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FQB9P25

P-Channel QFET® MOSFET

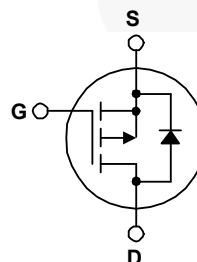
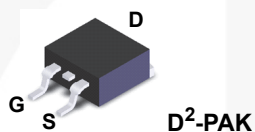
-250 V, -9.4 A, 620 mΩ

Description

These P-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, planar stripe, DMOS technology. This advanced technology is especially tailored to minimize on-state resistance, provide superior switching performance, and withstand a high energy pulse in the avalanche and commutation modes. These devices are well suited for high efficiency switching DC/DC converters.

Features

- -9.4 A, -250 V, $R_{DS(on)} = 620 \text{ m}\Omega$ (Max.) @ $V_{GS} = -10 \text{ V}$, $I_D = -4.7 \text{ A}$
- Low Gate Charge (Typ. 29 nC)
- Low Crss (Typ. 27 pF)
- 100% Avalanche Tested



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

Symbol	Parameter	FQB9P25TM	Unit
V_{DSS}	Drain-Source Voltage	-250	V
I_D	Drain Current - Continuous ($T_C = 25^\circ\text{C}$)	-9.4	A
	- Continuous ($T_C = 100^\circ\text{C}$)	-5.9	A
I_{DM}	Drain Current - Pulsed (Note 1)	-37.6	A
V_{GSS}	Gate-Source Voltage	± 30	V
E_{AS}	Single Pulsed Avalanche Energy (Note 2)	650	mJ
I_{AR}	Avalanche Current (Note 1)	-9.4	A
E_{AR}	Repetitive Avalanche Energy (Note 1)	12	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 ($T_C = 25^\circ\text{C}$)	120	W
	- Derate above 25°C	0.96	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 purposes, 1/8" from case for 5 seconds	300	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	FQB9P25TM	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	1.04	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Minimum Pad of 2-oz Copper), Max.	62.5	
	Thermal Resistance, Junction to Ambient (*1 in ² Pad of 2-oz Copper), Max.	40	

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FQB9P25TM	FQB9P25	D ² -PAK	Tape and Reel	330 mm	24 mm	800 units

Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = -250\ \mu\text{A}$	-250	--	--	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = -250\ \mu\text{A}$, Referenced to 25°C	--	-0.2	--	$\text{V}/^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -250\text{ V}, V_{GS} = 0\text{ V}$	--	--	-1	μA
		$V_{DS} = -200\text{ V}, T_C = 125^\circ\text{C}$	--	--	-10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = -30\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = 30\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\ \mu\text{A}$	-3.0	--	-5.0	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = -10\text{ V}, I_D = -4.7\text{ A}$	--	0.48	0.62	Ω
g_{FS}	Forward Transconductance	$V_{DS} = -40\text{ V}, I_D = -4.7\text{ A}$	--	5.7	--	S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -25\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	910	1180	pF
C_{oss}	Output Capacitance		--	170	220	pF
C_{rfs}	Reverse Transfer Capacitance		--	27	35	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -125\text{ V}, I_D = -9.4\text{ A},$ $R_G = 25\ \Omega$	--	20	50	ns
t_r	Turn-On Rise Time		--	150	310	ns
$t_{d(off)}$	Turn-Off Delay Time		--	45	100	ns
t_f	Turn-Off Fall Time		(Note 4)	--	65	140
Q_g	Total Gate Charge	$V_{DS} = -200\text{ V}, I_D = -9.4\text{ A},$ $V_{GS} = -10\text{ V}$	--	29	38	nC
Q_{gs}	Gate-Source Charge		--	7.6	--	nC
Q_{gd}	Gate-Drain Charge		(Note 4)	--	14	--

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current	--	--	-9.4	A	
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	-37.6	A	
V_{SD}	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = -9.4\text{ A}$	--	--	-5.0	V
t_{rr}	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = -9.4\text{ A},$ $di_F / dt = 100\text{ A}/\mu\text{s}$	--	190	--	ns
Q_{rr}	Reverse Recovery Charge		--	1.45	--	μC

Notes:

1. Repetitive rating; pulse-width limited by maximum junction temperature.
2. $L = 11.8\text{ mH}, I_{AS} = -9.4\text{ A}, V_{DD} = -50\text{ V}, R_G = 25\ \Omega,$ starting $T_J = 25^\circ\text{C}$.
3. $I_{SD} \leq -9.4\text{ A}, di/dt \leq 300\text{ A}/\mu\text{s}, V_{DD} \leq BV_{DSS},$ starting $T_J = 25^\circ\text{C}$.
4. Essentially independent of operating temperature.

