PD- 91901B

International
IOR Rectifier

SMPS MOSFET

IRF840AS
IRF840AL

HEXFET® Power MOSFET

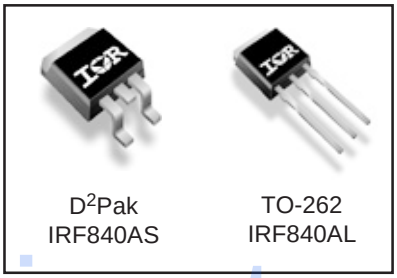
V_{DSS}	$R_{DS(on)}$ max	I_D
500V	0.85Ω	8.0A

Applications

- Switch Mode Power Supply (SMPS)
- Uninterruptible Power Supply
- High Speed Power Switching

Benefits

- Low Gate Charge Qg Results in Simple Drive Requirement
- Improved Gate, Avalanche and Dynamic dv/dt Ruggedness
- Fully Characterized Capacitance and Avalanche Voltage and Current
- Effective Coss Specified (See AN 1001)



D²Pak
IRF840AS

TO-262
IRF840AL

Absolute Maximum Ratings

	Parameter	Max.	Units
I_D @ T_C = 25°C	Continuous Drain Current, V_{GS} @ 10V⑥	8.0	A
I_D @ T_C = 100°C	Continuous Drain Current, V_{GS} @ 10V⑥	5.1	
I_{DM}	Pulsed Drain Current ①⑥	32	
P_D @T_C = 25°C	Power Dissipation	125	W
P_D @T_A = 25°C	Power Dissipation	3.1	
	Linear Derating Factor	1.0	W/°C
V_{GS}	Gate-to-Source Voltage	± 30	V
dv/dt	Peak Diode Recovery dv/dt ③⑥	5.0	V/ns
T_J	Operating Junction and	-55 to + 150	°C
T_{STG}	Storage Temperature Range		
	Soldering Temperature, for 10 seconds	300 (1.6mm from case)	

Typical SMPS Topologies

- Two Transistor Forward
- Haft Bridge
- Full Bridge

Notes ① through ⑥ are on page 10

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	500	—	—	V	V_{GS} = 0V, I_D = 250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.58	—	V/°C	Reference to 25°C, I_D = 1mA⑥
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	—	0.85	Ω	V_{GS} = 10V, I_D = 4.8A ④
$V_{GS(th)}$	Gate Threshold Voltage	2.0	—	4.0	V	V_{DS} = V_{GS}, I_D = 250µA
I_{DSS}	Drain-to-Source Leakage Current	—	—	25	µA	V_{DS} = 500V, V_{GS} = 0V
		—	—	250		V_{DS} = 400V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	V_{GS} = 30V
	Gate-to-Source Reverse Leakage	—	—	-100		V_{GS} = -30V

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	3.7	—	—	S	V_{DS} = 50V, I_D = 4.8A
Q_g	Total Gate Charge	—	—	38	nC	I_D = 8.0A
Q_{gs}	Gate-to-Source Charge	—	—	9.0		V_{DS} = 400V
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	—	18		V_{GS} = 10V, See Fig. 6 and 13 ④⑥
$t_{d(on)}$	Turn-On Delay Time	—	11	—	ns	V_{DD} = 250V
t_r	Rise Time	—	23	—		I_D = 8.0A
$t_{d(off)}$	Turn-Off Delay Time	—	26	—		R_G = 9.1Ω
t_f	Fall Time	—	19	—		R_D = 31Ω,See Fig. 10 ④⑥
C_{iss}	Input Capacitance	—	1018	—	pF	V_{GS} = 0V
C_{oss}	Output Capacitance	—	155	—		V_{DS} = 25V
C_{rss}	Reverse Transfer Capacitance	—	8.0	—		f = 1.0MHz, See Fig. 5
C_{oss}	Output Capacitance	—	1490	—		V_{GS} = 0V, V_{DS} = 1.0V, f = 1.0MHz
C_{oss}	Output Capacitance	—	42	—		V_{GS} = 0V, V_{DS} = 400V, f = 1.0MHz
C_{oss} eff.	Effective Output Capacitance	—	56	—		V_{GS} = 0V, V_{DS} = 0V to 480V ⑤⑥

