

# ON Semiconductor

## Is Now

The logo for onsemi, featuring the word "onsemi" in a dark teal, lowercase, sans-serif font. The letter "i" is stylized with a white dot and a teal vertical bar. A small orange triangle is positioned above the top right of the "i". A trademark symbol (TM) is located to the right of the logo.

To learn more about onsemi™, please visit our website at  
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**ON Semiconductor®**  
**IRFW630B**

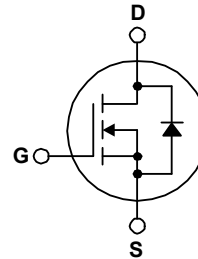
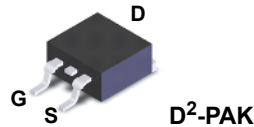
**N-Channel MOSFET**  
**200 V, 9 A, 400 mΩ**

**Description**

These N-Channel enhancement mode power field effect transistors are produced using ON Semiconductors proprietary, planar, DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and withstand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency switching DC/DC converters, switch mode power supplies, DC-AC converters for uninterrupted power supply and motor control.

**Features**

- 9.0 A, 200 V,  $R_{DS(on)} = 400 \text{ m}\Omega$  (Max.) @  $V_{GS} = 10 \text{ V}$ ,  $I_D = 4.5 \text{ A}$
- Low Gate Charge (Typ. 22 nC)
- Low  $C_{rss}$  (Typ. 22 pF)
- 100% Avalanche Tested



**Absolute Maximum Ratings**  $T_C = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	IRFW630BTM_FP001	Unit
$V_{DSS}$	Drain-Source Voltage	200	V
$I_D$	Drain Current - Continuous ( $T_C = 25^\circ\text{C}$ )	9.0	A
	- Continuous ( $T_C = 100^\circ\text{C}$ )	5.7	A
$I_{DM}$	Drain Current - Pulsed (Note 1)	36	A
$V_{GSS}$	Gate-Source voltage	$\pm 30$	V
$E_{AS}$	Single Pulsed Avalanche Energy (Note 2)	160	mJ
$I_{AR}$	Avalanche Current (Note 1)	9.0	A
$E_{AR}$	Repetitive Avalanche Energy (Note 1)	7.2	mJ
dv/dt	Peak Diode Recovery dv/dt (Note 3)	5.5	V/ns
$P_D$	Power Dissipation ( $T_A = 25^\circ\text{C}$ )*	3.13	W
	Power Dissipation ( $T_C = 25^\circ\text{C}$ )	72	W
	- Derate above $25^\circ\text{C}$	0.57	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +150	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering Purpose, 1/8" from Case for 5 Seconds	300	$^\circ\text{C}$

**Thermal Characteristics**

Symbol	Parameter	IRFW630BTM_FP001	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	1.74	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Min. Pad of 2-oz Copper), Max.	62.5	
	Thermal Resistance, Junction to Ambient (*1 in <sup>2</sup> Pad of 2-oz Copper), Max.	40	

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
IRFW630B	IRFW630BTM-FP001	D <sup>2</sup> -PAK	330 mm	24 mm	800 units

