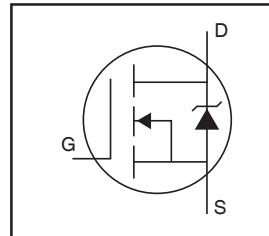
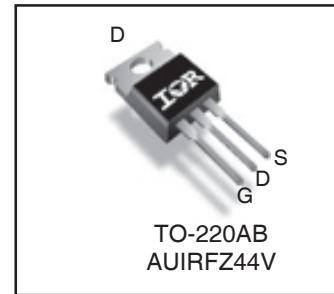


**Features**

- Advanced Planar Technology
- Low On-Resistance
- Dynamic dV/dT Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free, RoHS Compliant
- Automotive Qualified \*



$V_{(BR)DSS}$	<b>60V</b>
$R_{DS(on)}$ max.	<b>16.5mΩ</b>
$I_D$	<b>55A</b>



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

**Description**

Specifically designed for Automotive applications, this stripe planar 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.

**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, $V_{GS}$ @ 10V	55	A
$I_D$ @ $T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS}$ @ 10V	39	
$I_{DM}$	Pulsed Drain Current ①	220	
$P_D$ @ $T_C = 25^\circ\text{C}$	Power Dissipation	115	W
	Linear Derating Factor	0.77	W/°C
$V_{GS}$	Gate-to-Source Voltage	±20	V
$E_{AS}$	Single Pulse Avalanche Energy ②	115	mJ
$I_{AR}$	Avalanche Current ①	55	A
$E_{AR}$	Repetitive Avalanche Energy ①	11	mJ
$dv/dt$	Peak Diode Recovery $dv/dt$ ③	4.5	V/ns
$T_J$	Operating Junction and	-55 to + 175	°C
$T_{STG}$	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	
	Mounting Torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

**Thermal Resistance**

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.3	°C/W
$R_{\theta CS}$	Case-to-Sink, Flat, Greased Surface	0.50	—	
$R_{\theta JA}$	Junction-to-Ambient (PCB mounted)	—	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	60	—	—	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	—	0.062	—	$\text{V}/^\circ\text{C}$	Reference to $25^\circ\text{C}$ , $I_D = 1\text{mA}$
$R_{\text{DS}(\text{on})}$	Static Drain-to-Source On-Resistance	—	—	16.5	$\text{m}\Omega$	$V_{\text{GS}} = 10\text{V}$ , $I_D = 31\text{A}$ ④
$V_{\text{GS}(\text{th})}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{\text{DS}} = V_{\text{GS}}$ , $I_D = 250\mu\text{A}$
$g_{\text{fs}}$	Forward Transconductance	24	—	—	S	$V_{\text{DS}} = 25\text{V}$ , $I_D = 31\text{A}$ ④
$I_{\text{DSS}}$	Drain-to-Source Leakage Current	—	—	25	$\mu\text{A}$	$V_{\text{DS}} = 60\text{V}$ , $V_{\text{GS}} = 0\text{V}$
		—	—	250		$V_{\text{DS}} = 48\text{V}$ , $V_{\text{GS}} = 0\text{V}$ , $T_J = 150^\circ\text{C}$
$I_{\text{GSS}}$	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)

$Q_g$	Total Gate Charge	—	—	67	nC	$I_D = 51\text{A}$ $V_{\text{DS}} = 48\text{V}$ $V_{\text{GS}} = 10\text{V}$ , See Fig.6 and 13 ④
$Q_{\text{gs}}$	Gate-to-Source Charge	—	—	18		
$Q_{\text{gd}}$	Gate-to-Drain ("Miller" Charge	—	—	25		
$t_{\text{d}(\text{on})}$	Turn-On Delay Time	—	13	—	ns	$V_{\text{DD}} = 30\text{V}$ $I_D = 51\text{A}$ $R_G = 9.1\Omega$ $R_D = 0.6\Omega$ , See Fig.10 ④
$t_r$	Rise Time	—	97	—		
$t_{\text{d}(\text{off})}$	Turn-Off Delay Time	—	40	—		
$t_f$	Fall Time	—	57	—		
$L_D$	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.)
$L_S$	Internal Source Inductance	—	7.5	—		Between lead, and center of die contact
$C_{\text{iss}}$	Input Capacitance	—	1812	—	pF	$V_{\text{GS}} = 0\text{V}$
$C_{\text{oss}}$	Output Capacitance	—	393	—		$V_{\text{DS}} = 25\text{V}$
$C_{\text{rss}}$	Reverse Transfer Capacitance	—	103	—		$f = 1.0\text{MHz}$ , See Fig.5

## Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
$I_S$	Continuous Source Current (Body Diode)	—	—	55	A	MOSFET symbol showing the integral reverse p-n junction diode.
$I_{\text{SM}}$	Pulsed Source Current (Body Diode) ①	—	—	220		
$V_{\text{SD}}$	Diode Forward Voltage	—	—	2.5		$T_J = 25^\circ\text{C}$ , $I_S = 51\text{A}$ , $V_{\text{GS}} = 0\text{V}$ ④
$t_{\text{rr}}$	Reverse Recovery Time	—	70	105	ns	$T_J = 25^\circ\text{C}$ , $I_F = 51\text{A}$
$Q_{\text{rr}}$	Reverse Recovery Charge	—	146	219	nC	$\text{di}/\text{dt} = 100\text{A}/\mu\text{s}$ ④
$t_{\text{on}}$	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  $T_J = 25^\circ\text{C}$ ,  $L = 89\mu\text{H}$ ,  $R_G = 25\Omega$ ,  $I_{\text{AS}} = 51\text{A}$ . (See Figure 12)

③  $I_{\text{SD}} \leq 51\text{A}$ ,  $\text{di}/\text{dt} \leq 227\text{A}/\mu\text{s}$ ,  $V_{\text{DD}} \leq V_{(\text{BR})\text{DSS}}$ ,  $T_J \leq 175^\circ\text{C}$

④ Pulse width  $\leq 300\mu\text{s}$ ; duty cycle  $\leq 2\%$ .

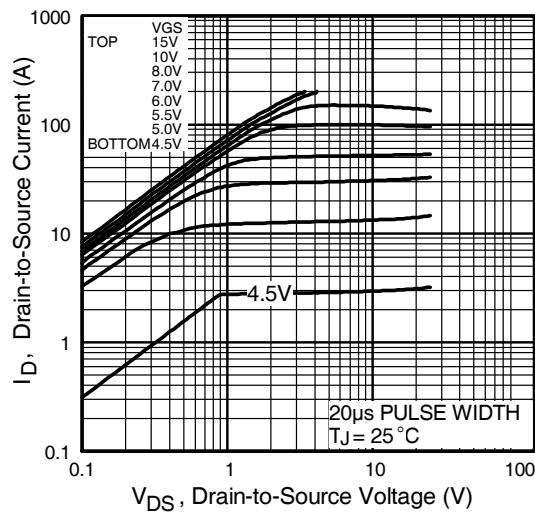
**Qualification Information<sup>†</sup>**

		Automotive (per AEC-Q101) <sup>††</sup>
<b>Qualification Level</b>		Comments: This part number(s) passed Automotive qualification. IR's Industrial and Consumer qualification level is granted by extension of the higher Automotive level.
<b>Moisture Sensitivity Level</b>		3L-TO-220      N/A
<b>ESD</b>	Machine Model	Class M3(+/- 400V) <sup>†††</sup> (per AEC-Q101-002)
	Human Body Model	Class H1B(+/- 1000V) <sup>†††</sup> (per AEC-Q101-001)
	Charged Device Model	Class C5(+/- 2000V) <sup>†††</sup> (per AEC-Q101-005)
<b>RoHS Compliant</b>		Yes

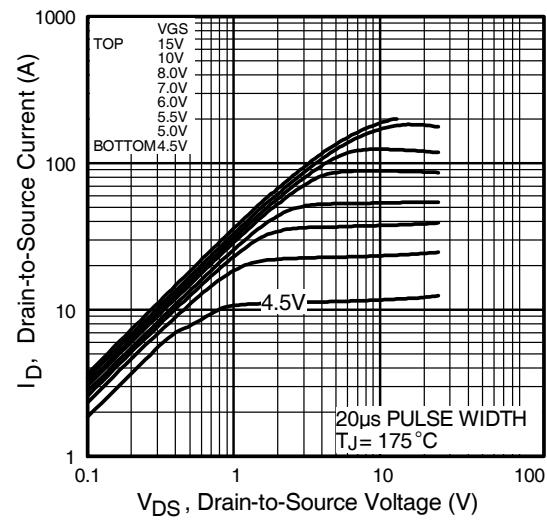
<sup>†</sup> Qualification standards can be found at International Rectifier's web site: <http://www.irf.com/>

<sup>††</sup> Exceptions (if any) to AEC-Q101 requirements are noted in the qualification report.

