International IƏR Rectifier

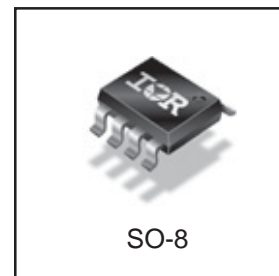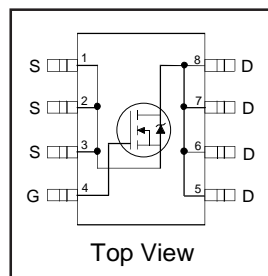# IRF7476PbF

HEXFET® Power MOSFET

Applications

- High Frequency 3.3V and 5V input Point-of-Load Synchronous Buck Converters for Netcom and Computing Applications.
- Power Management for Netcom, Computing and Portable Applications.
- Lead-Free

Benefits

- Ultra-Low Gate Impedance
- Very Low $R_{DS(on)}$
- Fully Characterized Avalanche Voltage and Current

V_{DSS}	$R_{DS(on)}$ max	I_D
12V	8.0mΩ@V_{GS} = 4.5V	15A

Top View

SO-8

Absolute Maximum Ratings

Symbol	Parameter	Max.	Units
V_{DS}	Drain-Source Voltage	12	V
V_{GS}	Gate-to-Source Voltage	±12	V
I_D @ T_A = 25°C	Continuous Drain Current, V_{GS} @ 10V	15	A
I_D @ T_A = 70°C	Continuous Drain Current, V_{GS} @ 10V	12	
I_{DM}	Pulsed Drain Current①	120	
P_D @T_A = 25°C	Maximum Power Dissipation④	2.5	W
P_D @T_A = 70°C	Maximum Power Dissipation④	1.6	W
	Linear Derating Factor	0.02	W/°C
T_J , T_{STG}	Junction and Storage Temperature Range	-55 to + 150	°C

Thermal Resistance

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JL}$	Junction-to-Drain Lead	——	20	
$R_{\theta JA}$	Junction-to-Ambient ④	——	50	°C/W

Notes ① through ④ are on page 8

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Static @ T$_J$ = 25°C (unless otherwise specified)

	Parameter	Min.	Typ.	Max.	Units	Conditions
V$_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	12	——	——	V	V$_{GS}$ = 0V, I$_D$ = 250µA
∆V$_{(BR)DSS}$/∆T$_J$	Breakdown Voltage Temp. Coefficient	——	0.014	——	V/°C	Reference to 25°C, I$_D$ = 1mA
R$_{DS(on)}$	Static Drain-to-Source On-Resistance	——	6.0	8.0	mΩ	V$_{GS}$ = 4.5V, I$_D$ = 15A ③
		——	12	30		V$_{GS}$ = 2.8V, I$_D$ = 12A ③
V$_{GS(th)}$	Gate Threshold Voltage	0.6	——	1.9	V	V$_{DS}$ = V$_{GS}$, I$_D$ = 250µA
I$_{DSS}$	Drain-to-Source Leakage Current	——	——	100	µA	V$_{DS}$ = 9.6V, V$_{GS}$ = 0V
		——	——	250		V$_{DS}$ = 9.6V, V$_{GS}$ = 0V, T$_J$ = 125°C
I$_{GSS}$	Gate-to-Source Forward Leakage	——	——	200	nA	V$_{GS}$ = 12V
	Gate-to-Source Reverse Leakage	——	——	-200		V$_{GS}$ = -12V

Dynamic @ T$_J$ = 25°C (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
g$_{fs}$	Forward Transconductance	31	——	——	S	V$_{DS}$ = 6.0V, I$_D$ = 12A
Q$_g$	Total Gate Charge	——	26	40	nC	I$_D$ = 12A
Q$_{gs}$	Gate-to-Source Charge	——	4.6	——		V$_{DS}$ = 10V
Q$_{gd}$	Gate-to-Drain ("Miller") Charge	——	11	——		V$_{GS}$ = 4.5V
Q$_{oss}$	Output Gate Charge	——	17	——		V$_{GS}$ = 0V, V$_{DS}$ = 5.0V
t$_{d(on)}$	Turn-On Delay Time	——	11	——	ns	V$_{DD}$ = 6.0V
t$_r$	Rise Time	——	29	——		I$_D$ = 12A
t$_{d(off)}$	Turn-Off Delay Time	——	19	——		R$_G$ = 1.8Ω
t$_f$	Fall Time	——	8.3	——		V$_{GS}$ = 4.5V ③
C$_{iss}$	Input Capacitance	——	2550	——	pF	V$_{GS}$ = 0V
C$_{oss}$	Output Capacitance	——	2190	——		V$_{DS}$ = 6.0V
C$_{rss}$	Reverse Transfer Capacitance	——	450	——		ƒ = 1.0MHz

