

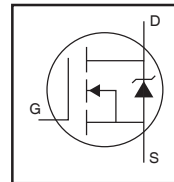
HEXFET® Power MOSFET

Features

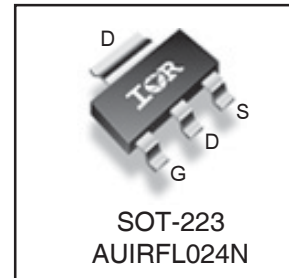
- Advanced Planar Technology
- Low On-Resistance
- Dynamic dV/dT Rating
- 150°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated
- Repetitive Avalanche Allowed up to Tjmax
- Lead-Free, RoHS Compliant
- Automotive Qualified*

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.



$V_{(BR)DSS}$		55V
$R_{DS(on)}$	max.	75mΩ
I_D		2.8A



G	D	S
Gate	Drain	Source

Base part number	Package Type	Standard Pack		Orderable Part Number
		Form	Quantity	
AUIRFL024N	SOT-223	Tube	95	AUIRFL024N
		Tape and Reel	2500	AUIRFL024NTR

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 @ $T_A = 25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V ⑥	4.0	A
I_D @ $T_A = 25^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V ⑤	2.8	
I_D @ $T_A = 70^\circ\text{C}$	Continuous Drain Current, V_{GS} @ 10V ⑤	2.3	
I_{DM}	Pulsed Drain Current ①	11.2	
P_D @ $T_A = 25^\circ\text{C}$	Power Dissipation (PCB Mount) ⑥	2.1	W
P_D @ $T_A = 25^\circ\text{C}$	Power Dissipation (PCB Mount) ⑤	1.0	
	Linear Derating Factor (PCB Mount) ⑤	8.3	mW/°C
V_{GS}	Gate-to-Source Voltage	± 20	V
E_{AS}	Single Pulse Avalanche Energy (Thermally Limited) ②	214	mJ
I_{AR}	Avalanche Current ①	2.8	A
E_{AR}	Repetitive Avalanche Energy ①③	0.1	mJ
dv/dt	Peak Diode Recovery dv/dt ③	5.0	V/ns
T_J	Operating Junction and	-55 to + 150	°C
T_{STG}	Storage Temperature Range		

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Junction-to-Ambient (PCB mount, steady state) ⑤	90	120	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB mount, steady state) ⑥	50	60	

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*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
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	55	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.056	—	V/ $^\circ\text{C}$	Reference to 25°C , $I_D = 1\text{mA}$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	75	m Ω	$V_{GS} = 10V, I_D = 2.8A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	$V_{DS} = V_{GS}, I_D = 250\mu A$
g_{fs}	Forward Transconductance	3.0	—	—	S	$V_{DS} = 25V, I_D = 1.6A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	$V_{DS} = 55V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 44V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -20V$

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
Q_g	Total Gate Charge	—	—	18.3	nC	$I_D = 1.68A$
Q_{gs}	Gate-to-Source Charge	—	—	3.0		$V_{DS} = 28V$
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	7.7		$V_{GS} = 10V$, See Fig. 6 and 9 ④
$t_{d(on)}$	Turn-On Delay Time	—	8.1	—	ns	$V_{DD} = 28V$
t_r	Rise Time	—	13.4	—		$I_D = 1.68A$
$t_{d(off)}$	Turn-Off Delay Time	—	22.2	—		$R_G = 24\Omega$
t_f	Fall Time	—	17.7	—		$R_D = 17\Omega$, See Fig. 10 ④
C_{iss}	Input Capacitance	—	400	—	pF	$V_{GS} = 0V$
C_{oss}	Output Capacitance	—	145	—		$V_{DS} = 25V$
C_{rss}	Reverse Transfer Capacitance	—	60	—		$f = 1.0\text{MHz}$, See Fig. 5