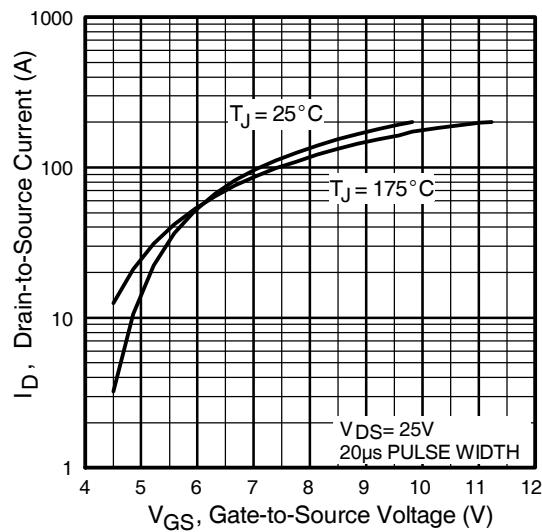
<sup>†††</sup> Highest passing voltage



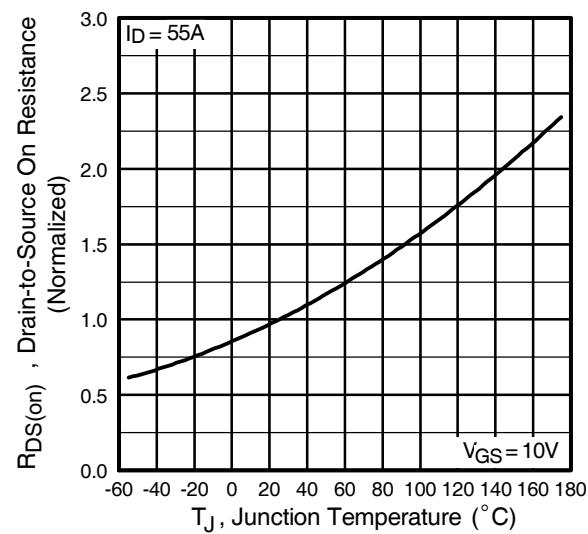
**Fig 1.** Typical Output Characteristics



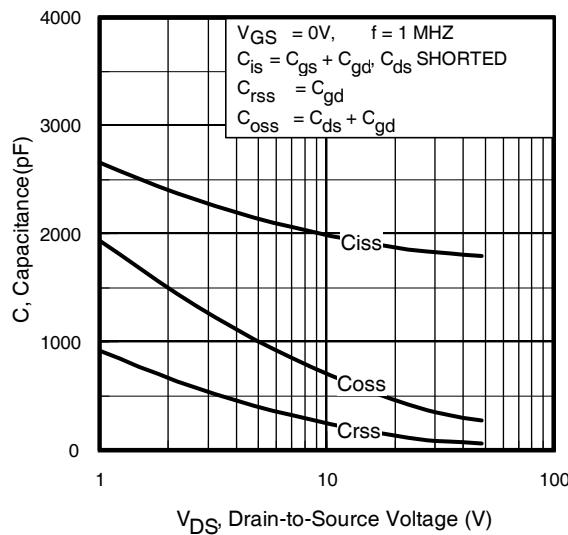
**Fig 2.** Typical Output Characteristics



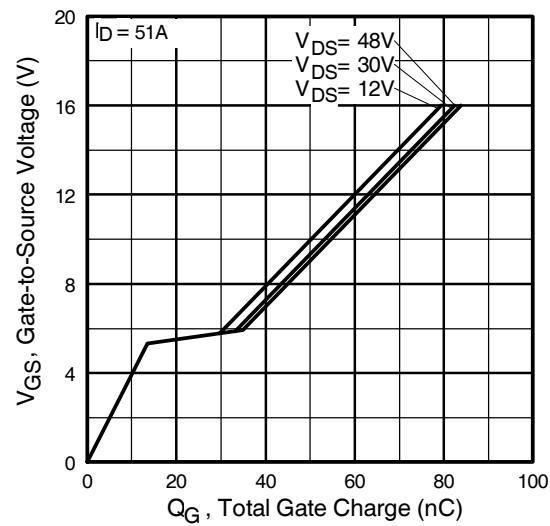
**Fig 3.** Typical Transfer Characteristics