Avalanche Characteristics

Symbol	Parameter	Typ.	Max.	Units
E$_{AS}$	Single Pulse Avalanche Energy②	——	160	mJ
I$_{AR}$	Avalanche Current①	——	12	A

Diode Characteristics

Symbol	Parameter	Min.	Typ.	Max.	Units	Conditions
I$_S$	Continuous Source Current (Body Diode)	——	——	2.5	A	MOSFET symbol showing the integral reverse p-n junction diode.
I$_{SM}$	Pulsed Source Current (Body Diode) ①	——	——	120		
V$_{SD}$	Diode Forward Voltage	——	0.87	1.2	V	T$_J$ = 25°C, I$_S$ = 12A, V$_{GS}$ = 0V ③
		——	0.73	——		T$_J$ = 125°C, I$_S$ = 12A, V$_{GS}$ = 0V ③
t$_{rr}$	Reverse Recovery Time	——	55	82	ns	T$_J$ = 25°C, I$_F$ = 12A, V$_R$=12V
Q$_{rr}$	Reverse Recovery Charge	——	59	89	nC	di/dt = 100A/µs ③
t$_{rr}$	Reverse Recovery Time	——	54	81	ns	T$_J$ = 125°C, I$_F$ = 12A, V$_R$=12V
Q$_{rr}$	Reverse Recovery Charge	——	60	90	nC	di/dt = 100A/µs ③

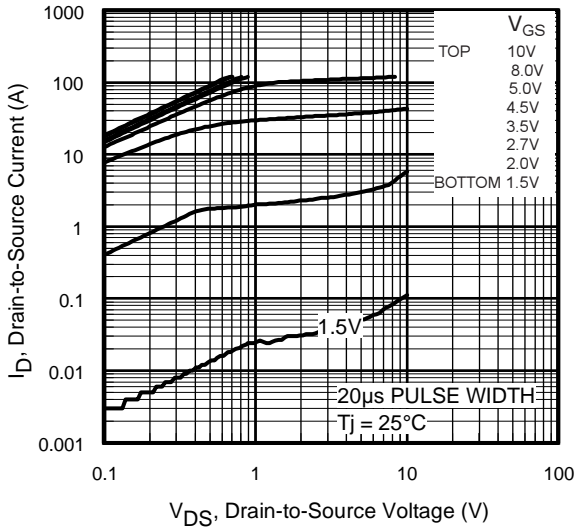# International IOR Rectifier

IRF7476PbF

Fig 1. Typical Output Characteristics
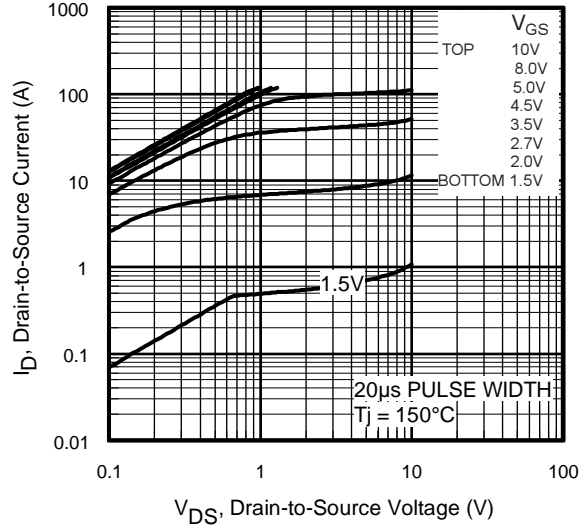

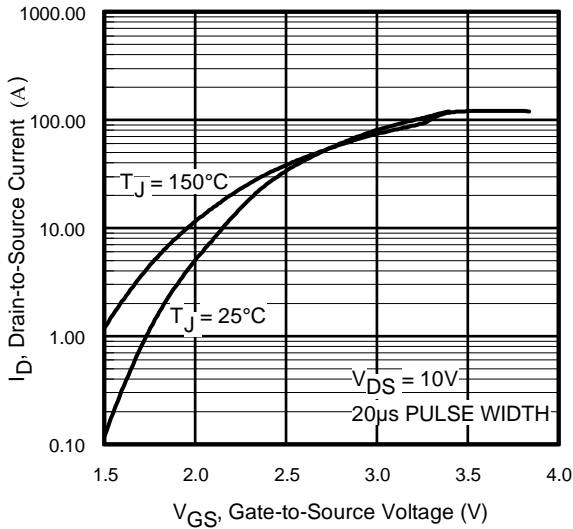**Fig 2.** Typical Output Characteristics

