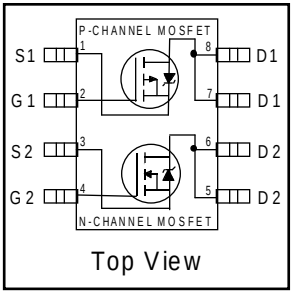
International
IOR Rectifier

PD - 9.1270H

IRF7509

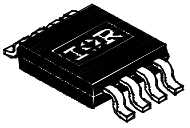
HEXFET® Power MOSFET

- Generation V Technology
- Ultra Low On-Resistance
- Dual N and P Channel MOSFET
- Very Small SOIC Package
- Low Profile (<1.1mm)
- Available in Tape & Reel
- Fast Switching



Top View

	N-Ch	P-Ch
V_{DSS}	30V	-30V
$R_{DS(on)}$	0.135Ω	0.27Ω


Micro8

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 new Micro8 package, with half the footprint area of the standard SO-8, provides the smallest footprint available in an SOIC outline. This makes the Micro8 an ideal device for applications where printed circuit board space is at a premium. The low profile (<1.1mm) of the Micro8 will allow it to fit easily into extremely thin application environments such as portable electronics and PCMCIA cards.

Absolute Maximum Ratings

	Parameter	Max.		Units
		N-Channel	P-Channel	
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V	2.4	-1.7	A
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V	1.9	-1.4	
I_{DM}	Pulsed Drain Current ①	14	-9.6	
P_D @T_A = 25°C	Power Dissipation	1.25		W
	Linear Derating Factor	10		mW/°C
V_{GS}	Gate-to-Source Voltage	± 20		V
dv/dt	Peak Diode Recovery dv/dt ②	5.0	-5.0	V/ns
T_J, T_{STG}	Junction and Storage Temperature Range	-55 to + 150		°C

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient④	——	100	°C/W

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

	Parameter		Min.	Typ.	Max.	Unit	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	—	0.059	—	V/°C	Reference to 25°C, I_D = 1mA
		P-Ch	—	-0.024	—		Reference to 25°C, I_D = -1mA
$R_{DS(ON)}$	Static Drain-to-Source On-Resistance	N-Ch	—	—	0.135	Ω	V_{GS} = 10V, I_D = 1.7A ③
			—	—	0.222		V_{GS} = 4.5V, I_D = 0.85A ③
		P-Ch	—	—	0.27		V_{GS} = -10V, I_D = -1.2A ③
			—	—	0.45		V_{GS} = -4.5V, I_D = -0.60A ③
$V_{GS(th)}$	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	1.9	—	—	S	V_{DS} = 10V, I_D = 0.85A ③
		P-Ch	0.94	—	—		V_{DS} = -10V, I_D = -0.60A ③
I_{DSS}	Drain-to-Source Leakage Current	N-Ch	—	—	1.0	µA	V_{DS} = 24V, V_{GS} = 0V
		P-Ch	—	—	-1.0		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	—	7.8	12	nC	N-Channel I_D = 1.7A, V_{DS} = 24V, V_{GS} = 10V ③ P-Channel I_D = -1.2A, V_{DS} = -24V, V_{GS} = -10V
		P-Ch	—	7.3	11		
Q_{gs}	Gate-to-Source Charge	N-Ch	—	1.2	1.8		
		P-Ch	—	1.1	1.6		
Q_{gd}	Gate-to-Drain ("Miller") Charge	N-Ch	—	2.5	3.8		
		P-Ch	—	2.4	3.7		
$t_{d(on)}$	Turn-On Delay Time	N-Ch	—	4.7	—	ns	N-Channel V_{DD} = 15V, I_D = 1.7A, R_G = 6.1Ω, R_D = 8.7Ω ③ P-Channel V_{DD} = -15V, I_D = -1.2A, R_G = 6.2Ω, R_D = 12Ω
		P-Ch	—	11	—		
t_r	Rise Time	N-Ch	—	10	—		
		P-Ch	—	15	—		
$t_{d(off)}$	Turn-Off Delay Time	N-Ch	—	12	—		
		P-Ch	—	36	—		
t_f	Fall Time	N-Ch	—	5.3	—		
		P-Ch	—	28	—		
C_{iss}	Input Capacitance	N-Ch	—	210	—	pF	N-Channel V_{GS} = 0V, V_{DS} = 25V, f = 1.0MHz ③ P-Channel V_{GS} = 0V, V_{DS} = -25V, f = 1.0MHz
		P-Ch	—	180	—		
C_{oss}	Output Capacitance	N-Ch	—	80	—		
		P-Ch	—	88	—		
C_{rss}	Reverse Transfer Capacitance	N-Ch	—	32	—		
		P-Ch	—	40	—		

