

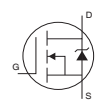
Static @ T_J = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
V _{(BR)DSS}	Drain-to-Source Breakdown Voltage	40	—	—	V	V _{GS} = 0V, I _D = 250μA
ΔV _{(BR)DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.032	—	V/°C	Reference to 25°C, I _D = 5mA ^②
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	1.3	1.6	mΩ	V _{GS} = 10V, I _D = 100A
V _{GS(th)}	Gate Threshold Voltage	2.2	3.0	3.9	V	V _{DS} = V _{GS} , I _D = 250μA
I _{DSS}	Drain-to-Source Leakage Current	—	—	1.0	μA	V _{DS} = 40V, V _{GS} = 0V
		—	—	150	μA	V _{DS} = 40V, 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	nA	V _{GS} = -20V
R _G	Internal Gate Resistance	—	2.1	—	Ω	

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

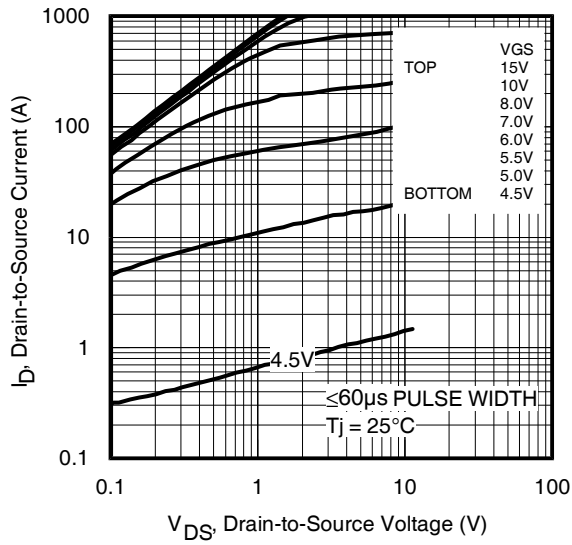
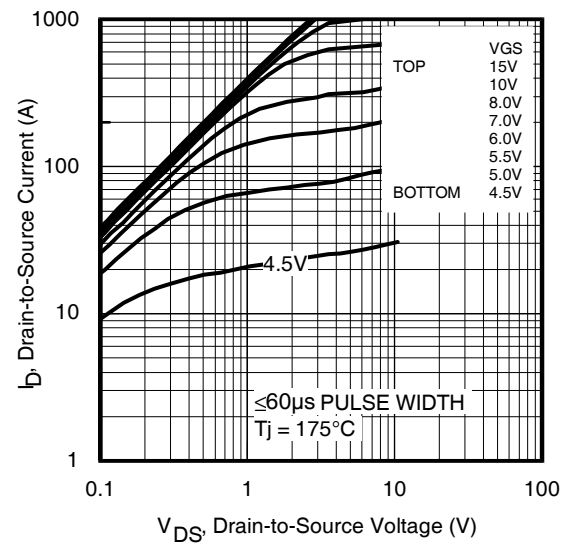
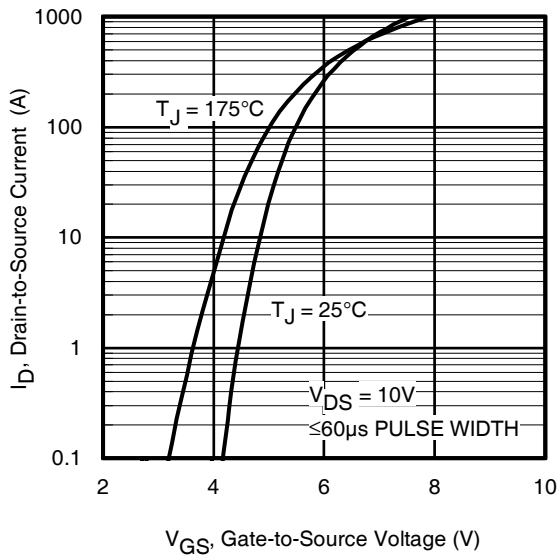
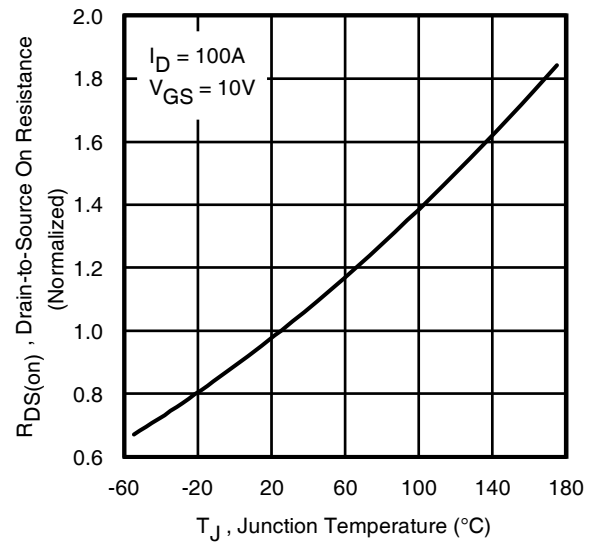
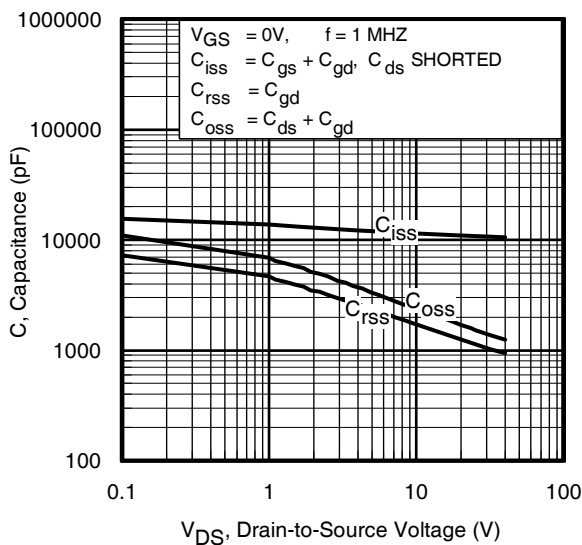
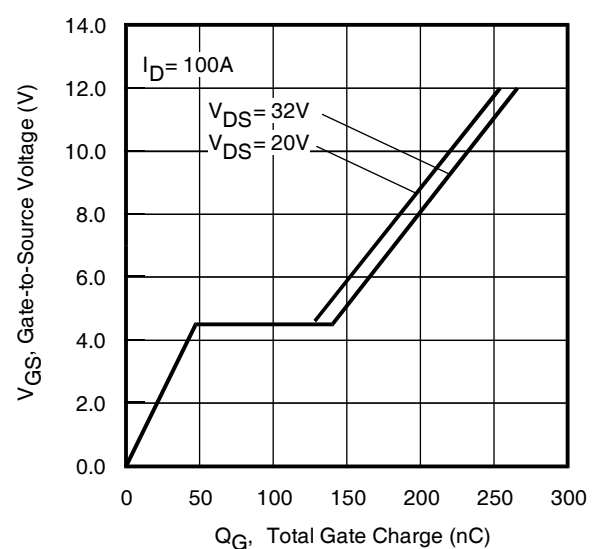
