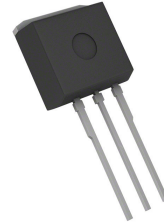


IRF1010NS

IRF1010NL

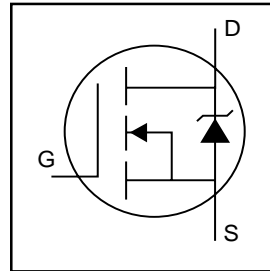
- Advanced Process Technology
- Ultra Low On-Resistance
- Dynamic dv/dt Rating
- 175°C Operating Temperature
- Fast Switching
- Fully Avalanche Rated

 D²Pak
IRF1010NS

 TO-262
IRF1010NL


Description

The D²Pak is a surface mount power package capable of accommodating die sizes up to HEX-4. It provides the highest power capability and the lowest possible on-resistance in any existing surface mount package. The D²Pak is suitable for high current applications because of its low internal connection resistance and can dissipate up to 2.0W in a typical surface mount application. The through-hole version (IRF1010NL) is available for low-profile applications.



$V_{DSS} = 55V$
$R_{DS(on)} = 11m\Omega$
$I_D = 85A \textcircled{7}$

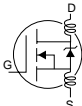
Absolute Maximum Ratings

	Parameter	Max.	Units
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V \textcircled{8}$	85 $\textcircled{7}$	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V \textcircled{8}$	60	
I_{DM}	Pulsed Drain Current $\textcircled{1} \textcircled{8}$	290	
$P_D @ T_C = 25^\circ C$	Power Dissipation	180	W
	Linear Derating Factor	1.2	W/ $^\circ C$
V_{GS}	Gate-to-Source Voltage	± 20	V
I_{AR}	Avalanche Current $\textcircled{1}$	43	A
E_{AR}	Repetitive Avalanche Energy $\textcircled{1}$	18	mJ
dv/dt	Peak Diode Recovery dv/dt $\textcircled{3} \textcircled{8}$	3.6	V/ns
T_J	Operating Junction and	-55 to + 175	$^\circ C$
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds		
	Mounting torque, 6-32 or M3 screw	10 lbf•in (1.1N•m)	

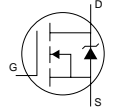
Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	0.85	$^\circ C/W$
$R_{\theta JA}$	Junction-to-Ambient (PCB Mounted, steady-state)**	—	40	

Electrical Characteristics @ T_J = 25°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 = 250μA
ΔV _{(BR)DSS} /ΔT _J	Breakdown Voltage Temp. Coefficient	—	0.058	—	V/°C	Reference to 25°C, I _D = 1mA ⑧
R _{DS(on)}	Static Drain-to-Source On-Resistance	—	—	11	mΩ	V _{GS} = 10V, I _D = 43A ④
V _{GS(th)}	Gate Threshold Voltage	2.0	—	4.0	V	V _{DS} = V _{GS} , I _D = 250μA
g _{fs}	Forward Transconductance	32	—	—	S	V _{DS} = 25V, I _D = 43A④⑧
I _{DSS}	Drain-to-Source Leakage Current	—	—	25	μA	V _{DS} = 55V, V _{GS} = 0V
		—	—	250		V _{DS} = 44V, 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
Q _g	Total Gate Charge	—	—	120	nC	I _D = 43A
Q _{gs}	Gate-to-Source Charge	—	—	19		V _{DS} = 44V
Q _{gd}	Gate-to-Drain ("Miller") Charge	—	—	41		V _{GS} = 10V, See Fig. 6 and 13 ④⑧
t _{d(on)}	Turn-On Delay Time	—	13	—	ns	V _{DD} = 28V
t _r	Rise Time	—	76	—		I _D = 43A
t _{d(off)}	Turn-Off Delay Time	—	39	—		R _G = 3.6Ω
t _f	Fall Time	—	48	—		V _{GS} = 10V, See Fig. 10 ④⑧
L _D	Internal Drain Inductance	—	4.5	—	nH	Between lead, 6mm (0.25in.) from package and center of die contact
L _S	Internal Source Inductance	—	7.5	—		
C _{iss}	Input Capacitance	—	3210	—	pF	V _{GS} = 0V
C _{oss}	Output Capacitance	—	690	—		V _{DS} = 25V
C _{rss}	Reverse Transfer Capacitance	—	140	—		f = 1.0MHz, See Fig. 5 ⑧
E _{AS}	Single Pulse Avalanche Energy②⑧	—	1030⑤	250⑥		mJ

