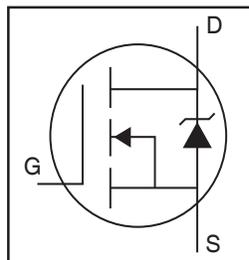


HEXFET® Power MOSFET

Features

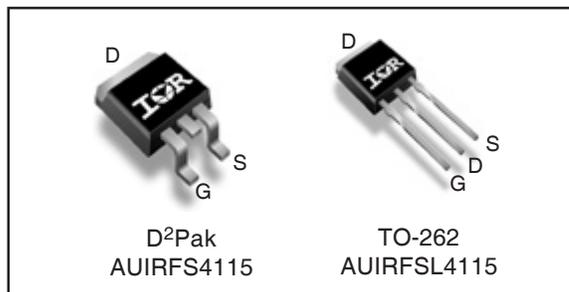
- Advanced Process Technology
- Ultra Low On-Resistance
- 175°C Operating Temperature
- Fast Switching
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free, RoHS Compliant
- Automotive Qualified *



V_{DSS}		150V
$R_{DS(on)}$	typ.	10.3mΩ
	max.	12.1mΩ
I_D		99A

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	
AUIRFS4115	D2-Pak	Tube	50	AUIRFS4115
		Tape and Reel Left	800	AUIRFS4115TRL
AUIRFSL4115	TO-262	Tube	50	AUIRFSL4115

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
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	99	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	70	
I_{DM}	Pulsed Drain Current ①	396	
$P_D @ T_C = 25^\circ C$	Maximum Power Dissipation	375	W
	Linear Derating Factor	2.5	W/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
dv/dt	Peak Diode Recovery ③	18	V/ns
E_{AS} (Thermally limited)	Single Pulse Avalanche Energy ②	230	mJ
T_J T_{STG}	Operating Junction and Storage Temperature Range	-55 to + 175	°C
	Soldering Temperature, for 10 seconds (1.6mm from case)	300	

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case ④⑤	—	0.4	°C/W
$R_{\theta JA}$	Junction-to-Ambient ⑥	—	40	

HEXFET® is a registered trademark of International Rectifier.

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

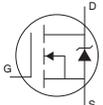
Static Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	150	—	—	V	V _{GS} = 0V, I _D = 250μA
ΔV _{(BR)DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.18	—	V/°C	Reference to 25°C, I _D = 3.5mA ^①
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	10.3	12.1	mΩ	V _{GS} = 10V, I _D = 62A ^④
V _{GS(th)}	Gate Threshold Voltage	3.0	—	5.0	V	V _{DS} = V _{GS} , I _D = 250μA
g _{fs}	Forward Transconductance	97	—	—	S	V _{DS} = 50V, I _D = 62A
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°C
I _{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	V _{GS} = 20V
	Gate-to-Source Reverse Leakage	—	—	-100		V _{GS} = -20V
R _G	Internal Gate Resistance	—	2.3	—	Ω	

Dynamic Electrical Characteristics @ T_J = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q _g	Total Gate Charge	—	77	120	nC	I _D = 62A
Q _{gs}	Gate-to-Source Charge	—	28	—		V _{DS} = 75V
Q _{gd}	Gate-to-Drain ("Miller") Charge	—	26	—		V _{GS} = 10V ^④
Q _{sync}	Total Gate Charge Sync. (Q _g - Q _{gd})	—	51	—		I _D = 62A, V _{DS} = 0V, V _{GS} = 10V
t _{d(on)}	Turn-On Delay Time	—	18	—	ns	V _{DD} = 98V
t _r	Rise Time	—	73	—		I _D = 62A
t _{d(off)}	Turn-Off Delay Time	—	41	—		R _G = 2.2Ω
t _f	Fall Time	—	39	—		V _{GS} = 10V ^④
C _{iss}	Input Capacitance	—	5270	—	pF	V _{GS} = 0V
C _{oss}	Output Capacitance	—	490	—		V _{DS} = 50V
C _{rss}	Reverse Transfer Capacitance	—	105	—		f = 1.0 MHz, See Fig. 5
C _{oss} eff. (ER)	Effective Output Capacitance (Energy Related)	—	460	—		V _{GS} = 0V, V _{DS} = 0V to 120V ^⑥ , See Fig. 11
C _{oss} eff. (TR)	Effective Output Capacitance (Time Related)	—	530	—		V _{GS} = 0V, V _{DS} = 0V to 120V ^⑤