Typical Characteristics

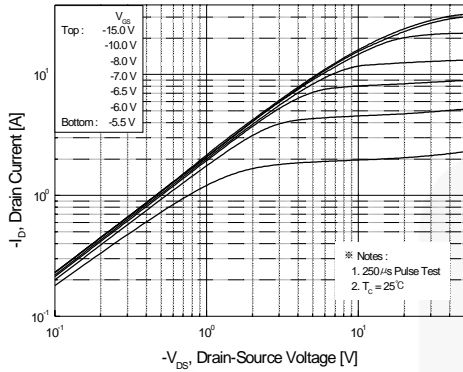


Figure 1. On-Region Characteristics

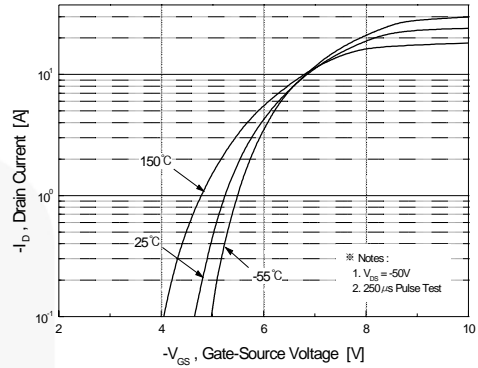


Figure 2. Transfer Characteristics

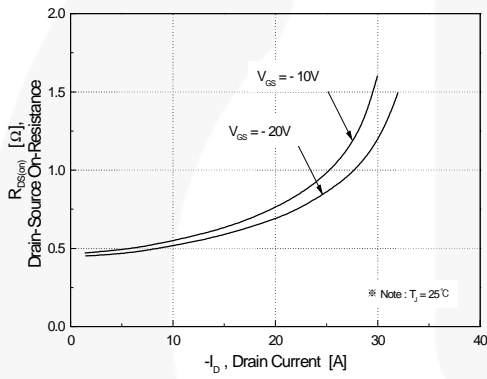


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

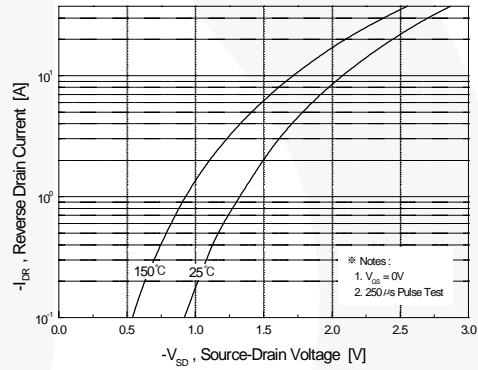


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

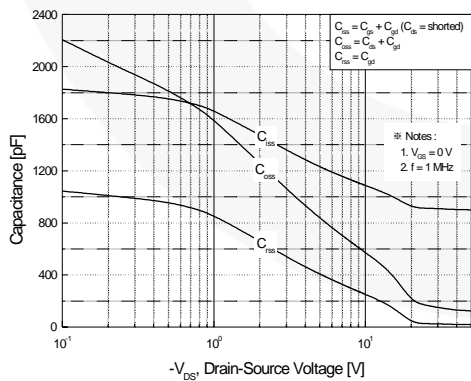


Figure 5. Capacitance Characteristics

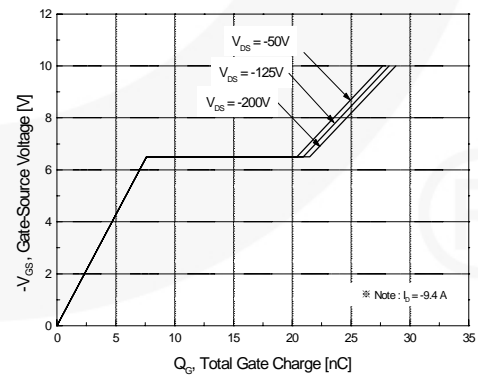


Figure 6. Gate Charge Characteristics

Typical Characteristics (Continued)

