

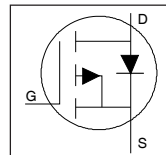
Features

- 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 *

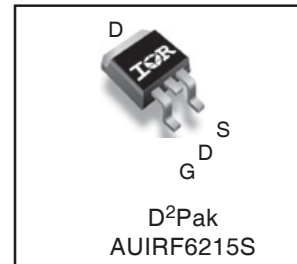
Description

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_{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	A
$I_D @ T_C = 100^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ -10\text{V}$	-9.0	
I_{DM}	Pulsed Drain Current ①	-44	
$P_D @ T_A = 25^\circ\text{C}$	Maximum Power Dissipation	3.8	W
$P_D @ T_C = 25^\circ\text{C}$	Maximum Power Dissipation	110	
	Linear Derating Factor	0.71	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy 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)		

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ④	—	1.4	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount, steady state) ⑤	—	40	

HEXFET® is a registered trademark of International Rectifier.

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


Static Electrical Characteristics @ T_J = 25°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 = -250μA
ΔBV _{DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	-0.20	—	V/°C	Reference to 25°C, I _D = -1mA
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	—	0.29	Ω	V _{GS} = -10V, I _D = -6.6A ④
		—	—	0.58		V _{GS} = -10V, I _D = -6.6A, T _J = 150°C ⑤
V _{GS(th)}	Gate Threshold Voltage	-2.0	—	-4.0	V	V _{DS} = V _{GS} , I _D = -250μA
g _{fs}	Forward Transconductance	3.6	—	—	S	V _{DS} = -25V, I _D = -6.6A
I _{DSS}	Drain-to-Source Leakage Current	—	—	-25	μA	V _{DS} = -150V, V _{GS} = 0V
		—	—	-250		V _{DS} = -120V, V _{GS} = 0V, T _J = 150°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°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q _g	Total Gate Charge	—	—	66	nC	I _D = -6.6A
Q _{gs}	Gate-to-Source Charge	—	—	8.1		V _{DS} = -120V
Q _{gd}	Gate-to-Drain ("Miller") Charge	—	—	35		V _{GS} = -10V ④
t _{d(on)}	Turn-On Delay Time	—	14	—	ns	V _{DD} = -75V
t _r	Rise Time	—	36	—		I _D = -6.6A
t _{d(off)}	Turn-Off Delay Time	—	53	—		R _G = 6.8Ω
t _f	Fall Time	—	37	—		R _D = 12Ω ③
L _S	Internal Source Inductance	—	7.5	—		nH
C _{iss}	Input Capacitance	—	860	—	pF	V _{GS} = 0V
C _{oss}	Output Capacitance	—	220	—		V _{DS} = -25V
C _{rss}	Reverse Transfer Capacitance	—	130	—		f = 1.0MHz, See Fig. 5

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	-11	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	V	T _J = 25°C, I _S = -6.6A, V _{GS} = 0V ④
t _{rr}	Reverse Recovery Time	—	160	240	ns	T _J = 25°C, I _F = -6.6A
Q _{rr}	Reverse Recovery Charge	—	1.2	1.7	μC	di/dt = 100A/μs ④
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. (See fig. 11)
- ② Starting T_J = 25°C, L = 14mH, R_G = 25Ω, I_{AS} = -6.6A. (See Figure 12)
- ③ I_{SD} ≤ -6.6A, di/dt ≤ 620A/μs, V_{DD} ≤ V_{(BR)DSS}, T_J ≤ 175°C.

- ④ Pulse width ≤ 300μs; duty cycle ≤ 2%.
- ⑤ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.
- ⑥ 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		D ² Pak	MSL1
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/>

^{††} Highest passing voltage.