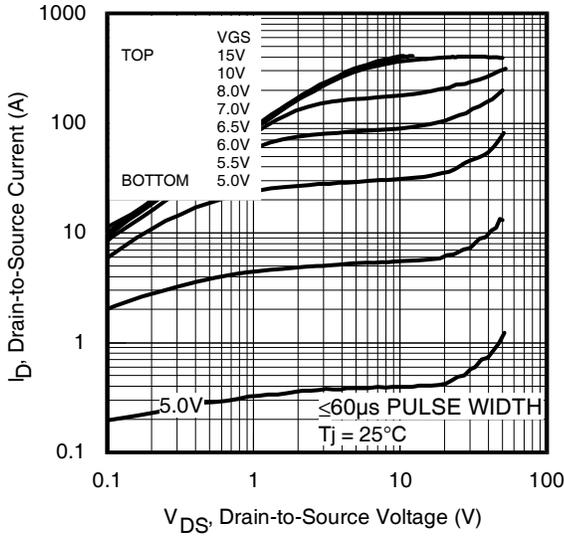
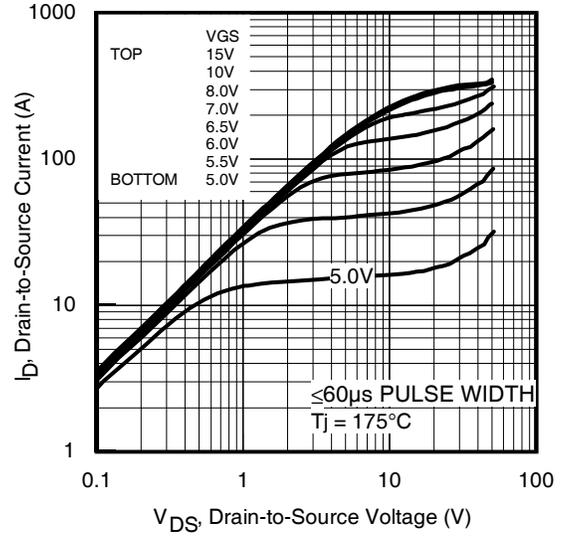
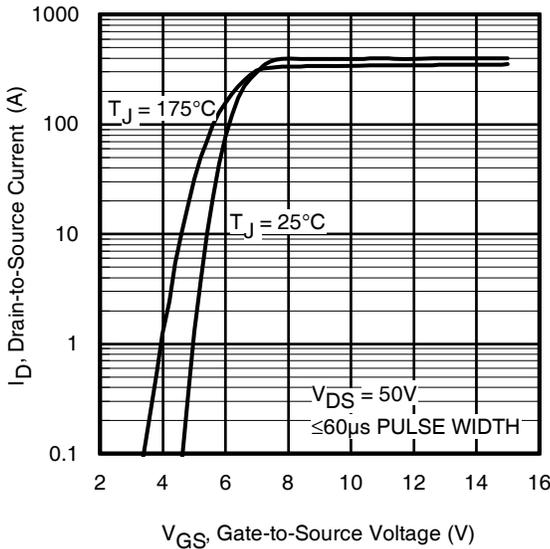
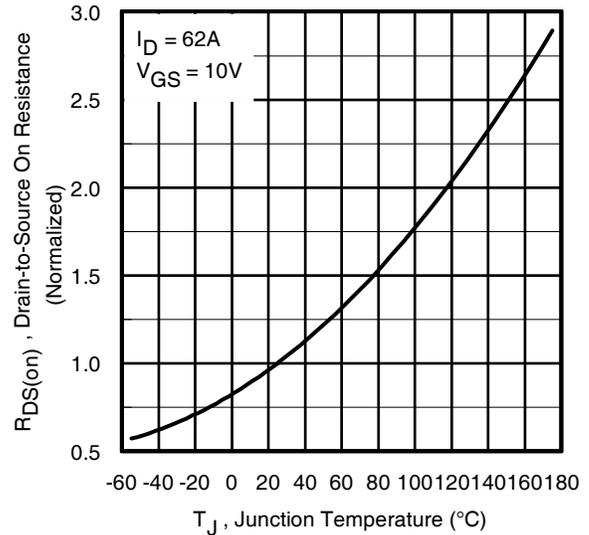
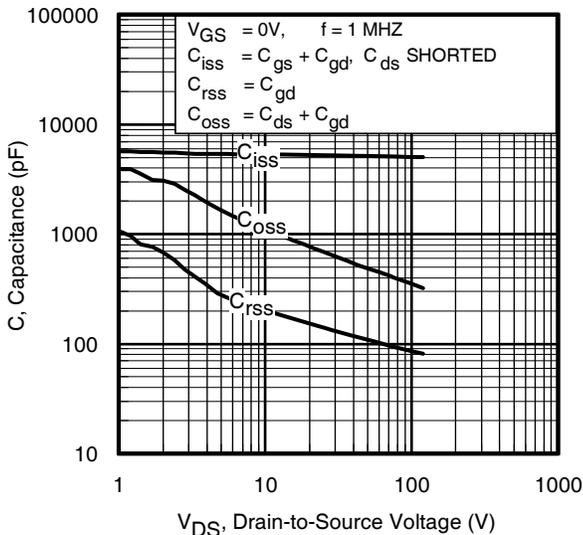
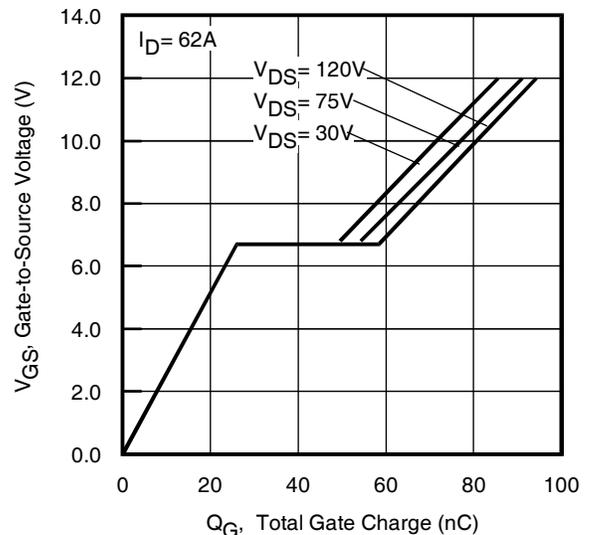
Diode Characteristics