Source-Drain Ratings and Characteristics

	Parameter		Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	N-Ch	—	—	1.25	A	
		P-Ch	—	—	-1.25		
I_{SM}	Pulsed Source Current (Body Diode) ①	N-Ch	—	—	14		
		P-Ch	—	—	-9.6		
V_{SD}	Diode Forward Voltage	N-Ch	—	—	1.2	V	T_J = 25°C, I_S =1.7A, V_{GS} = 0V ③
		P-Ch	—	—	-1.2		T_J = 25°C, I_S = -1.2A, V_{GS} = 0V ③
t_{rr}	Reverse Recovery Time	N-Ch	—	40	60	ns	N-Channel T_J = 25°C, I_F = 1.7A, di/dt = 100A/µs P-Channel ③ T_J = 25°C, I_F = -1.2A, di/dt = 100A/µs
		P-Ch	—	40	60		
Q_{rr}	Reverse Recovery Charge	N-Ch	—	48	72	nC	
		P-Ch	—	45	67		

Notes:

① Repetitive rating; pulse width limited by max. junction temperature. (See Fig. 21)

② N-Channel I_{SD} ≤ 1.7A, di/dt ≤ 120A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 150°C
P-Channel I_{SD} ≤ -1.2A, di/dt ≤ 160A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_J ≤ 150°C

③ Pulse width ≤ 300µs; duty cycle ≤ 2%.

④ Surface mounted on FR-4 board, t ≤ 10sec.