## Electrical Characteristics T<sub>C</sub> = 25°C unless otherwise noted.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Off Characteristics</b>						
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> = 0 V, I <sub>D</sub> = 250 μA	200	--	--	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C	--	0.2	--	V/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 200 V, V <sub>GS</sub> = 0 V	--	--	10	μA
		V <sub>DS</sub> = 160 V, T <sub>C</sub> = 125°C	--	--	100	μA
I <sub>GSSF</sub>	Gate-Body Leakage Current, Forward	V <sub>GS</sub> = 30 V, V <sub>DS</sub> = 0 V	--	--	100	nA
I <sub>GSSR</sub>	Gate-Body Leakage Current, Reverse	V <sub>GS</sub> = -30 V, V <sub>DS</sub> = 0 V	--	--	-100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA	2.0	--	4.0	V
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 4.5 A	--	0.34	0.4	Ω
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 40 V, I <sub>D</sub> = 4.5 A	--	7.05	--	S
<b>Dynamic Characteristics</b>						
C <sub>iSS</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz	--	550	720	pF
C <sub>oss</sub>	Output Capacitance		--	85	110	pF
C <sub>rSS</sub>	Reverse Transfer Capacitance		--	22	29	pF
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 100 V, I <sub>D</sub> = 9.0 A R <sub>G</sub> = 25 Ω	--	11	30	ns
t <sub>r</sub>	Turn-On Rise Time		--	70	150	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	60	130	ns
t <sub>f</sub>	Turn-Off Fall Time		(Note 4)	--	65	140
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = 160 V, I <sub>D</sub> = 9.0 A V <sub>GS</sub> = 10 V	--	22	29	nC
Q <sub>gs</sub>	Gate-Source Charge		--	3.6	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		(Note 4)	--	10.2	--
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Maximum Continuous Drain-Source Diode Forward Current		--	--	9.0	A
I <sub>SM</sub>	Maximum Pulsed Drain-Source Diode Forward Current		--	--	36	A
V <sub>SD</sub>	Drain-Source Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 9.0 A	--	--	1.5	V
t <sub>rr</sub>	Reverse Recovery Time	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 9.0 A di <sub>F</sub> /dt = 100 A/μs	--	140	--	ns
Q <sub>rr</sub>	Reverse Recovery Charge		--	0.87	--	μC

### Notes:

- Repetitive rating: pulse-width limited by maximum junction temperature.
- L = 3 mH, I<sub>AS</sub> = 9.0 A, V<sub>DD</sub> = 50 V, R<sub>G</sub> = 25 Ω, starting T<sub>J</sub> = 25°C.
- I<sub>SD</sub> ≤ 9.0 A, di/dt ≤ 300 A/μs, V<sub>DD</sub> ≤ BV<sub>DSS</sub>, starting T<sub>J</sub> = 25°C.
- Essentially independent of operating temperature.