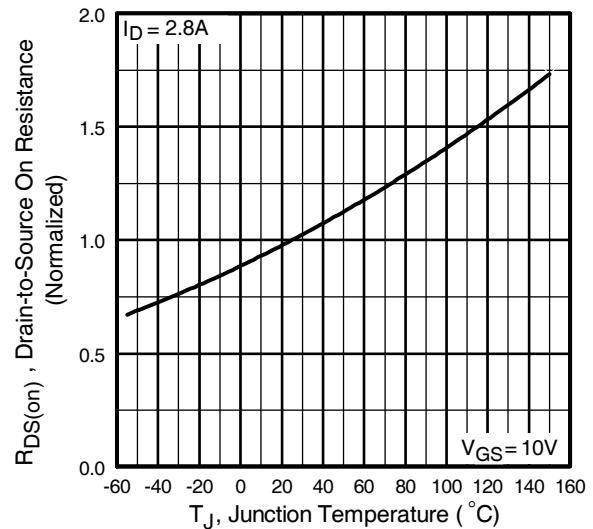
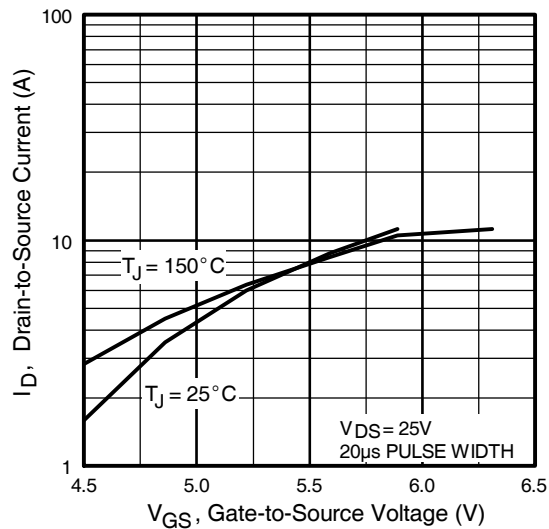
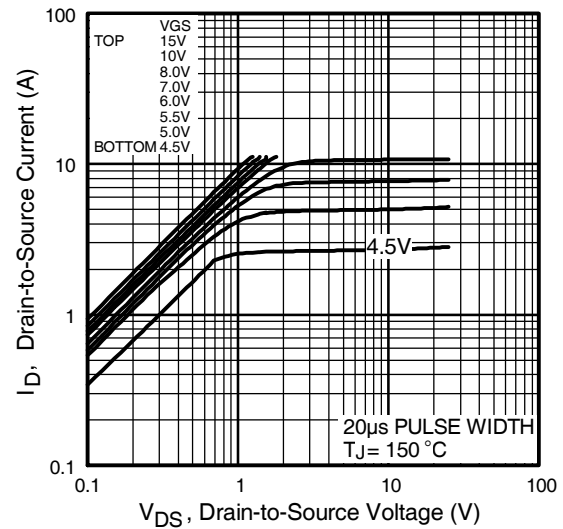
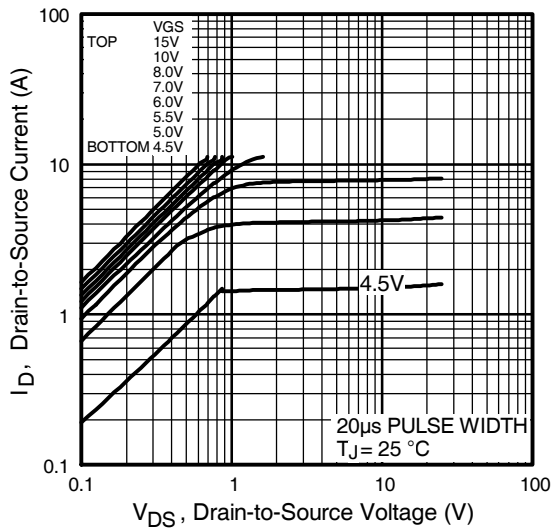
Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	2.8	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	11.2		
V_{SD}	Diode Forward Voltage	—	—	1.0	V	$T_J = 25^\circ\text{C}, I_S = 1.68A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	35	53	ns	$T_J = 25^\circ\text{C}, I_F = 1.68A$
Q_{rr}	Reverse Recovery Charge	—	50	75	nC	$di/dt = 100A/\mu s$ ④
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 $V_{DD} = 25V$, starting $T_J = 25^\circ\text{C}$, $L = 54.7\text{mH}$
 $R_G = 25\Omega$, $I_{AS} = 2.8A$. (See Figure 12)
- ③ $I_{SD} \leq 1.68A$, $di/dt \leq 155A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$,
 $T_J \leq 150^\circ\text{C}$.

- ④ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.
- ⑤ When mounted on FR-4 board using minimum recommended footprint.
- ⑥ When mounted on 1 inch square copper board, for comparison with other SMD devices.