Fig 3. Typical Transfer Characteristics
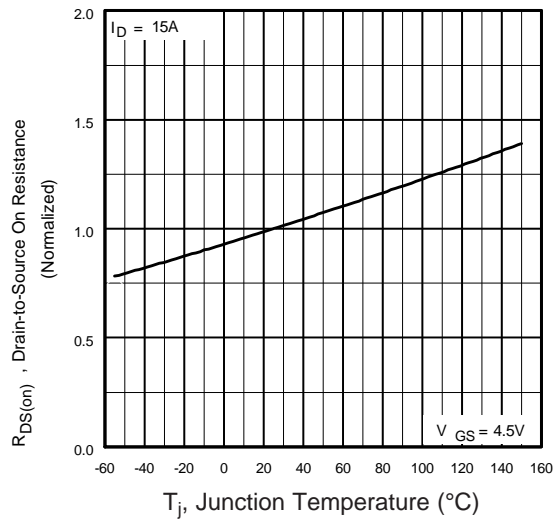

Fig 4. Normalized On-Resistance Vs. Temperature
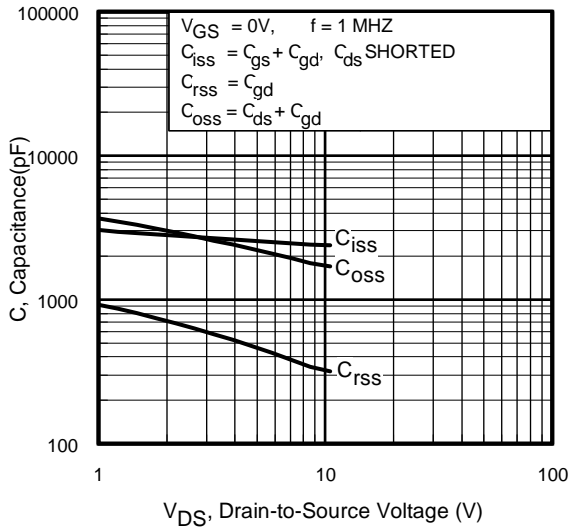
IRF7476PbF

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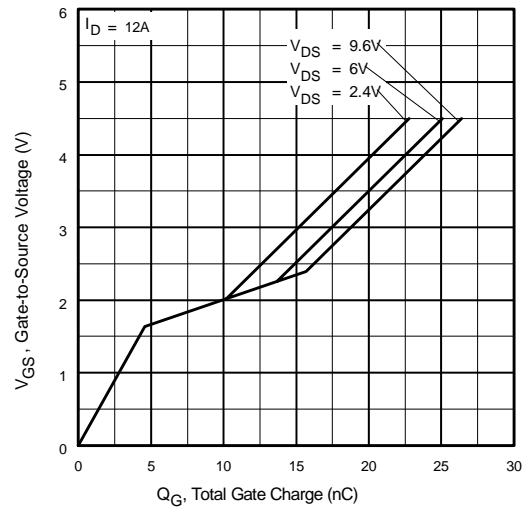Drain-to-Source Voltage
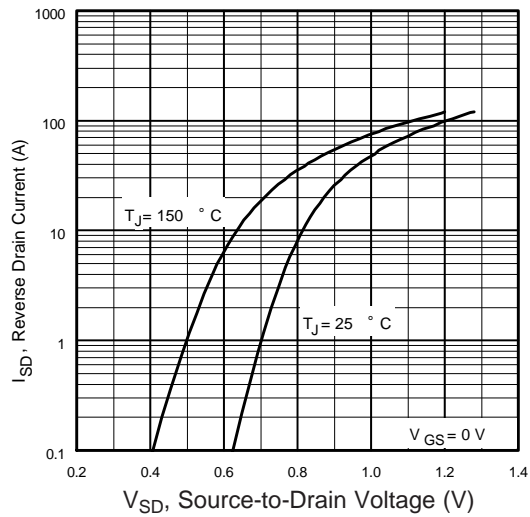