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g _{fs}	Forward Transconductance	211	—	—	S	V _{DS} = 10V, I _D = 100A
Q _g	Total Gate Charge	—	216	324	nC	I _D = 100A
Q _{gs}	Gate-to-Source Charge	—	51	—	nC	V _{DS} = 20V
Q _{gd}	Gate-to-Drain ("Miller") Charge	—	77	—	nC	V _{GS} = 10V ^⑤
Q _{sync}	Total Gate Charge Sync. (Q _g - Q _{gd})	—	139	—	nC	I _D = 100A, V _{DS} = 0V, V _{GS} = 10V
t _{d(on)}	Turn-On Delay Time	—	29	—	ns	V _{DD} = 26V
t _r	Rise Time	—	202	—	ns	I _D = 100A
t _{d(off)}	Turn-Off Delay Time	—	108	—	ns	R _G = 2.4Ω
t _f	Fall Time	—	119	—	ns	V _{GS} = 10V ^⑤
C _{iss}	Input Capacitance	—	10820	—	pF	V _{GS} = 0V
C _{oss}	Output Capacitance	—	1540	—	pF	V _{DS} = 25V
C _{rss}	Reverse Transfer Capacitance	—	1140	—	pF	f = 1.0 MHz, See Fig. 5
C _{oss} eff. (ER)	Effective Output Capacitance (Energy Related)	—	1880	—	pF	V _{GS} = 0V, V _{DS} = 0V to 32V ^⑥ See Fig. 11
C _{oss} eff. (TR)	Effective Output Capacitance (Time Related)	—	2208	—	pF	V _{GS} = 0V, V _{DS} = 0V to 32V ^⑦