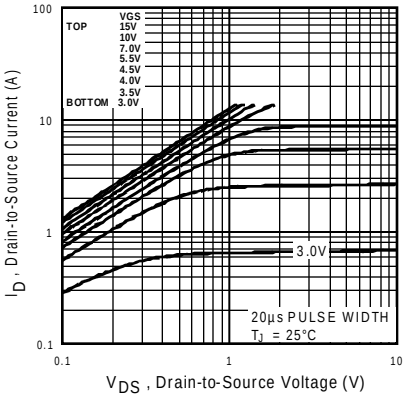


Fig 1. Typical Output Characteristics

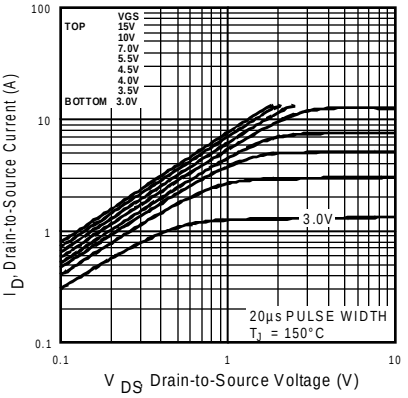


Fig 2. Typical Output Characteristics

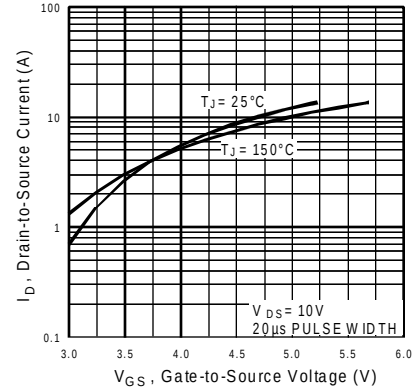


Fig 3. Typical Transfer Characteristics

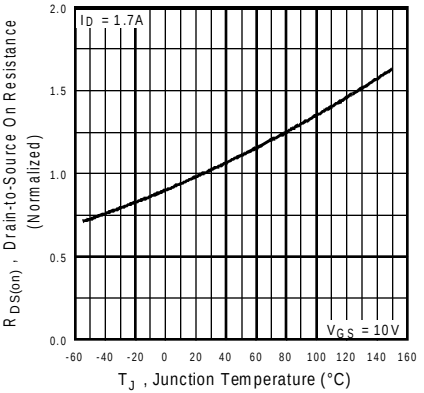


Fig 4. Normalized On-Resistance Vs. Temperature

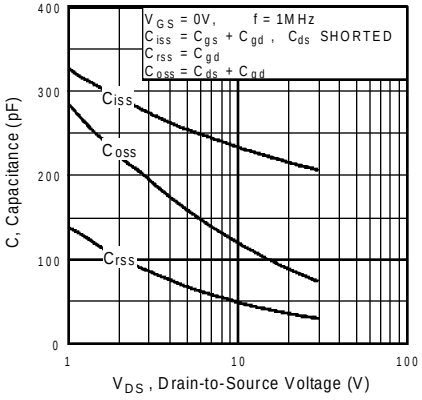


Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage

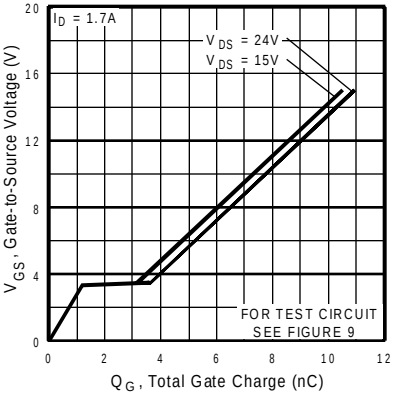


Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage

