

IRF7854PbF

HEXFET® Power MOSFET

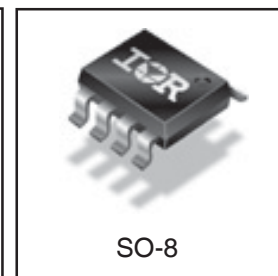
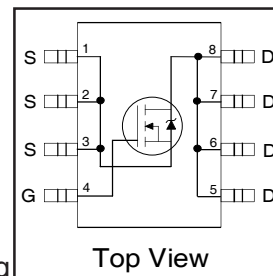
Applications

- Primary Side Switch in Bridge or two-switch forward topologies using 48V ($\pm 10\%$) or 36V to 60V ETSI range inputs.
- Secondary Side Synchronous Rectification Switch for 12Vout
- Suitable for 48V Non-Isolated Synchronous Buck DC-DC Applications

Benefits

- Low Gate to Drain Charge to Reduce Switching Losses
- Fully Characterized Capacitance Including Effective C_{OSS} to Simplify Design, (See App. Note AN1001)
- Fully Characterized Avalanche Voltage and Current

V_{DSS}	$R_{DS(on)}$ max	I_D
80V	13.4m Ω @ $V_{GS} = 10V$	10A



Absolute Maximum Ratings

	Parameter	Max.	Units
V_{DS}	Drain-to-Source Voltage	80	V
V_{GS}	Gate-to-Source Voltage	± 20	
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	10	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	7.9	
I_{DM}	Pulsed Drain Current ①	79	
$P_D @ T_A = 25^\circ C$	Maximum Power Dissipation	2.5	W
	Linear Derating Factor	0.02	W/ $^\circ C$
dv/dt	Peak Diode Recovery dv/dt ②	11	V/ns
T_J	Operating Junction and	-55 to + 150	$^\circ C$
T_{STG}	Storage Temperature Range		

Thermal Resistance

	Parameter	Typ.	Max.	Units
$R_{\theta JL}$	Junction-to-Drain Lead	—	20	$^\circ C/W$
$R_{\theta JA}$	Junction-to-Ambient (PCB Mount) ③ ⑦	—	50	

Notes ① through ⑦ are on page 8

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

	Parameter	Min.	Typ.	Max.	Units	Conditions
$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	80	—	—	V	$V_{GS} = 0V, I_D = 250\mu A$
$\Delta V_{(BR)DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	—	0.095	—	V/°C	Reference to $25^\circ\text{C}, I_D = 1mA$
$R_{DS(on)}$	Static Drain-to-Source On-Resistance	—	11	13.4	m Ω	$V_{GS} = 10V, I_D = 10A$ ④
$V_{GS(th)}$	Gate Threshold Voltage	3.0	—	4.9	V	$V_{DS} = V_{GS}, I_D = 100\mu A$
I_{DSS}	Drain-to-Source Leakage Current	—	—	20	μA	$V_{DS} = 80V, V_{GS} = 0V$
		—	—	250		$V_{DS} = 80V, V_{GS} = 0V, T_J = 125^\circ\text{C}$
I_{GSS}	Gate-to-Source Forward Leakage	—	—	100	nA	$V_{GS} = 20V$
	Gate-to-Source Reverse Leakage	—	—	-100		$V_{GS} = -20V$

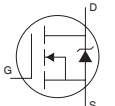
Dynamic @ $T_J = 25^\circ\text{C}$ (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
g_{fs}	Forward Transconductance	12	—	—	S	$V_{DS} = 25V, I_D = 6.0A$
Q_g	Total Gate Charge	—	27	41	nC	$I_D = 6.0A$ $V_{DS} = 40V$ $V_{GS} = 10V$ ④
Q_{gs}	Gate-to-Source Charge	—	7.7	—		
Q_{gd}	Gate-to-Drain ("Miller") Charge	—	8.7	—		
$t_{d(on)}$	Turn-On Delay Time	—	9.4	—	ns	$V_{DD} = 40V$ $I_D = 6.0A$ $R_G = 6.2\Omega$ $V_{GS} = 10V$ ④
t_r	Rise Time	—	8.5	—		
$t_{d(off)}$	Turn-Off Delay Time	—	15	—		
t_f	Fall Time	—	8.6	—		
C_{iss}	Input Capacitance	—	1620	—	pF	$V_{GS} = 0V$ $V_{DS} = 25V$ $f = 1.0MHz$
C_{oss}	Output Capacitance	—	350	—		
C_{riss}	Reverse Transfer Capacitance	—	86	—		
C_{oss}	Output Capacitance	—	1730	—		
C_{oss}	Output Capacitance	—	230	—		
C_{oss}	Output Capacitance	—	230	—		
$C_{oss\ eff.}$	Effective Output Capacitance	—	410	—		