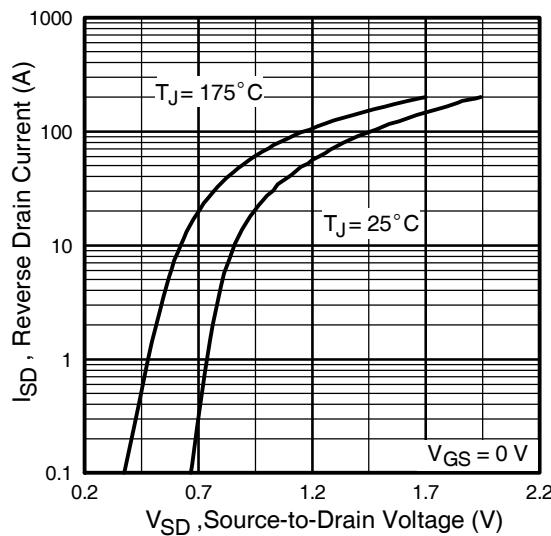
**Fig 4.** Normalized On-Resistance  
 Vs. Temperature



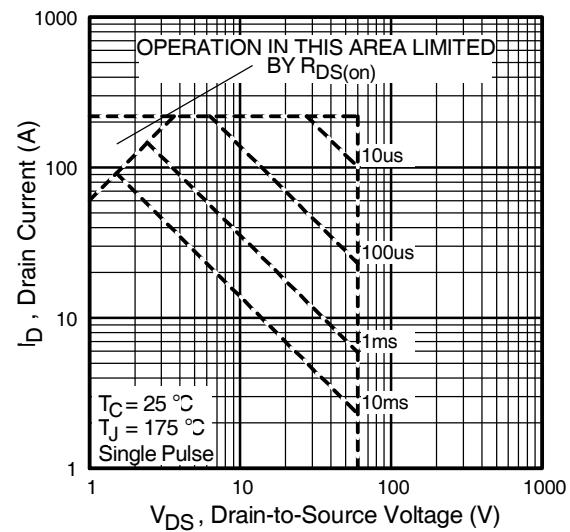
**Fig 5.** Typical Capacitance Vs.  
Drain-to-Source Voltage



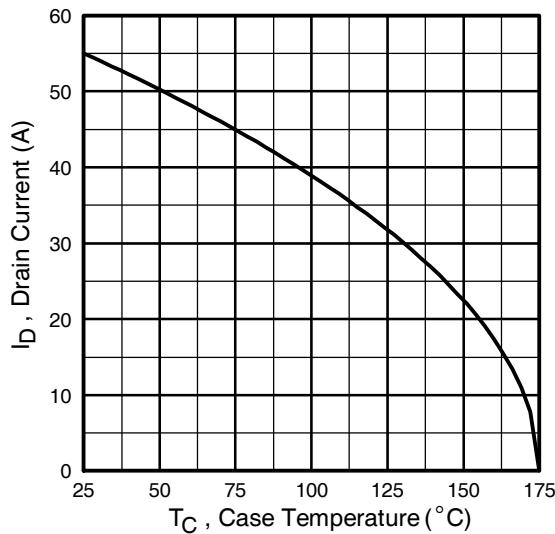
**Fig 6.** Typical Gate Charge Vs.  
Gate-to-Source Voltage



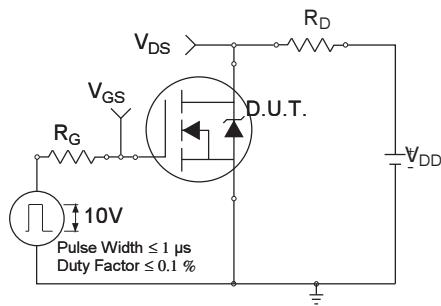
**Fig 7.** Typical Source-Drain Diode  
Forward Voltage