Fig 6. Typical Gate Charge Vs.
Gate-to-Source Voltage
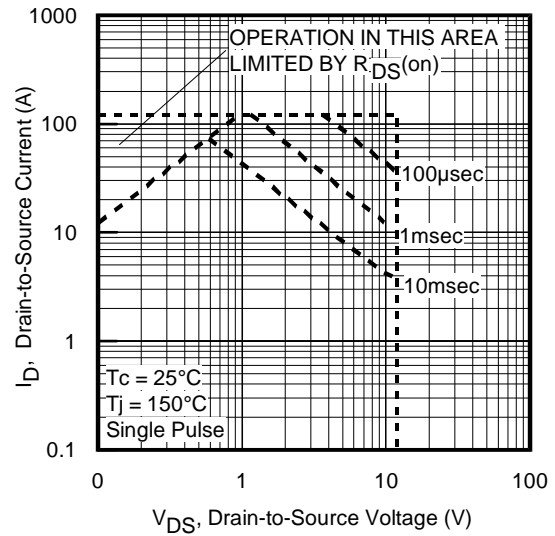

Fig 7. Typical Source-Drain Diode
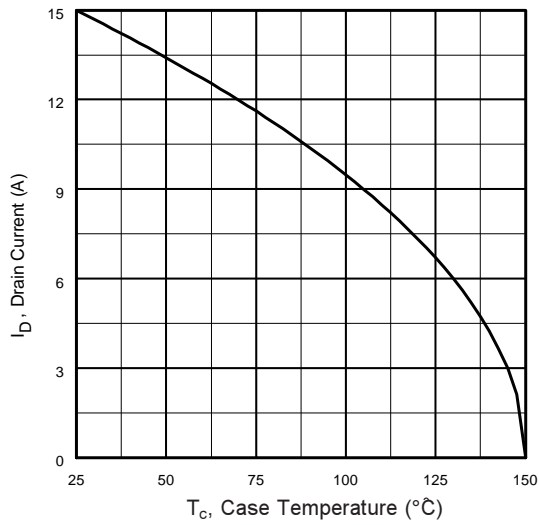Forward Voltage

Fig 8. Maximum Safe Operating Area

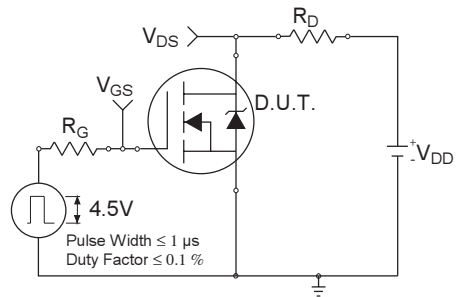**Fig 9.** Maximum Drain Current Vs. Case Temperature

