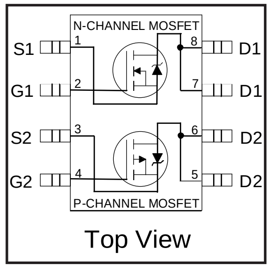
International
IOR Rectifier

PD - 95135

IRF9952PbF

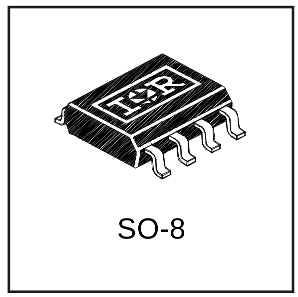
HEXFET® Power MOSFET

- Generation V Technology
- Ultra Low On-Resistance
- Dual N and P Channel MOSFET
- Surface Mount
- Very Low Gate Charge and Switching Losses
- Fully Avalanche Rated
- Lead-Free



	N-Ch	P-Ch
V_{DSS}	30V	-30V
$R_{DS(on)}$	0.10Ω	0.25Ω

Recommended upgrade: IRF7309 or IRF7319
Lower profile/smaller equivalent: IRF7509



Description

Fifth Generation HEXFETs from International Rectifier utilize advanced processing techniques to achieve extremely 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 a wide variety of applications.

The SO-8 has been modified through a customized leadframe for enhanced thermal characteristics and multiple-die capability making it ideal in a variety of power applications. With these improvements, multiple devices can be used in an application with dramatically reduced board space. The package is designed for vapor phase, infra red, or wave soldering techniques.

		Symbol	Maximum		Units
			N-Channel	P-Channel	
Drain-Source Voltage		V_{DS}	30		V
Gate-Source Voltage		V_{GS}	± 20		V
Continuous Drain Current⑤	T_A = 25°C	I_D	3.5	-2.3	A
	T_A = 70°C		2.8	-1.8	
Pulsed Drain Current		I_{DM}	16	-10	
Continuous Source Current (Diode Conduction)		I_S	1.7	-1.3	
Maximum Power Dissipation ⑤	T_A = 25°C	P_D	2.0		W
	T_A = 70°C		1.3		
Single Pulse Avalanche Energy		E_{AS}	44	57	mJ
Avalanche Current		I_{AR}	2.0	-1.3	A
Repetitive Avalanche Energy		E_{AR}	0.25		mJ
Peak Diode Recovery dv/dt ②		dv/dt	5.0	-5.0	V/ ns
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to + 150 °C		

Thermal Resistance Ratings

Parameter	Symbol	Limit	Units
Maximum Junction-to-Ambient ⑤	$R_{\theta JA}$	62.5	°C/W

09/15/04

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

	Parameter		Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	N-Ch	30	—	—	V	V_{GS} = 0V, I_D = 250µA
		P-Ch	-30	—	—		V_{GS} = 0V, I_D = -250µA
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	N-Ch	—	0.015	—	V/°C	Reference to 25°C, I_D = 1mA
		P-Ch	—	0.015	—		Reference to 25°C, I_D = -1mA
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	N-Ch	—	0.08	0.10	Ω	V_{GS} = 10V, I_D = 2.2A ④
			—	0.12	0.15		V_{GS} = 4.5V, I_D = 1.0A ④
		P-Ch	—	0.165	0.250		V_{GS} = -10V, I_D = -1.0A ④
			—	0.290	0.400		V_{GS} = -4.5V, I_D = -0.50A ④
$V_{GS(th)}$	Gate Threshold Voltage	N-Ch	1.0	—	—	V	V_{DS} = V_{GS}, I_D = 250µA
		P-Ch	-1.0	—	—		V_{DS} = V_{GS}, I_D = -250µA
g_{fs}	Forward Transconductance	N-Ch	—	12	—	S	V_{DS} = 15V, I_D = 3.5A ④
		P-Ch	—	2.4	—		V_{DS} = -15V, I_D = -2.3A ④
I_{DSS}	Drain-to-Source Leakage Current	N-Ch	—	—	2.0	µA	V_{DS} = 24V, V_{GS} = 0V
		P-Ch	—	—	-2.0		V_{DS} = -24V, V_{GS} = 0V
		N-Ch	—	—	25		V_{DS} = 24V, V_{GS} = 0V, T_J = 125°C
		P-Ch	—	—	-25		V_{DS} = -24V, V_{GS} = 0V, T_J = 125°C
I_{GSS}	Gate-to-Source Forward Leakage	N-P	—	—	±100	nA	V_{GS} = ±20V
Q_g	Total Gate Charge	N-Ch	—	6.9	14	nC	N-Channel I_D = 1.8A, V_{DS} = 10V, V_{GS} = 10V ④ P-Channel I_D = -2.3A, V_{DS} = -10V, V_{GS} = -10V
		P-Ch	—	6.1	12		
Q_{gs}	Gate-to-Source Charge	N-Ch	—	1.0	2.0		
		P-Ch	—	1.7	3.4		
Q_{gd}	Gate-to-Drain ("Miller") Charge	N-Ch	—	1.8	3.5		
		P-Ch	—	1.1	2.2		
$t_{d(on)}$	Turn-On Delay Time	N-Ch	—	6.2	12	ns	N-Channel V_{DD} = 10V, I_D = 1.0A, R_G = 6.0Ω, R_D = 10Ω ④ P-Channel V_{DD} = -10V, I_D = -1.0A, R_G = 6.0Ω, R_D = 10Ω
		P-Ch	—	9.7	19		
t_r	Rise Time	N-Ch	—	8.8	18		
		P-Ch	—	14	28		
$t_{d(off)}$	Turn-Off Delay Time	N-Ch	—	13	26		
		P-Ch	—	20	40		
t_f	Fall Time	N-Ch	—	3.0	6.0		
		P-Ch	—	6.9	14		
C_{iss}	Input Capacitance	N-Ch	—	190	—	pF	N-Channel V_{GS} = 0V, V_{DS} = 15V, ƒ = 1.0MHz P-Channel V_{GS} = 0V, V_{DS} = -15V, ƒ = 1.0MHz
		P-Ch	—	190	—		
C_{oss}	Output Capacitance	N-Ch	—	120	—		
		P-Ch	—	110	—		
C_{rss}	Reverse Transfer Capacitance	N-Ch	—	61	—		
		P-Ch	—	54	—		