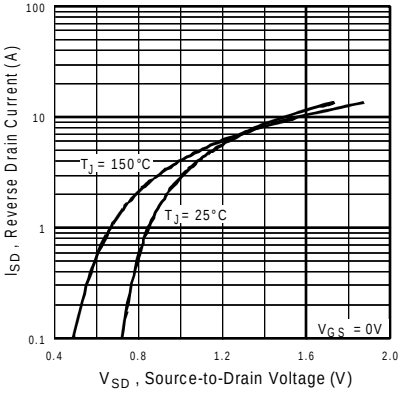


Fig 7. Typical Source-Drain Diode Forward Voltage

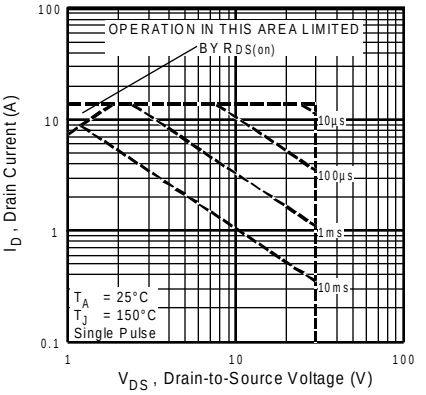


Fig 8. Maximum Safe Operating Area

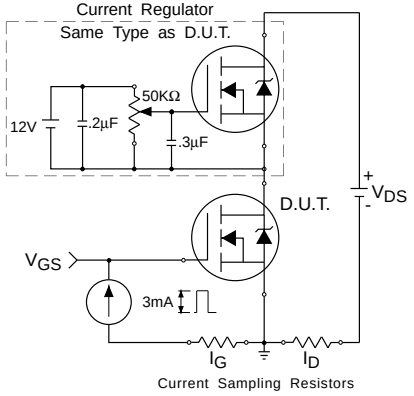


Fig 9a. Gate Charge Test Circuit

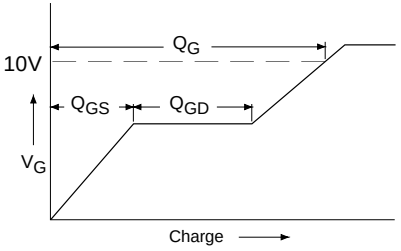


Fig 9b. Basic Gate Charge Waveform

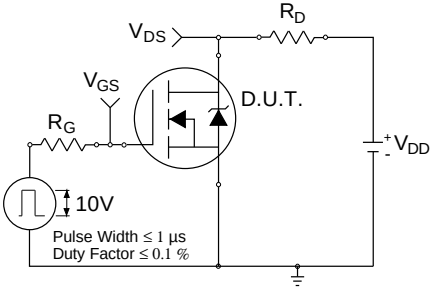


Fig 10a. Switching Time Test Circuit

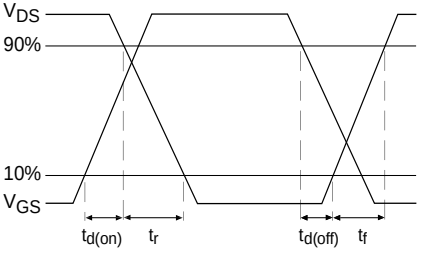


Fig 10b. Switching Time Waveforms

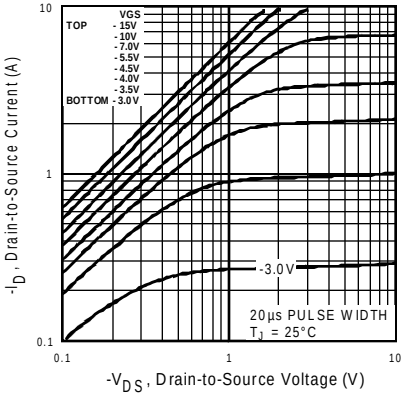