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy②	—	510	mJ
I_{AR}	Avalanche Current①	—	8.0	A
E_{AR}	Repetitive Avalanche Energy①	—	13	mJ

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JC}$	Junction-to-Case	—	1.0	°C/W
$R_{\theta JA}$	Junction-to-Ambient (PCB Mounted, steady-state)*	—	40	

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	8.0	A	MOSFET symbol showing the integral reverse p-n junction diode.
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	32		
V_{SD}	Diode Forward Voltage	—	—	2.0	V	T_J = 25°C, I_S = 8.0A, V_{GS} = 0V ④
t_{rr}	Reverse Recovery Time	—	422	633	ns	T_J = 25°C, I_F = 8.0A
Q_{rr}	Reverse RecoveryCharge	—	2.0	3.0	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)				

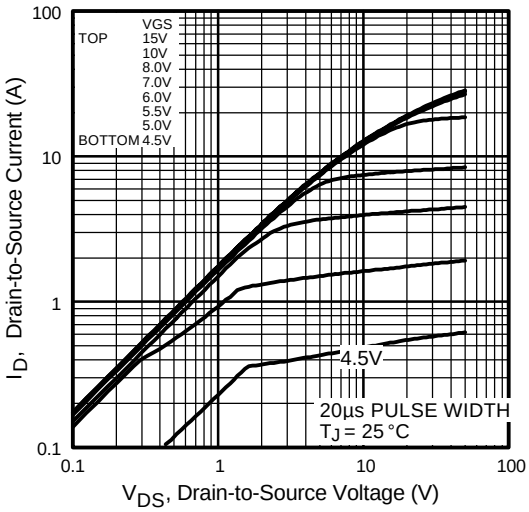


Fig 1. Typical Output Characteristics

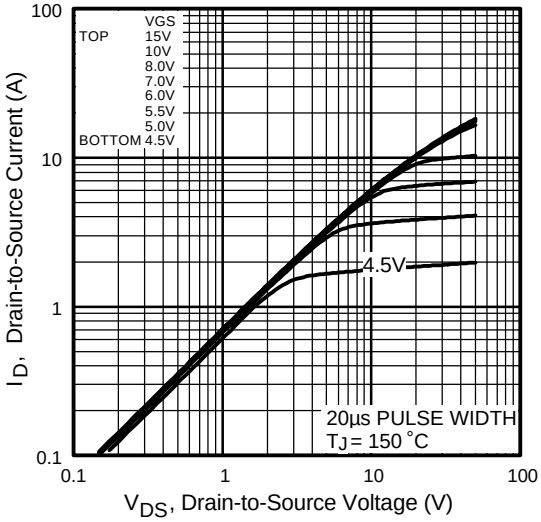


Fig 2. Typical Output Characteristics

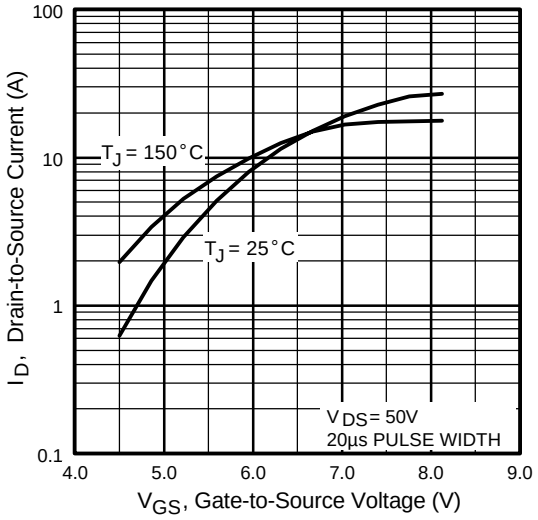


Fig 3. Typical Transfer Characteristics

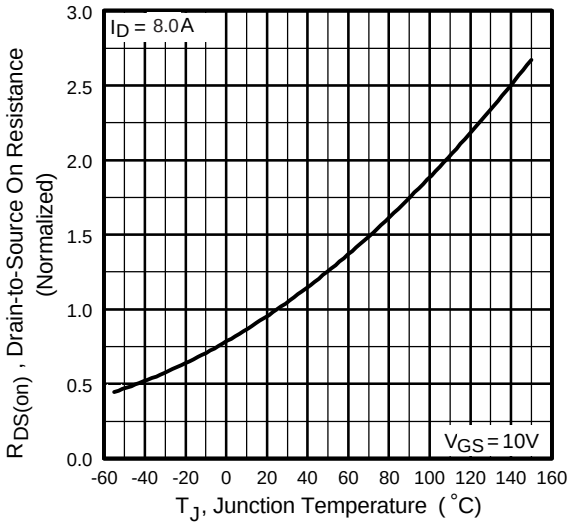


Fig 4. Normalized On-Resistance Vs. Temperature

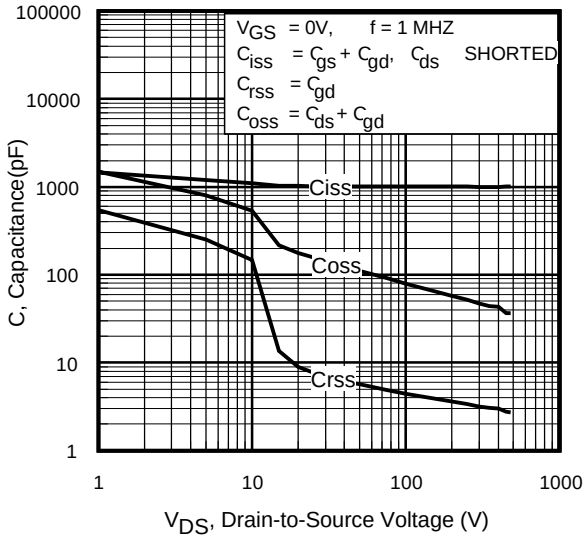