Source-Drain Ratings and Characteristics

	Parameter		Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	N-Ch	—	—	1.7	A	
		P-Ch	—	—	-1.3		
I_{SM}	Pulsed Source Current (Body Diode) ①	N-Ch	—	—	16		
		P-Ch	—	—	16		
V_{SD}	Diode Forward Voltage	N-Ch	—	0.82	1.2	V	T_J = 25°C, I_S = 1.25A, V_{GS} = 0V ③
		P-Ch	—	-0.82	-1.2		T_J = 25°C, I_S = -1.25A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	N-Ch	—	27	53	ns	N-Channel T_J = 25°C, I_F =1.25A, di/dt = 100A/µs ④ P-Channel T_J = 25°C, I_F = -1.25A, di/dt = 100A/µs
		P-Ch	—	27	54		
Q_{rr}	Reverse Recovery Charge	N-Ch	—	28	57	nC	
		P-Ch	—	31	62		

Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See fig. 23)

② N-Channel $I_{SD} \leq$ 2.0A, di/dt $\leq$ 100A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq$ 150°C
P-Channel $I_{SD} \leq$ -1.3A, di/dt $\leq$ 84A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq$ 150°C

③ N-Channel Starting T_J = 25°C, L = 22mH R_G = 25Ω, I_{AS} = 2.0A. (See Figure 12)
P-Channel Starting T_J = 25°C, L = 67mH R_G = 25Ω, I_{AS} = -1.3A.

④ Pulse width $\leq$ 300µs; duty cycle $\leq$ 2%.

⑤ Surface mounted on FR-4 board, t $\leq$ 10sec.