Source-Drain Ratings and Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I _S	Continuous Source Current (Body Diode)	—	—	85⑦	A	MOSFET symbol showing the integral reverse p-n junction diode.
I _{SM}	Pulsed Source Current (Body Diode)①	—	—	290		
V _{SD}	Diode Forward Voltage	—	—	1.3	V	T _J = 25°C, I _S = 43A, V _{GS} = 0V ④
t _{rr}	Reverse Recovery Time	—	69	100	ns	T _J = 25°C, I _F = 43A
Q _{rr}	Reverse Recovery Charge	—	220	230	nC	di/dt = 100A/μs ④⑧
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 = 270μH
R_G = 25Ω, I_{AS} = 43A, V_{GS} = 10V (See Figure 12)
- ③ I_{SD} ≤ 43A, di/dt ≤ 210A/μs, V_{DD} ≤ V_{(BR)DSS},
T_J ≤ 175°C
- ④ Pulse width ≤ 400μs; duty cycle ≤ 2%.
- ⑤ This is a typical value at device destruction and represents operation outside rated limits.

- ⑥ This is a calculated value limited to T_J = 175°C .
- ⑦ Calculated continuous current based on maximum allowable junction temperature. Package limitation current is 75A.
- ⑧ Uses IRF1010N data and test conditions.