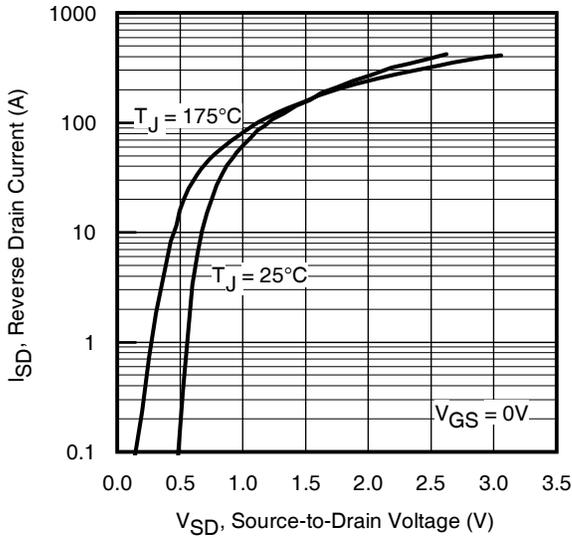
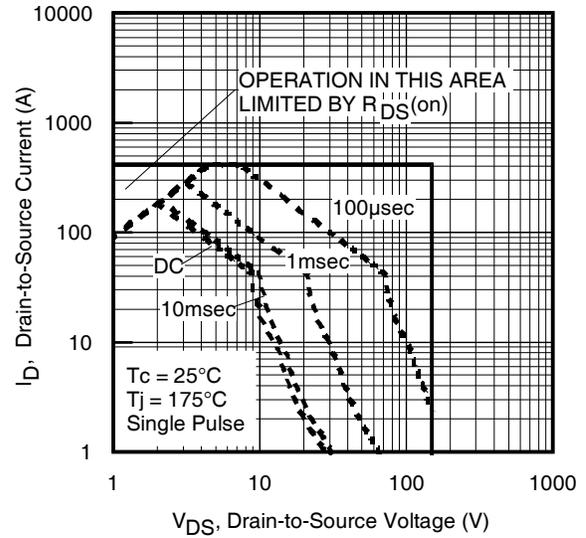
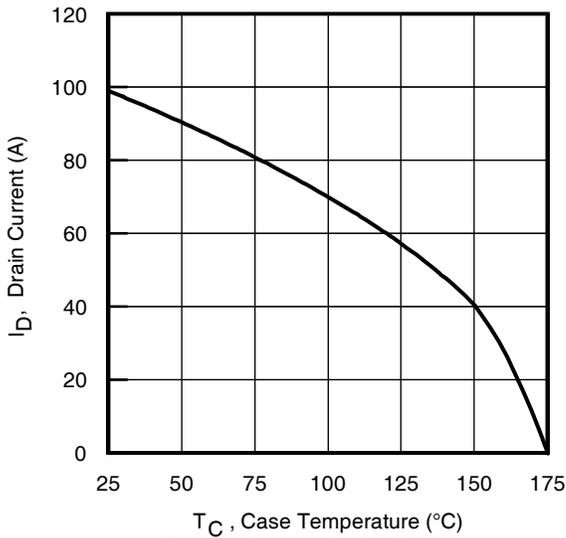
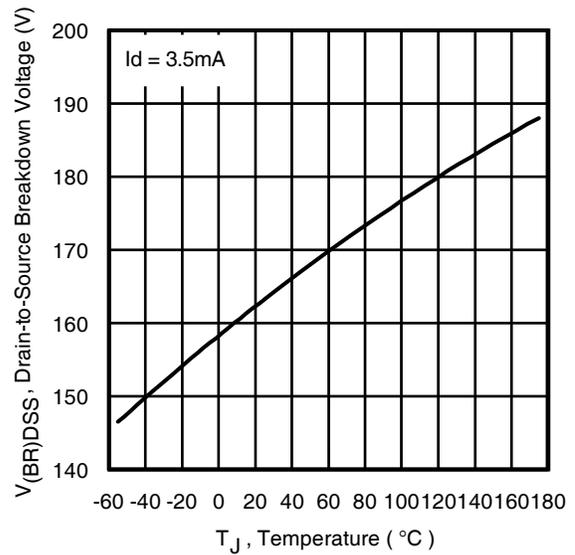
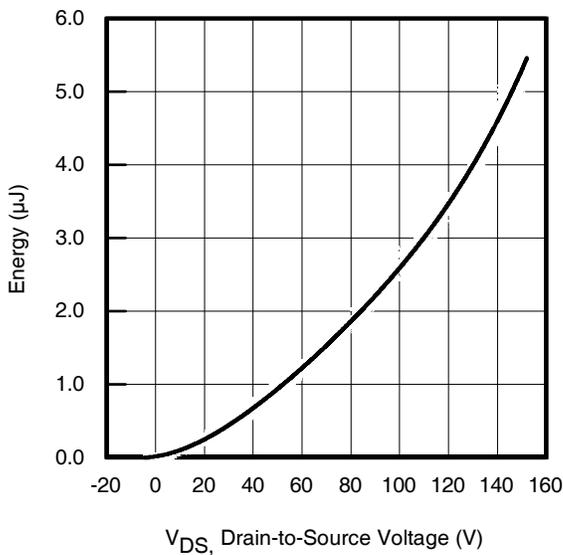
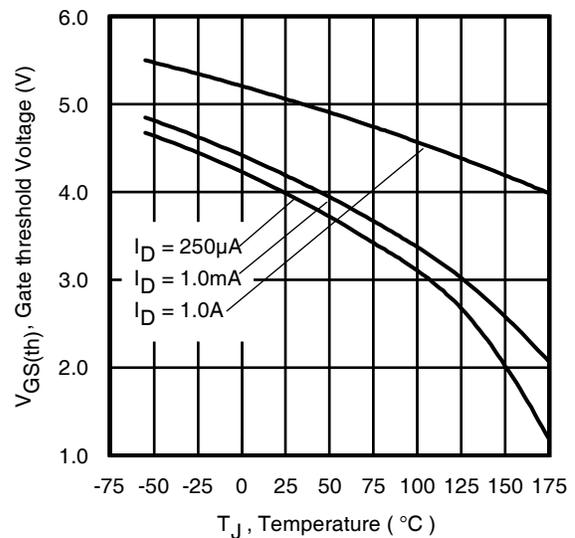
	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	99	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I _{SM}	Pulsed Source Current (Body Diode) ^①	—	—	396	A	
V _{SD}	Diode Forward Voltage	—	—	1.3	V	T _J = 25°C, I _S = 62A, V _{GS} = 0V ^④
t _{rr}	Reverse Recovery Time	—	86	—	ns	T _J = 25°C V _R = 130V,
		—	110	—		T _J = 125°C I _F = 62A
Q _{rr}	Reverse Recovery Charge	—	300	—	nC	T _J = 25°C di/dt = 100A/μs ^④
		—	450	—		T _J = 125°C
I _{RRM}	Reverse Recovery Current	—	6.5	—	A	T _J = 25°C
t _{on}	Forward Turn-On Time	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