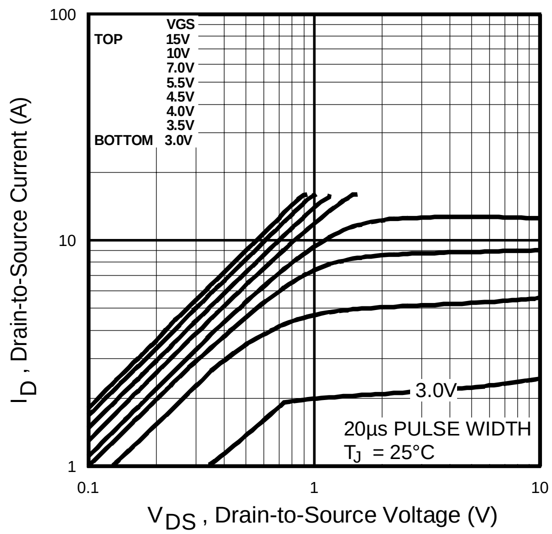


Fig 1. Typical Output Characteristics

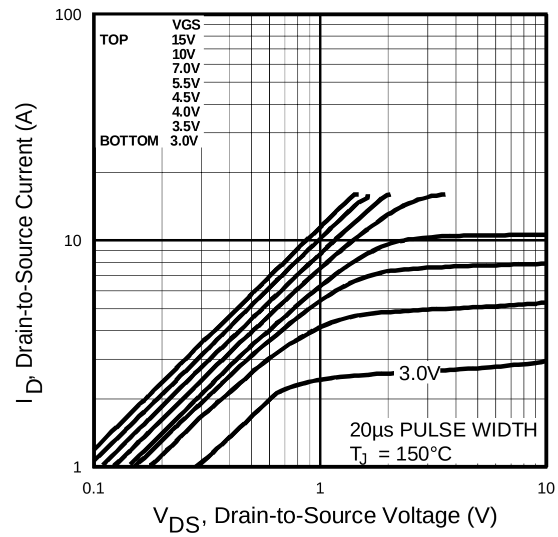


Fig 2. Typical Output Characteristics

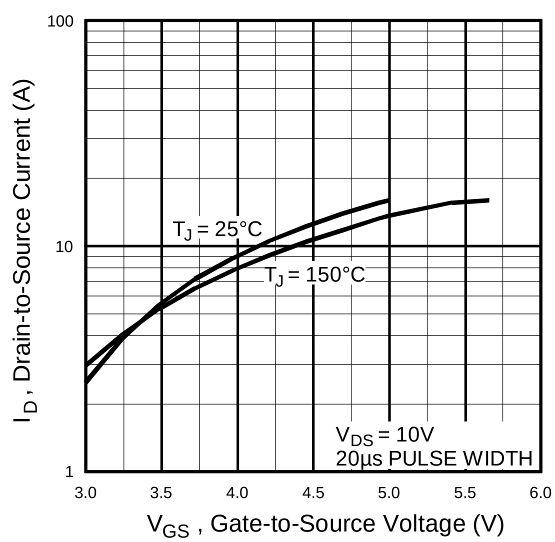


Fig 3. Typical Transfer Characteristics

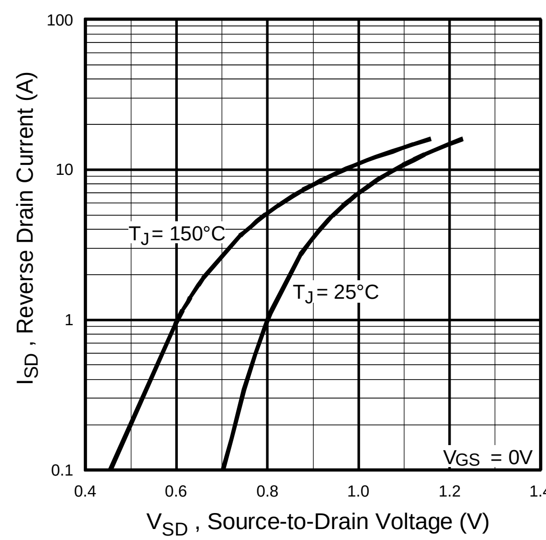


Fig 4. Typical Source-Drain Diode Forward Voltage

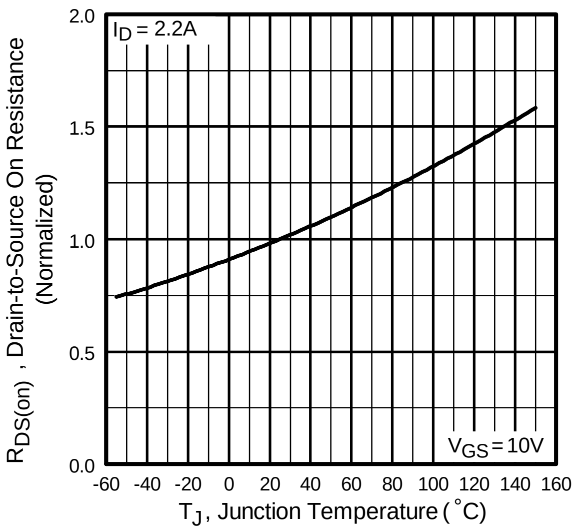