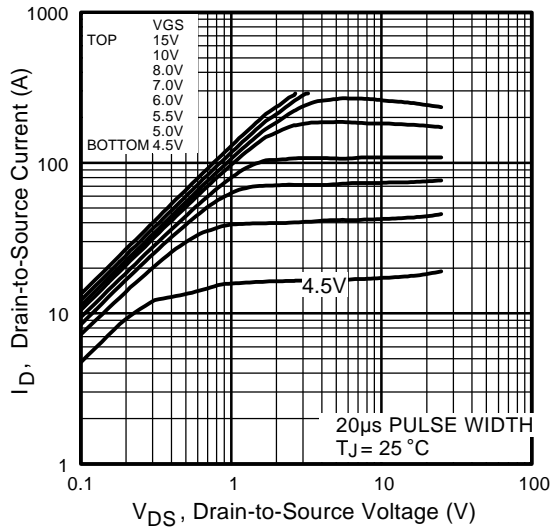


Fig 1. Typical Output Characteristics

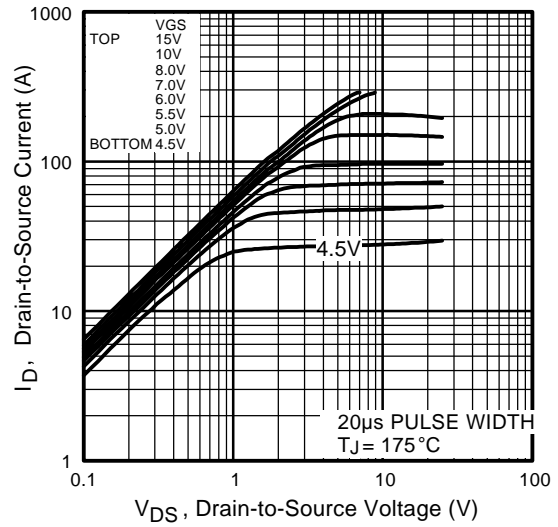


Fig 2. Typical Output Characteristics

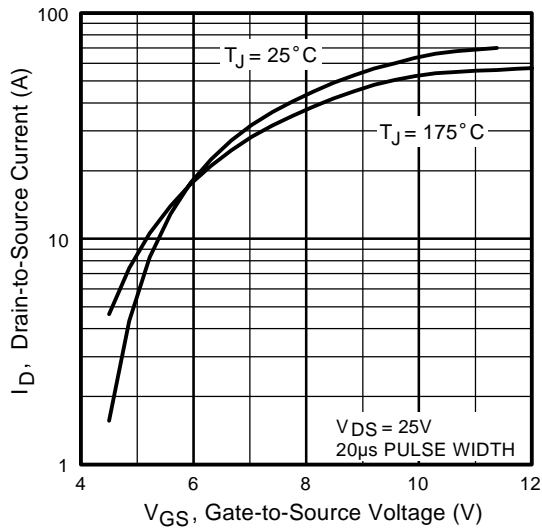


Fig 3. Typical Transfer Characteristics

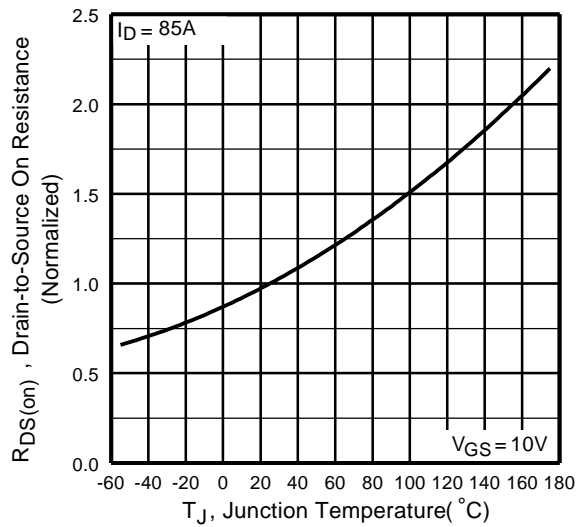


Fig 4. Normalized On-Resistance Vs. Temperature

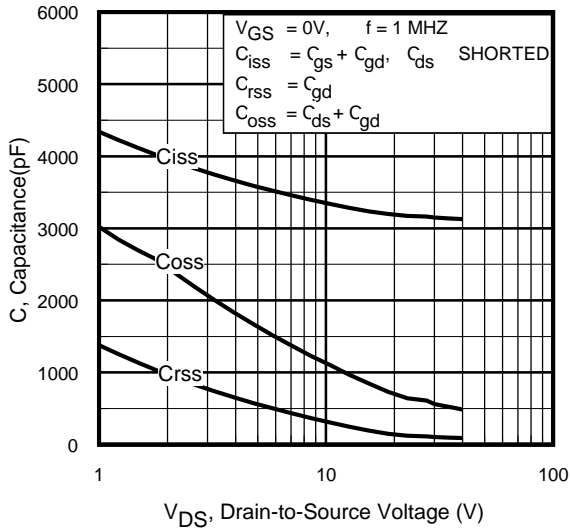