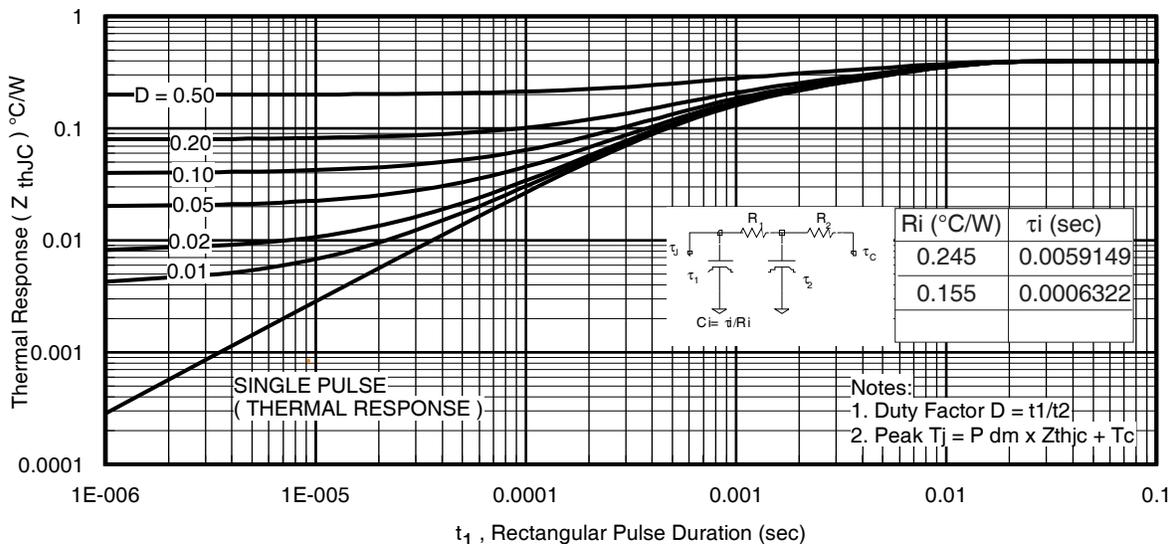
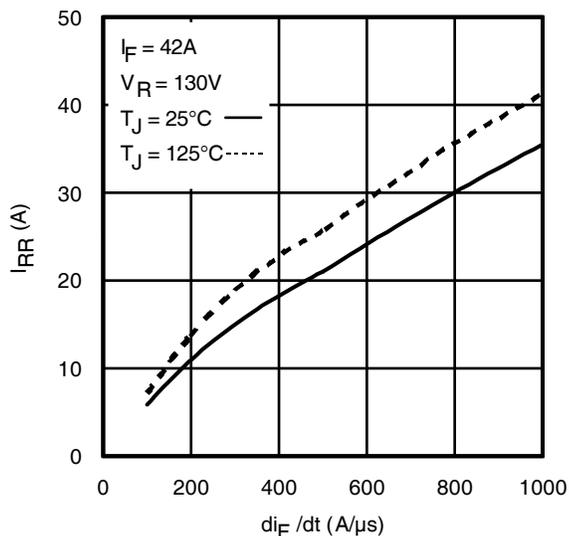
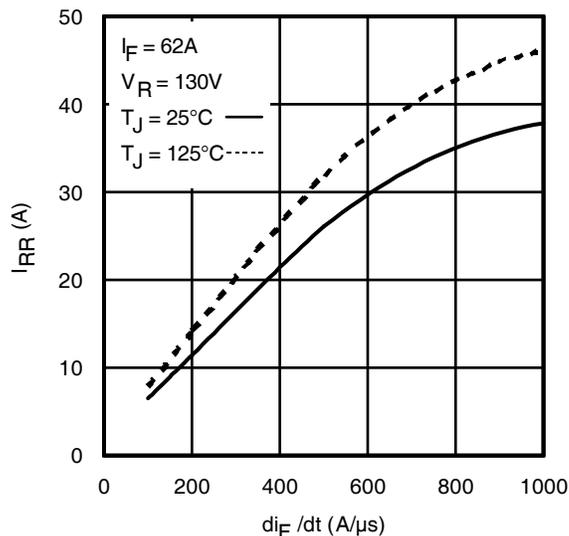
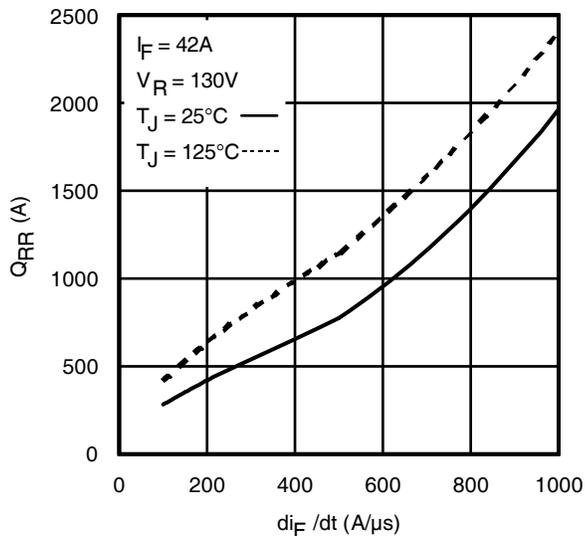
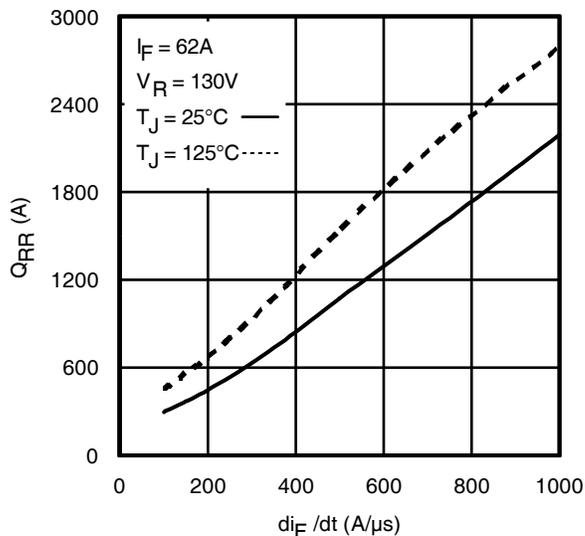
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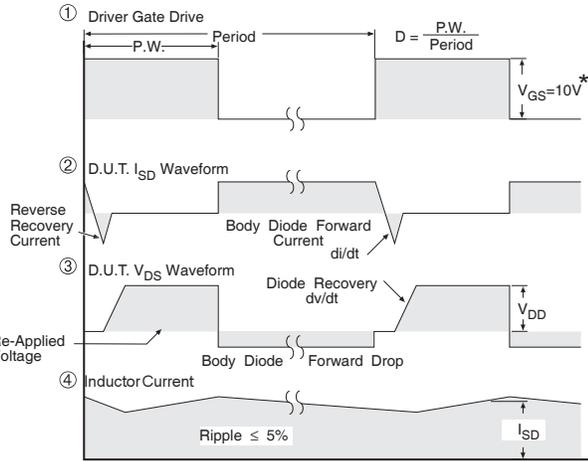
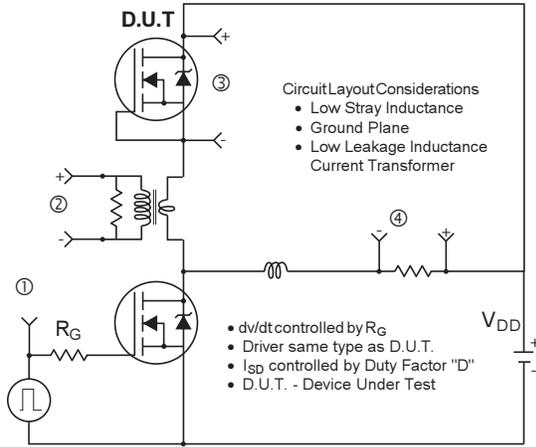
- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Recommended max EAS limit, starting T_J = 25°C, L = 0.115mH, R_G = 25Ω, I_{AS} = 63A, V_{GS} = 10V.
- ③ I_{SD} ≤ 62A, di/dt ≤ 1040A/μs, V_{DD} ≤ V_{(BR)DSS}, T_J ≤ 175°C.
- ④ Pulse width ≤ 400μs; duty cycle ≤ 2%.
- ⑤ C_{oss} 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}.