Fig 5. Normalized On-Resistance Vs. Temperature

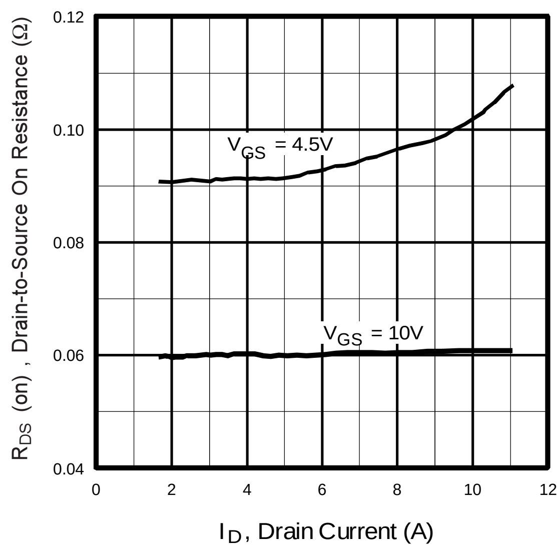


Fig 6. Typical On-Resistance Vs. Drain Current

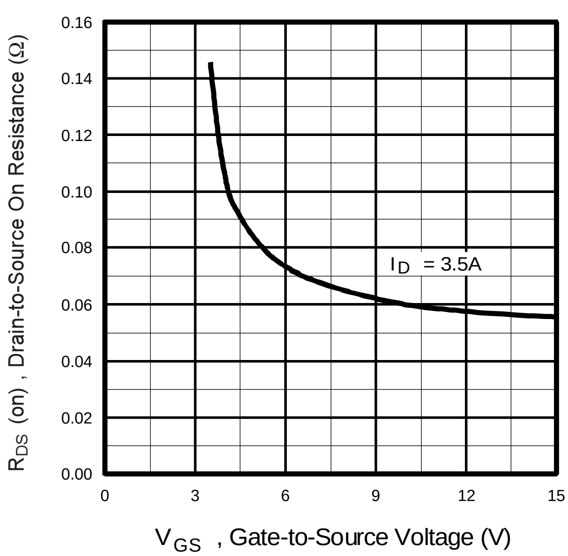


Fig 7. Typical On-Resistance Vs. Gate Voltage

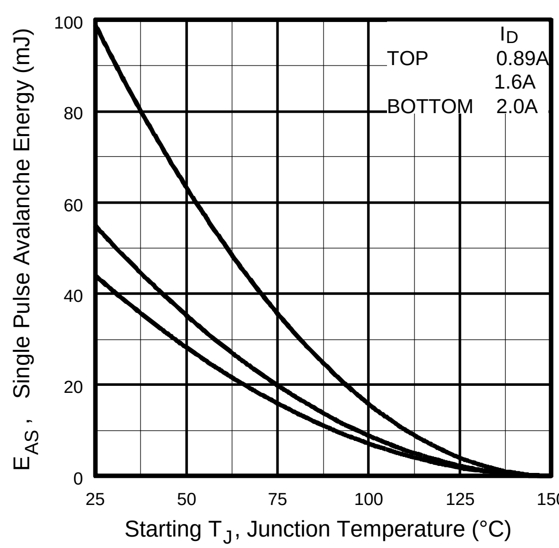


Fig 8. Maximum Avalanche Energy Vs. Drain Current

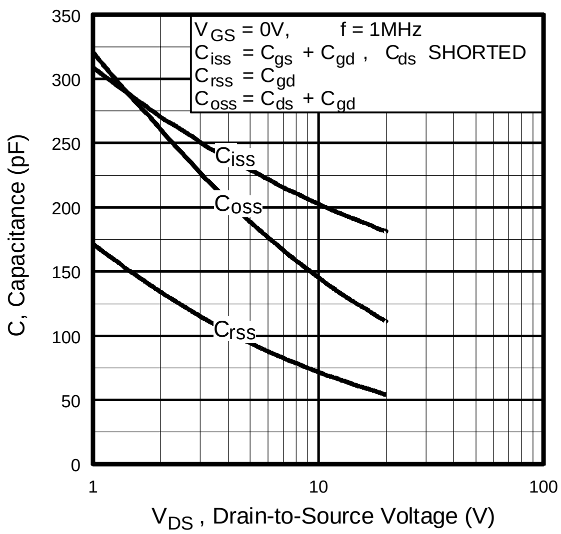


Fig 9. Typical Capacitance Vs. Drain-to-Source Voltage