Typical Characteristics

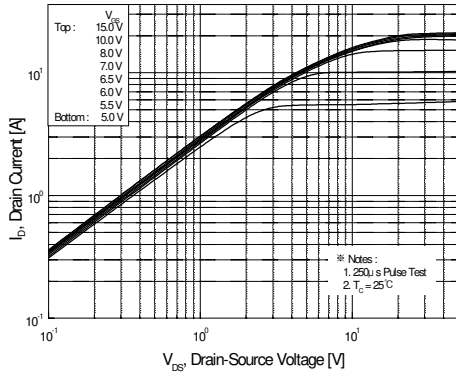


Figure 1. On-Region Characteristics

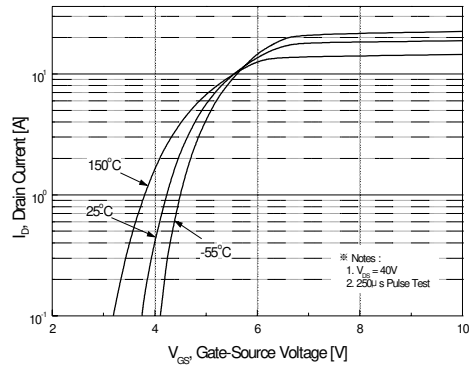


Figure 2. Transfer Characteristics

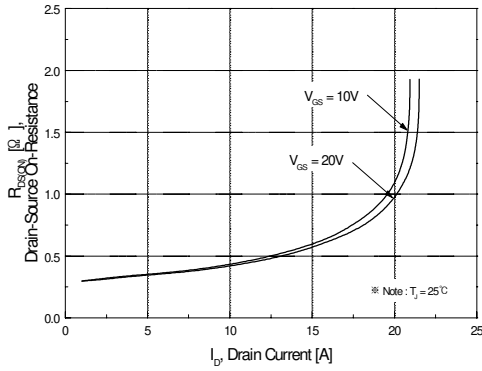


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

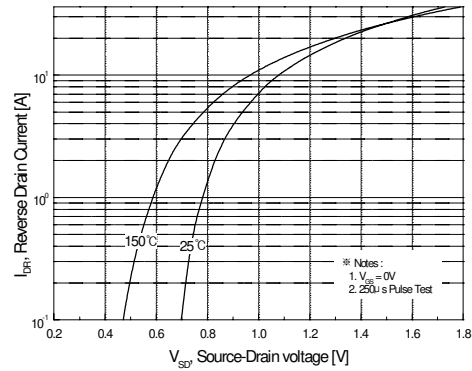


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

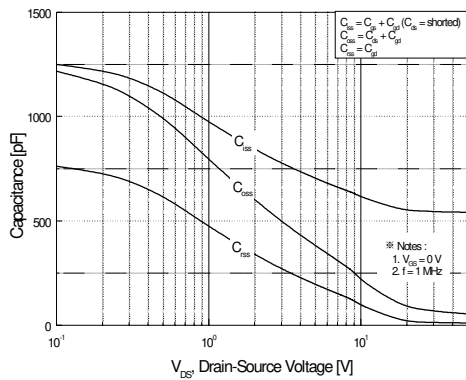