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

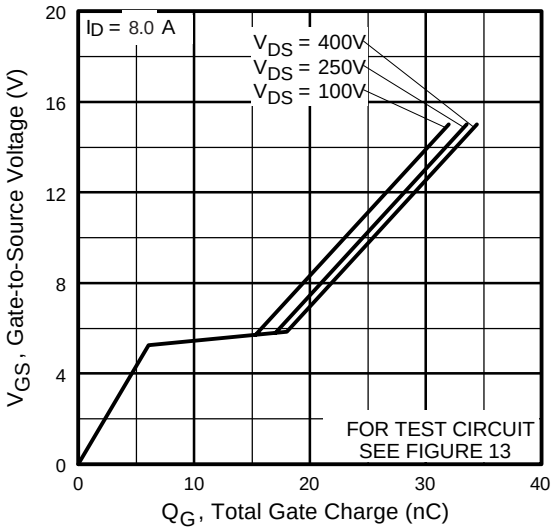


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

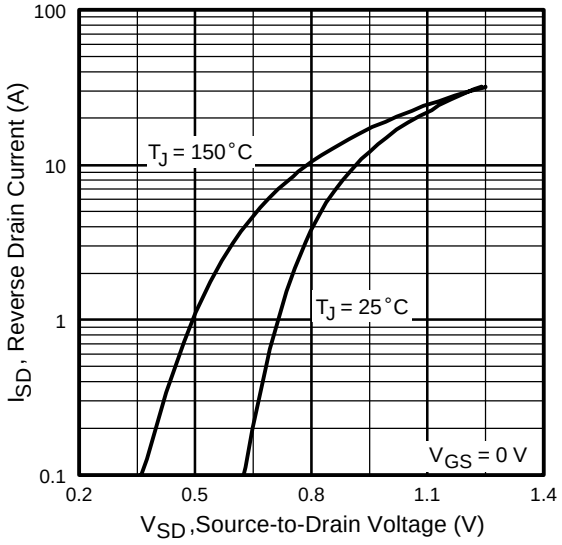


Fig 7. Typical Source-Drain Diode Forward Voltage

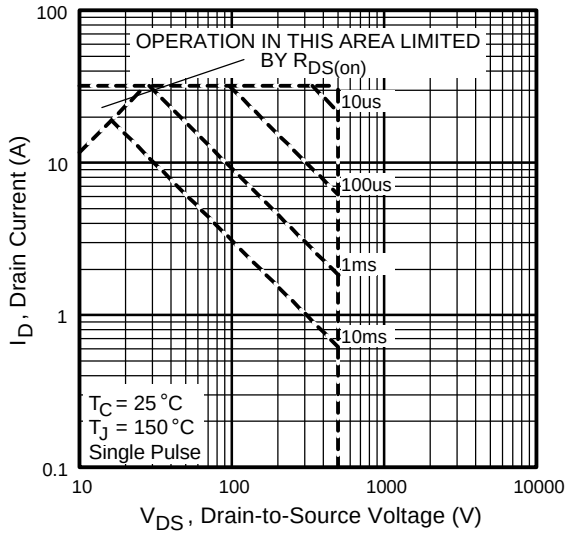


Fig 8. Maximum Safe Operating Area

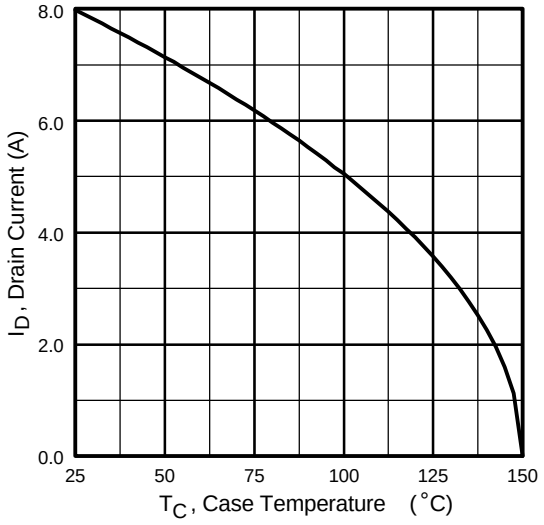


Fig 9. Maximum Drain Current Vs. Case Temperature

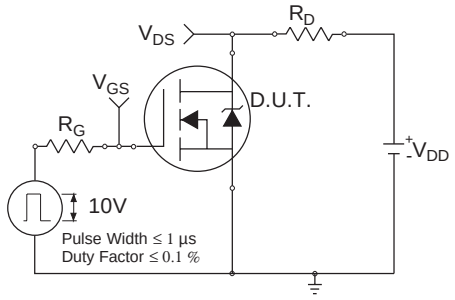


Fig 10a. Switching Time Test Circuit

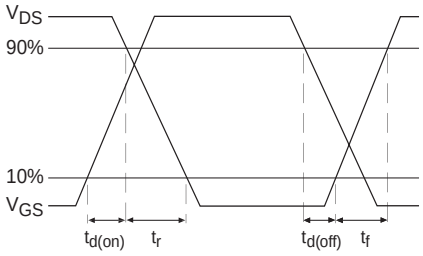
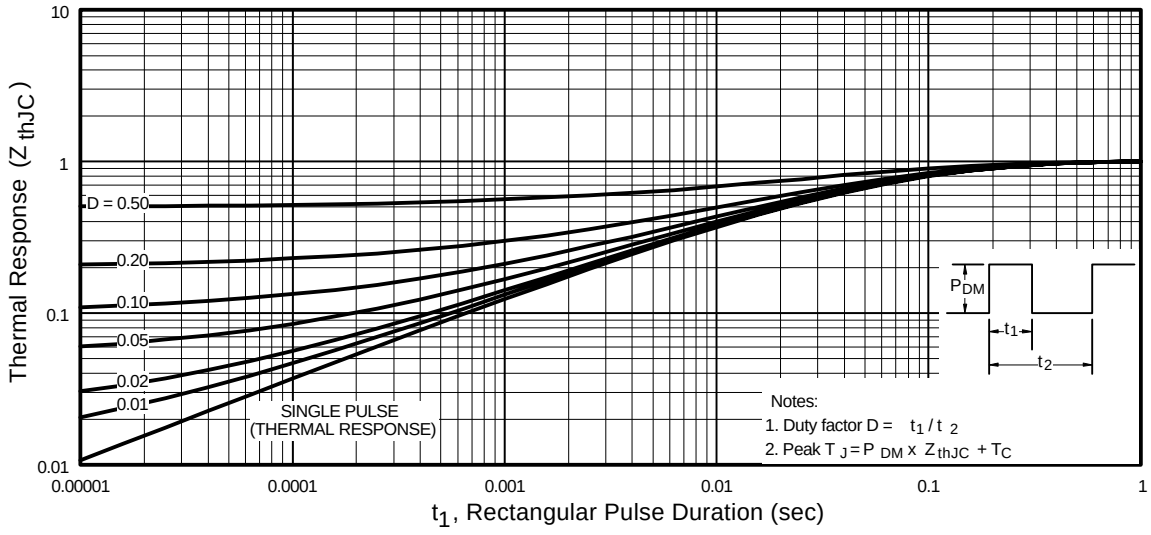