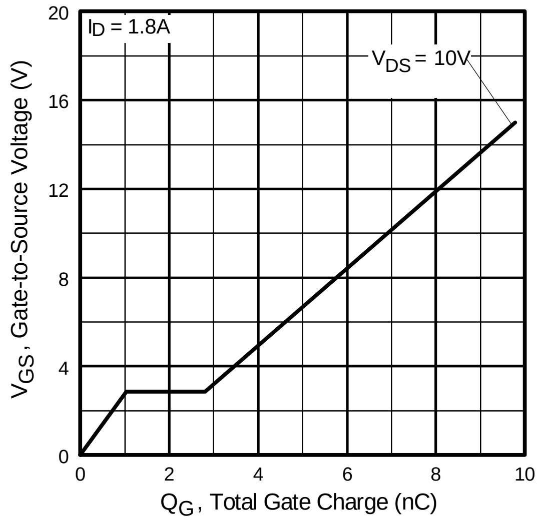


Fig 10. Typical Gate Charge Vs. Gate-to-Source Voltage

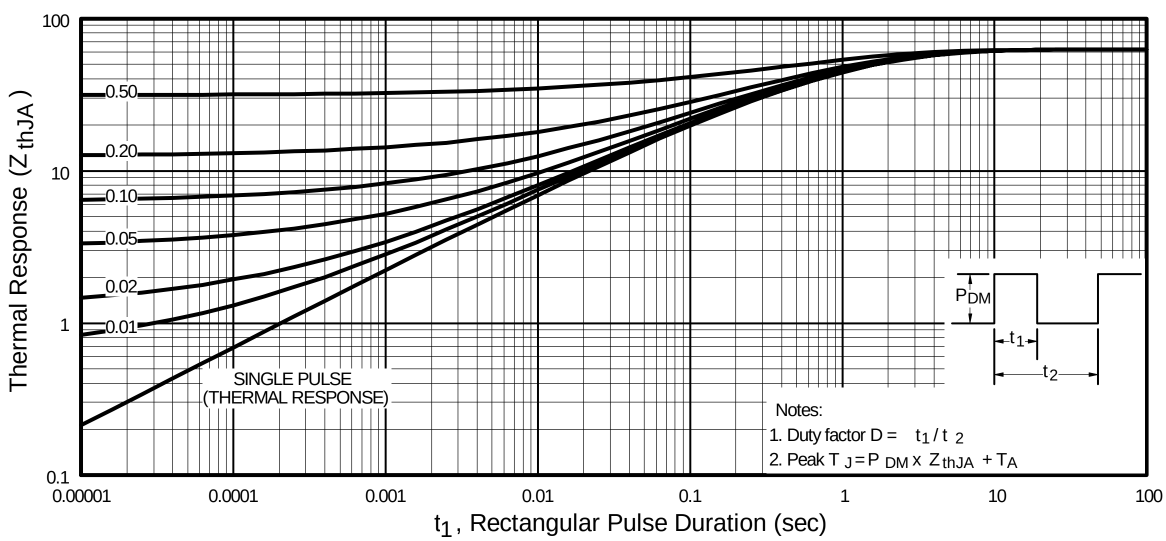


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

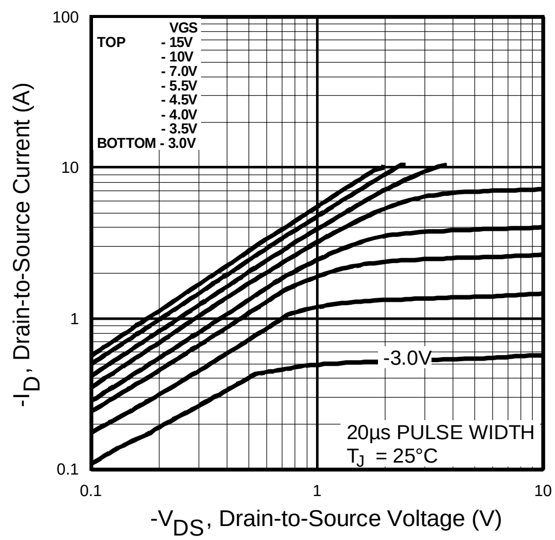


Fig 12. Typical Output Characteristics

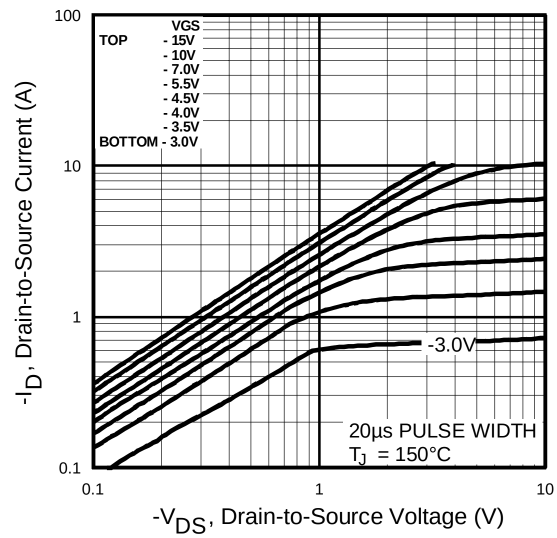


Fig 13. Typical Output Characteristics

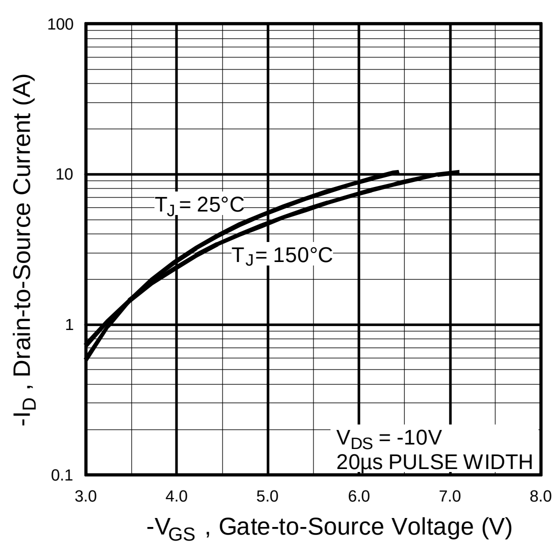