Avalanche Characteristics

	Parameter	Typ.	Max.	Units
E_{AS}	Single Pulse Avalanche Energy ②	—	110	mJ
I_{AR}	Avalanche Current ①	—	6.0	A

Diode Characteristics

	Parameter	Min.	Typ.	Max.	Units	Conditions
I_S	Continuous Source Current (Body Diode)	—	—	2.3	A	MOSFET symbol showing the integral reverse p-n junction diode. 
I_{SM}	Pulsed Source Current (Body Diode) ①	—	—	79		
V_{SD}	Diode Forward Voltage	—	—	1.3	V	$T_J = 25^\circ\text{C}, I_S = 6.0A, V_{GS} = 0V$ ④
t_{rr}	Reverse Recovery Time	—	43	65	ns	$T_J = 25^\circ\text{C}, I_F = 6.0A, V_{DD} = 25V$
Q_{rr}	Reverse Recovery Charge	—	76	110	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)				

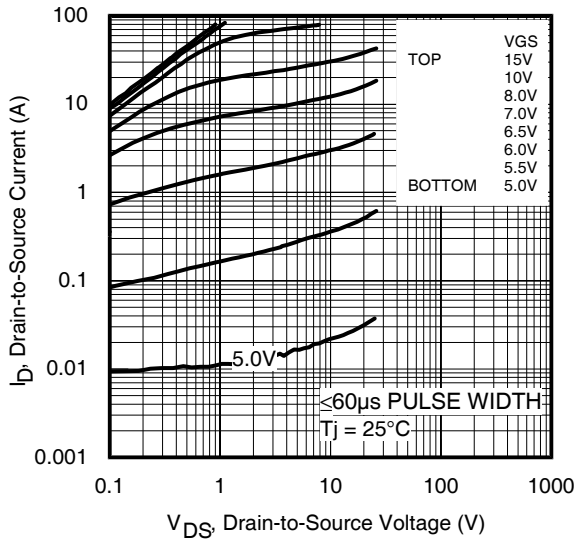


Fig 1. Typical Output Characteristics

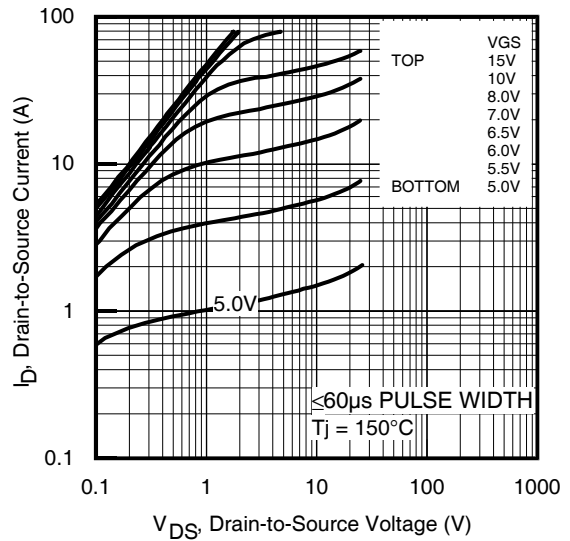


Fig 2. Typical Output Characteristics

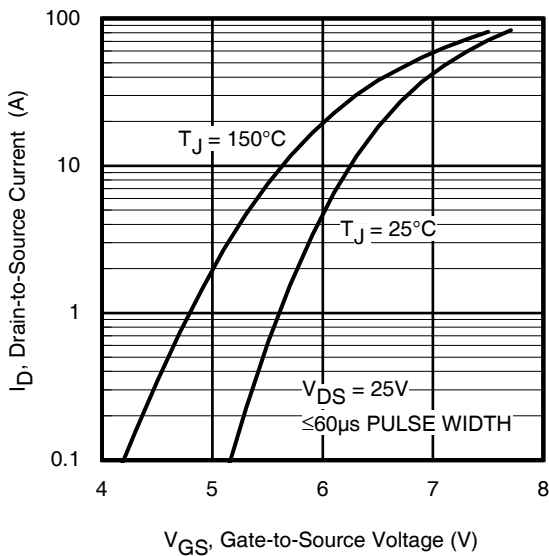


Fig 3. Typical Transfer Characteristics

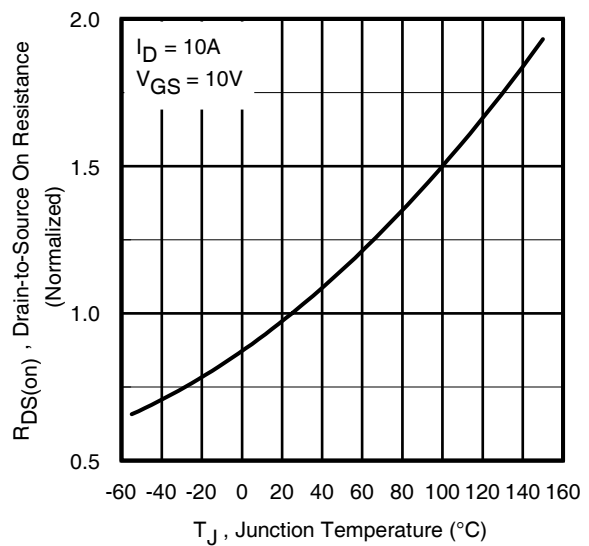


Fig 4. Normalized On-Resistance vs. Temperature

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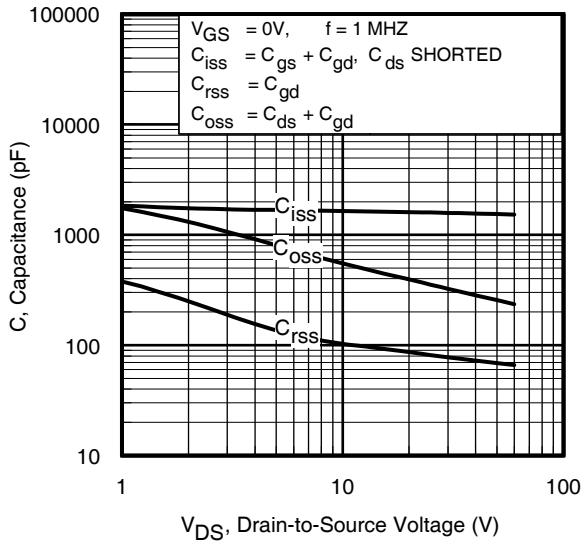