Fig 11. Typical Output Characteristics

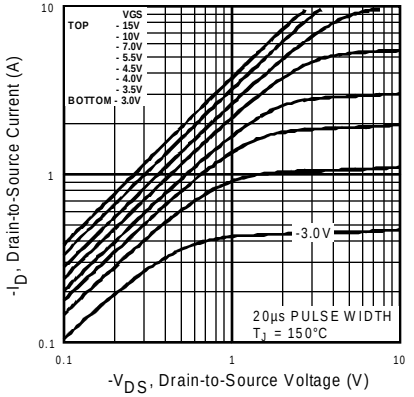


Fig 12. Typical Output Characteristics

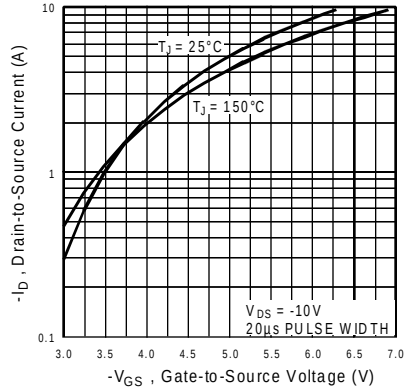


Fig 13. Typical Transfer Characteristics

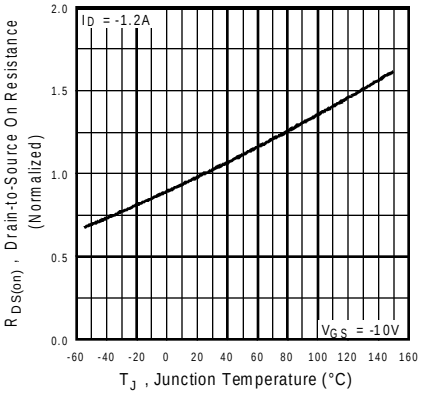


Fig 14. Normalized On-Resistance Vs. Temperature

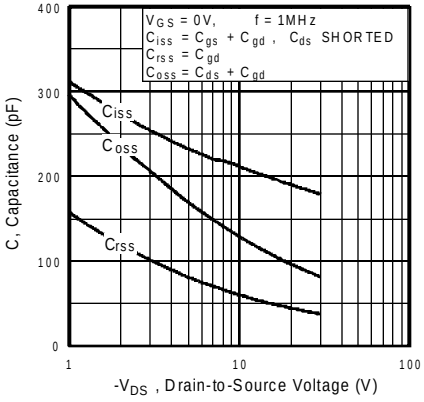


Fig 15. Typical Capacitance Vs. Drain-to-Source Voltage

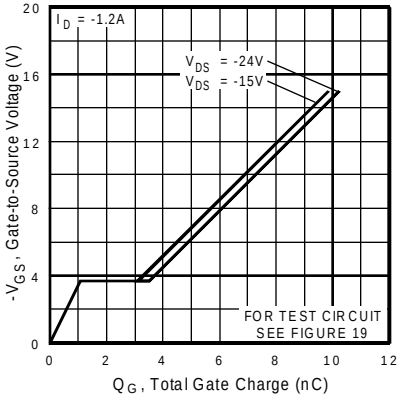


Fig 16. Typical Gate Charge Vs. Gate-to-Source Voltage

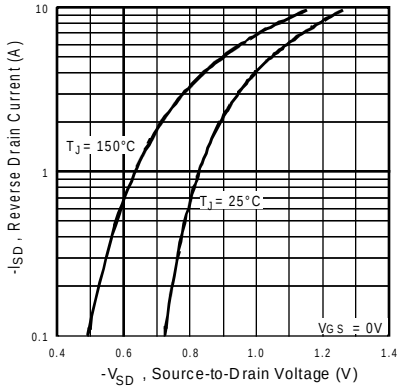