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

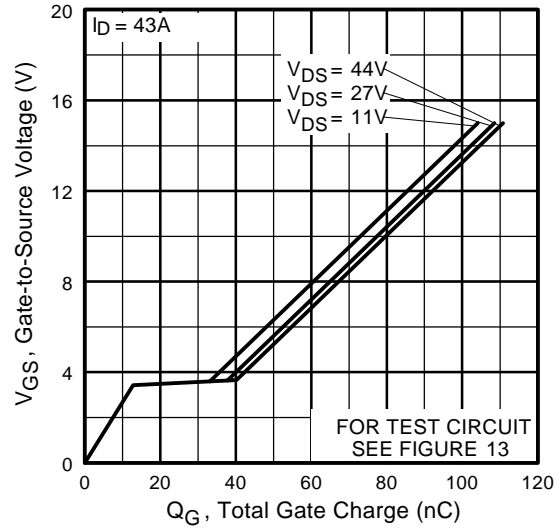


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

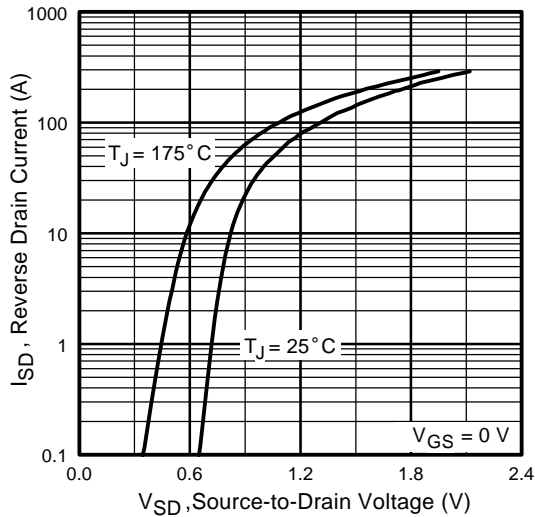


Fig 7. Typical Source-Drain Diode Forward Voltage

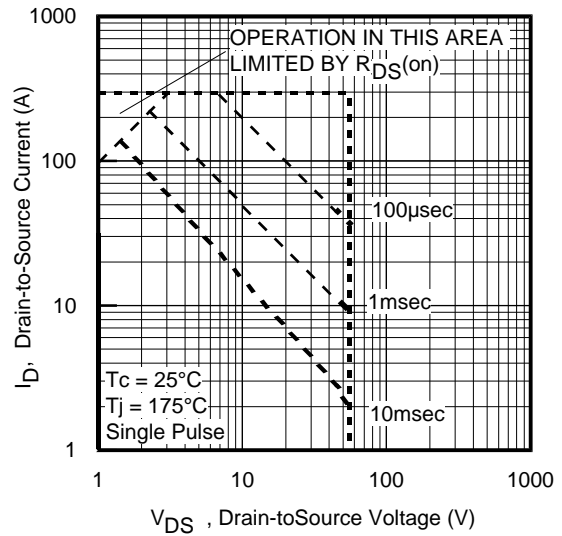


Fig 8. Maximum Safe Operating Area

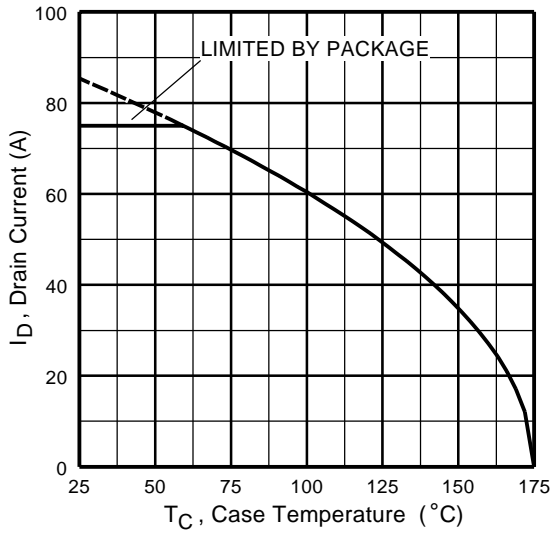