Fig 14. Typical Transfer Characteristics

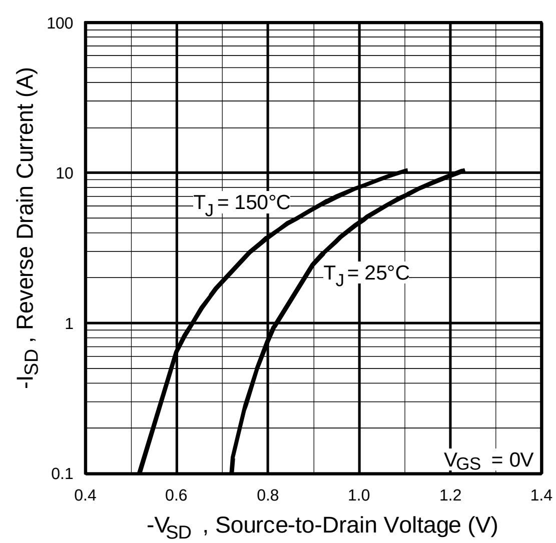


Fig 15. Typical Source-Drain Diode Forward Voltage

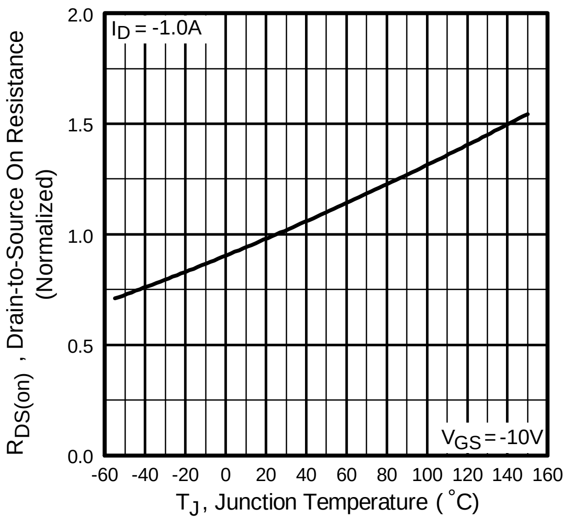


Fig 16. Normalized On-Resistance Vs. Temperature

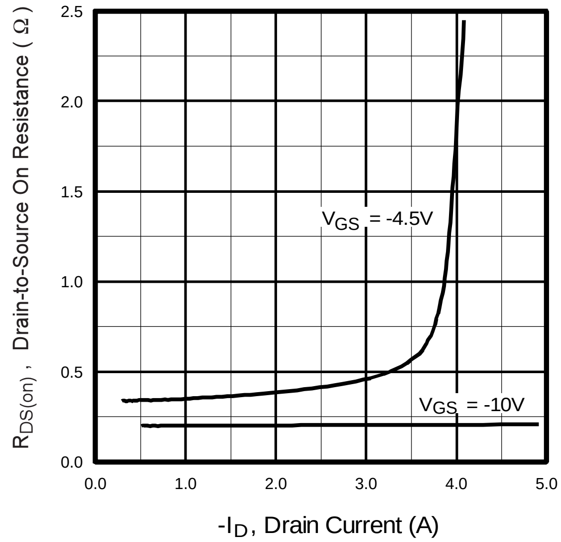


Fig 17. Typical On-Resistance Vs. Drain Current

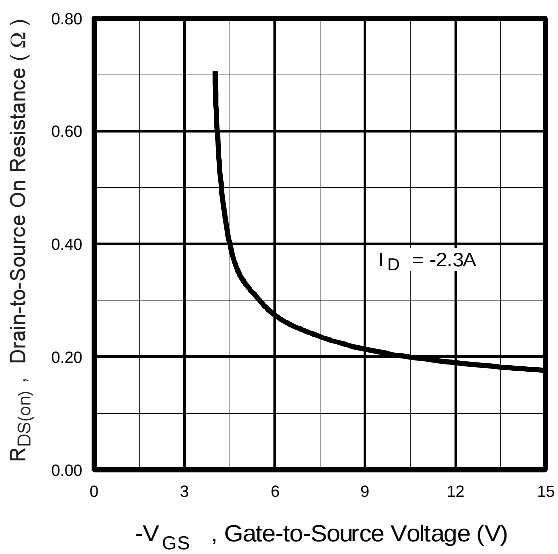


Fig 18. Typical On-Resistance Vs. Gate Voltage