Fig 17. Typical Source-Drain Diode Forward Voltage

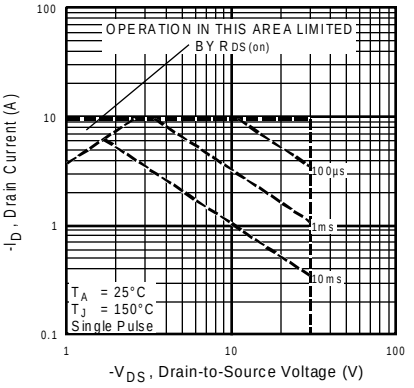


Fig 18. Maximum Safe Operating Area

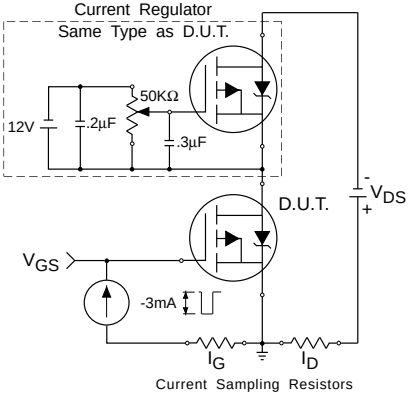


Fig 19a. Gate Charge Test Circuit

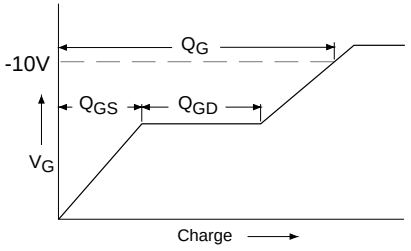


Fig 19b. Basic Gate Charge Wavefor

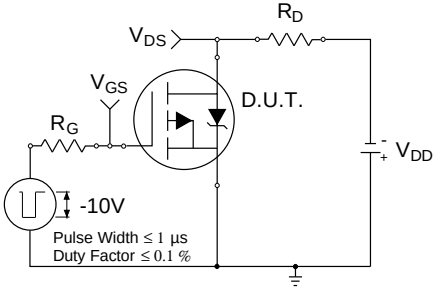


Fig 20a. Switching Time Test Circuit

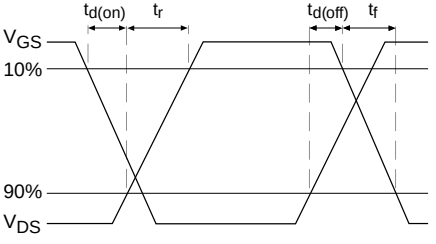


Fig 20b. Switching Time Waveforms

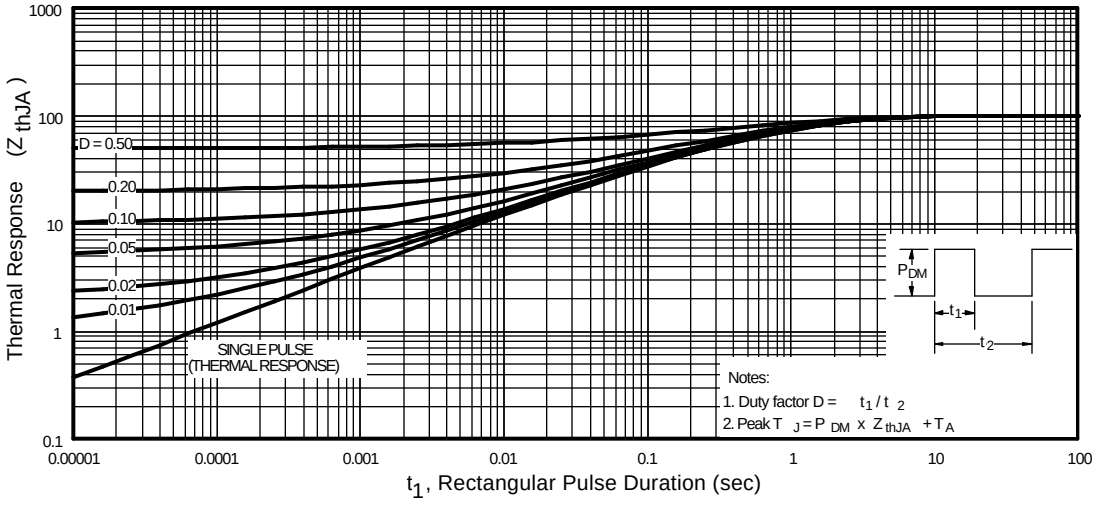
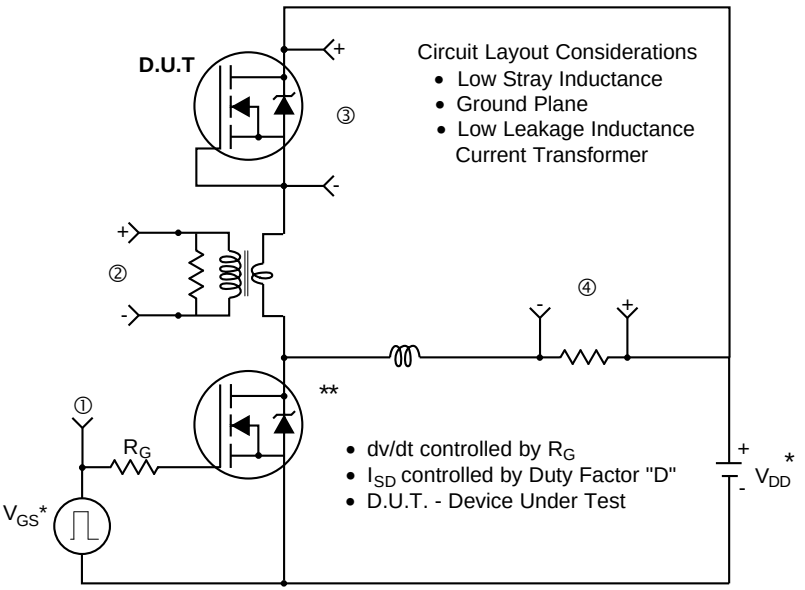