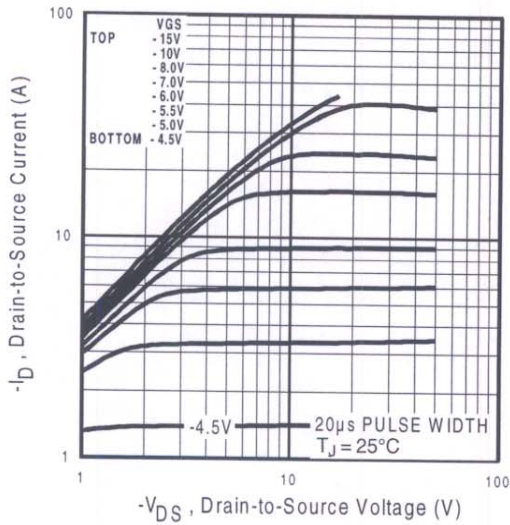


Fig 1. Typical Output Characteristics

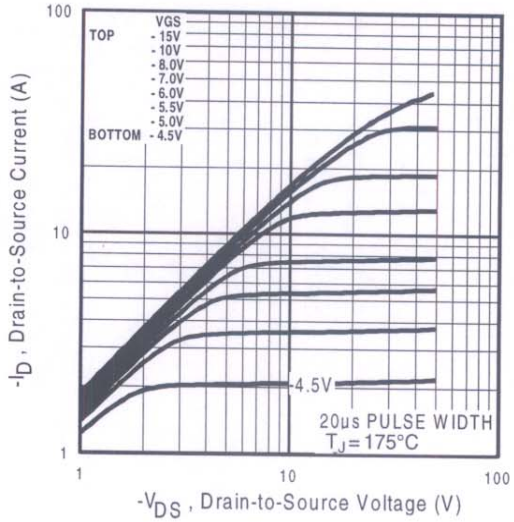


Fig 2. Typical Output Characteristics

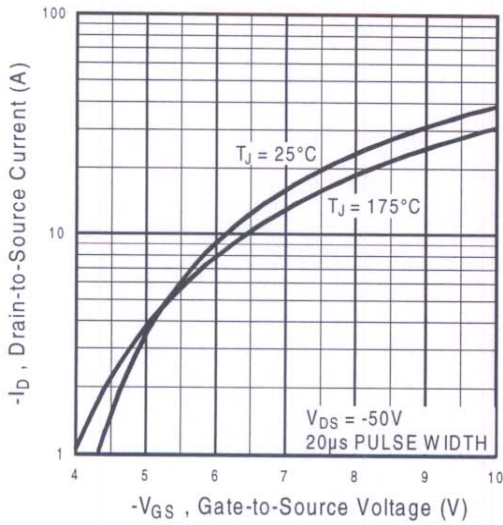


Fig 3. Typical Transfer Characteristics

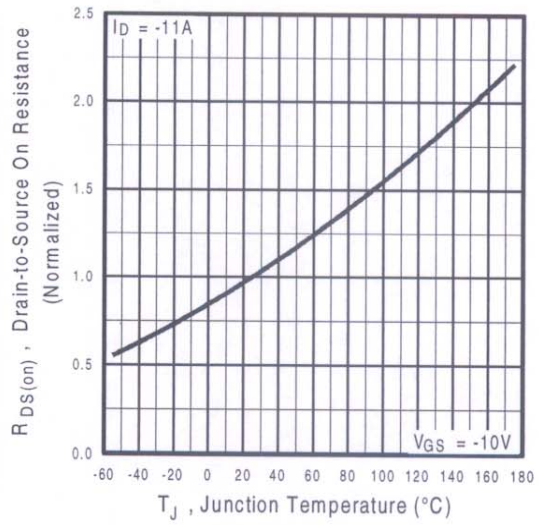
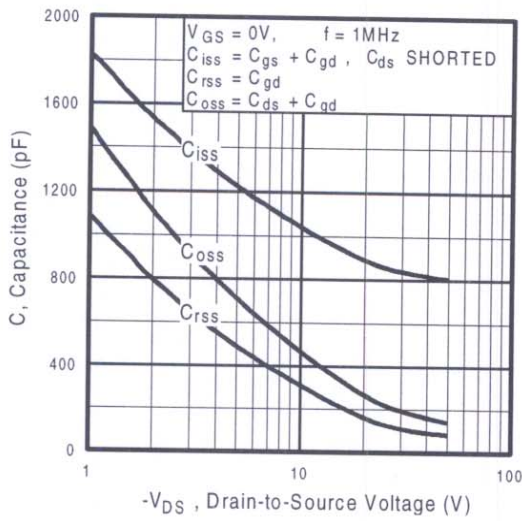
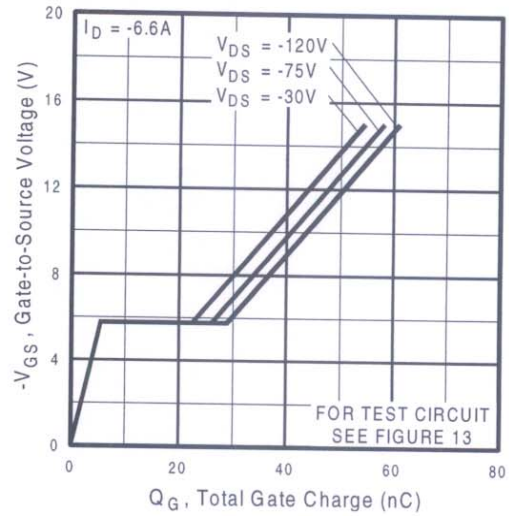
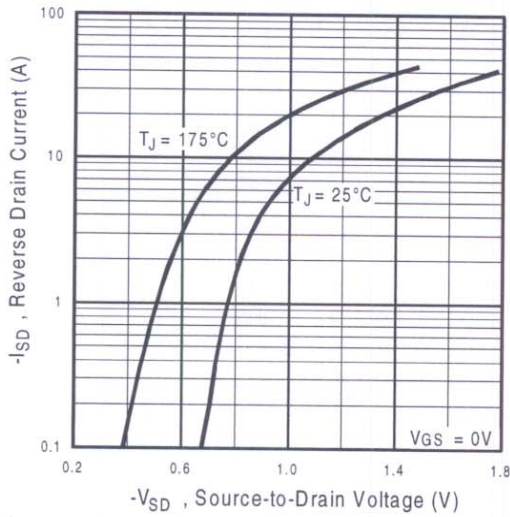
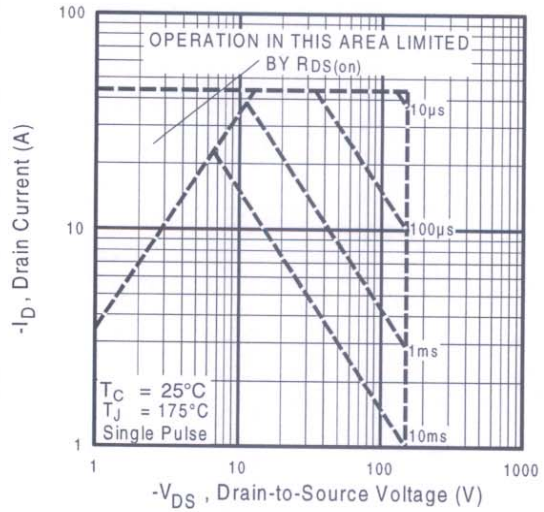