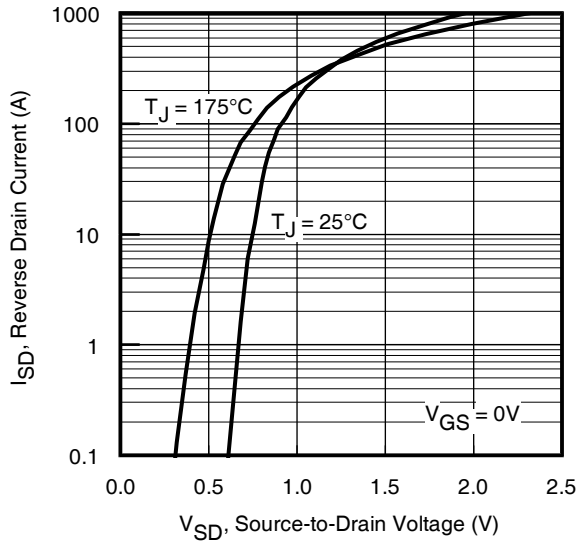
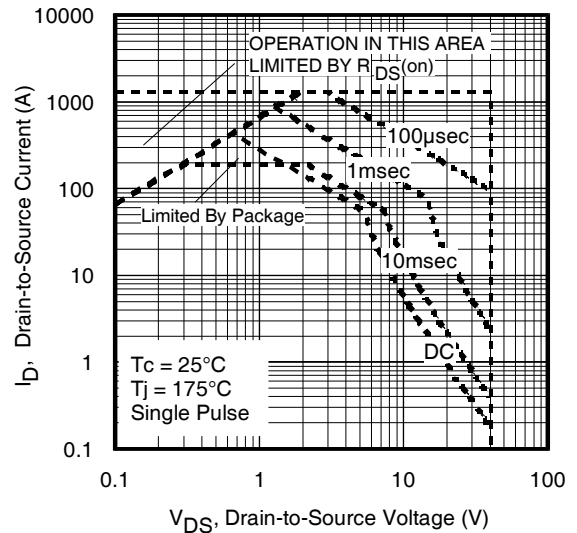
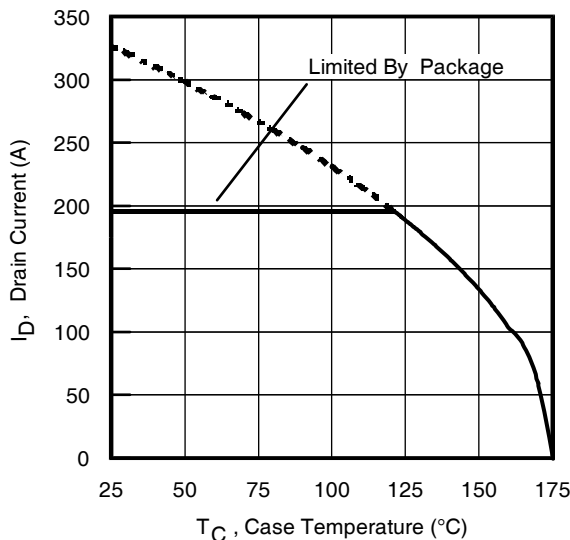
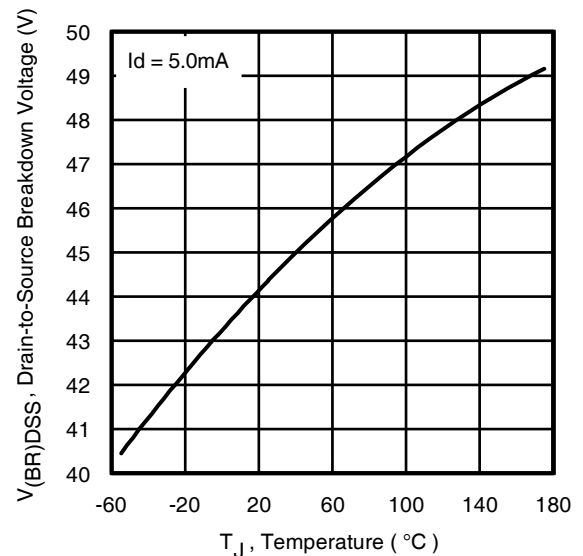
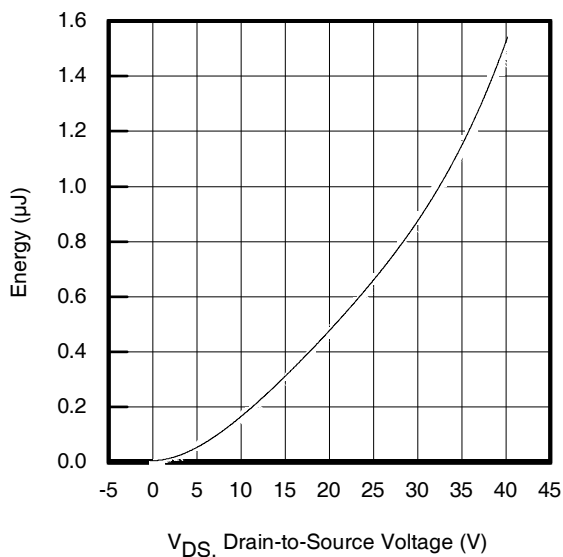
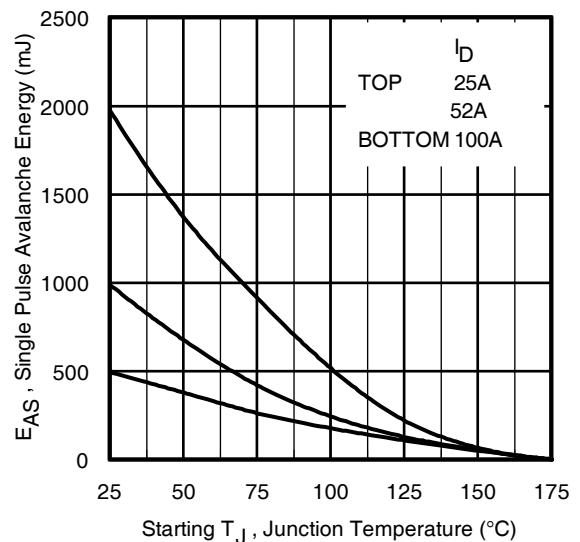
Diode Characteristics