Fig 10b. Switching Time Waveforms



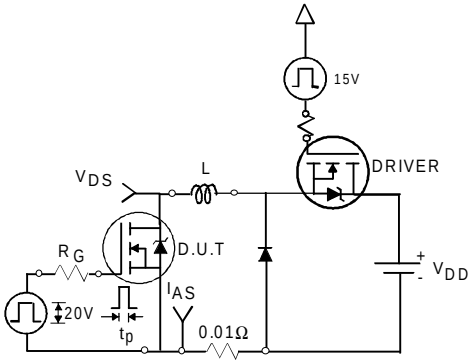


Fig 12a. Unclamped Inductive Test Circuit

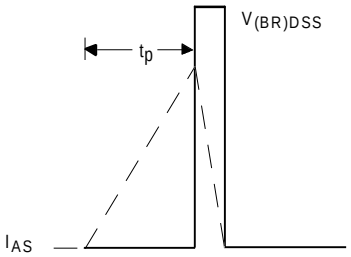


Fig 12b. Unclamped Inductive Waveforms

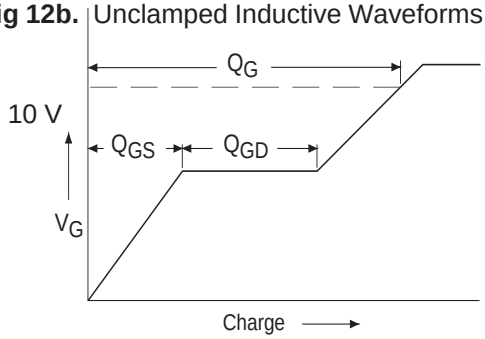


Fig 13a. Basic Gate Charge Waveform