Fig 4. Normalized On-Resistance Vs. Temperature


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

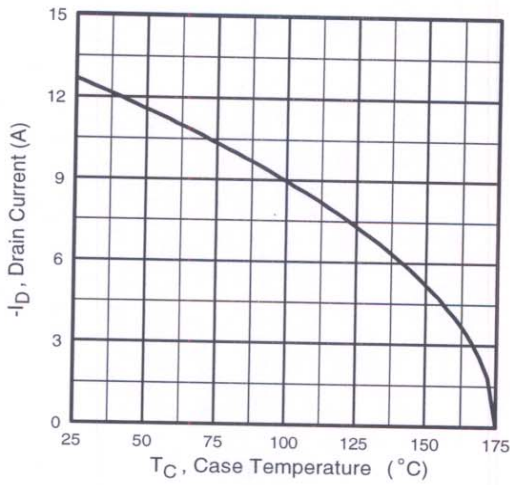


Fig 9. Maximum Drain Current Vs. Case Temperature

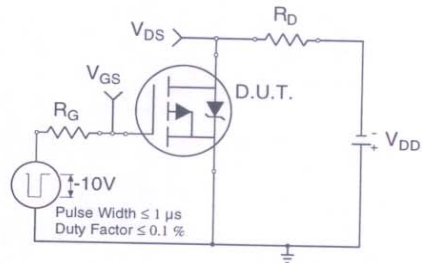


Fig 10a. Switching Time Test Circuit

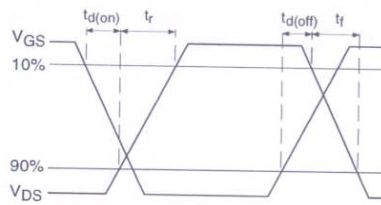