Figure 5. Capacitance Characteristics

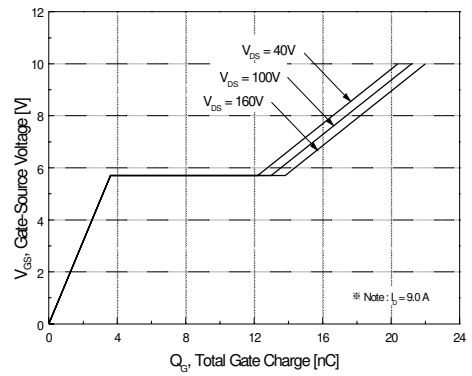


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

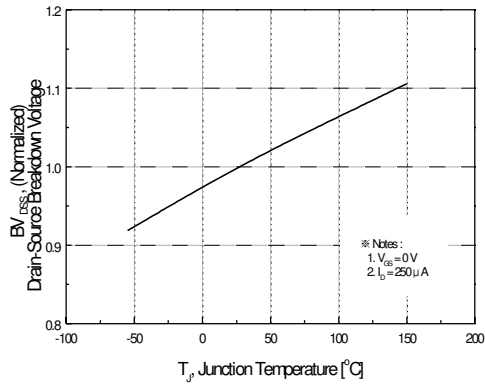


Figure 7. Breakdown Voltage Variation vs. Temperature

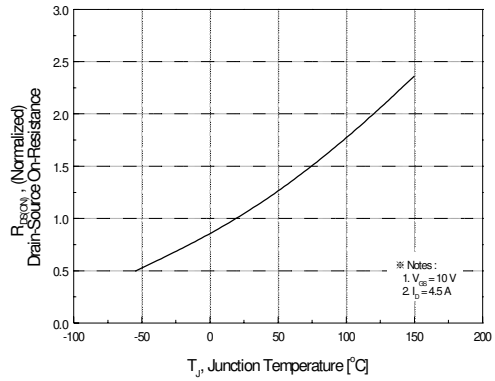


Figure 8. On-Resistance Variation vs. Temperature

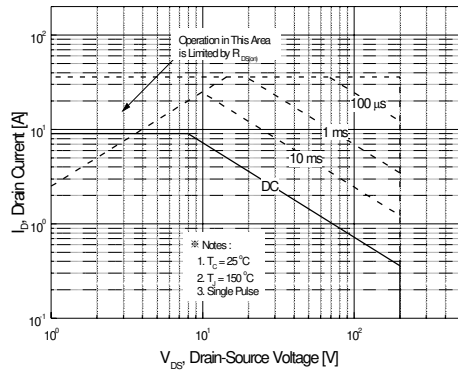