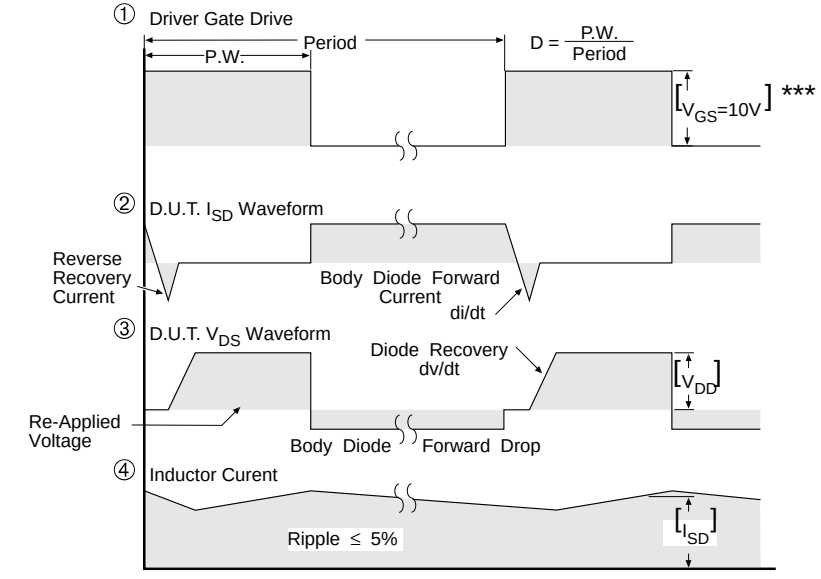
Fig 21. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

Peak Diode Recovery dv/dt Test Circuit



* Reverse Polarity for P-Channel

** Use P-Channel Driver for P-Channel Measurements



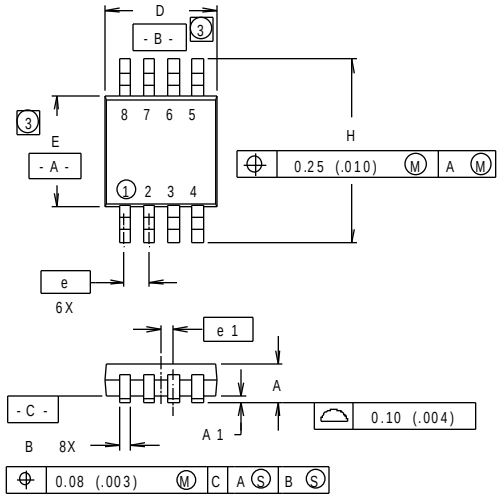
*** V_{GS} = 5.0V for Logic Level and 3V Drive Devices

Fig 22. For N and P Channel HEXFETS

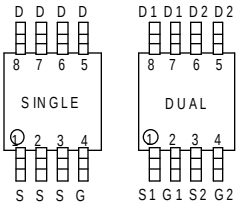
Package Outline

Micro8 Outline

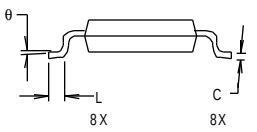
Dimensions are shown in millimeters (inches)