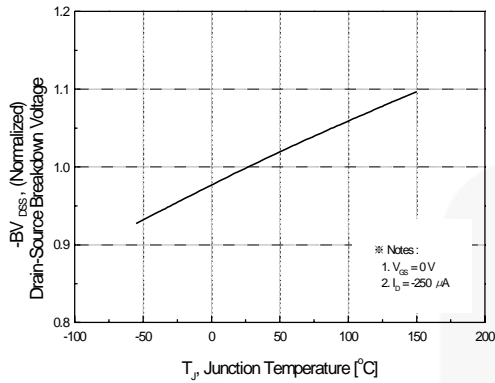


Figure 7. Breakdown Voltage Variation vs. Temperature

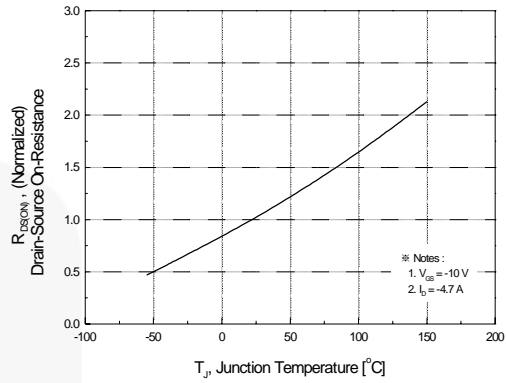


Figure 8. On-Resistance Variation vs. Temperature

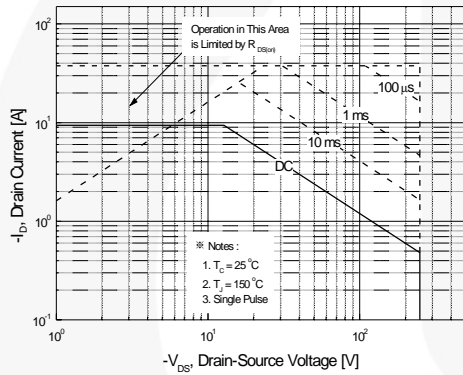


Figure 9. Maximum Safe Operating Area

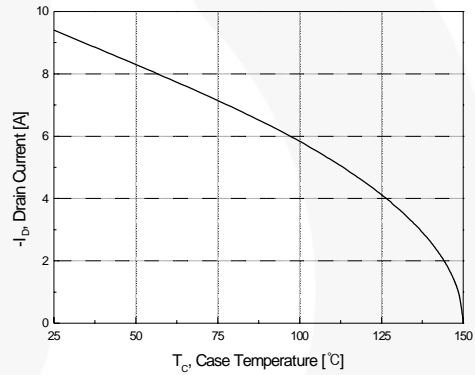