Fig 3. Typical Transfer Characteristics
Fig 4. Normalized On-Resistance Vs. Temperature

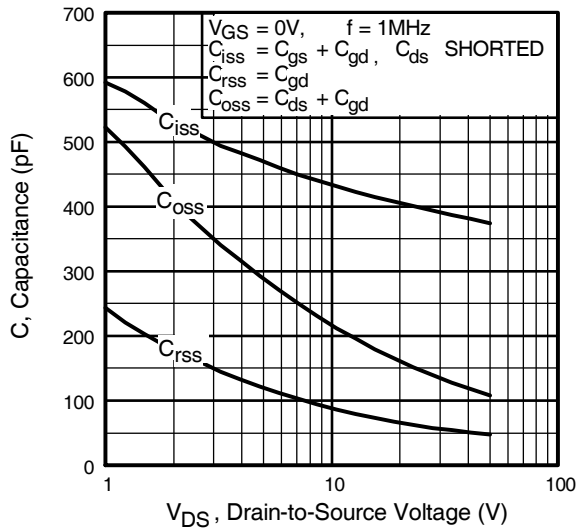


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

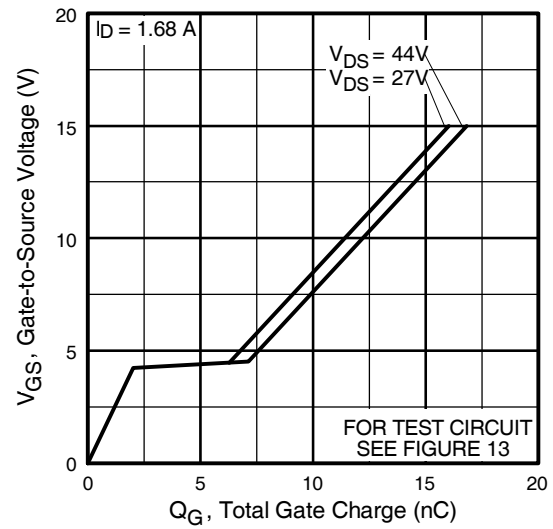


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

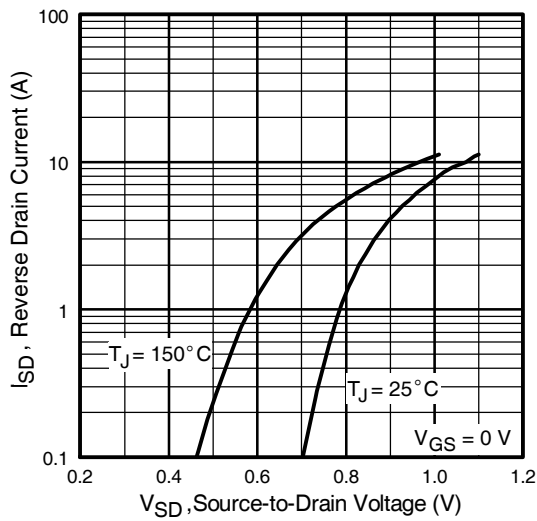