- ⑥ 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}.
- ⑦ When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.
- ⑧ R_θ is measured at T_J approximately 90°C.
- ⑨ R_{θJC} value shown is at time zero.


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. Threshold Voltage vs. Temperature


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

Fig. 14 - Typical Recovery Current vs. di_F/dt

Fig. 15 - Typical Recovery Current vs. di_F/dt

Fig. 16 - Typical Stored Charge vs. di_F/dt

Fig. 17 - Typical Stored Charge vs. di_F/dt



* $V_{GS} = 5V$ for Logic Level Devices

Fig 18. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

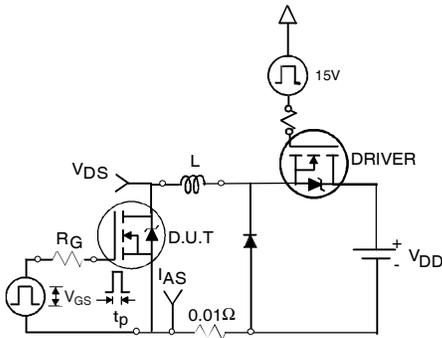


Fig 19a. Unclamped Inductive Test Circuit

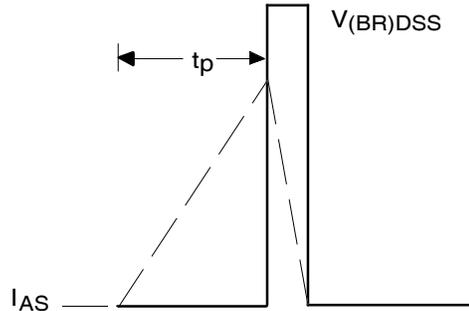


Fig 19b. Unclamped Inductive Waveforms

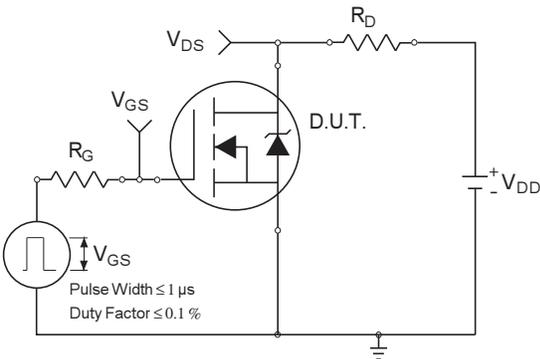


Fig 20a. Switching Time Test Circuit

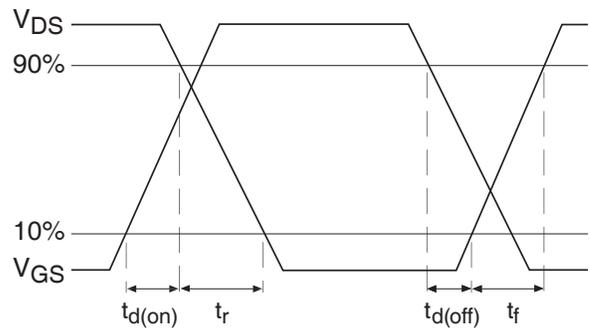


Fig 20b. Switching Time Waveforms

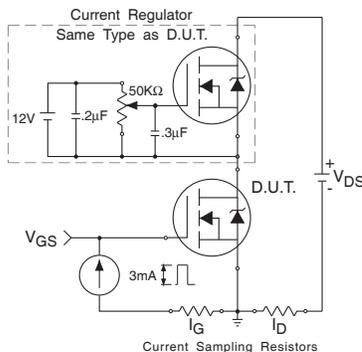


Fig 21a. Gate Charge Test Circuit

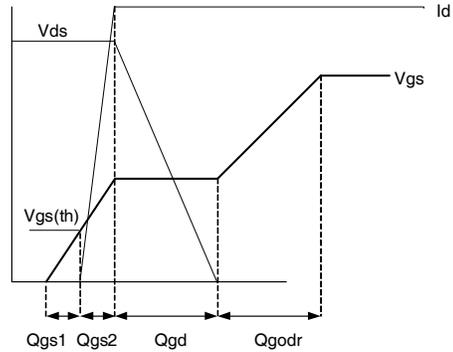
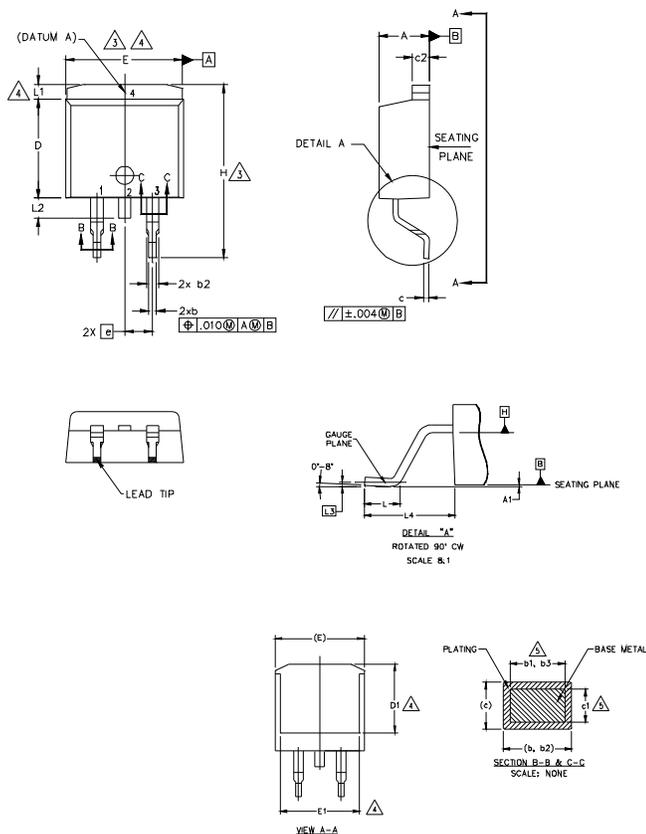