Fig 9. Maximum Drain Current Vs. Case Temperature

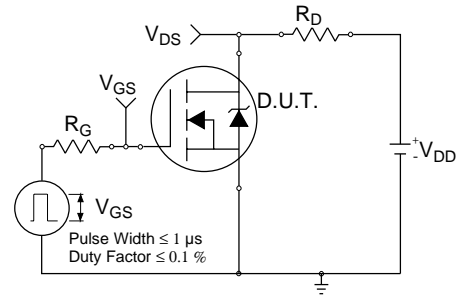


Fig 10a. Switching Time Test Circuit

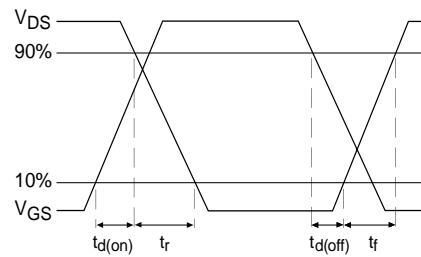


Fig 10b. Switching Time Waveforms

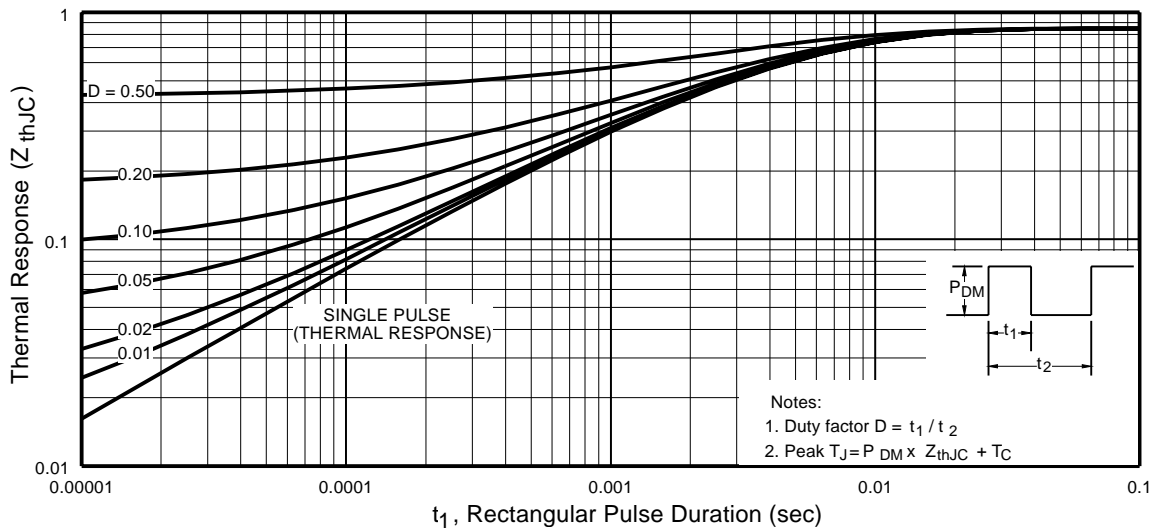


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case

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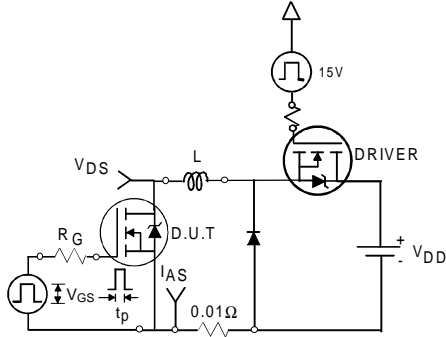