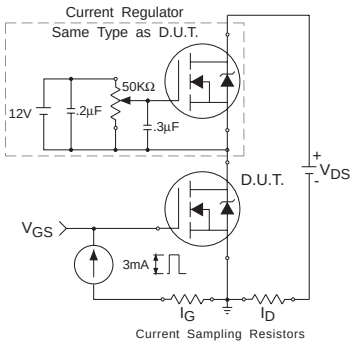


Fig 13b. Gate Charge Test Circuit

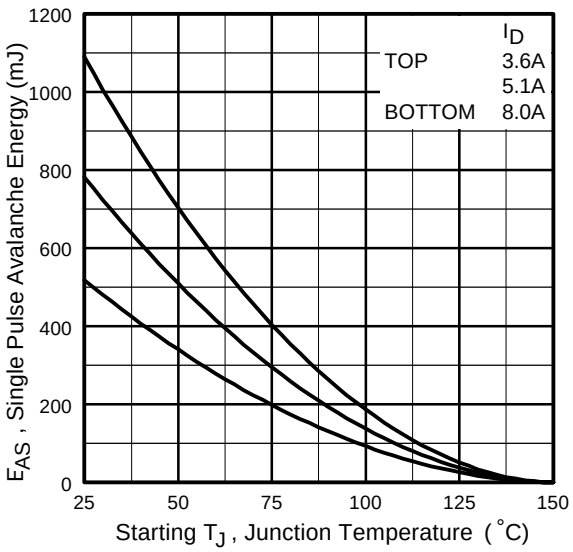


Fig 12c. Maximum Avalanche Energy Vs. Drain Current

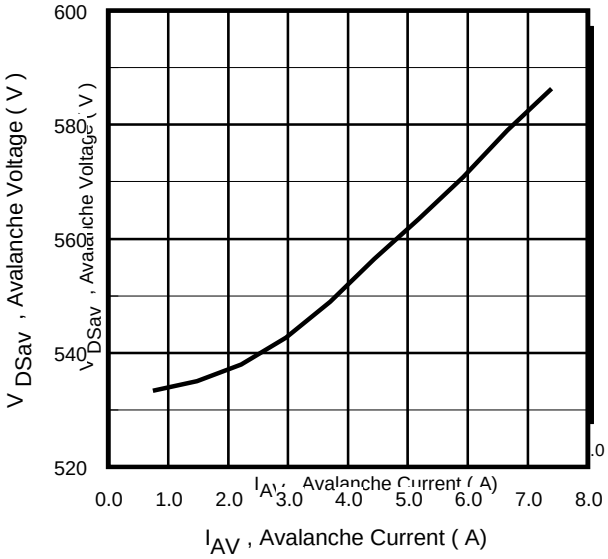
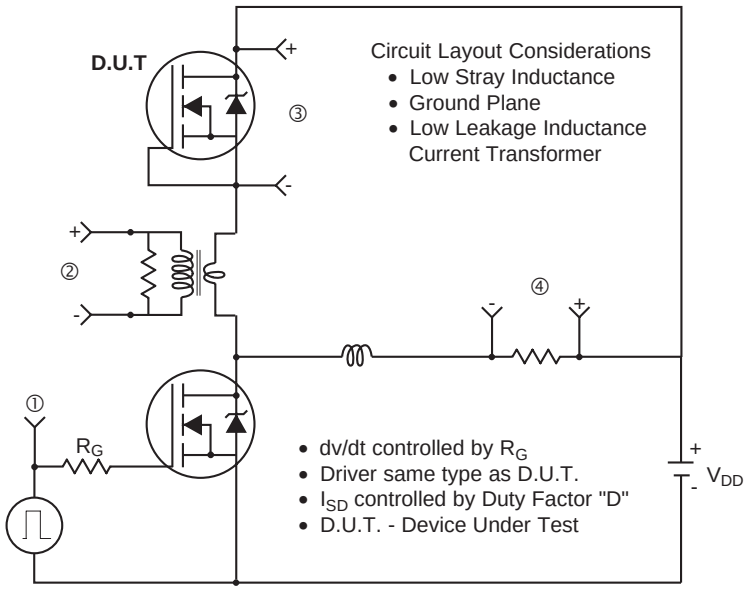
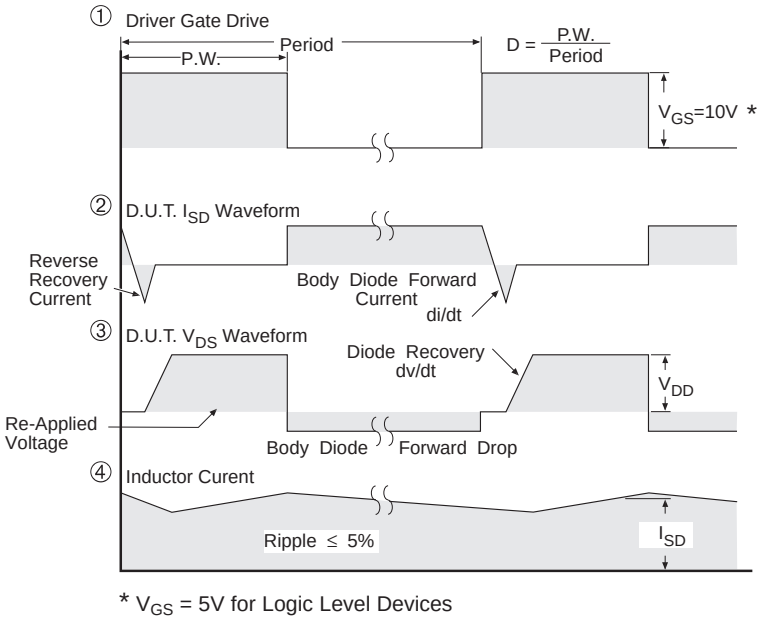


