6.6\text{A}$, $V_{\text{GS}} = 0\text{V}$ ④
t_{rr}	Reverse Recovery Time	—	160	240	ns	$T_J = 25^\circ\text{C}$, $I_F = -6.6\text{A}$ $dI/dt = 100\text{A}/\mu\text{s}$ ④
Q_{rr}	Reverse Recovery Charge	—	1.2	1.7	nC	
t_{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)
 ② Starting $T_J = 25^\circ\text{C}$, $L = 14\text{mH}$,
 $R_G = 25\Omega$, $I_{AS} = -6.6\text{A}$. (See Figure 12)

③ $I_{SD} \leq -6.6\text{A}$, $di/dt \leq -620\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(\text{BR})\text{DSS}}$,
 $T_J \leq 175^\circ\text{C}$.
 ④ Pulse width $\leq 300\mu\text{s}$; duty cycle $\leq 2\%$.
 ⑤ 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	TO-220	N/A
ESD	Machine Model	Class M3 (400V) AEC-Q101-002
	Human Body Model	Class H1B (1000V) AEC-Q101-001
	Charged Device Model	Class C5 (1125V) 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.

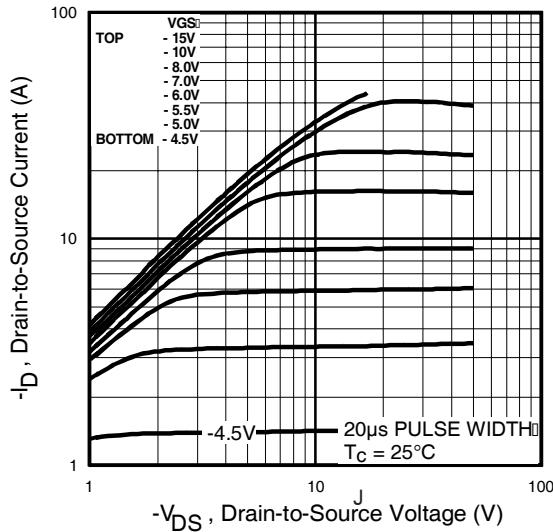


Fig 1. Typical Output Characteristics,

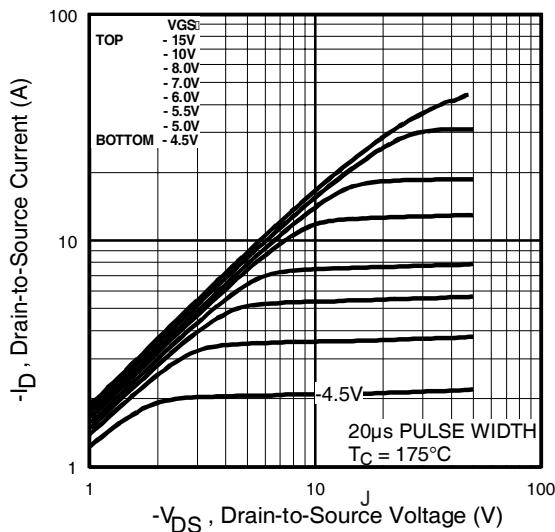


Fig 2. Typical Output Characteristics,