Fig 10b. Switching Time Waveforms

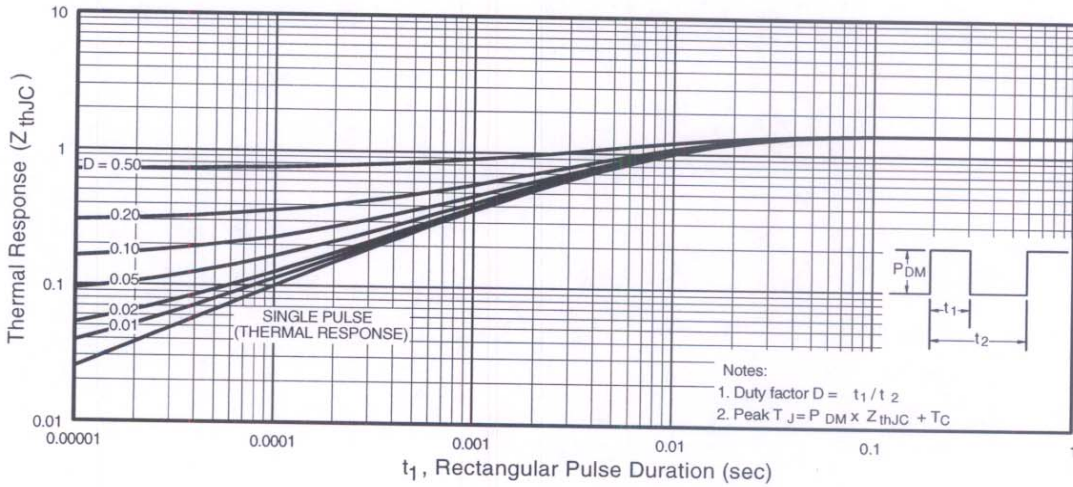
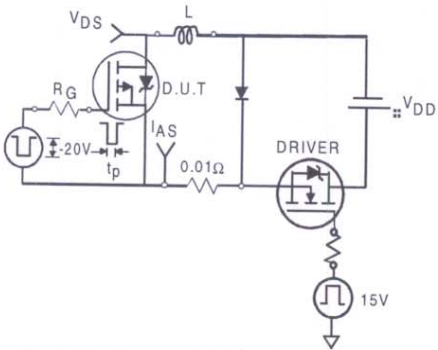
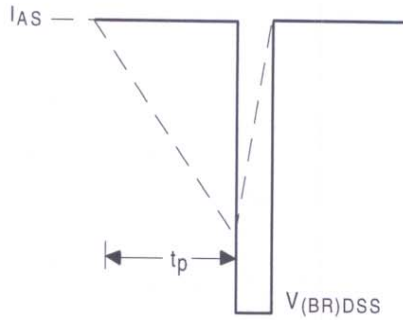
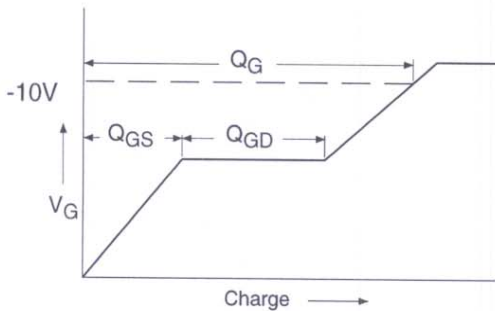
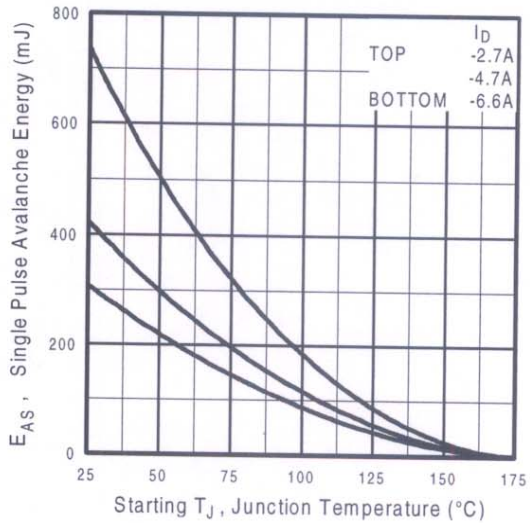
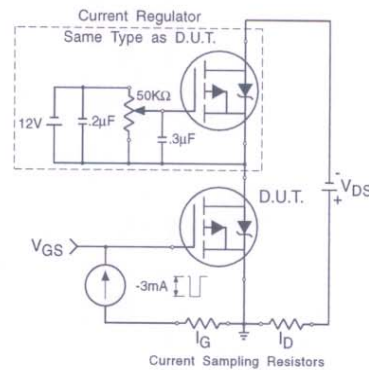
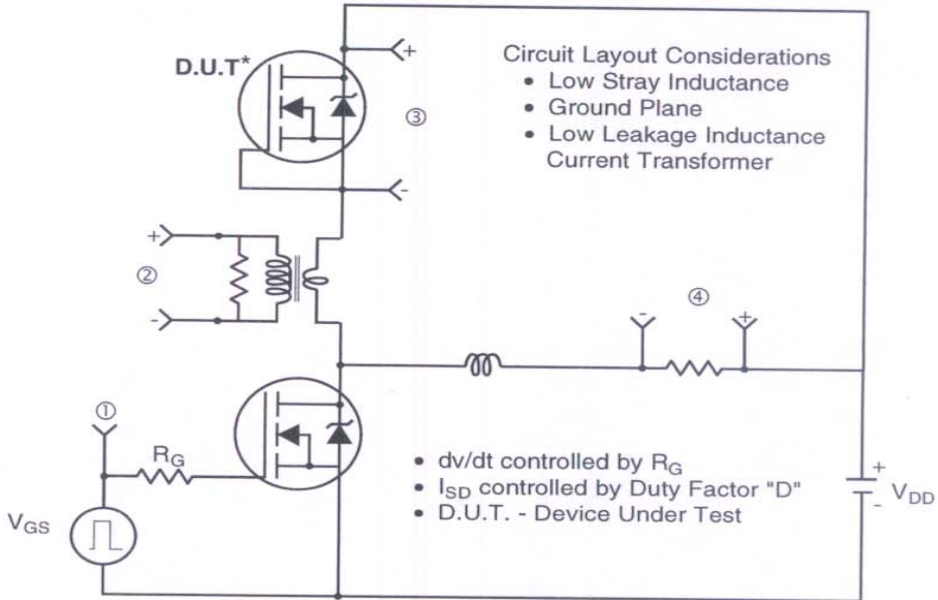