Figure 10. Maximum Drain Current vs. Case Temperature

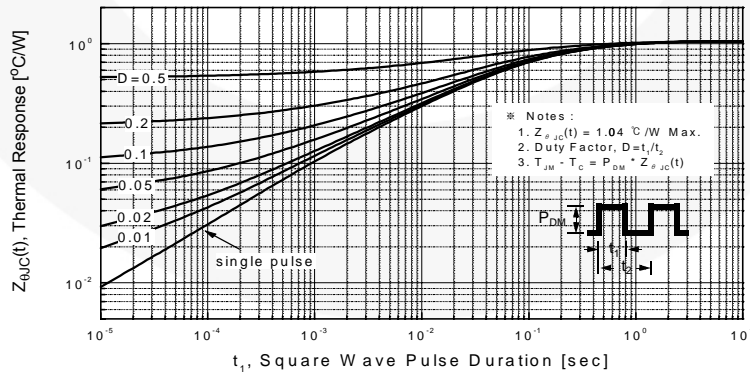


Figure 11. Transient Thermal Response Curve

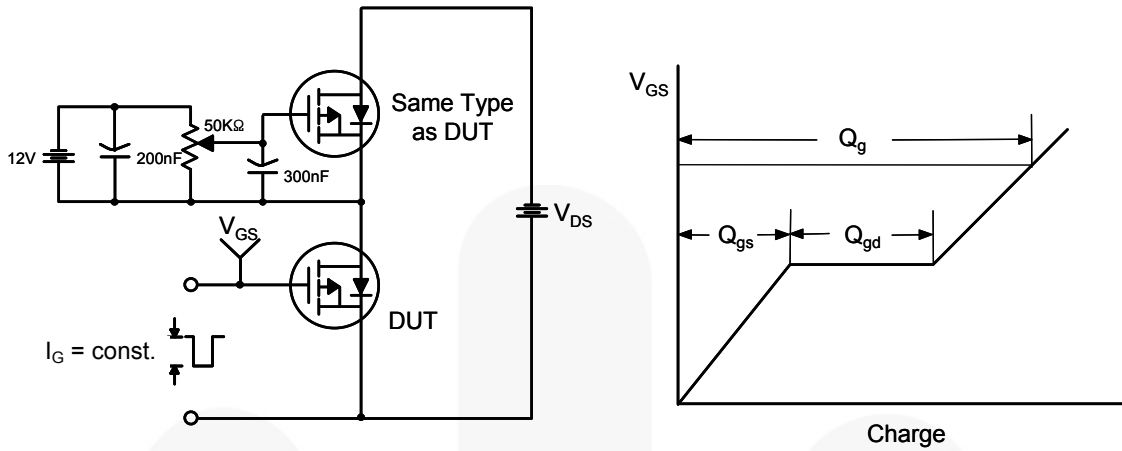


Figure 12. Gate Charge Test Circuit & Waveform

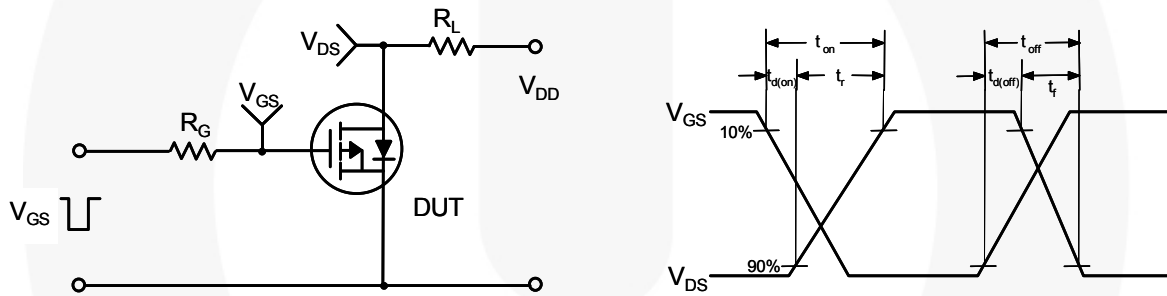


Figure 13. Resistive Switching Test Circuit & Waveforms