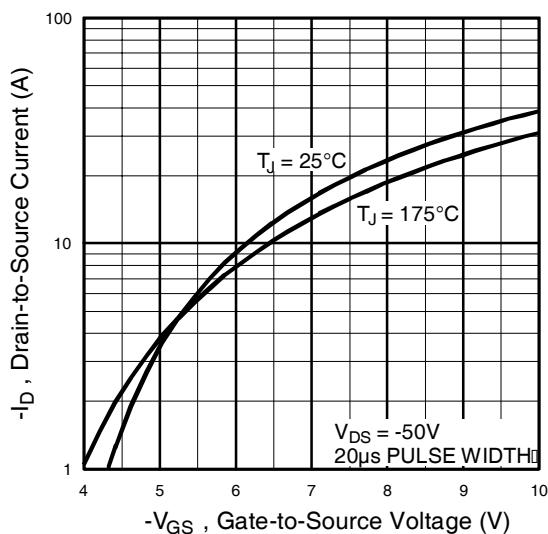


Fig 3. Typical Transfer Characteristics

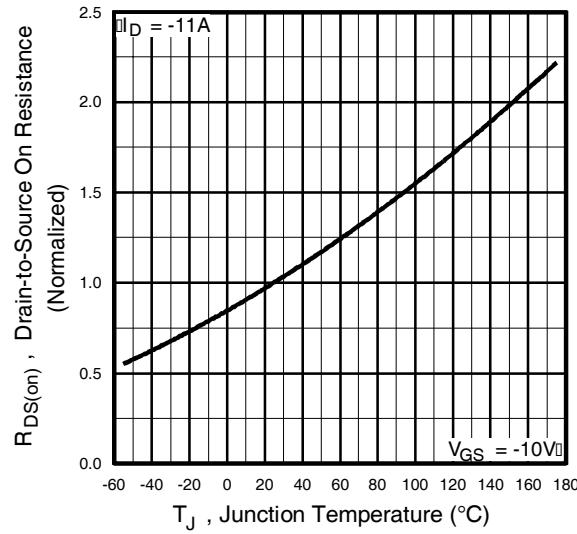


Fig 4. Normalized On-Resistance Vs. Temperature

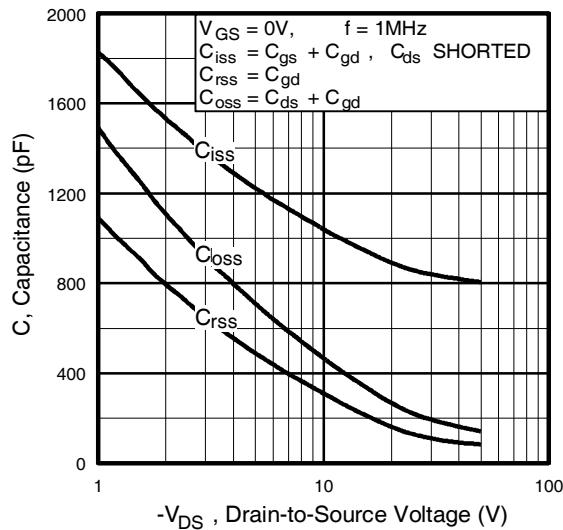


Fig 5. Typical Capacitance Vs.
Drain-to-Source Voltage

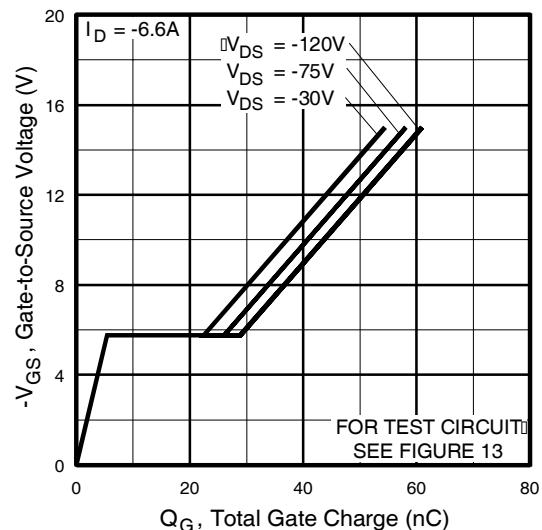


Fig 6. Typical Gate Charge Vs.
Gate-to-Source Voltage

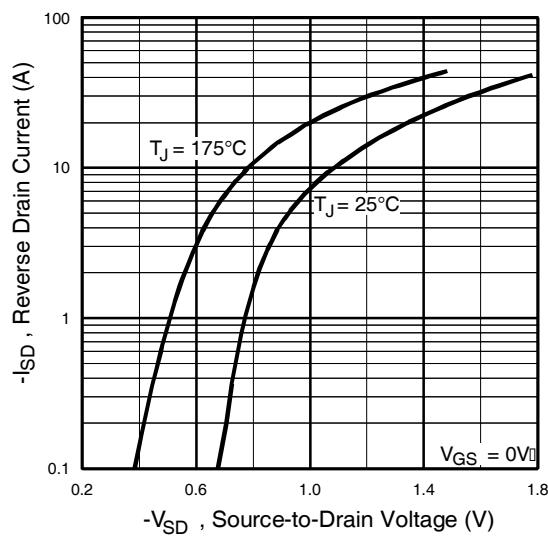


Fig 7. Typical Source-Drain Diode
Forward Voltage

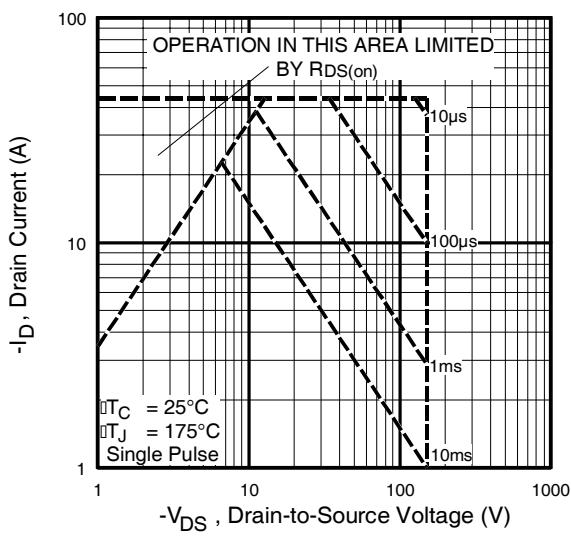


Fig 8. Maximum Safe Operating Area