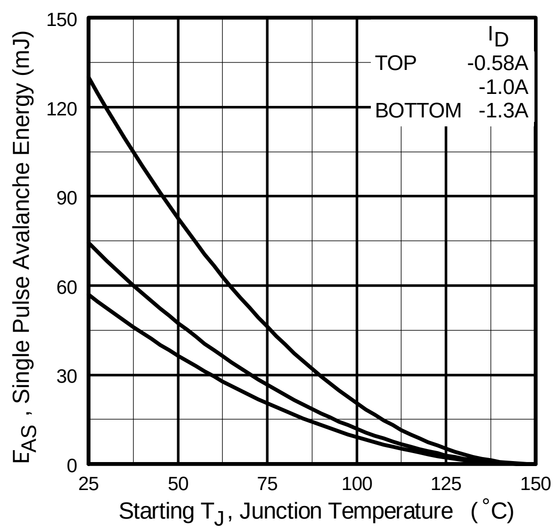


Fig 19. Maximum Avalanche Energy Vs. Drain Current

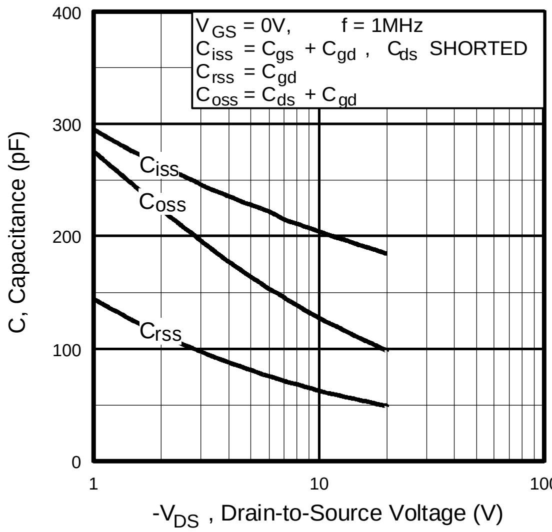


Fig 20. Typical Capacitance Vs. Drain-to-Source Voltage

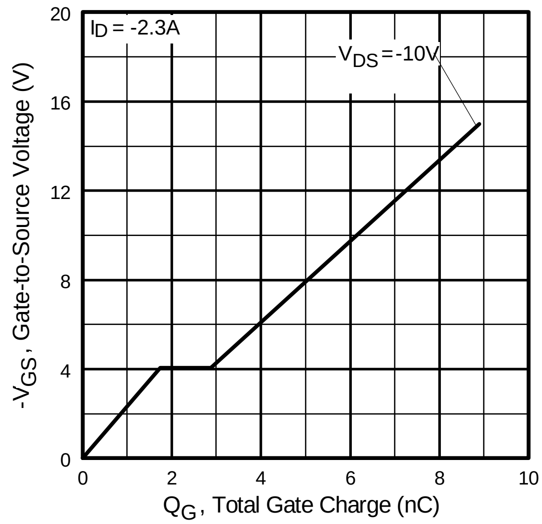


Fig 21. Typical Gate Charge Vs. Gate-to-Source Voltage

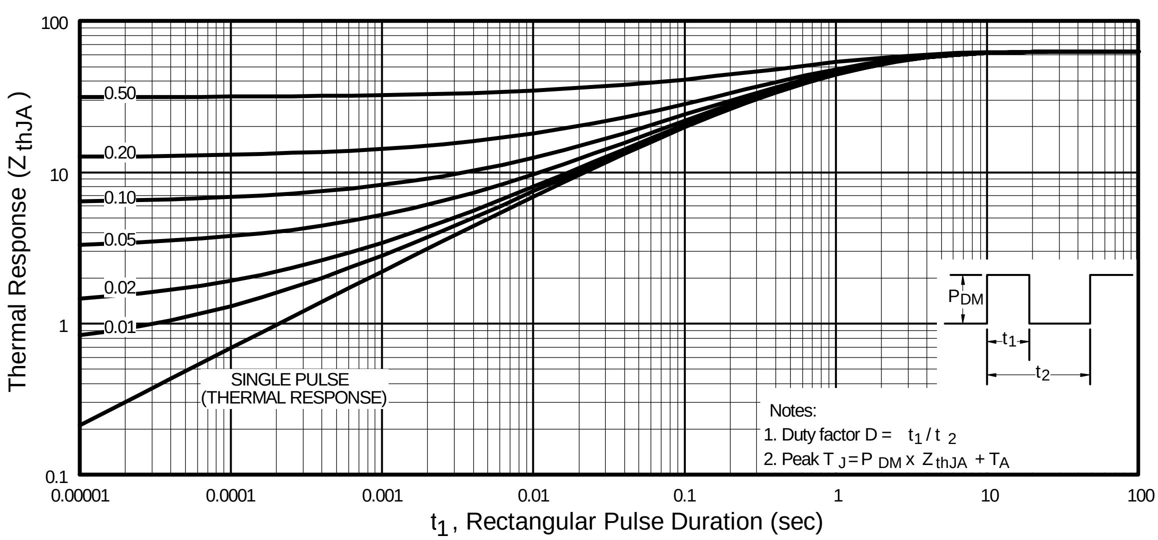
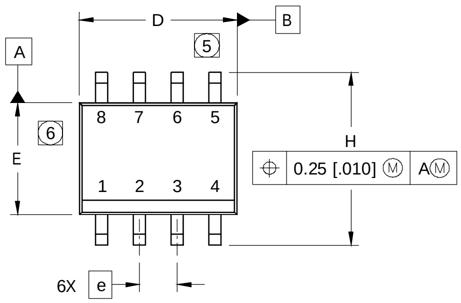