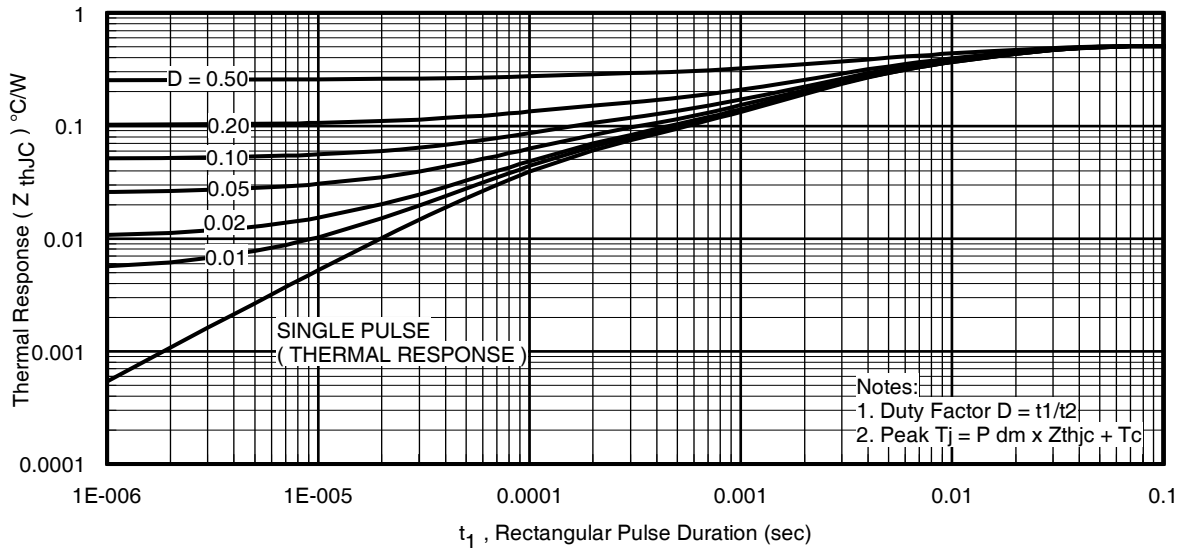
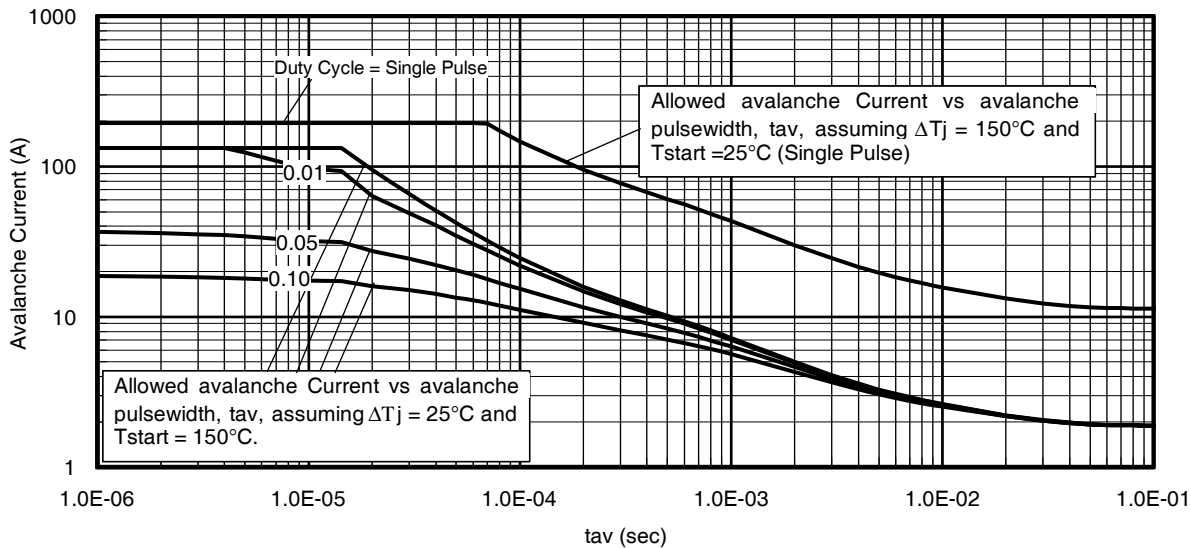
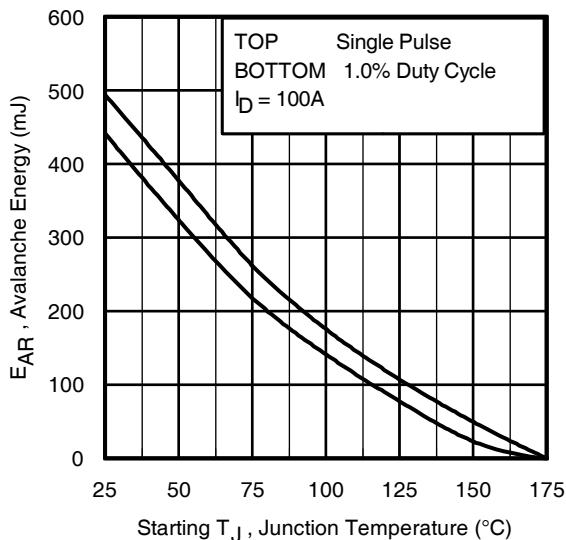
Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	317 ^①	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I _{SM}	Pulsed Source Current (Body Diode) ^①	—	—	1270 ^⑩	A	
V _{SD}	Diode Forward Voltage	—	0.9	1.3	V	T _J = 25°C, I _S = 100A, V _{GS} = 0V ^⑤
dv/dt	Peak Diode Recovery ^④	—	5.0	—	V/ns	T _J = 175°C, I _S = 100A, V _{DS} = 40V
t _{rr}	Reverse Recovery Time	—	38	—	ns	T _J = 25°C V _R = 34V, T _J = 125°C I _F = 100A
Q _{rr}	Reverse Recovery Charge	—	50	—	nC	
		—	50	—	nC	T _J = 25°C di/dt = 100A/μs
I _{RRM}	Reverse Recovery Current	—	1.9	—	A	T _J = 25°C