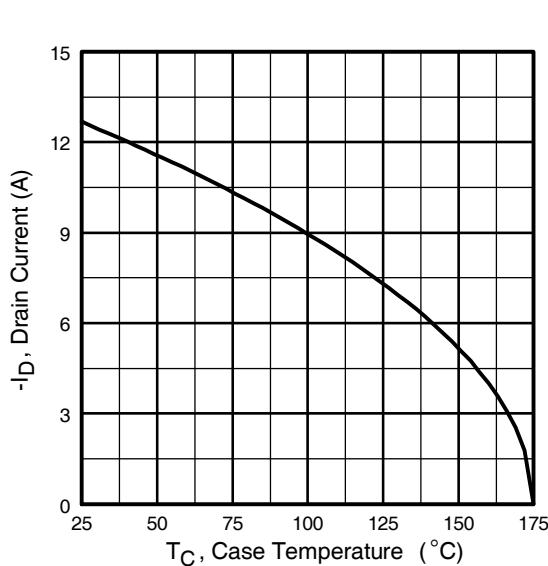


Fig 9. Maximum Drain Current Vs.
Case Temperature

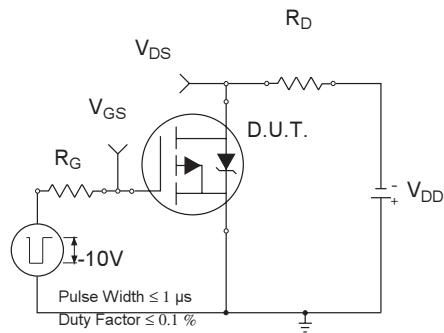


Fig 10a. Switching Time Test Circuit

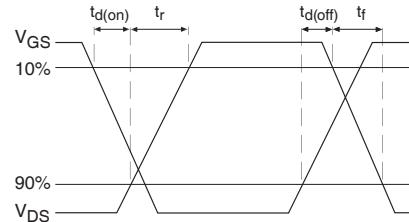


Fig 10b. Switching Time Waveforms

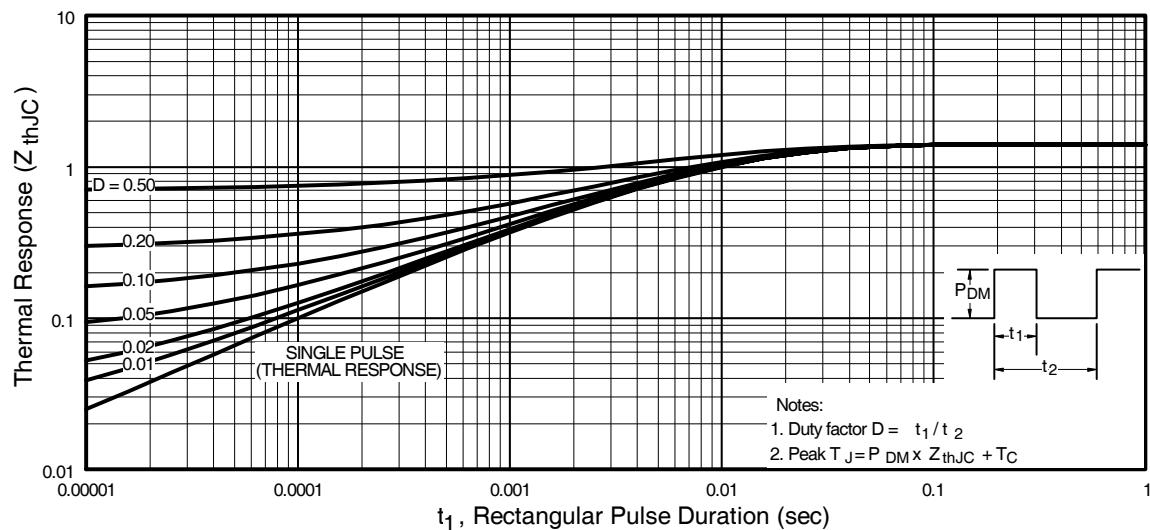


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

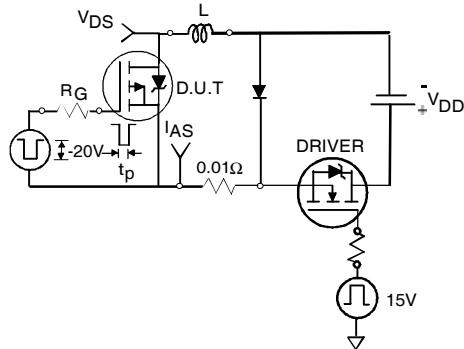


Fig 12a. Unclamped Inductive Test Circuit

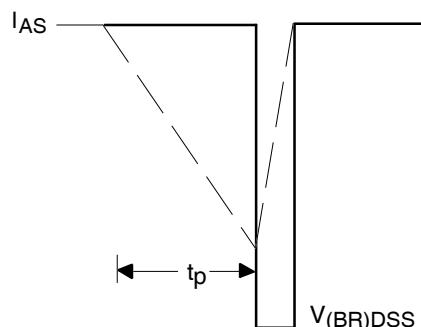
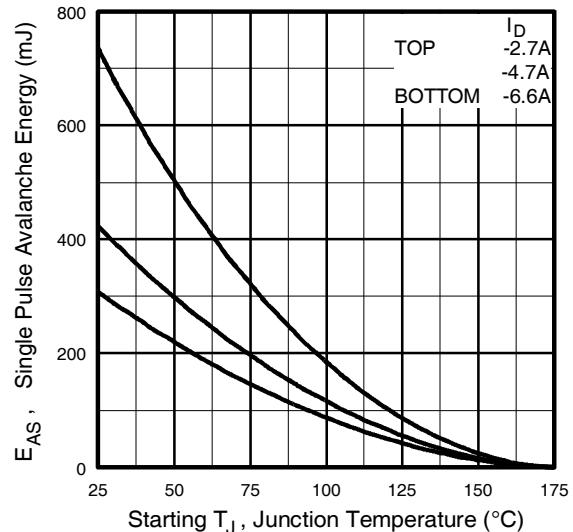