Fig 12d. Typical Drain-to-Source Voltage Vs. Avalanche Current

Peak Diode Recovery dv/dt Test Circuit

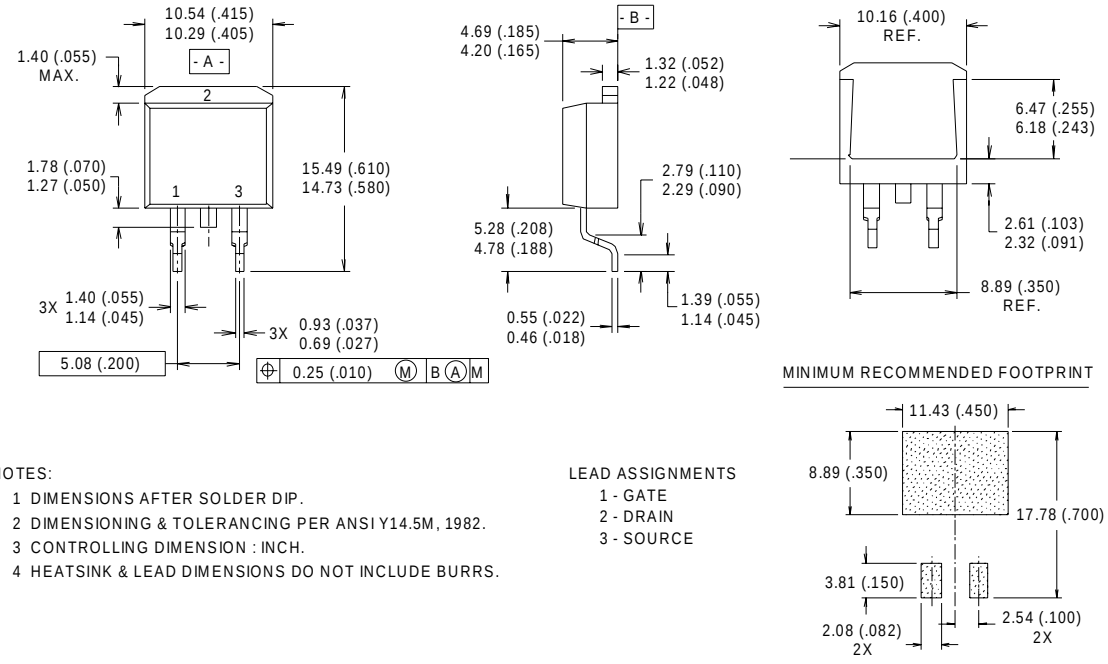




* V_{GS} = 5V for Logic Level Devices

Fig 14. For N-Channel HEXFET® Power MOSFETs

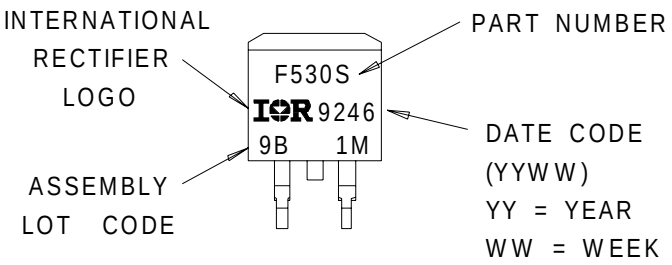
D²Pak Package Outline



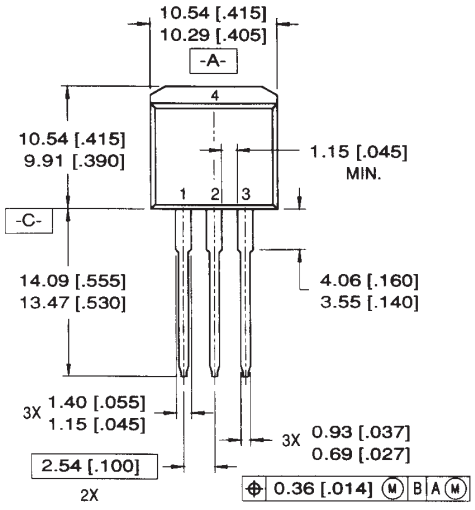
NOTES:
1 DIMENSIONS AFTER SOLDER DIP.
2 DIMENSIONING & TOLERANCING PER ANSI Y14.5M, 1982.
3 CONTROLLING DIMENSION : INCH.
4 HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