Fig 21b. Gate Charge Waveform

D²Pak (TO-263AB) 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 [0.005"] 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	5
A1	0.00	0.254	.000	.010	
b	0.51	0.99	.020	.039	
b1	0.51	0.89	.020	.035	
b2	1.14	1.78	.045	.070	
b3	1.14	1.73	.045	.068	
c	0.38	0.74	.015	.029	
c1	0.38	0.58	.015	.023	
c2	1.14	1.65	.045	.065	
D	8.38	9.65	.330	.380	
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	4
L	1.78	2.79	.070	.110	
L1	-	1.65	-	.066	
L2	1.27	1.78	-	.070	
L3	0.25 BSC		.010 BSC		
L4	4.78	5.28	.188	.208	

LEAD ASSIGNMENTS

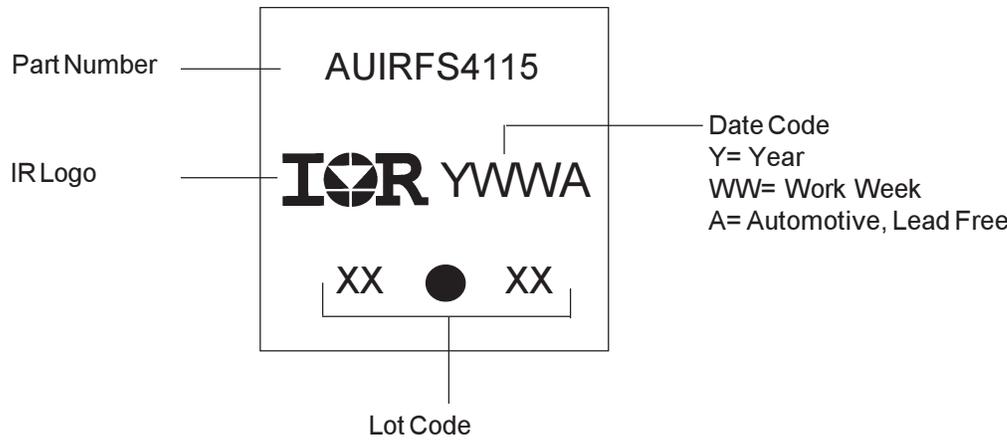
- HEXFET**
- 1.- GATE
 - 2, 4.- DRAIN
 - 3.- SOURCE

- IGBTs, CoPACK**
- 1.- GATE
 - 2, 4.- COLLECTOR
 - 3.- EMITTER

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

* PART DEPENDENT.

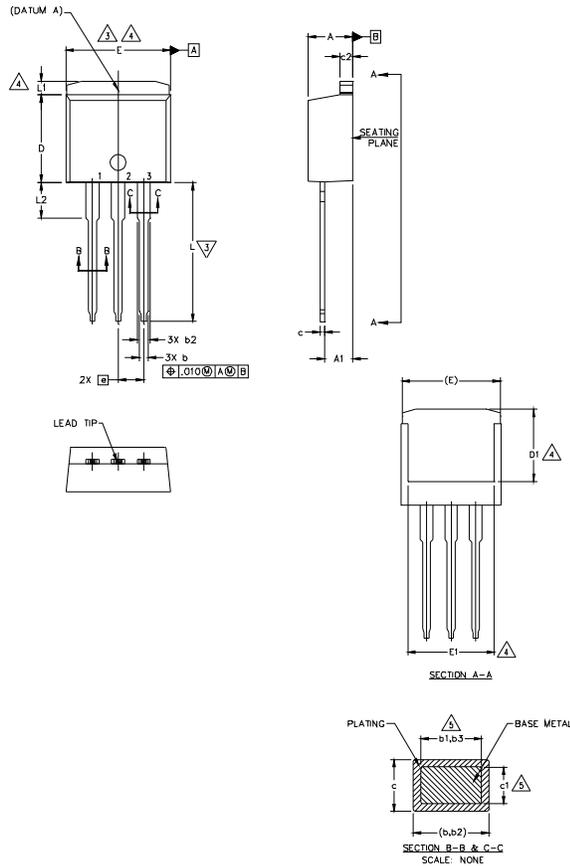
D²Pak Part Marking Information



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

TO-262 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 [0.005"] PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTMOST EXTREMES OF THE PLASTIC BODY.
4. THERMAL PAD CONTOUR OPTIONAL WITHIN DIMENSION E, L1, D1 & E1.
5. DIMENSION b1 AND c1 APPLY TO BASE METAL ONLY.
6. CONTROLLING DIMENSION: INCH.
- 7.- OUTLINE CONFORM TO JEDEC TO-262 EXCEPT A1(max.), b(min.) AND D1(min.) WHERE DIMENSIONS DERIVED THE ACTUAL PACKAGE OUTLINE.

SYMBOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	
A1	2.03	3.02	.080	.119	
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		
L	13.46	14.10	.530	.555	
L1	-	1.65	-	.065	4
L2	3.56	3.71	.140	.146	

LEAD ASSIGNMENTS

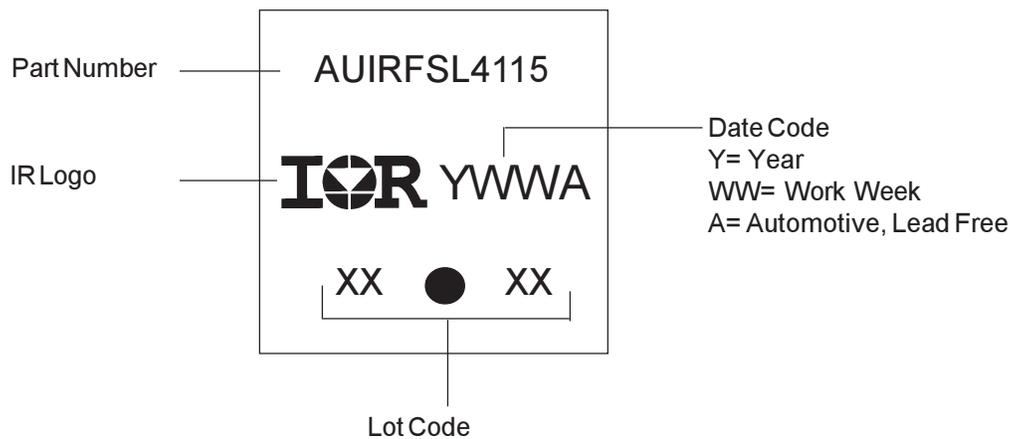
HEXFET

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

IGBTs, CoPACK

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

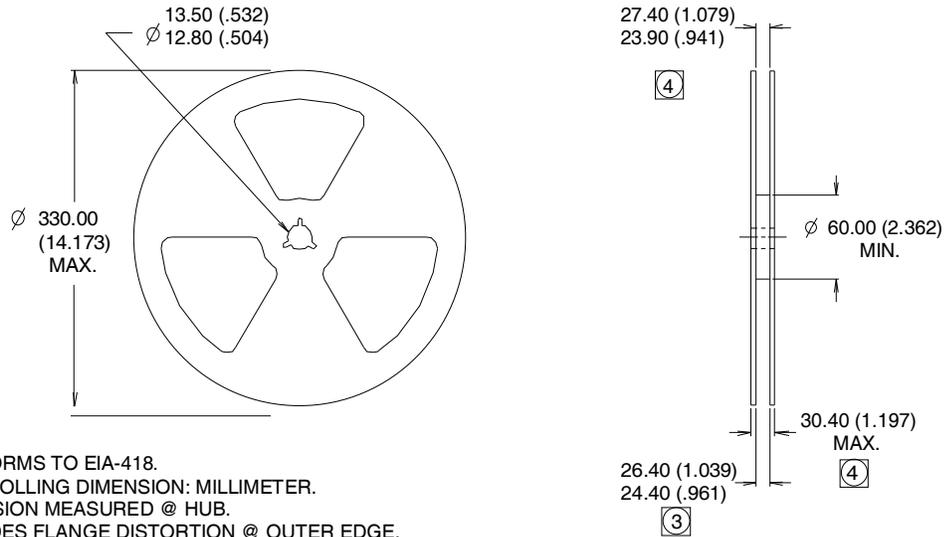
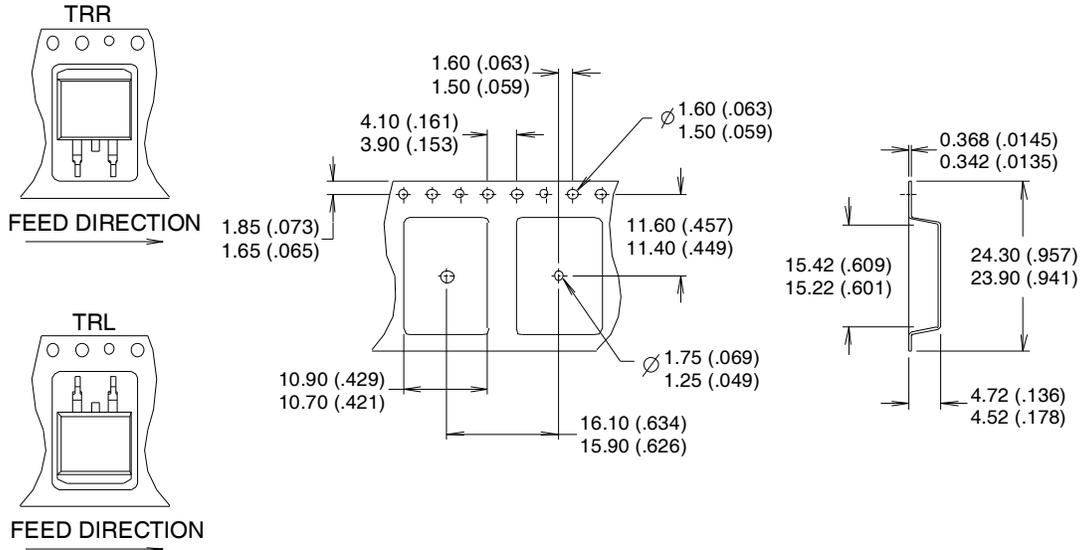
TO-262 Part Marking Information



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

D²Pak (TO-263AB) 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/>

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-D2 PAK	MSL1
		3L-TO-262	N/A
ESD	Human Body Model	Class H2(+/- 4000V) ^{†††} (per AEC-Q101-001)	
	Charged Device Model	Class C5(+/- 2000V) ^{†††} (per AEC-Q101-005)	
RoHS Compliant		Yes	

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

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

††† Highest passing voltage

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

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