Notes:

- ① Calculated continuous current based on maximum allowable junction temperature. Bond wire current limit is 195A by source bonding technology. Note that current limitations arising from heating of the device leads may occur with some lead mounting arrangements. (Refer to AN-1140)
- ② Repetitive rating; pulse width limited by max. junction temperature.
- ③ Limited by T_{Jmax}, starting T_J = 25°C, L = 0.099mH, R_G = 50Ω, I_{AS} = 100A, V_{GS} = 10V. Part not recommended for use above this value.
- ④ I_{SD} ≤ 100A, di/dt ≤ 1307A/μs, V_{DD} ≤ V_{(BR)DSS}, T_J ≤ 175°C.
- ⑤ Pulse width ≤ 400μs; duty cycle ≤ 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 When mounted on 1" square PCB (FR-4 or G-10 Material). For recommended footprint and soldering techniques refer to application note #AN-994.
- ⑨ R_θ is measured at T_J approximately 90°C.
- ⑩ Pulse drain current is limited by source bonding technology.


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

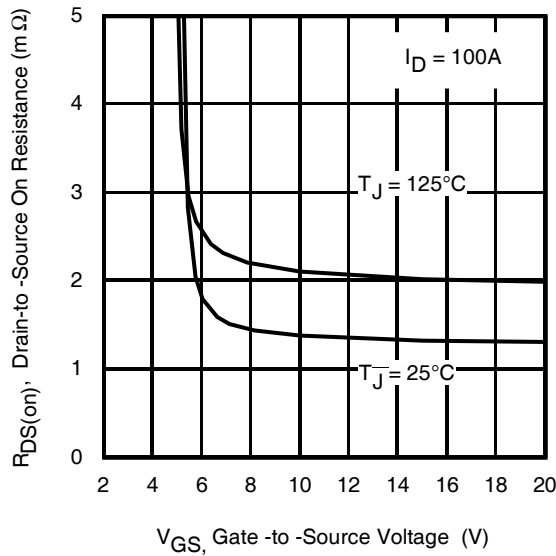
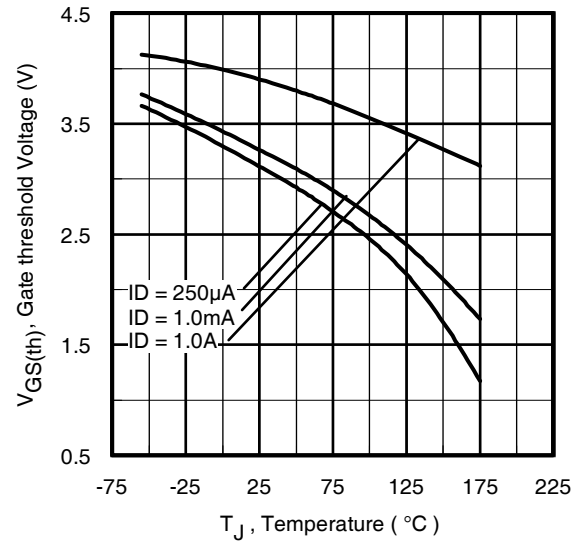
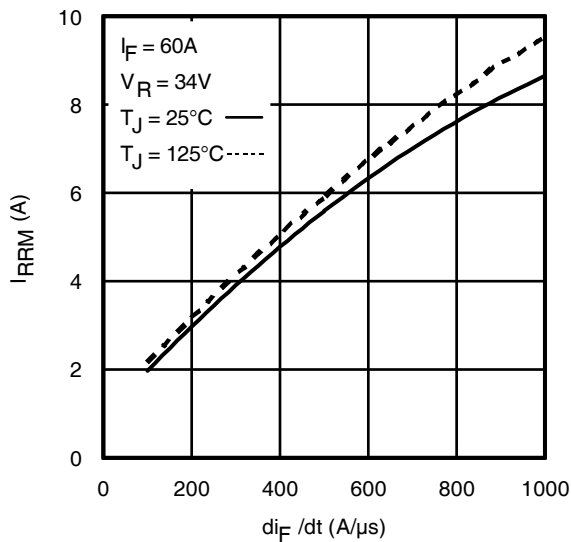
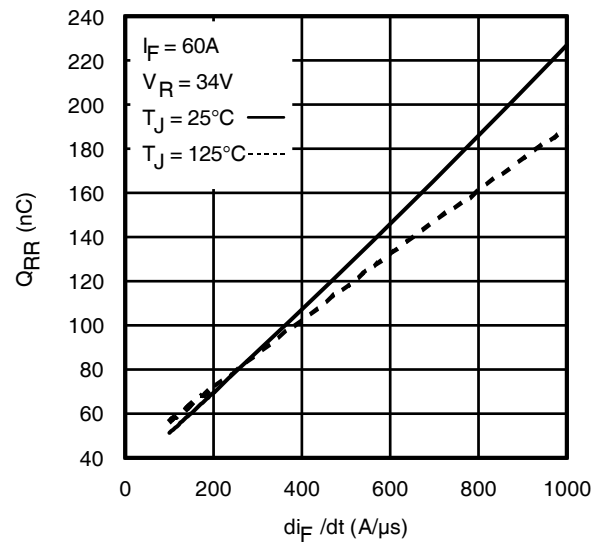
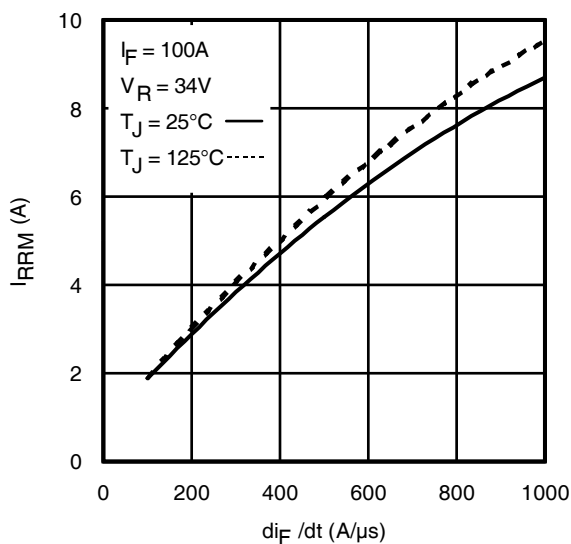
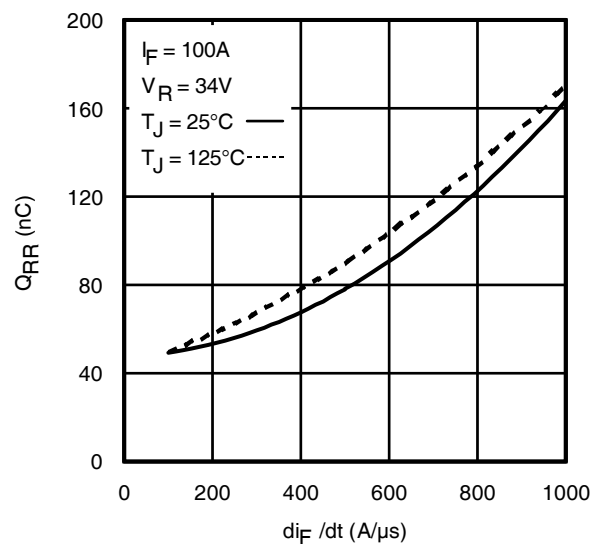
**Notes on Repetitive Avalanche Curves , Figures 14, 15
(For further info, see AN-1005 at www.irf.com)**