Fig 7. Typical Source-Drain Diode Forward Voltage

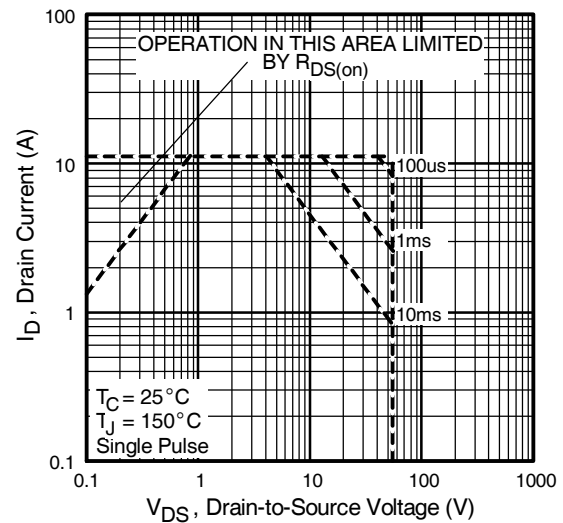
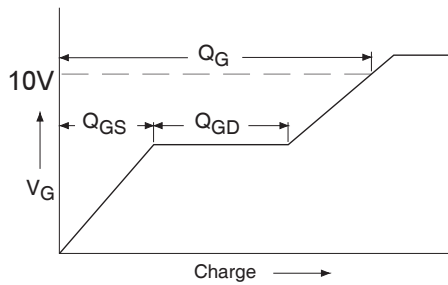
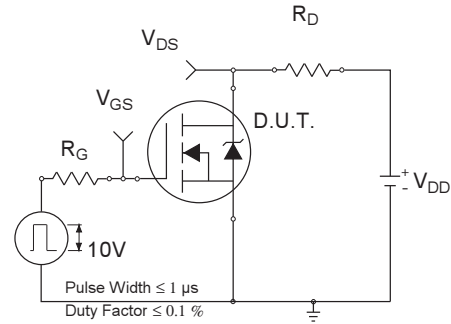
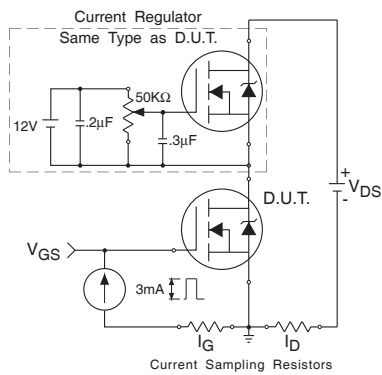
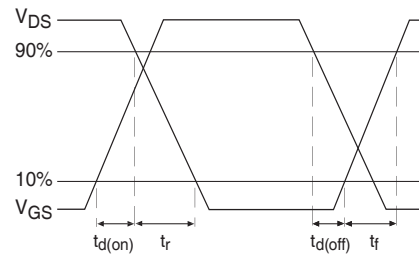
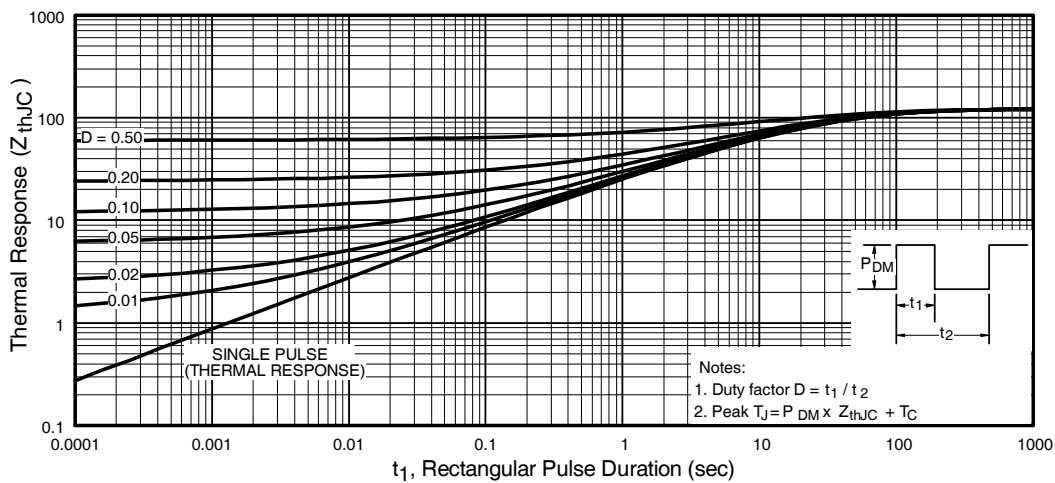