Fig 12b. Unclamped Inductive Waveforms

Fig 12c. Maximum Avalanche Energy Vs. Drain Current

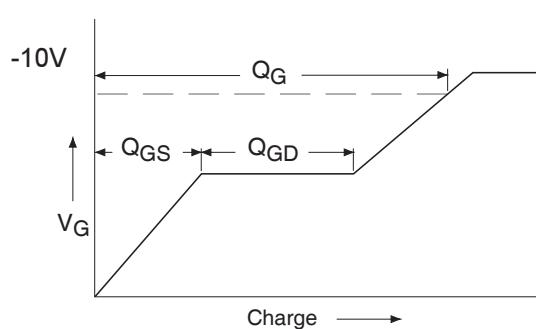


Fig 13a. Basic Gate Charge Waveform

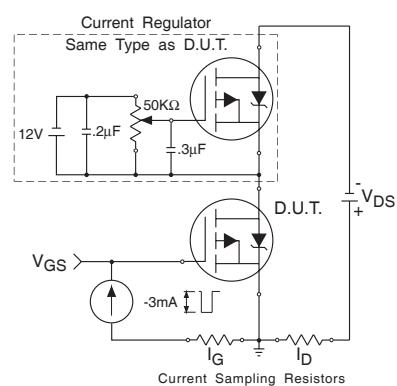
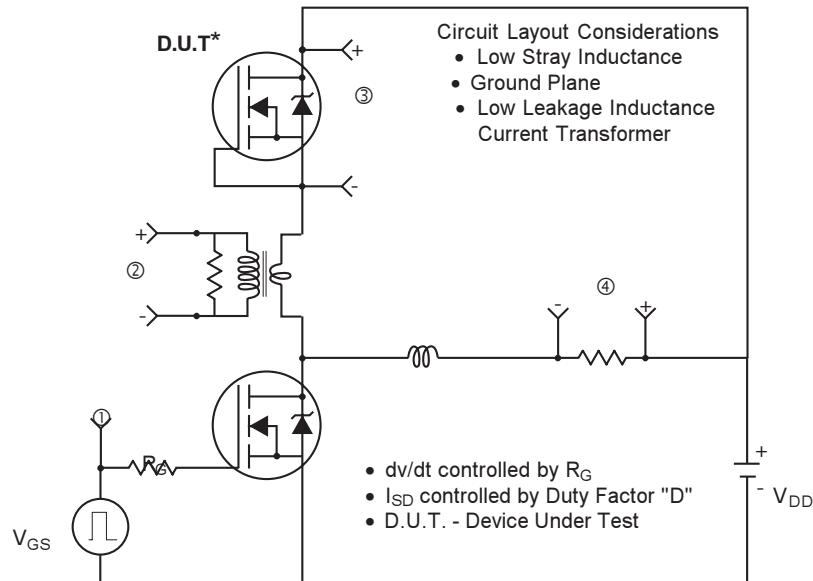
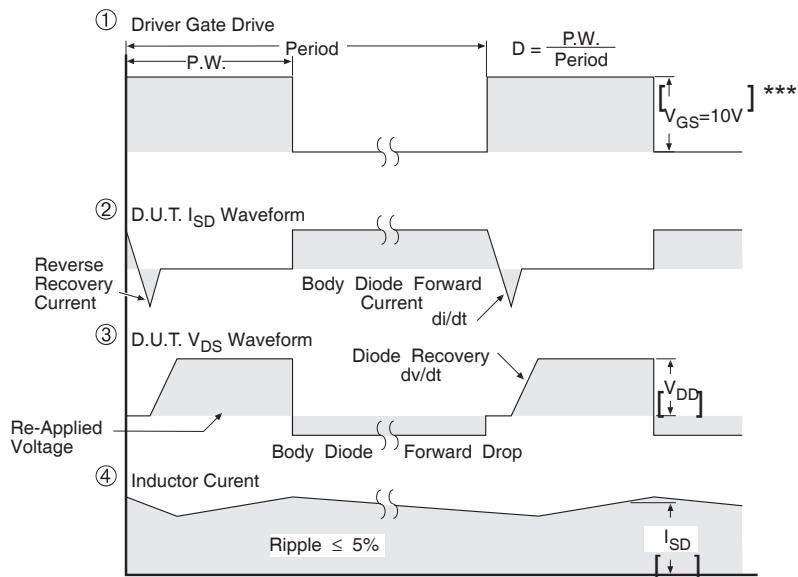