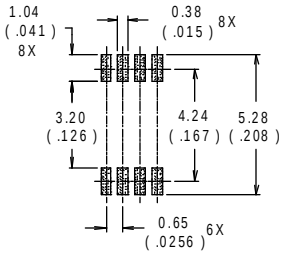
LEAD ASSIGNMENTS



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.036	.044	0.91	1.11
A1	.004	.008	0.10	0.20
B	.010	.014	0.25	0.36
C	.005	.007	0.13	0.18
D	.116	.120	2.95	3.05
e	.0256 BASIC		0.65 BASIC	
e1	.0128 BASIC		0.33 BASIC	
E	.116	.120	2.95	3.05
H	.188	.198	4.78	5.03
L	.016	.026	0.41	0.66
θ	0°	6°	0°	6°



RECOMMENDED FOOTPRINT



NOTES:

1 DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1982.

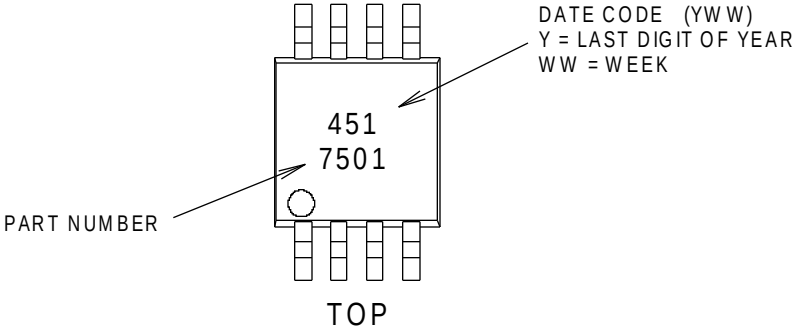
2 CONTROLLING DIMENSION : INCH.

3 DIMENSIONS DO NOT INCLUDE MOLD FLASH.

Part Marking Information

Micro8

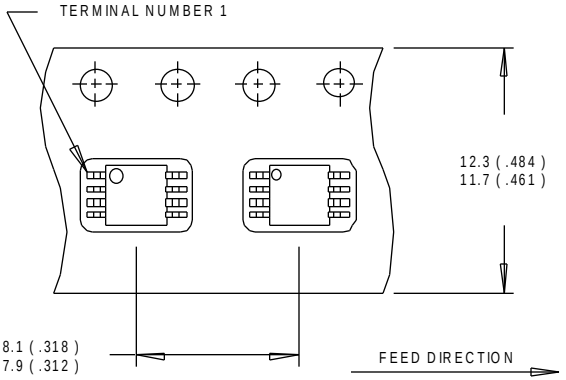
EXAMPLE : THIS IS AN IRF7501



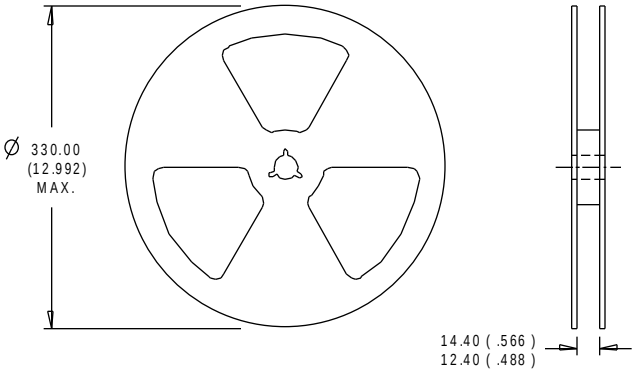
Tape & Reel Information

Micro8

Dimensions are shown in millimeters (inches)



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



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

International
IOR Rectifier

WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, Tel: (310) 322 3331
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IR CANADA: 7321 Victoria Park Ave., Suite 201, Markham, Ontario L3R 2Z8, Tel: (905) 475 1897
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 FAR EAST: K&H Bldg., 2F, 30-4 Nishi-Ikebukuro 3-Chome, Toshima-Ku, Tokyo Japan 171 Tel: 81 3 3983 0086
IR SOUTHEAST ASIA: 315 Outram Road, #10-02 Tan Boon Liat Building, Singapore 0316 Tel: 65 221 8371