Fig 8. Maximum Safe Operating Area


Fig 9a. Basic Gate Charge Waveform

Fig 10a. Switching Time Test Circuit

Fig 9b. Gate Charge Test Circuit

Fig 10b. Switching Time Waveforms

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

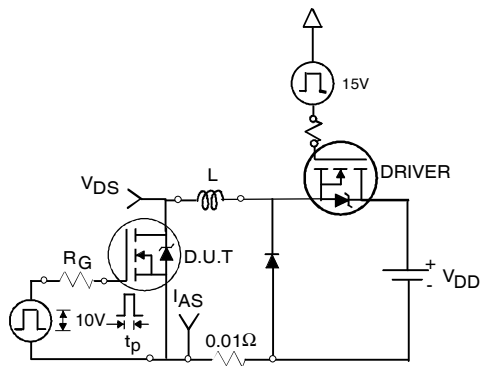


Fig 12a. Unclamped Inductive Test Circuit

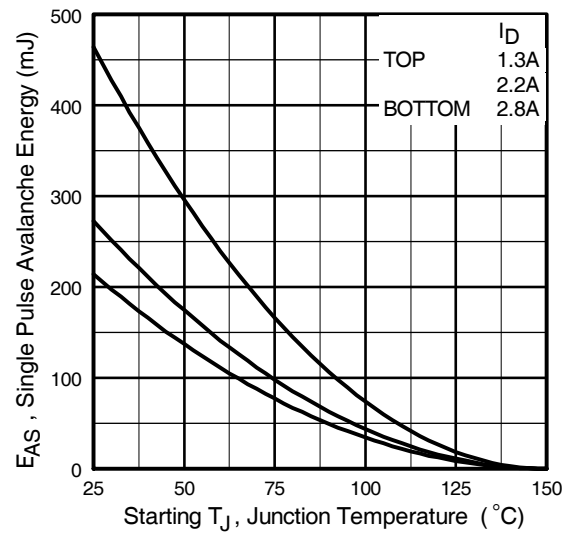


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

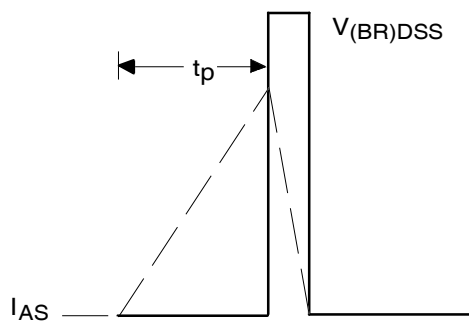
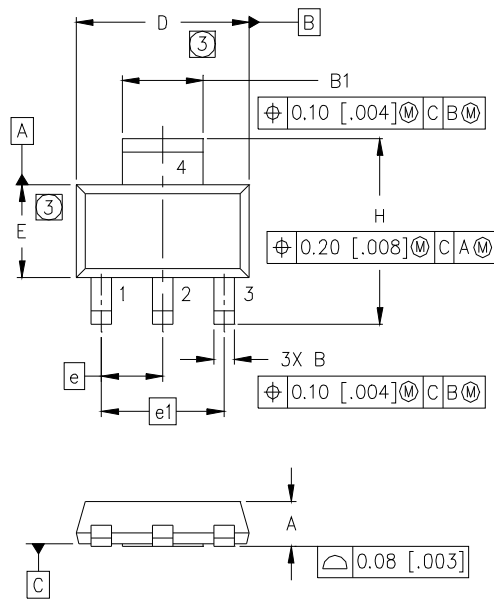


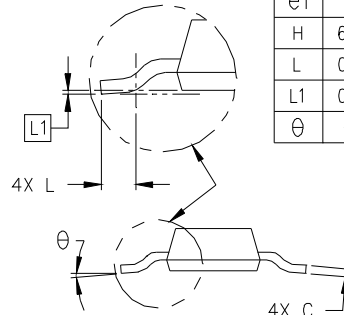
Fig 12b. Unclamped Inductive Waveforms

SOT-223 (TO-261AA) Package Outline

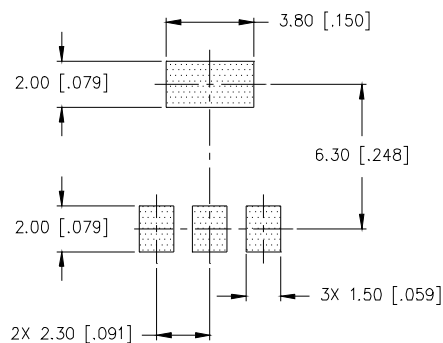
Dimensions are shown in millimeters (inches)



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	1.55	1.80	.061	.071
B	0.65	0.85	.026	.033
B1	2.95	3.15	.116	.124
C	0.25	0.35	.010	.014
D	6.30	6.70	.248	.264
E	3.30	3.70	.130	.146
e	2.30	BSC	.0905	BSC
e1	4.60	BSC	.181	BSC
H	6.71	7.29	.264	.287
L	0.91	—	.036	—
L1	0.061	BSC	.0024	BSC
θ	—	10°	—	10°



MINIMUM RECOMMENDED FOOTPRINT



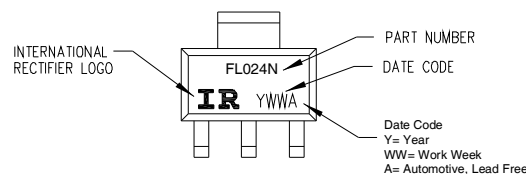
LEAD ASSIGNMENTS

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

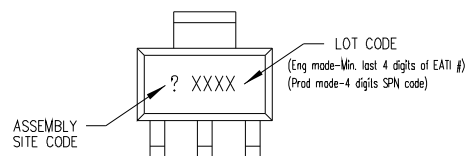
NOTES:

- DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
- CONTROLLING DIMENSION: INCH.
- DIMENSIONS DO NOT INCLUDE MOLD FLASH.
- OUTLINE CONFORMS TO JEDEC OUTLINE TO-261AA.
- DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].