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



* Reverse Polarity of D.U.T for P-Channel

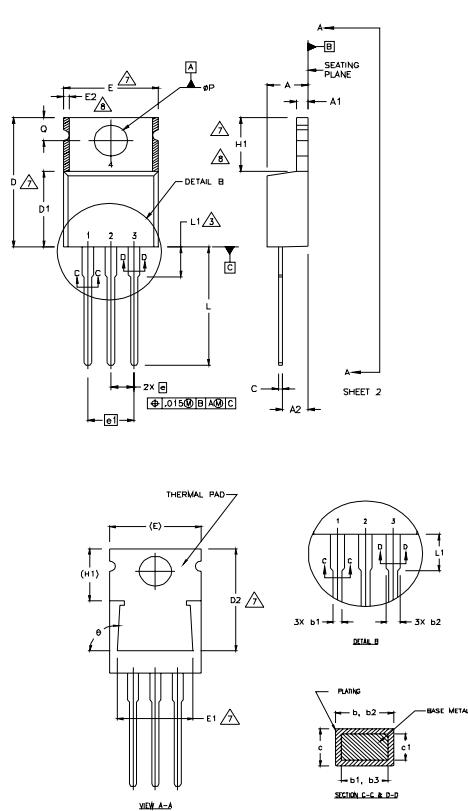


*** $V_{GS} = 5.0V$ for Logic Level and 3V Drive Devices

Fig 14. For P-Channel HEXFETS

TO-220AB Package Outline

Dimensions are shown in millimeters (inches)



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" (.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 IRRREGULARITIES ARE ALLOWED.

LEAD ASSIGNMENTS

HEXFET

1. GATE
2. DRAIN
3. SOURCE

IGBTs, CoPACK

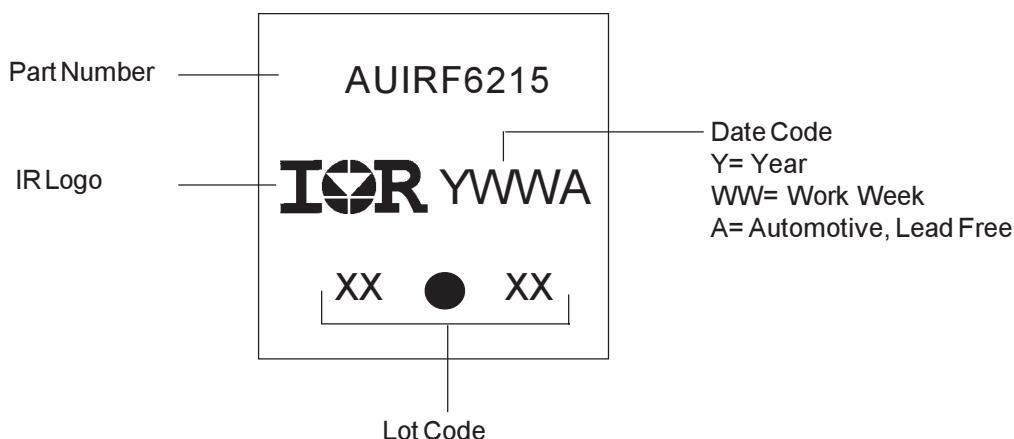
1. GATE
2. COLLECTOR
3. Emitter

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	0.58	1.01	.015	.040
b1	0.38	0.96	.015	.038
b2	1.15	1.77	.045	.070
b3	1.15	1.73	.045	.068
c	0.56	0.61	.014	.024
c1	0.36	0.56	.014	.022
D	14.22	16.51	.560	.650
D1	8.58	9.02	.330	.355
D2	12.19	12.88	.480	.507
E	9.66	10.66	.380	.420
E1	8.38	8.89	.330	.350
e	2.54	5.08	.100 BSC	
e1			.200 BSC	
H1	5.85	6.55	.230	.270
L	12.70	14.73	.500	.580
L1	—	6.35	—	.250
φP	3.54	4.08	.139	.161
O	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/>

AUIRF6215

International
IR Rectifier

Ordering Information

Base part number	Package Type	Standard Pack		Complete Part Number
		Form	Quantity	
AUIRF6215	TO-220	Tube	50	AUIRF6215

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