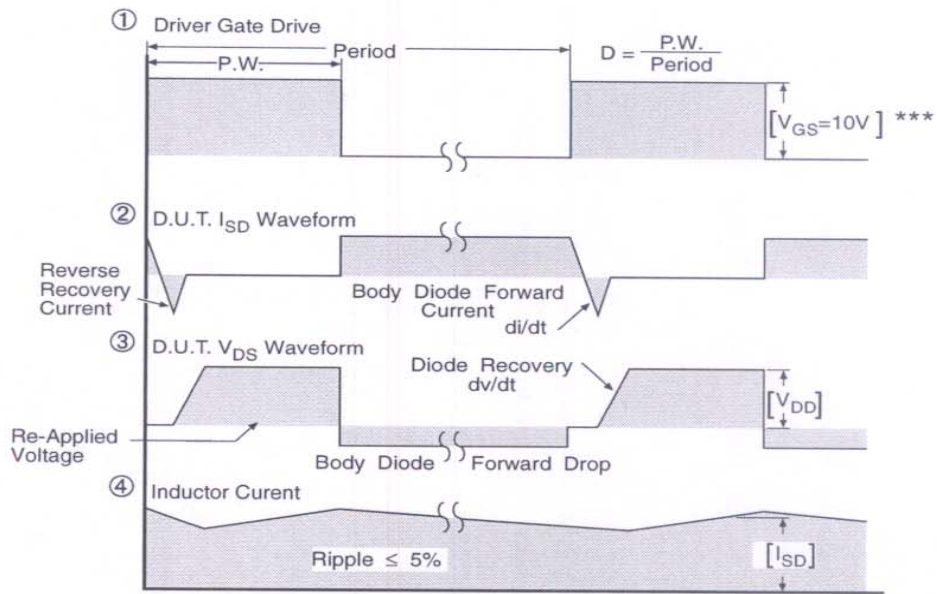
Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case