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 T_{jmax} is not exceeded.
3. Equation below based on circuit and waveforms shown in Figures 24a, 24b.
4. $P_{D(ave)}$ = 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)

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

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

$$E_{AS(AR)} = P_{D(ave)} \cdot t_{av}$$


Fig 16. On-Resistance vs. Gate Voltage

Fig 17. Threshold Voltage vs. Temperature

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

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

Fig. 20 - Typical Recovery Current vs. di_T/dt

Fig. 21 - Typical Stored Charge vs. di_T/dt

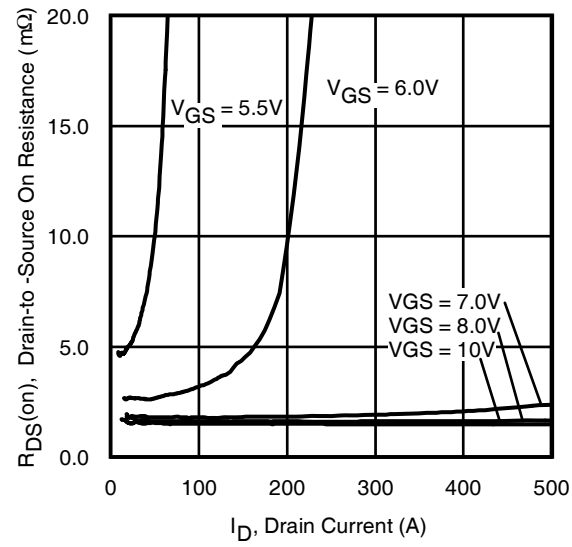
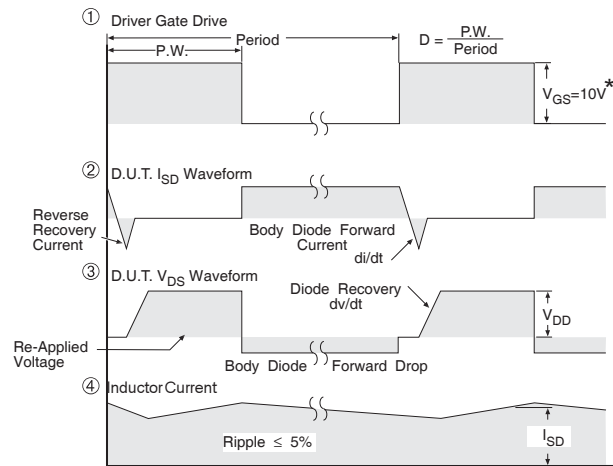
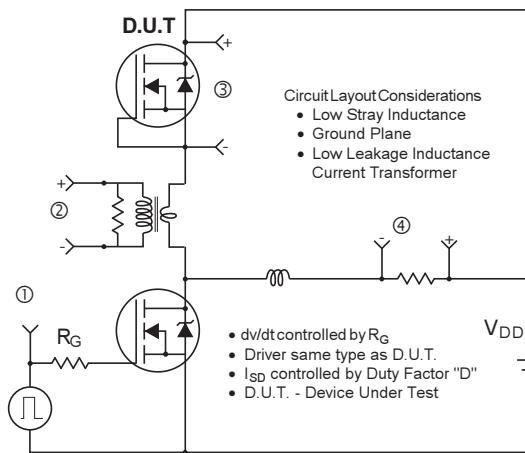


Fig 22. Typical On-Resistance vs. Drain Current



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

Fig 23. Peak Diode Recovery dv/dt Test Circuit for N-Channel HEXFET® Power MOSFETs