Figure 9. Maximum Safe Operating Area

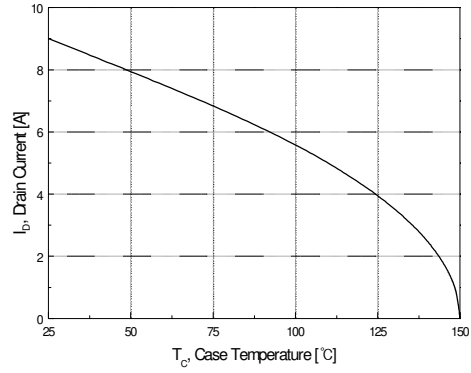


Figure 10. Maximum Drain Current vs. Case Temperature

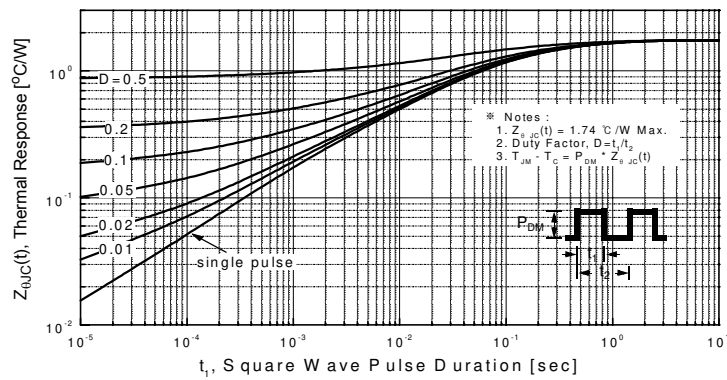


Figure 11. Transient Thermal Response Curve

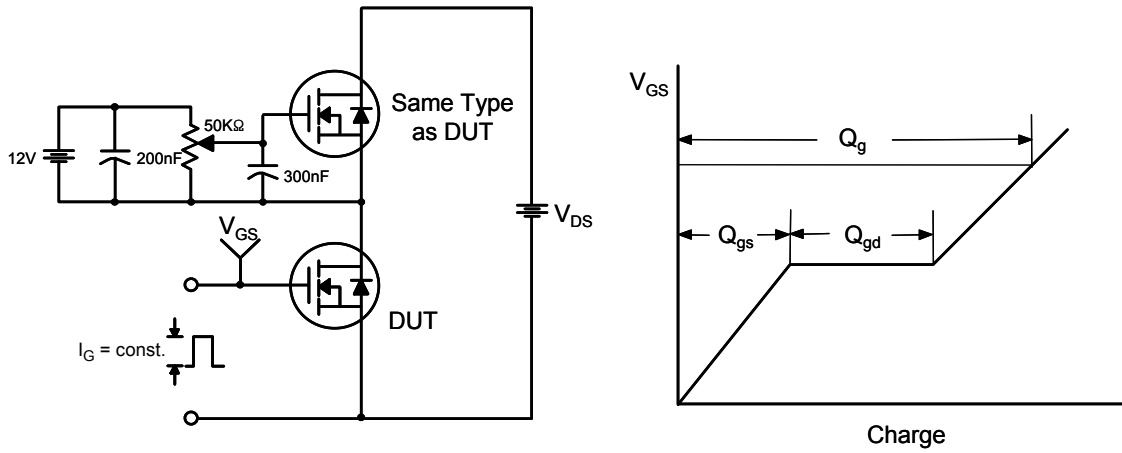


Figure 12. Gate Charge Test Circuit & Waveform

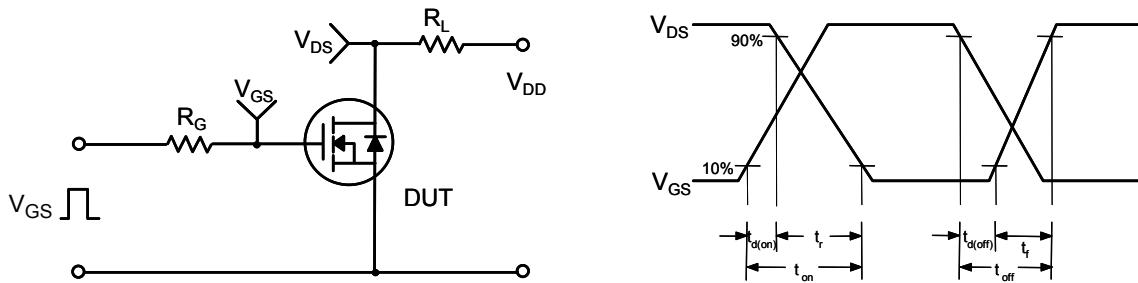


Figure 13. Resistive Switching Test Circuit & Waveforms