Fig 5. Typical Capacitance vs. Drain-to-Source Voltage

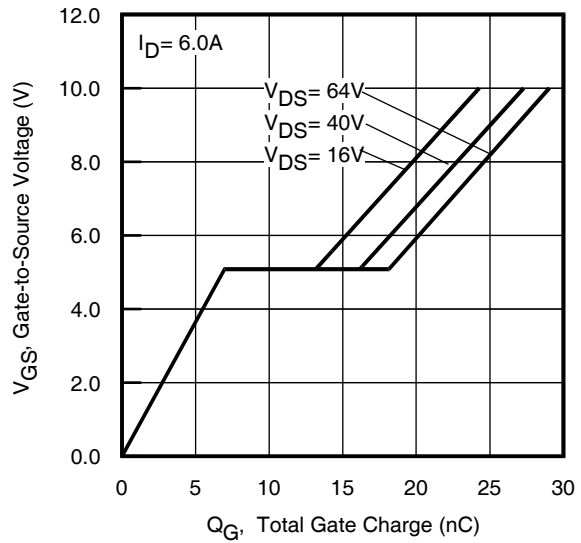


Fig 6. Typical Gate Charge vs. Gate-to-Source Voltage

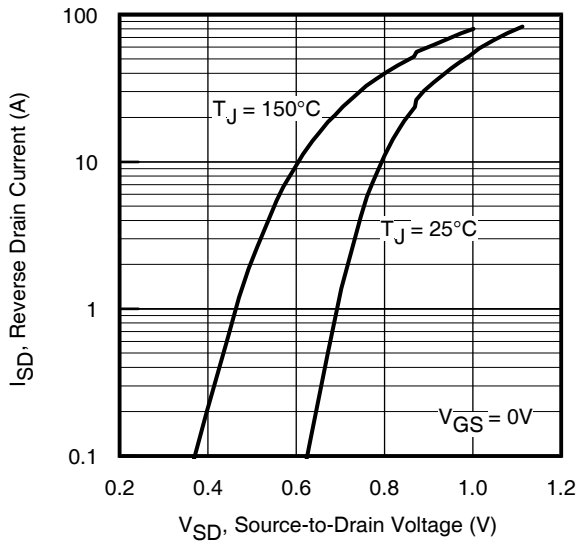


Fig 7. Typical Source-Drain Diode Forward Voltage

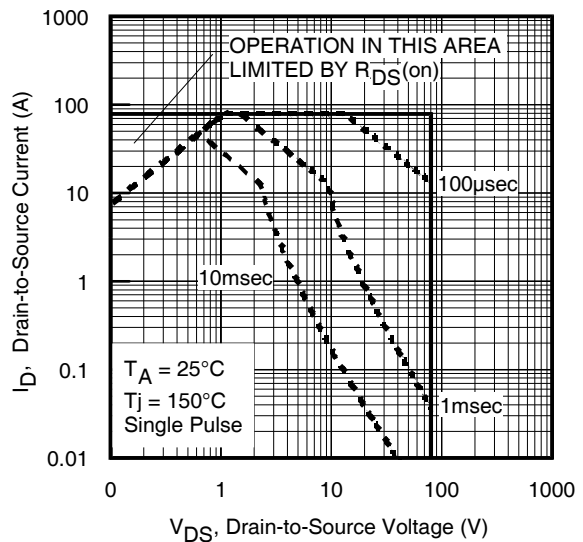


Fig 8. Maximum Safe Operating Area

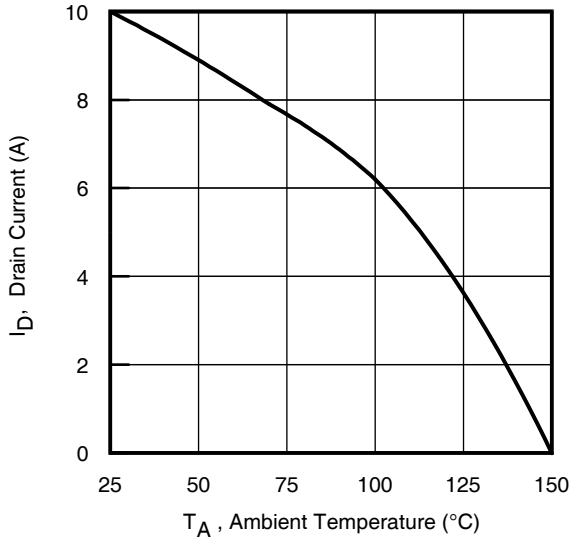


Fig 9. Maximum Drain Current vs. Ambient Temperature