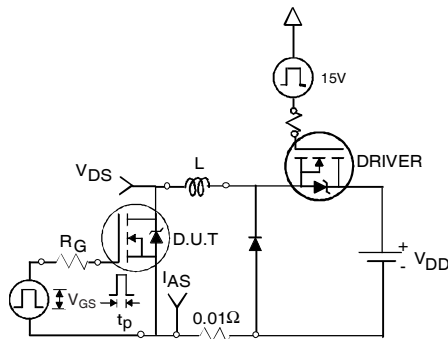


Fig 24a. Unclamped Inductive Test Circuit

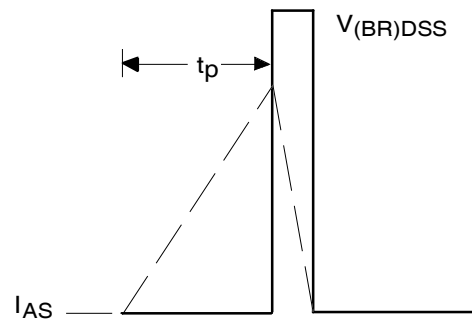


Fig 24b. Unclamped Inductive Waveforms

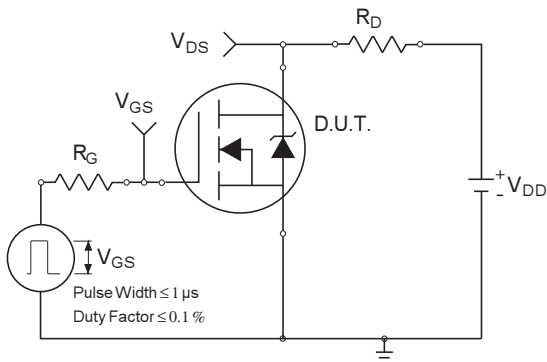


Fig 25a. Switching Time Test Circuit

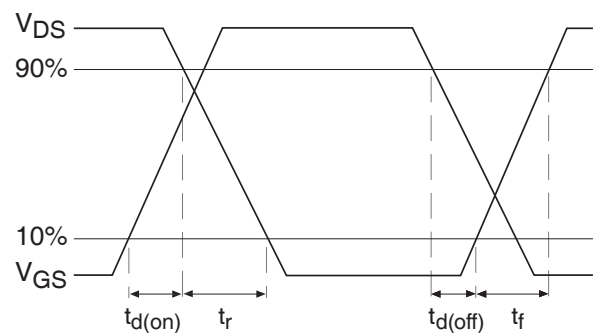


Fig 25b. Switching Time Waveforms

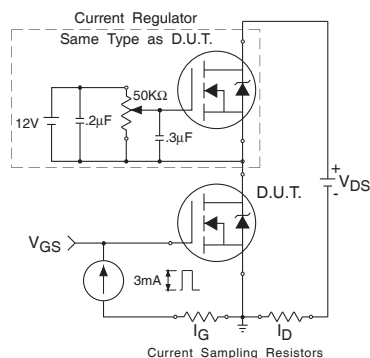


Fig 26a. Gate Charge Test Circuit

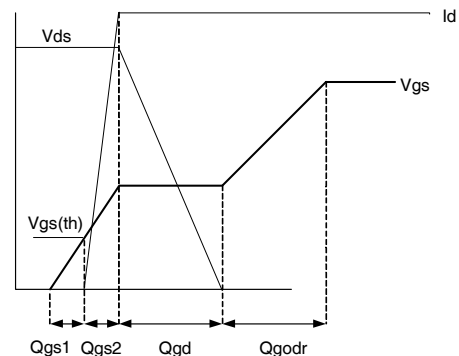
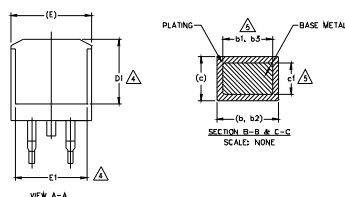
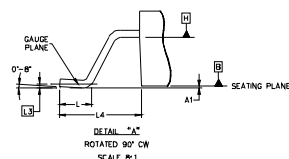
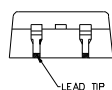
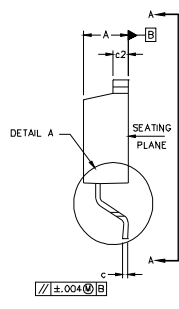
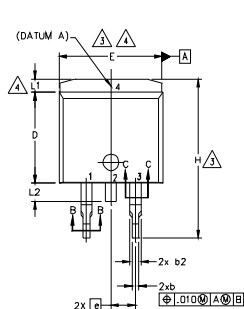


Fig 26b. Gate Charge Waveform

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 [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.

SYM- BOL	DIMENSIONS				NOTES
	MILLIMETERS		INCHES		
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	.160	.190	5
A1	0.00	0.254	.000	.010	
b1	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	5
c	0.38	0.74	.015	.029	5
c1	0.38	0.58	.015	.023	
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	4
H	14.61	15.88	.575	.625	
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

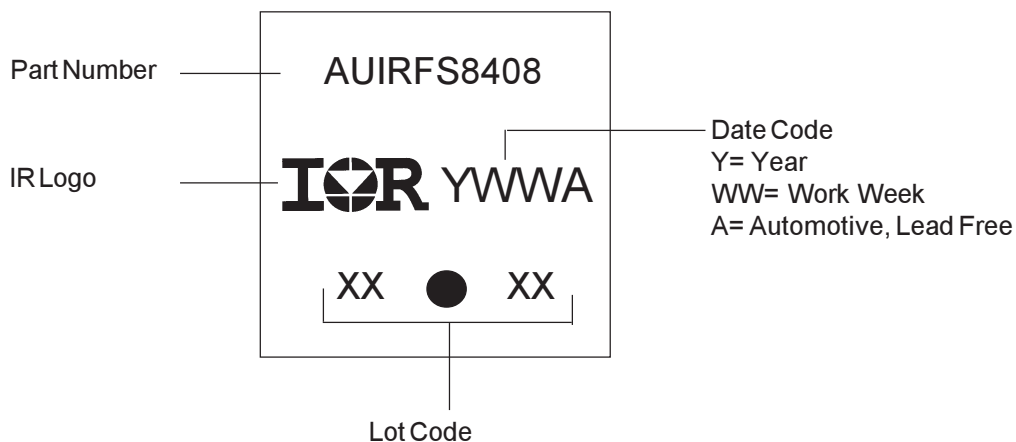
- 1.- GATE
2, 4.- COLLECTOR
3.- EMITTER

DIODES

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

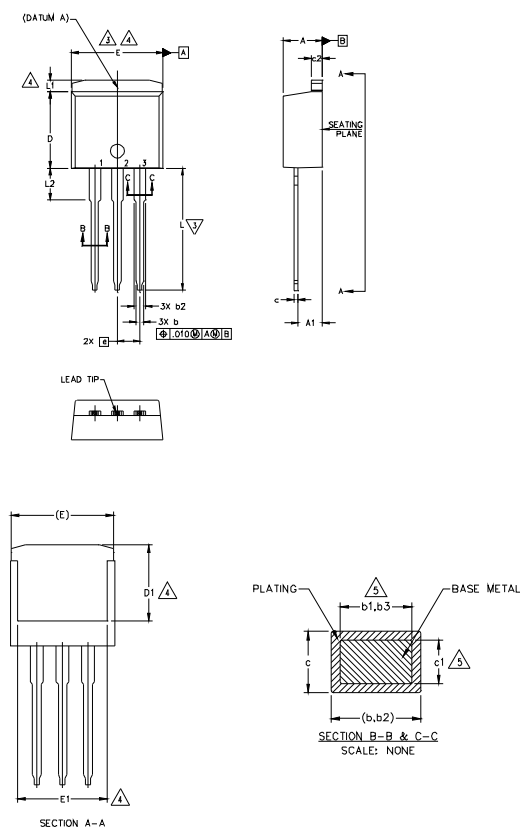
* PART DEPENDENT.