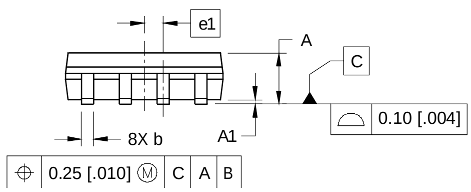
Fig 22. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

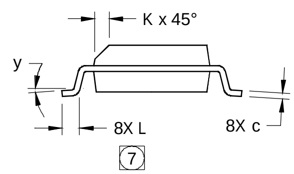
SO-8 Package Outline

Dimensions are shown in millimeters (inches)



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
c	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
e	.050 BASIC		1.27 BASIC	
e 1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.0099	.0196	0.25	0.50
L	.016	.050	0.40	1.27
y	0°	8°	0°	8°

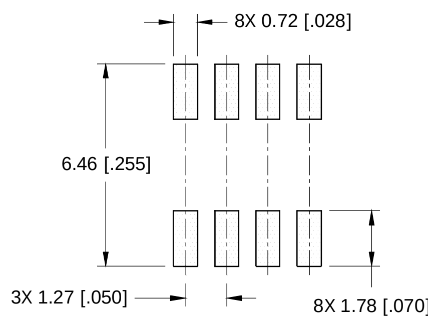




NOTES:

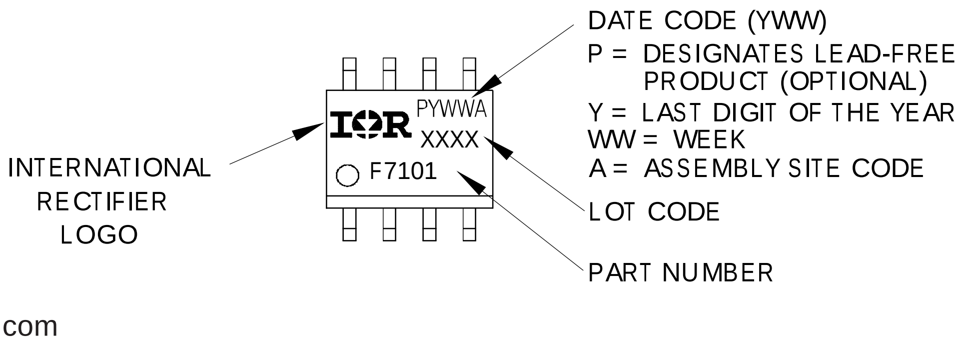
1. DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: MILLIMETER
3. DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
4. OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
5. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [.006].
6. DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 [.010].
7. DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

FOOTPRINT



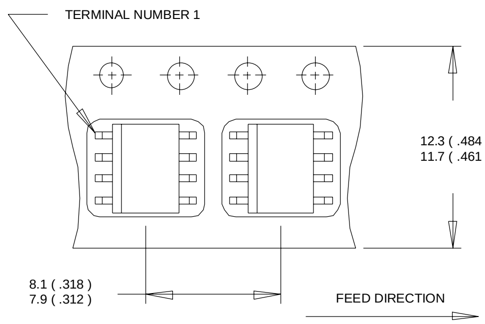
SO-8 Part Marking

EXAMPLE: THIS IS AN IRF7101 (MOSFET)

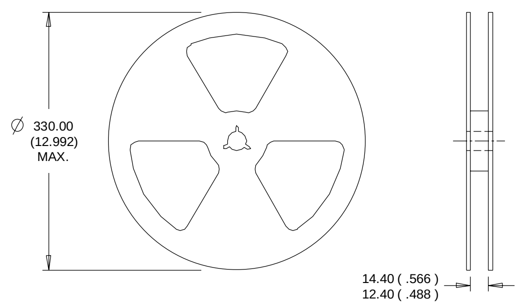


SO-8 Tape and Reel

Dimensions are shown in millimeters (inches)



NOTES:
1. CONTROLLING DIMENSION : MILLIMETER.
2. ALL DIMENSIONS ARE SHOWN IN MILLIMETERS(INCHES).
3. OUTLINE CONFORMS TO EIA-481 & EIA-541.



NOTES :
1. CONTROLLING DIMENSION : MILLIMETER.
2. OUTLINE CONFORMS TO EIA-481 & EIA-541.

Data and specifications subject to change without notice.
This product has been designed and qualified for the Consumer market.
Qualifications Standards can be found on IR's Web site.

International
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IMPORTANT NOTICE

WARNINGS