Fig 12a. Unclamped Inductive Test Circuit

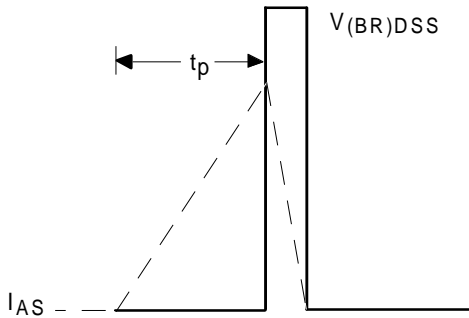


Fig 12b. Unclamped Inductive Waveforms

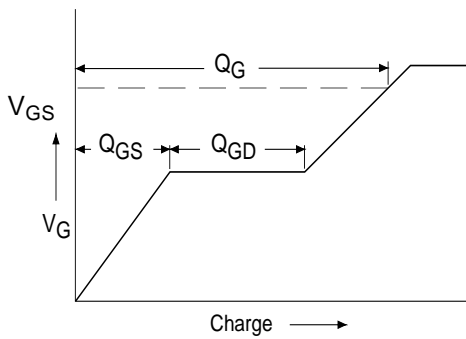


Fig 13a. Basic Gate Charge Waveform

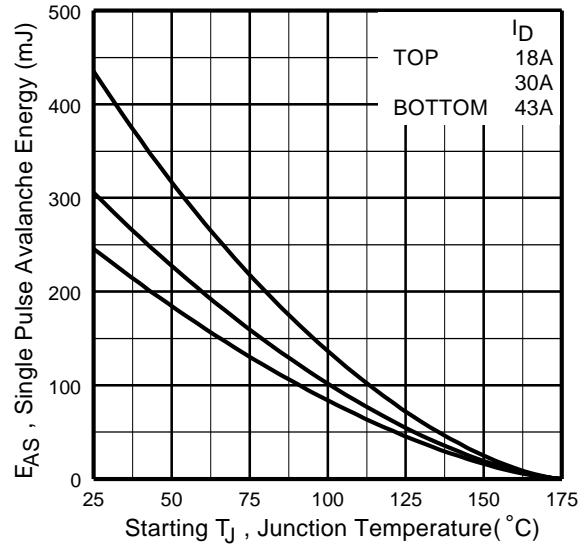


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

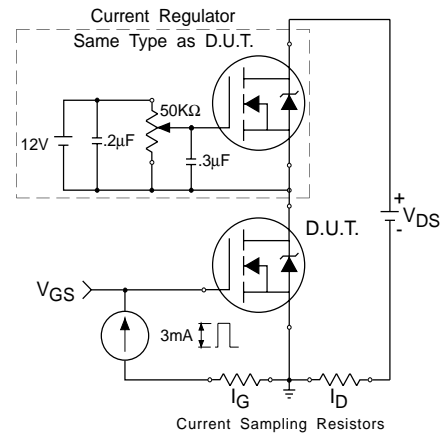
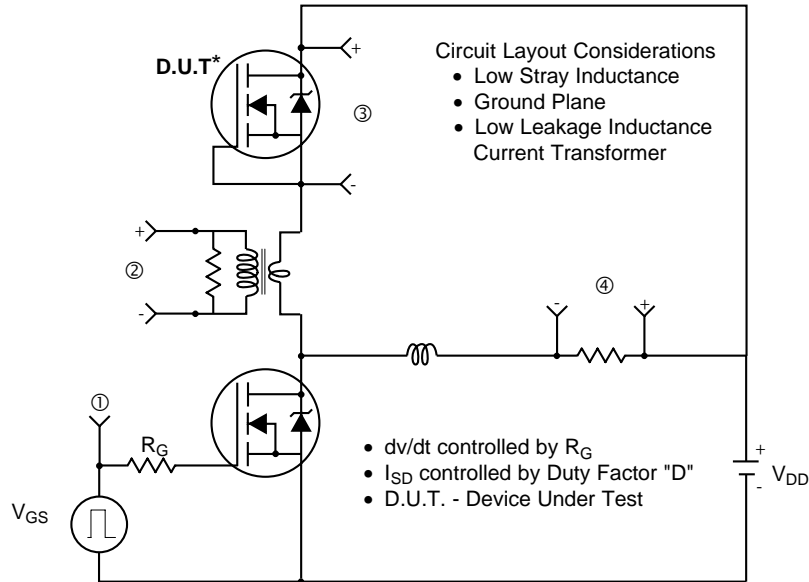
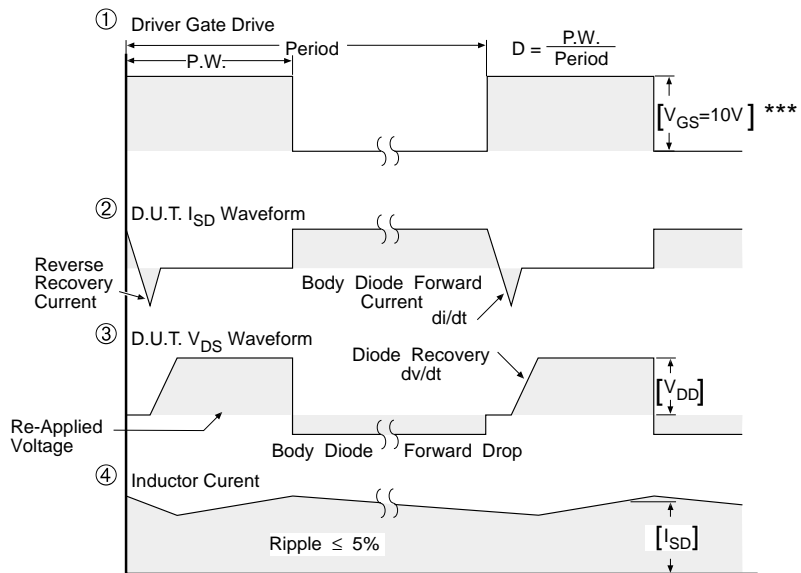