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

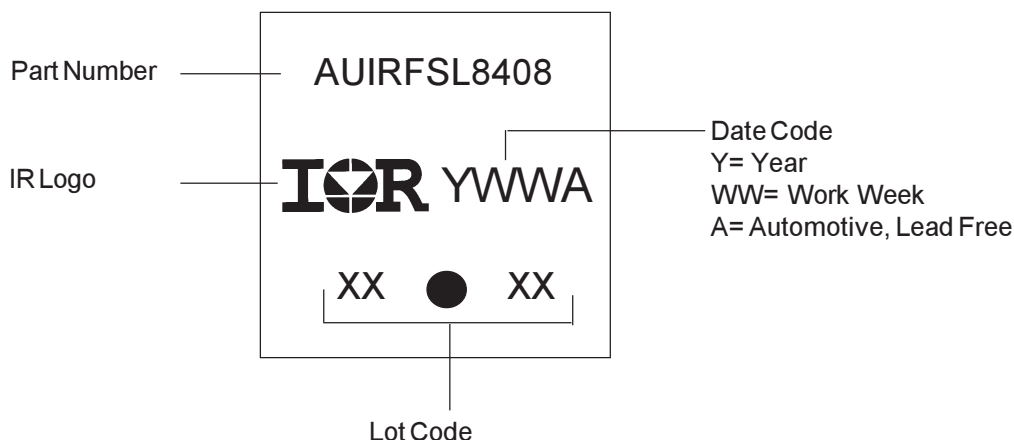
HEXFET

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

IGBTs, CoPACK

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

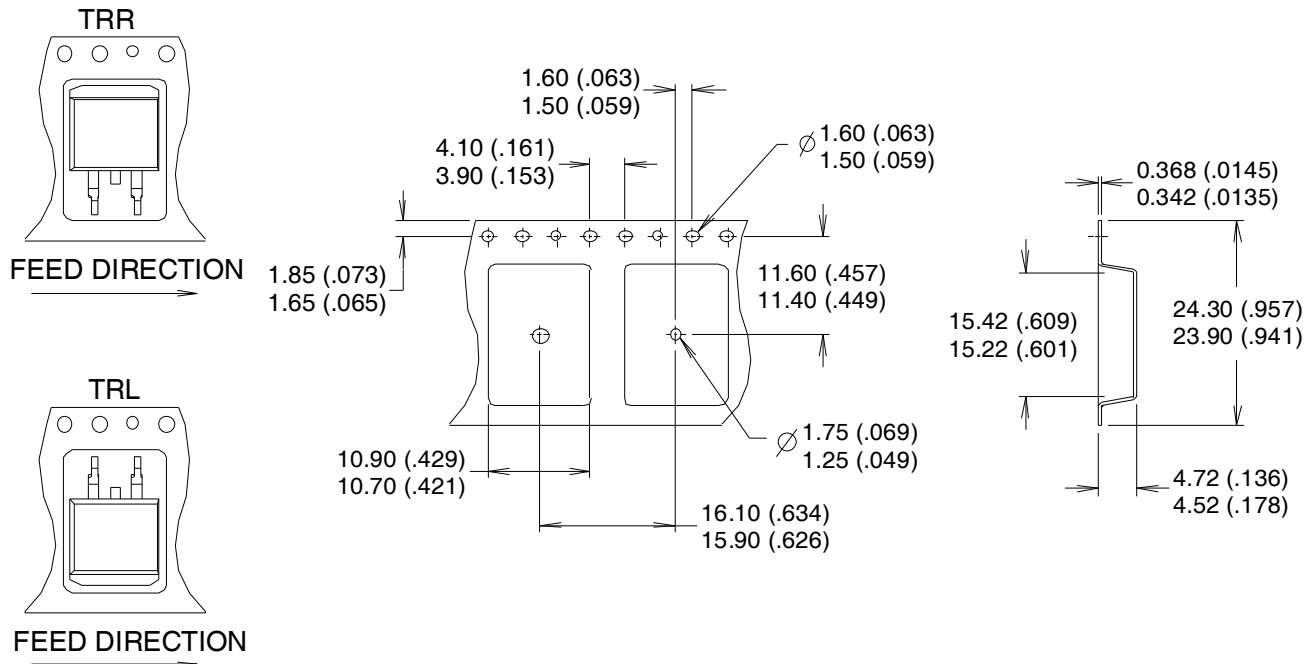
TO-262 Part Marking Information



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.

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-D ² PAK	MSL1
		3L-TO-262-PAK	N/A
ESD	Machine Model	Class M4 (+/- 600) ^{††} AEC-Q101-002	
	Human Body Model	Class H3A (+/- 6000) ^{††} AEC-Q101-001	
	Charged Device Model	Class C5 (+/- 2000) ^{††} AEC-Q101-005	
RoHS Compliant		Yes	

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

^{††} Highest passing voltage.

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

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