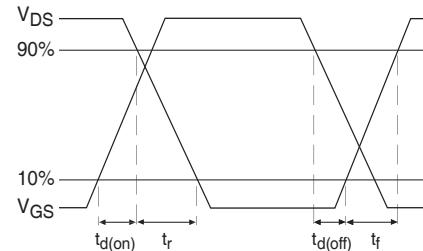
**Fig 8.** Maximum Safe Operating Area



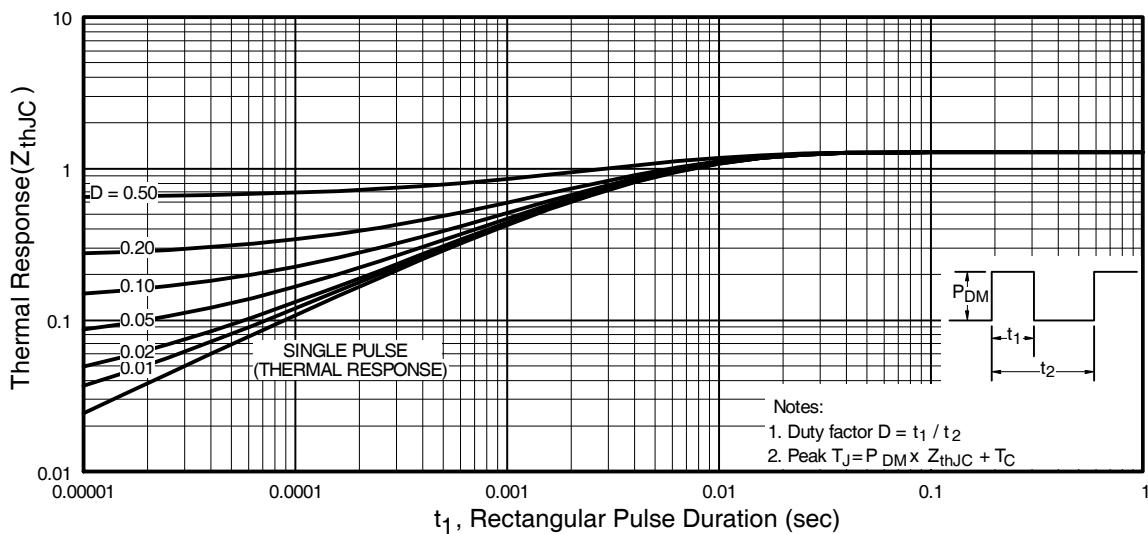
**Fig 9.** Maximum Drain Current Vs.  
Case Temperature



**Fig 10a.** Switching Time Test Circuit



**Fig 10b.** Switching Time Waveforms



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

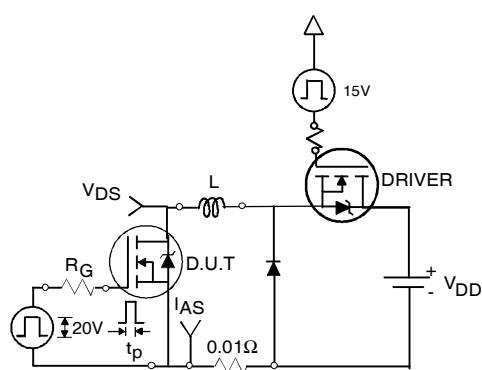


Fig 12a. Unclamped Inductive Test Circuit

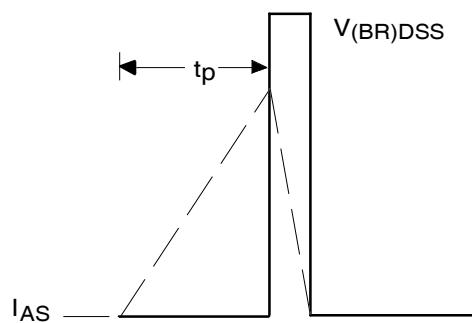
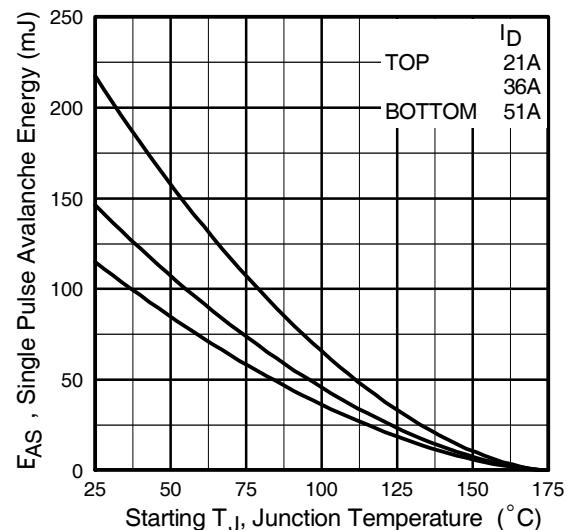