LEAD ASSIGNMENTS
1 - GATE
2 - DRAIN
3 - SOURCE

D²Pak Part Marking Information

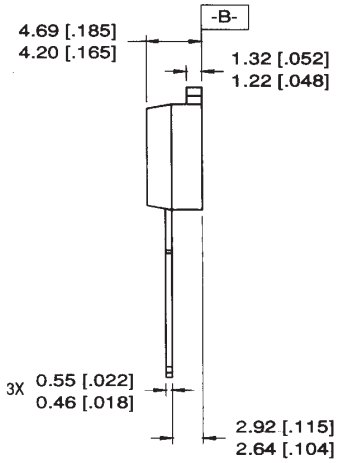


TO-262 Package Outline



LEAD ASSIGNMENTS

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

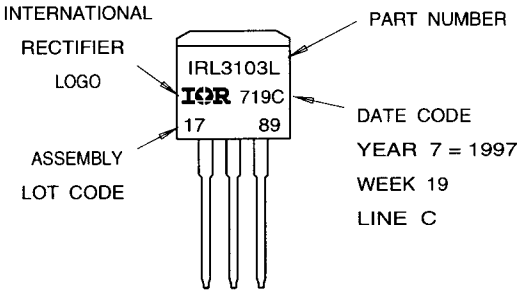


NOTES:

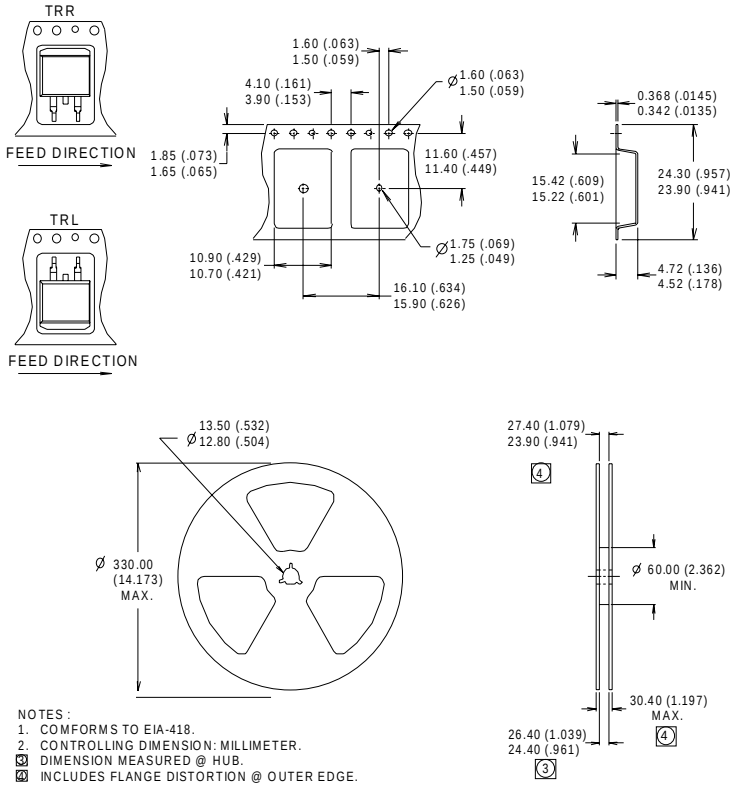
1. DIMENSIONING & TOLERANCING PER ANSI Y14.5M-1982
2. CONTROLLING DIMENSION: INCH.
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. HEATSINK & LEAD DIMENSIONS DO NOT INCLUDE BURRS.

TO-262 Part Marking Information

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



D²Pak Tape & Reel Information



Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 11)

② Starting T_J = 25°C, L = 16mH R_G = 25Ω, I_{AS} = 8.0A. (See Figure 12)

③ $I_{SD} \leq$ 8.0A, di/dt ≤ 100A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq$ 150°C

④ Pulse width ≤ 300µs; duty cycle ≤ 2%.

⑤ C_{oss} eff. 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 Uses IRF840A data and test conditions

* When mounted on 1" square PCB (FR-4 or G-10 Material).
For recommended footprint and soldering techniques refer to application note #AN-994.

International
IOR Rectifier

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IR CANADA: 15 Lincoln Court, Brampton, Ontario L6T3Z2, Tel: (905) 453 2200
IR GERMANY: Saalburgstrasse 157, 61350 Bad Homburg Tel: ++ 49 6172 96590
IR ITALY: Via Liguria 49, 10071 Borgaro, Torino Tel: ++ 39 11 451 0111
IR JAPAN: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo Japan 171 Tel: 81 3 3983 0086
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IR TAIWAN:16 Fl. Suite D. 207, Sec. 2, Tun Haw South Road, Taipei, 10673, Taiwan Tel: 886-2-2377-9936
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