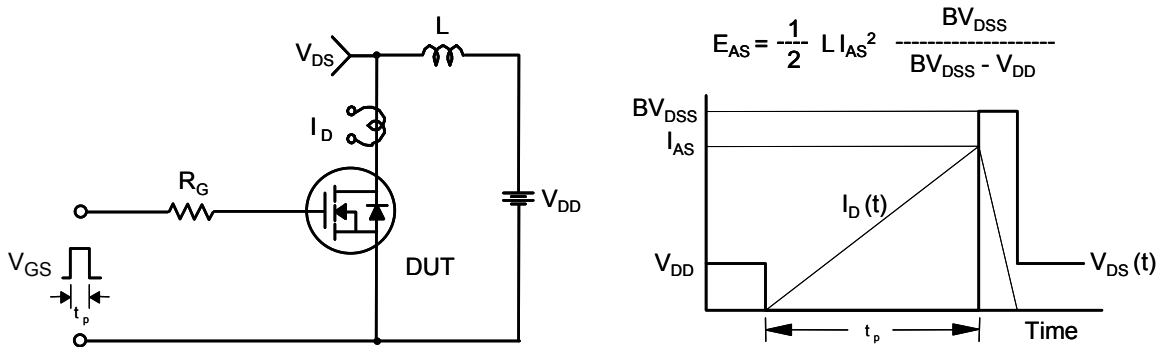


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

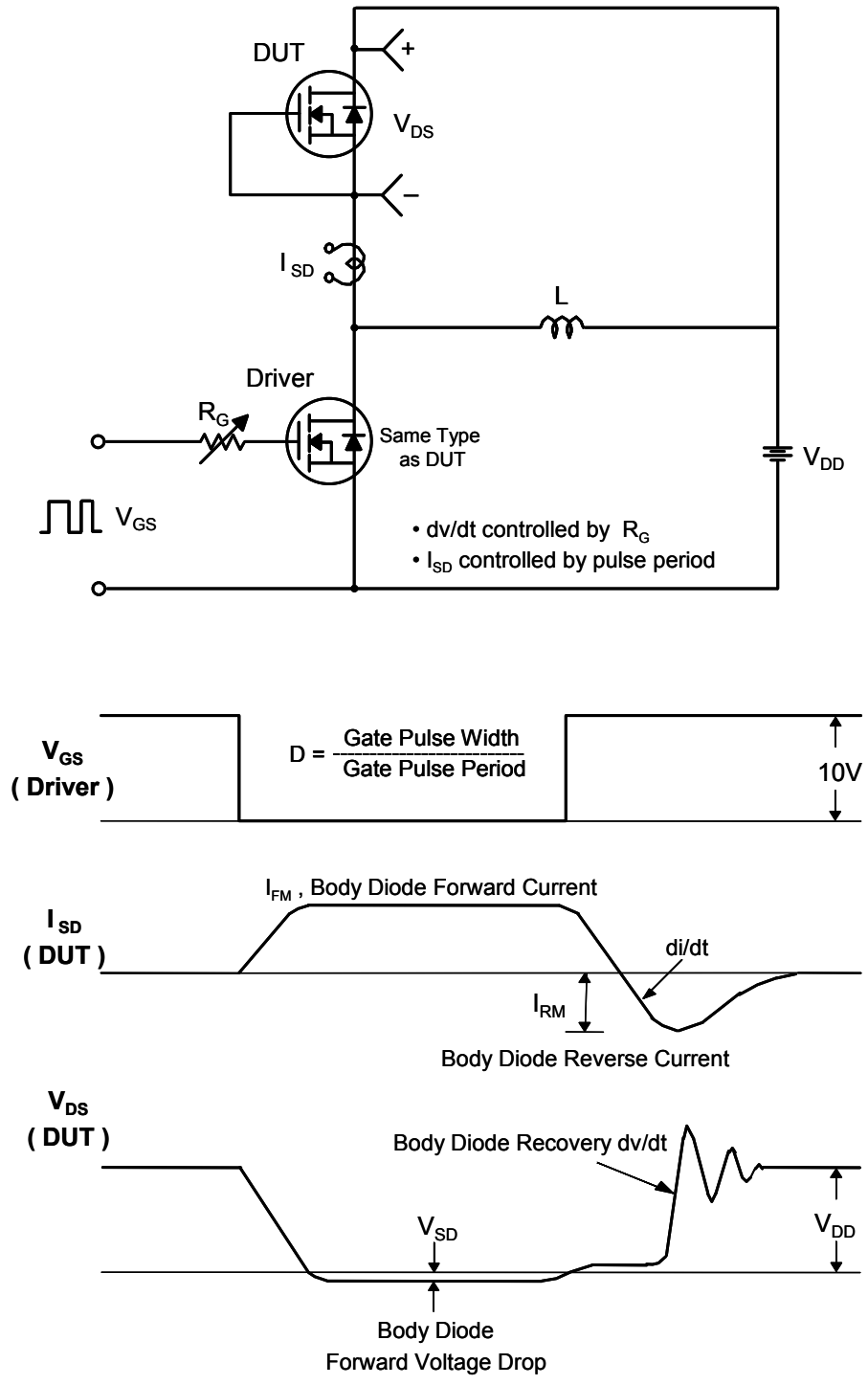


Figure 15. Peak Diode Recovery  $dv/dt$  Test Circuit & Waveforms

Mechanical Dimensions

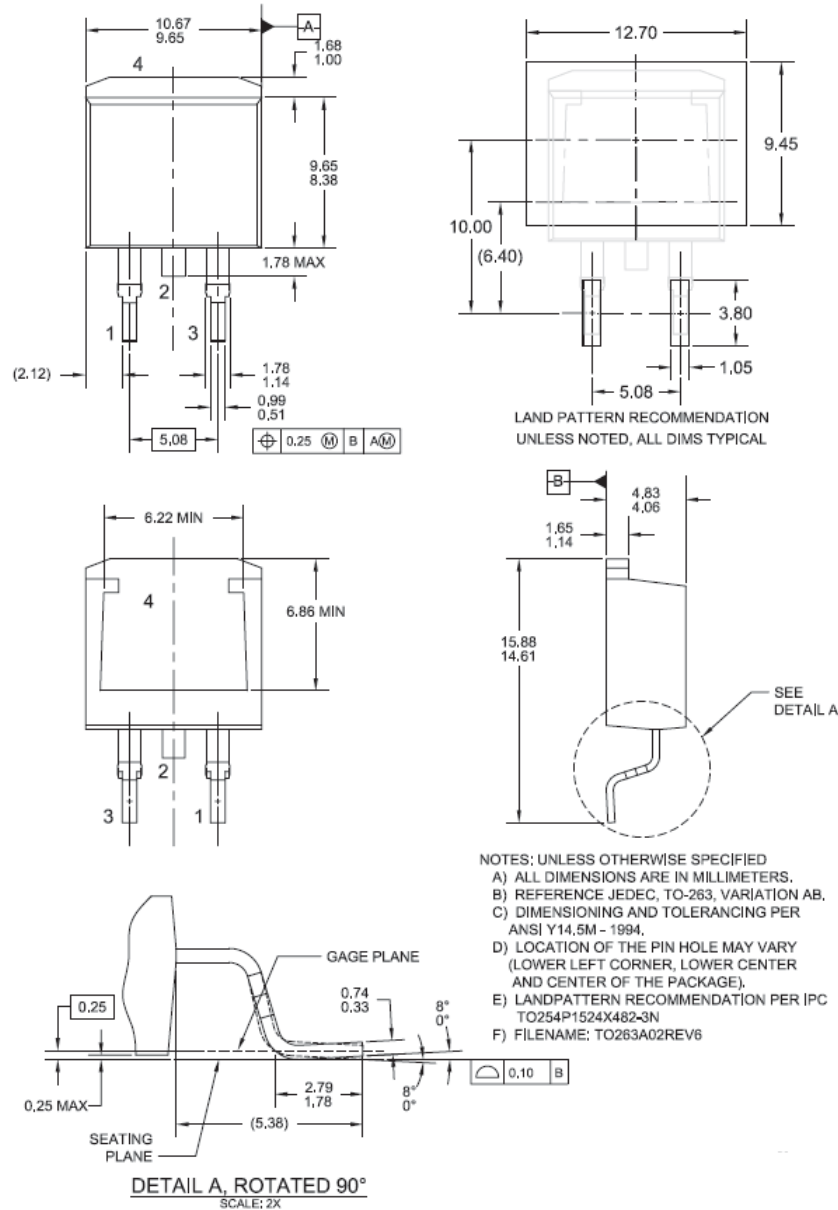



Figure 16. TO263 (D<sup>2</sup>PAK), Molded, 2-Lead, Surface Mount

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