Fig 12b. Unclamped Inductive Waveforms

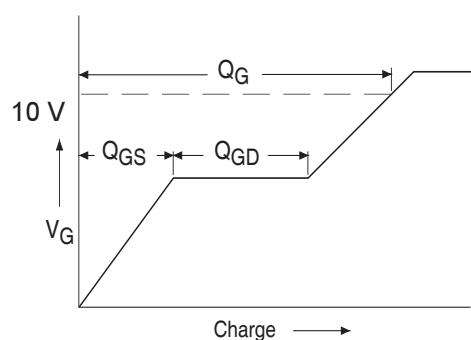


Fig 13a. Basic Gate Charge Waveform

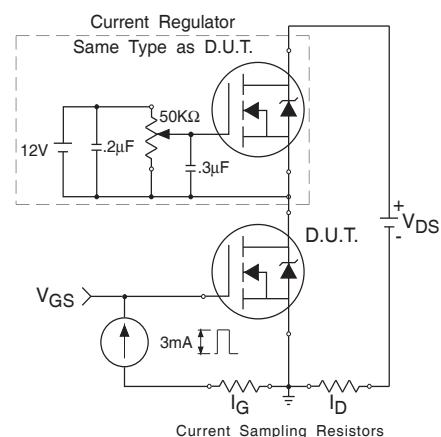


Fig 13b. Gate Charge Test Circuit

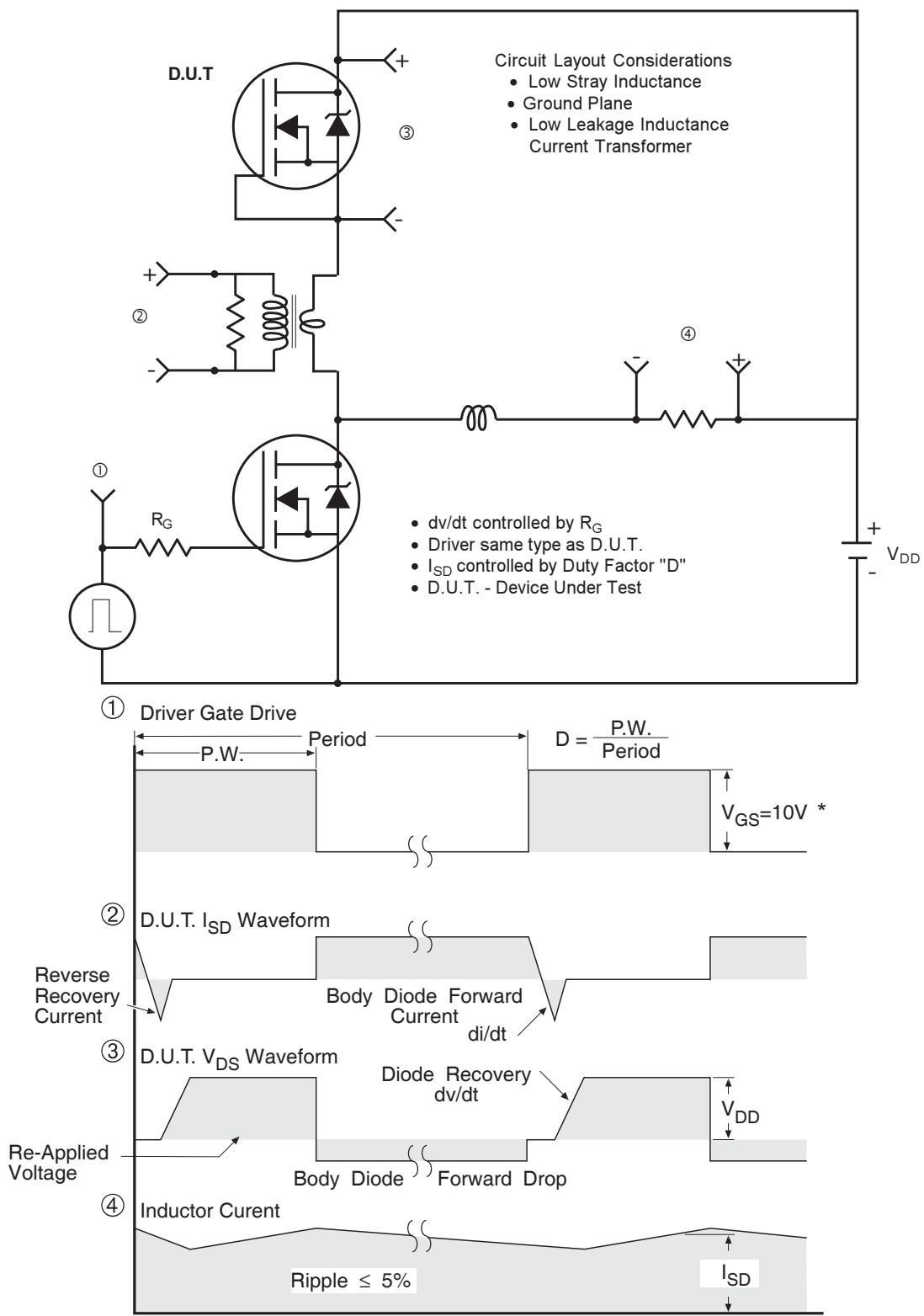
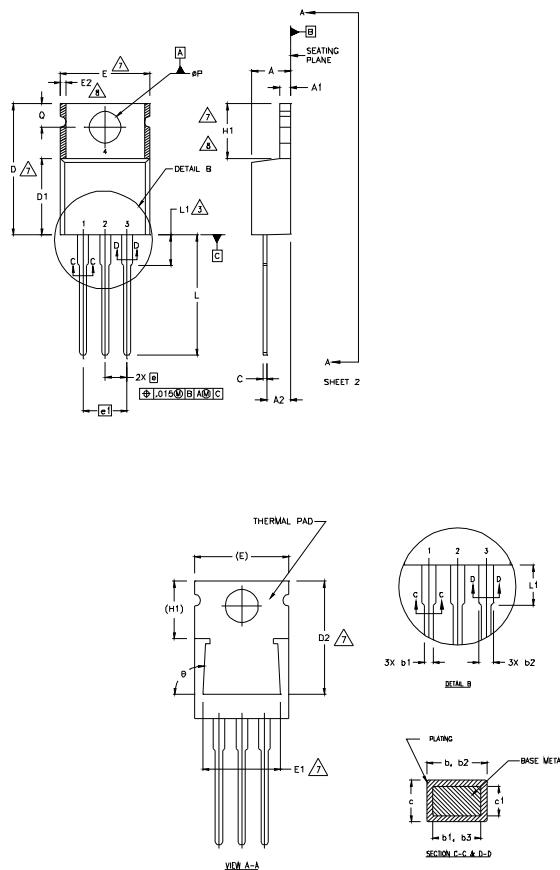