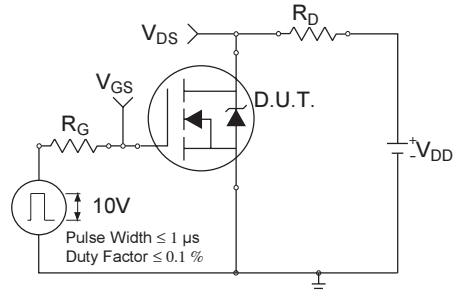


Fig 10a. Switching Time Test Circuit

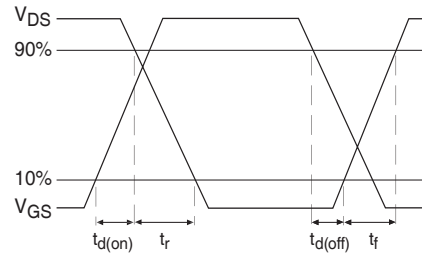


Fig 10b. Switching Time Waveforms

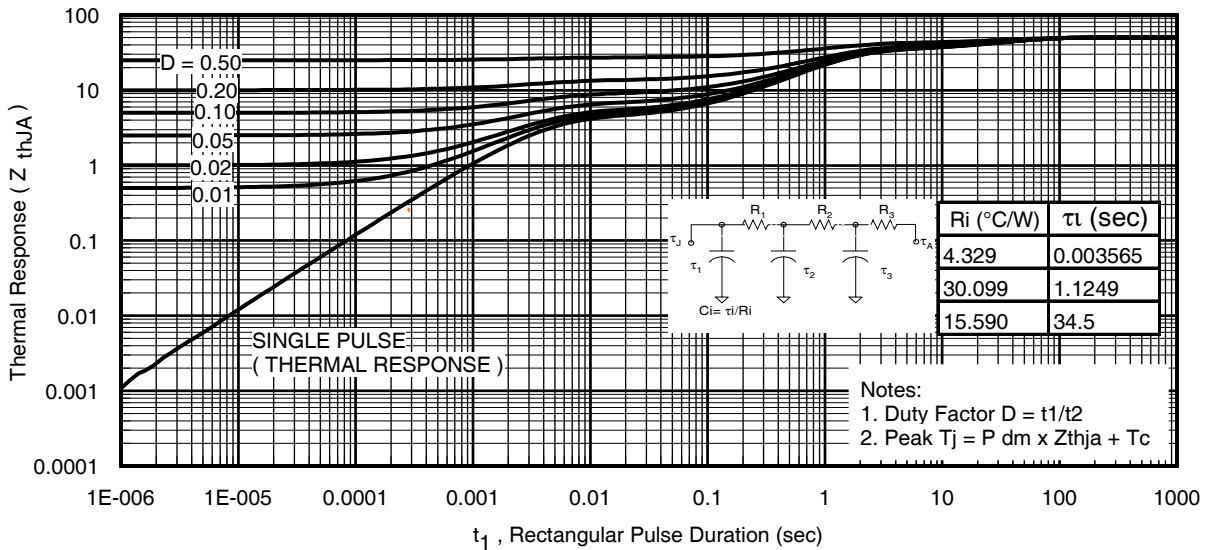


Fig 11. Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

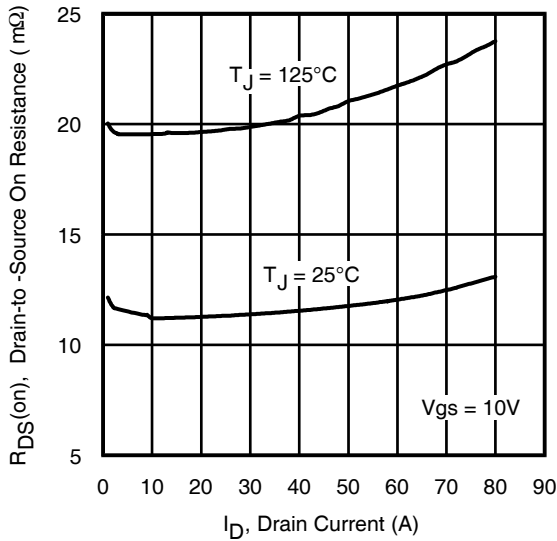


Fig 12. On-Resistance vs. Drain Current

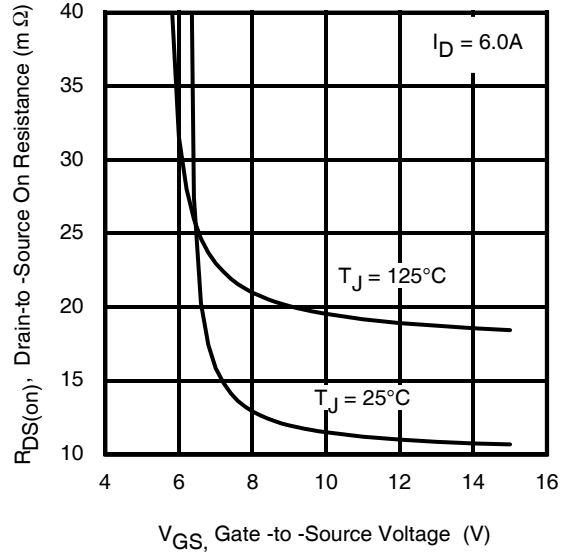


Fig 13. On-Resistance vs. Gate Voltage