Fig 10a. Switching Time Test Circuit

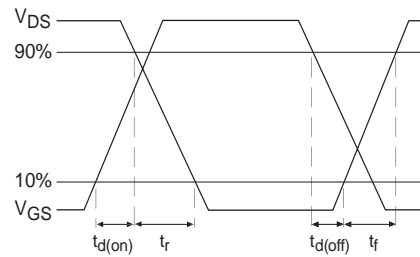**Fig 10b.** Switching Time Waveforms

Notes:
1. Duty factor D = t_1 / t_2
2. Peak T_J = P_{DM} x Z_{thJA} + T_A
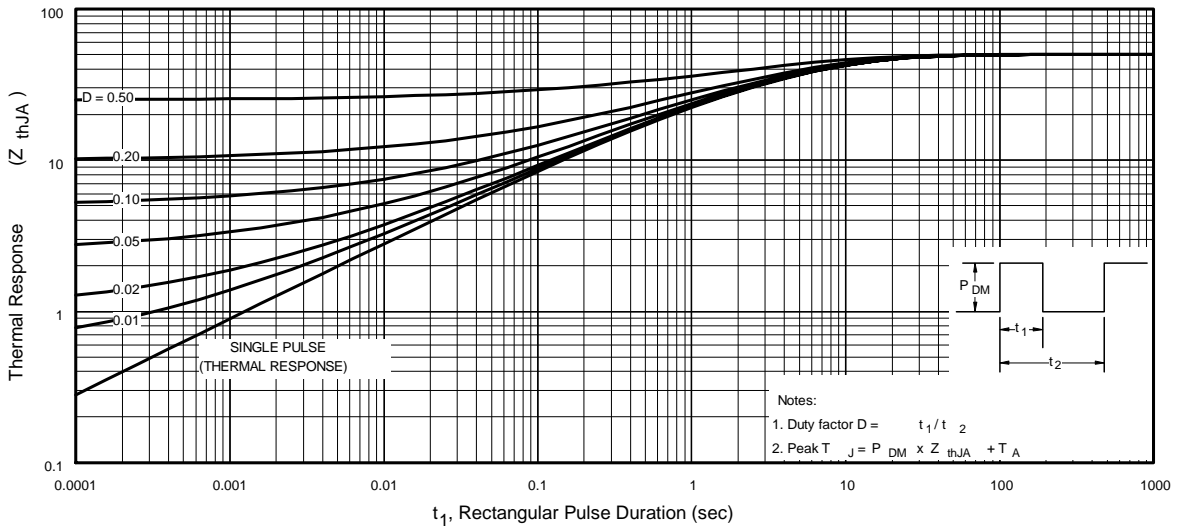
Fig 10. Maximum Effective Transient Thermal Impedance, Junction-to-Case

IRF7476PbF
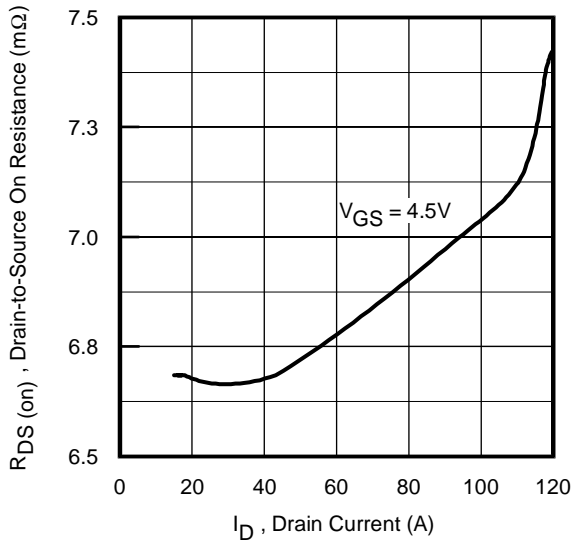
International
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Fig 12. On-Resistance Vs. Drain Current
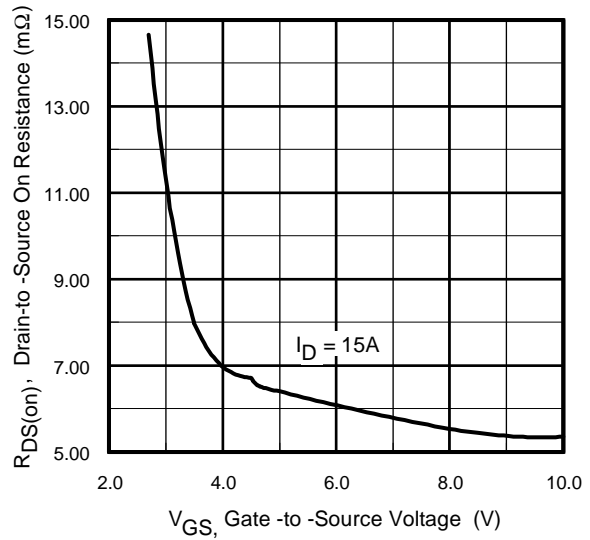

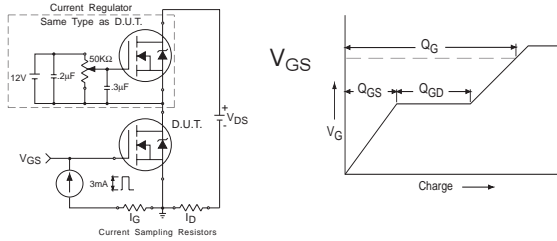**Fig 13.** On-Resistance Vs. Gate Voltage