Fig 14. For N-Channel HEXFETs

## 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" (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 E1, 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, CoPACK

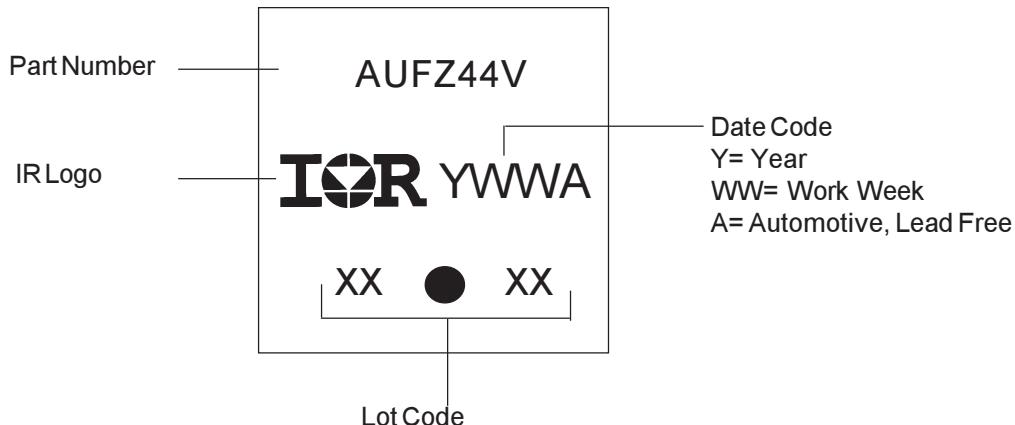
1. GATE
2. COLLECTOR
3. Emitter

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	0.38	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		
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/>

## Ordering Information

Base part	Package Type	Standard Pack		Complete Part Number
		Form	Quantity	
AUIRFZ44V	TO-220	Tube	50	AUIRFZ44V

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