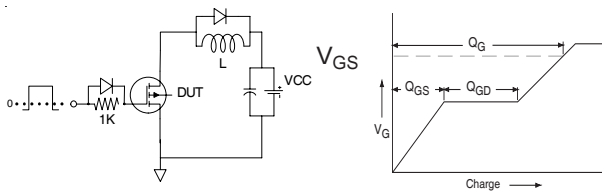


Fig 14a&b. Basic Gate Charge Test Circuit and Waveform

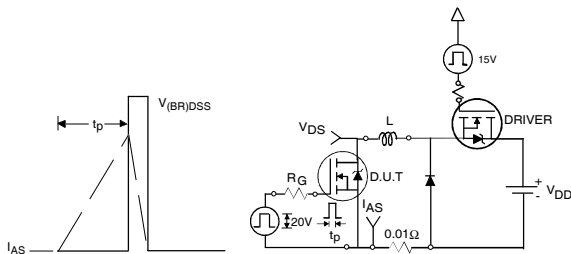


Fig 15a&b. Unclamped Inductive Test circuit and Waveforms

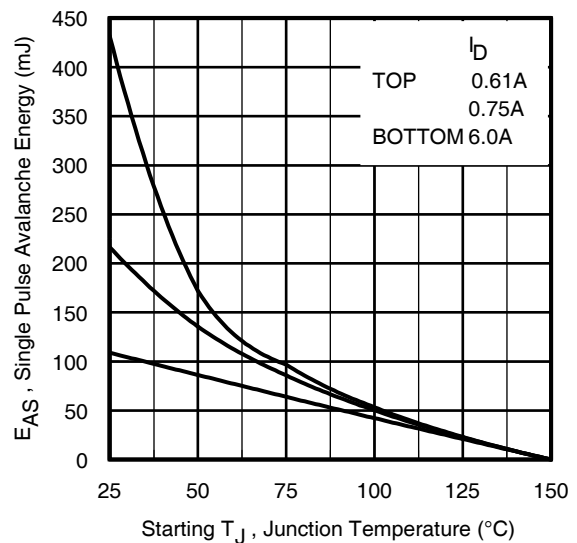
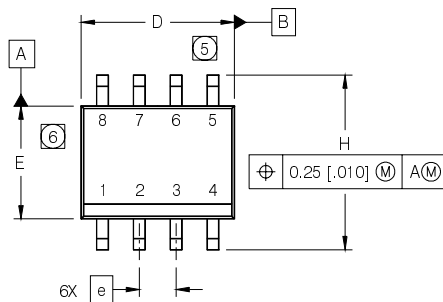


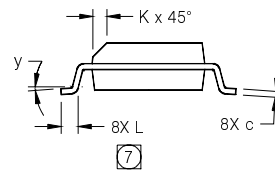
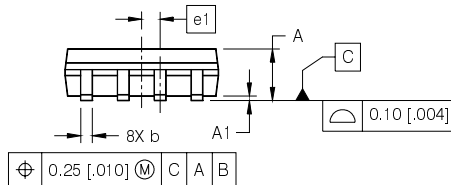
Fig 15c. Maximum Avalanche Energy vs. Drain Current