Fig 13b. Gate Charge Test Circuit

Peak Diode Recovery dv/dt Test Circuit



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

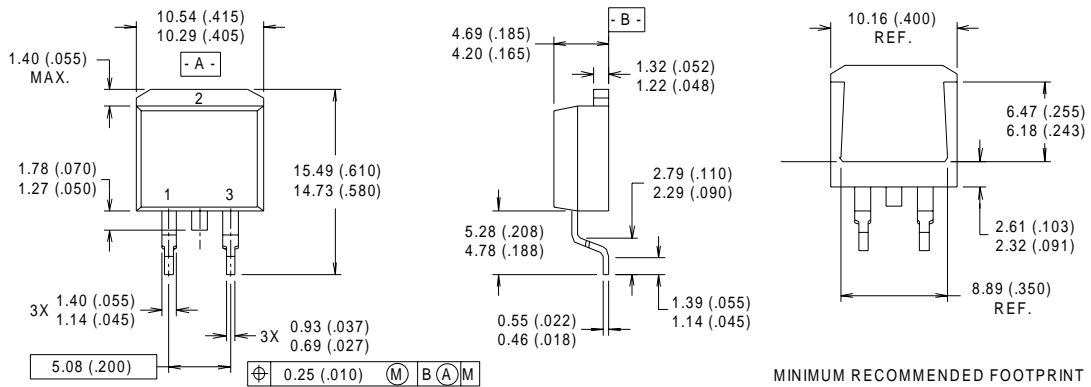


*** $V_{GS} = 5.0V$ for Logic Level and 3V Drive Devices



IRF1010NS/IRF1010NL

D²Pak Package Outline



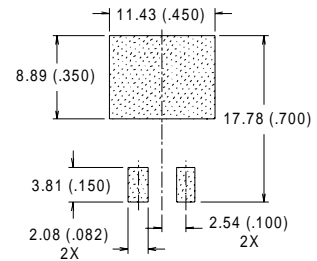
NOTES:

- 1 DIMENSIONS AFTER SOLDER DIP.
- 2 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
- 3 CONTROLLING DIMENSION : INCH.
- 4 HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