Fig 12a. Unclamped Inductive Test Circuit

Fig 12b. Unclamped Inductive Waveforms

Fig 13a. Basic Gate Charge Waveform

Fig 12c. Maximum Avalanche Energy Vs. Drain Current

Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



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

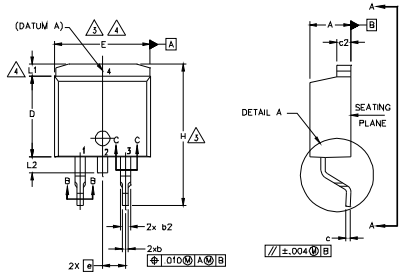


*** $V_{GS} = 5.0V$ for Logic Level and 3V Drive Devices

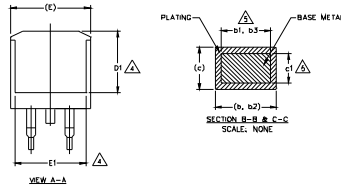
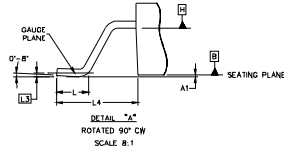
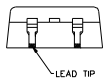
Fig 14. For P-Channel HEXFETS

D²Pak Package Outline

(Dimensions are shown in millimeters (inches))



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994
 2. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
 3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.127 [.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
 4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
 5. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
 6. DATUM A & B TO BE DETERMINED AT DATUM PLANE H.
 7. CONTROLLING DIMENSION: INCH.
 8. OUTLINE CONFORMS TO JEDEC OUTLINE TO-263AB.



SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	0.00	0.254	.000	.010	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	5
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	5
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	5
c2	1.14	1.65	.045	.065	
D	8.38	9.65	.330	.380	3
D1	6.86	-	.270	-	4
E	9.65	10.67	.380	.420	3,4
E1	6.22	-	.245	-	4
e	2.54 BSC		.100 BSC		
H	14.61	15.88	.575	.625	
L	1.78	2.79	.070	.110	
L1	-	1.65	-	.066	4
L2	1.27	1.78	-	.070	
L3	0.25 BSC		.010 BSC		
L4	4.78	5.28	.188	.208	

LEAD ASSIGNMENTS

HEXFET

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

IGBTs, CoPACK

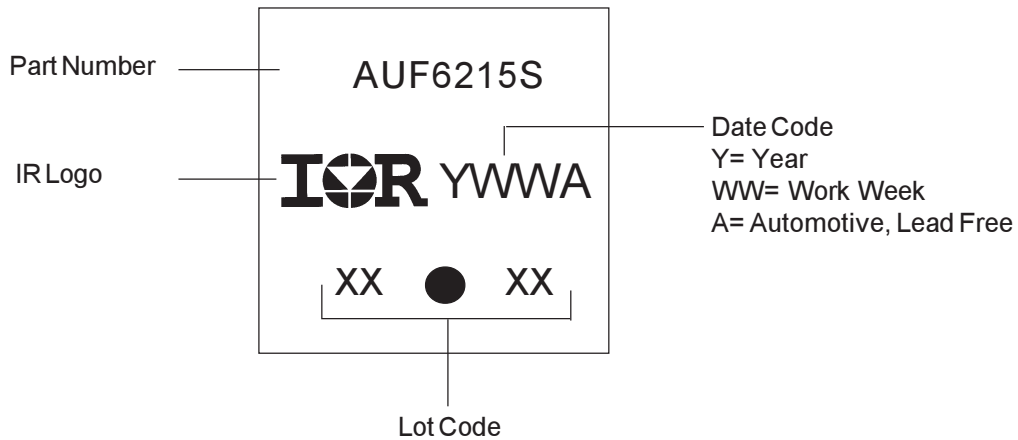
- 1.- GATE
- 2, 4.- COLLECTOR
- 3.- EMITTER

DIODES

- 1.- ANODE *
- 2, 4.- CATHODE
- 3.- ANODE

* PART DEPENDENT.