SOT-223 (TO-261AA) Part Marking Information



TOP MARKING

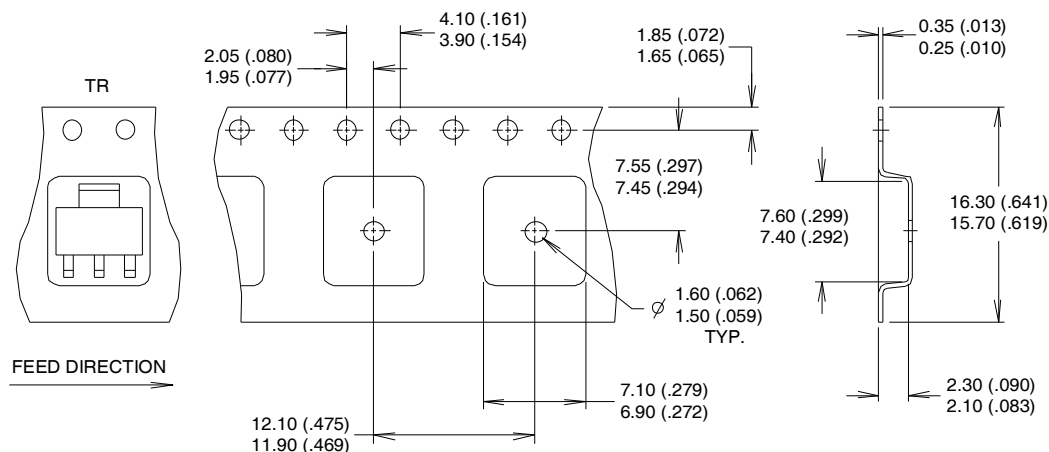


BOTTOM MARKING

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

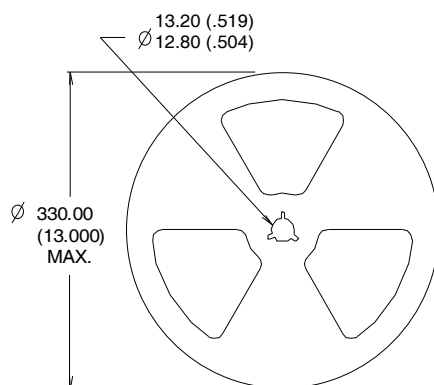
SOT-223 (TO-261AA) Tape & Reel Information

Dimensions are shown in millimeters (inches)



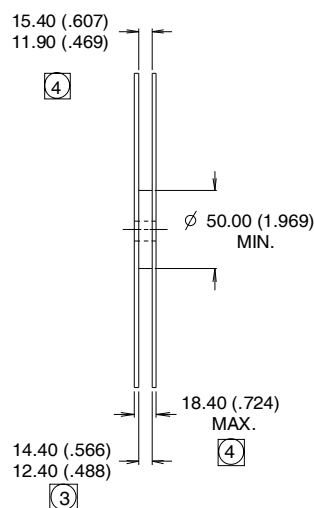
NOTES ·

1. CONTROLLING DIMENSION: MILLIMETER.
2. OUTLINE CONFORMS TO EIA-481 & EIA-541.
3. EACH $\phi 330.00$ (13.00) REEL CONTAINS 2,500 DEVICES.



NOTES :

1. OUTLINE COMFORMS TO EIA-418-1.
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		SOT-223	MSL1
ESD	Machine Model	Class M2 (+/- 150V) ^{†††} AEC-Q101-002	
	Human Body Model	Class H1A (+/- 350V) ^{†††} AEC-Q101-001	
	Charged Device Model	Class C5 (+/- 2000V) ^{†††} 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
<http://www.irf.com/technical-info/>

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Revision History

Date	Comments
3/26/2014	• Updated part marking on page 7 • Updated data sheet with new IR corporate template