LEAD ASSIGNMENTS

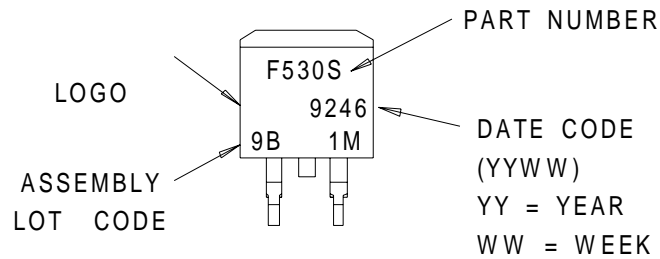
- 1 - GATE
- 2 - DRAIN
- 3 - SOURCE

MINIMUM RECOMMENDED FOOTPRINT



Part Marking Information

D²Pak

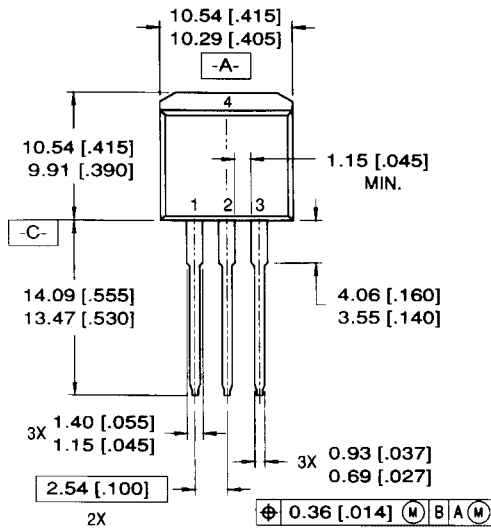




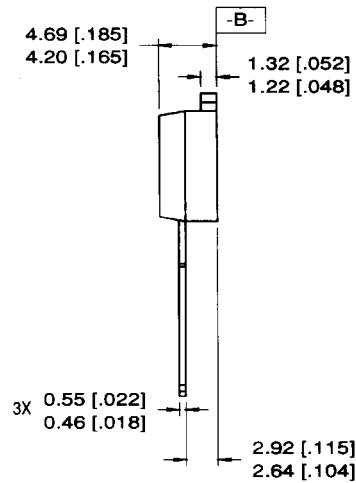
IRF1010NS/IRF1010NL

Package Outline

TO-262 Outline



LEAD ASSIGNMENTS
 1 = GATE 3 = SOURCE
 2 = DRAIN 4 = DRAIN



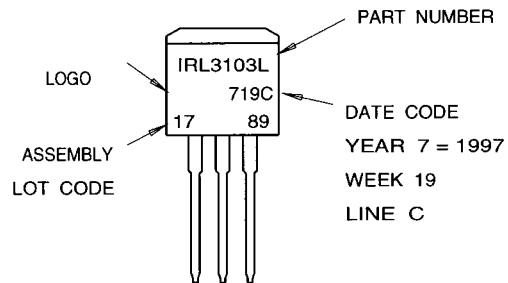
NOTES:

1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

Part Marking Information

TO-262

EXAMPLE: THIS IS AN IRL3103L
 LOT CODE 1789
 ASSEMBLED ON WW 19, 1997
 IN THE ASSEMBLY LINE "C"

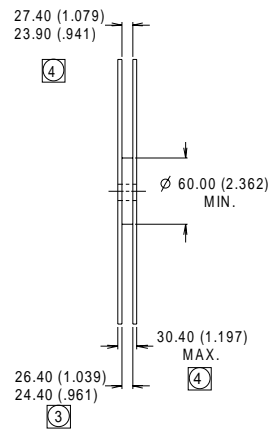
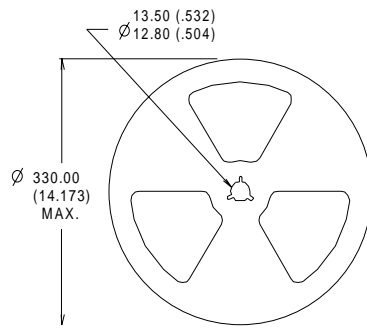
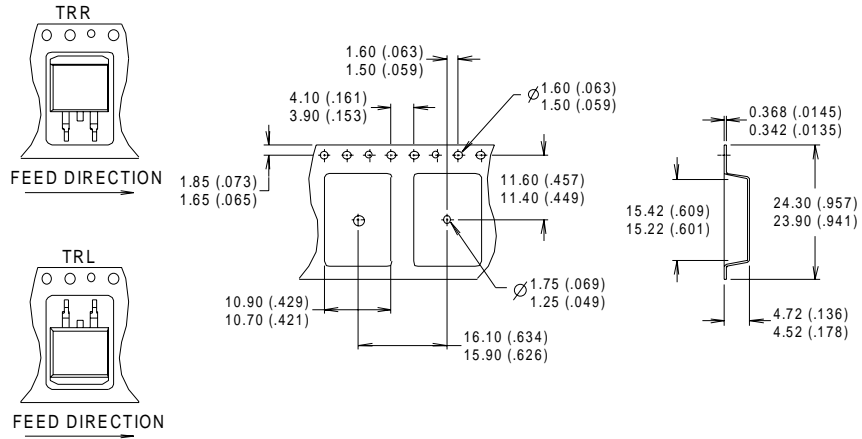




IRF1010NS/IRF1010NL

Tape & Reel Information

D²Pak



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