SO-8 Package Outline

Dimensions are shown in millimeters (inches)



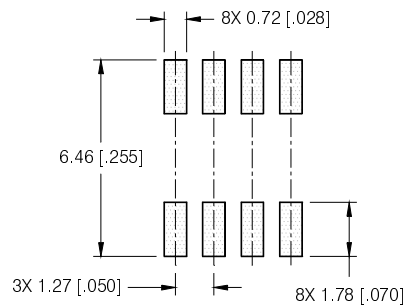
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.0532	.0688	1.35	1.75
A1	.0040	.0098	0.10	0.25
b	.013	.020	0.33	0.51
c	.0075	.0098	0.19	0.25
D	.189	.1968	4.80	5.00
E	.1497	.1574	3.80	4.00
e	.050 BASIC		1.27 BASIC	
e1	.025 BASIC		0.635 BASIC	
H	.2284	.2440	5.80	6.20
K	.0099	.0196	0.25	0.50
L	.016	.050	0.40	1.27
y	0°	8°	0°	8°



NOTES:

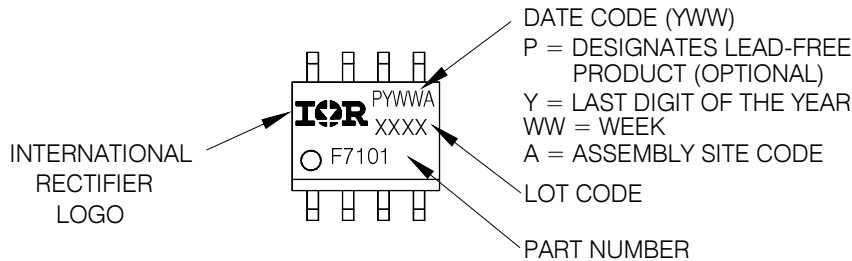
- DIMENSIONING & TOLERANCING PER ASME Y14.5M-1994.
- CONTROLLING DIMENSION: MILLIMETER
- DIMENSIONS ARE SHOWN IN MILLIMETERS [INCHES].
- OUTLINE CONFORMS TO JEDEC OUTLINE MS-012AA.
- ⑤** DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.15 [0.006].
- ⑥** DIMENSION DOES NOT INCLUDE MOLD PROTRUSIONS. MOLD PROTRUSIONS NOT TO EXCEED 0.25 [0.010].
- ⑦** DIMENSION IS THE LENGTH OF LEAD FOR SOLDERING TO A SUBSTRATE.

FOOTPRINT



SO-8 Part Marking Information

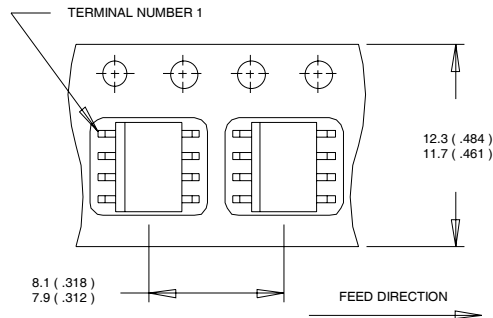
EXAMPLE: THIS IS AN IRF7101 (MOSFET)



IRF7854PbF

International
IR Rectifier

SO-8 Tape and Reel



- 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.

Notes:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Starting $T_J = 25^\circ\text{C}$, $L = 6.0\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 6.0\text{A}$.
- ③ When mounted on 1 inch square copper board, $t \leq 10$ sec.
- ④ Pulse width $\leq 400\mu\text{s}$; duty cycle $\leq 2\%$.
- 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 $I_{SD} \leq 6.0\text{A}$, $di/dt \leq 350\text{A}/\mu\text{s}$, $V_{DD} \leq V_{(BR)DSS}$, $T_J \leq 150^\circ\text{C}$.
- ⑦ R_{θ} is measured at T_J of approximately 90°C .

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

International
IR Rectifier

IR WORLD HEADQUARTERS: 233 Kansas St., El Segundo, California 90245, USA Tel: (310) 252-7105
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