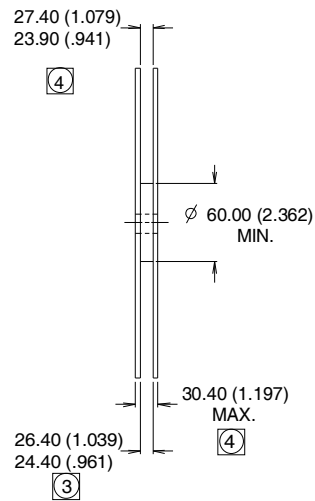
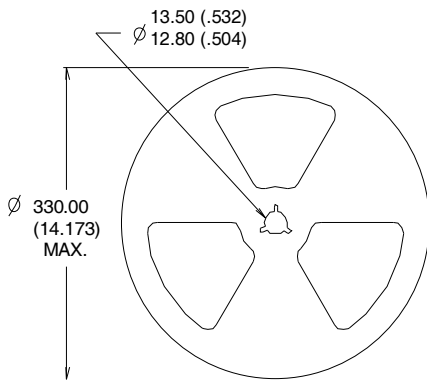
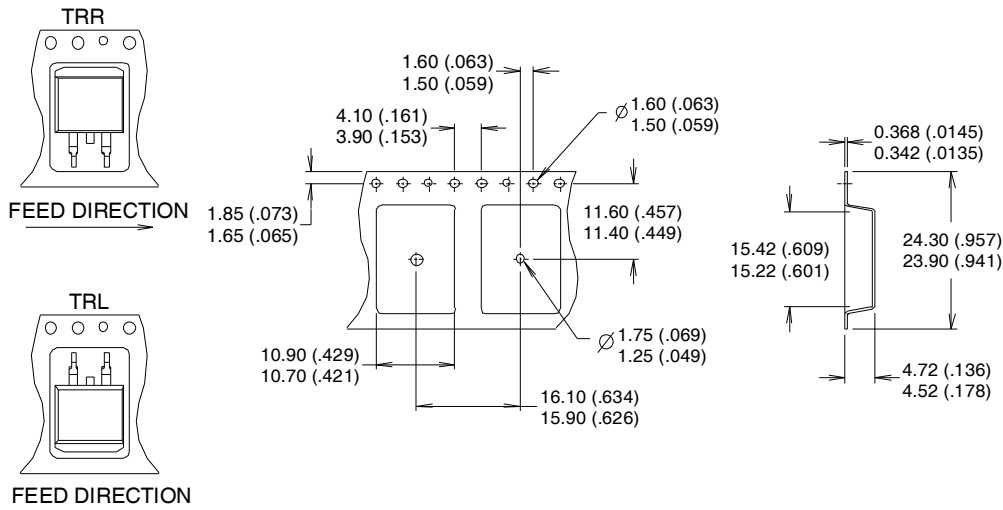
D²Pak Part Marking Information



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

D²Pak Tape & Reel Information

Dimensions are shown in millimeters (inches)



NOTES :

1. COMFORMS TO EIA-418.
2. CONTROLLING DIMENSION: MILLIMETER.
- ③ DIMENSION MEASURED @ HUB.
- ④ INCLUDES FLANGE DISTORTION @ OUTER EDGE.

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

Ordering Information

Base part number	Package Type	Standard Pack		Complete Part Number
		Form	Quantity	
AUIRF6215STRL	D2Pak	Tube	50	AUIRF6215S
		Tape and Reel Left	800	AUIRF6215STRL
		Tape and Reel Right	800	AUIRF6215STRR

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