Fig 13a&b. Basic Gate Charge Test Circuit and Waveform

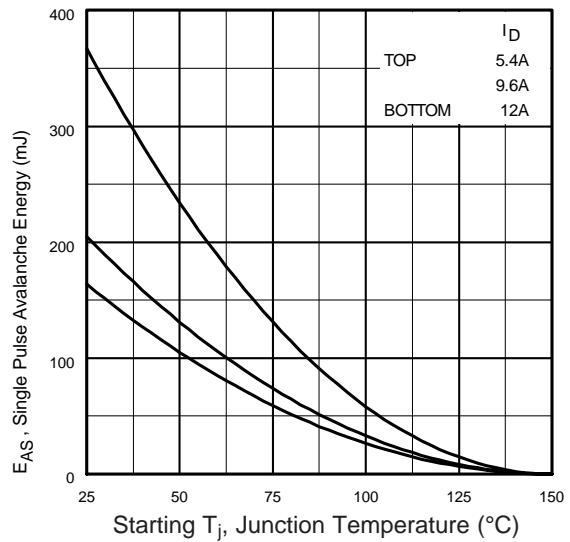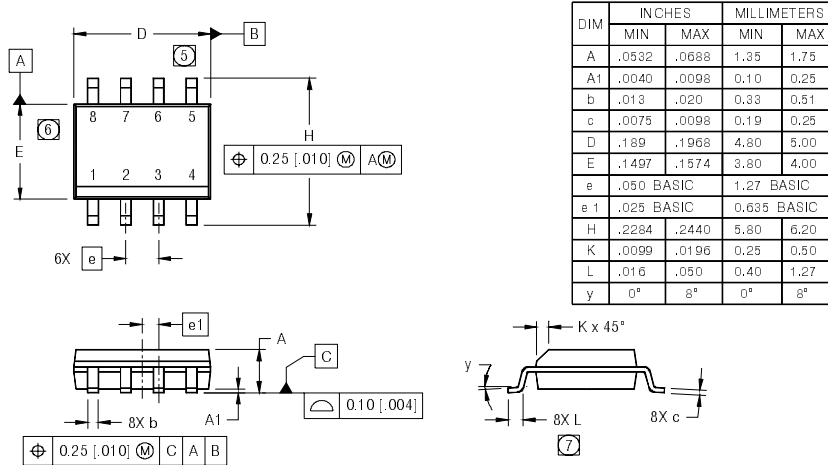**Fig 14a&b.** Unclamped Inductive Test circuit and Waveforms

Fig 14c. Maximum Avalanche Energy Vs. Drain Current

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SO-8 Package Outline

Dimensions are shown in milimeters (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°

⊕ 0.25 [.010] Ⓜ AⓂ

6X e

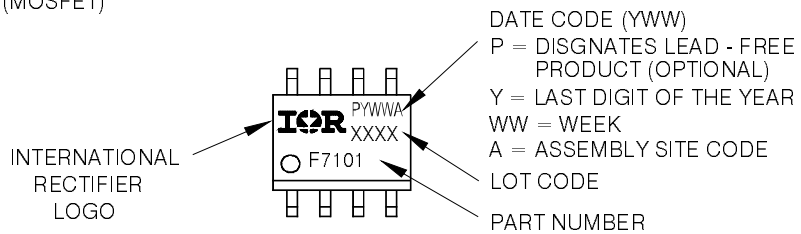⊕ 0.25 [.010] Ⓜ C A B

⌒ 0.10 [.004]

K x 45°

8X L   8X c

⑦

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

8X 0.72 [.028]

6.46 [.255]

3X 1.27 [.050]   8X 1.78 [.070]

SO-8 Part Marking Information

EXAMPLE: THIS IS AN IRF7101 (MOSFET)

INTERNATIONAL
RECTIFIER
LOGO

IƠR PYWWA
XXXX
○ F7101

DATE CODE (YWW)
P = DISGNATES LEAD - FREE
    PRODUCT (OPTIONAL)
Y = LAST DIGIT OF THE YEAR
WW = WEEK
A = ASSEMBLY SITE CODE
LOT CODE
PART NUMBER

IRF7476PbF

SO-8 Tape and Reel

Dimensions are shown in millimeters (inches)

TERMINAL NUMBER 1

12.3 (.484)
11.7 (.461)

8.1 (.318)
7.9 (.312)

FEED DIRECTION

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

∅ 330.00
(12.992)
MAX.

14.40 (.566)
12.40 (.488)

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°C, L = 2.3mH
R_G = 25Ω, I_{AS} = 12A.

③ Pulse width ≤ 400µs; duty cycle ≤ 2%.

④ When mounted on 1 inch square copper board.

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