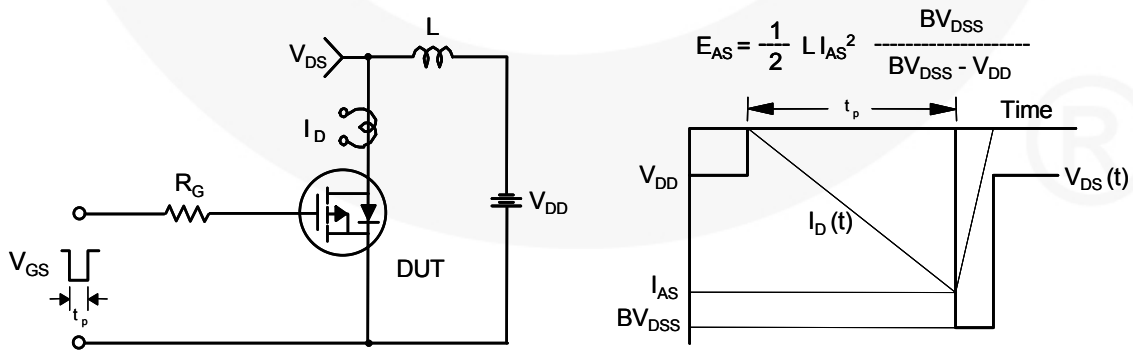


Figure 14. Unclamped Inductive Switching Test Circuit & Waveforms

$$E_{AS} = \frac{1}{2} L I_{AS}^2 \frac{BV_{DSS}}{BV_{DSS} - V_{DD}}$$

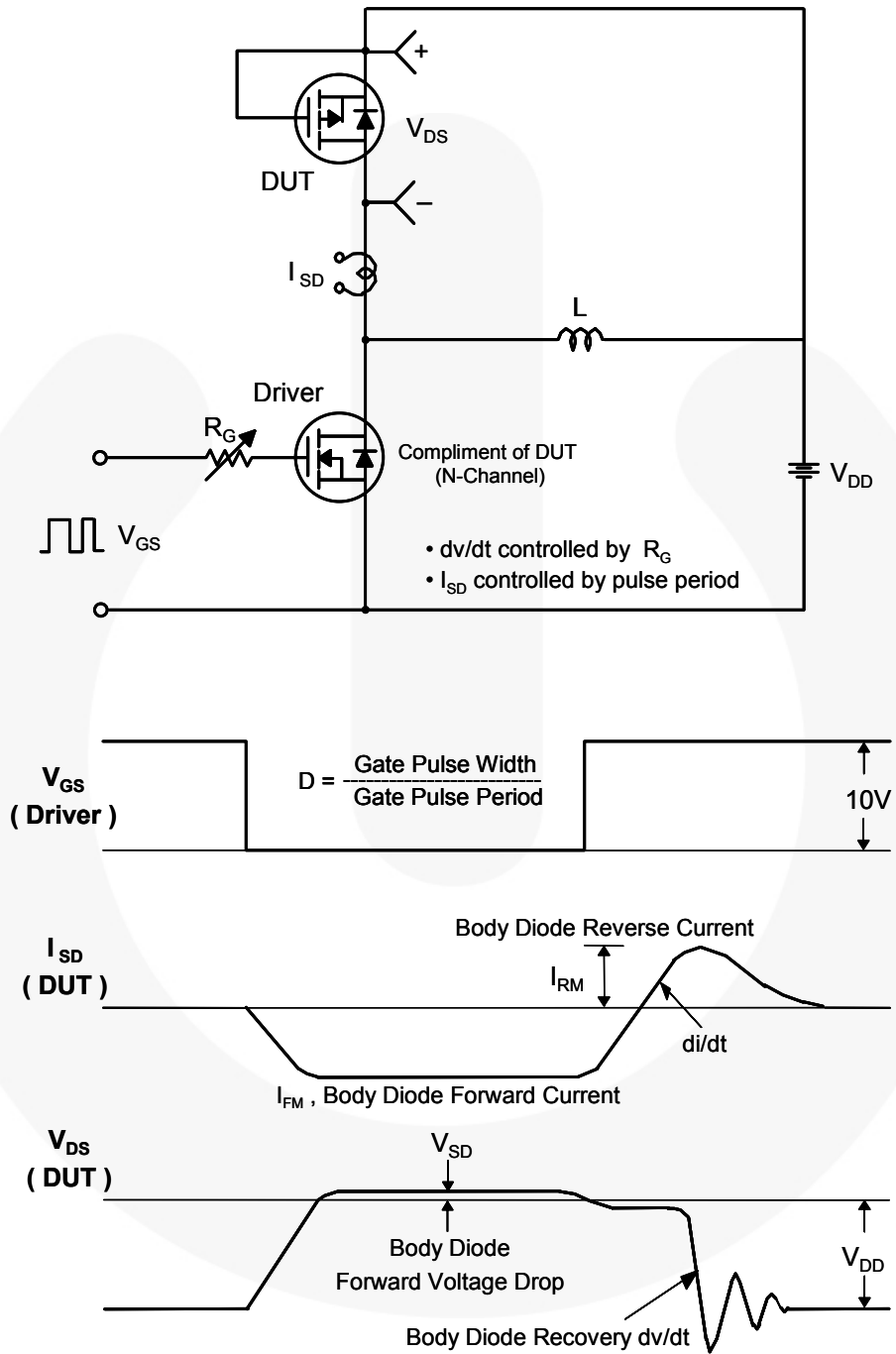


Figure 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms

Mechanical Dimensions

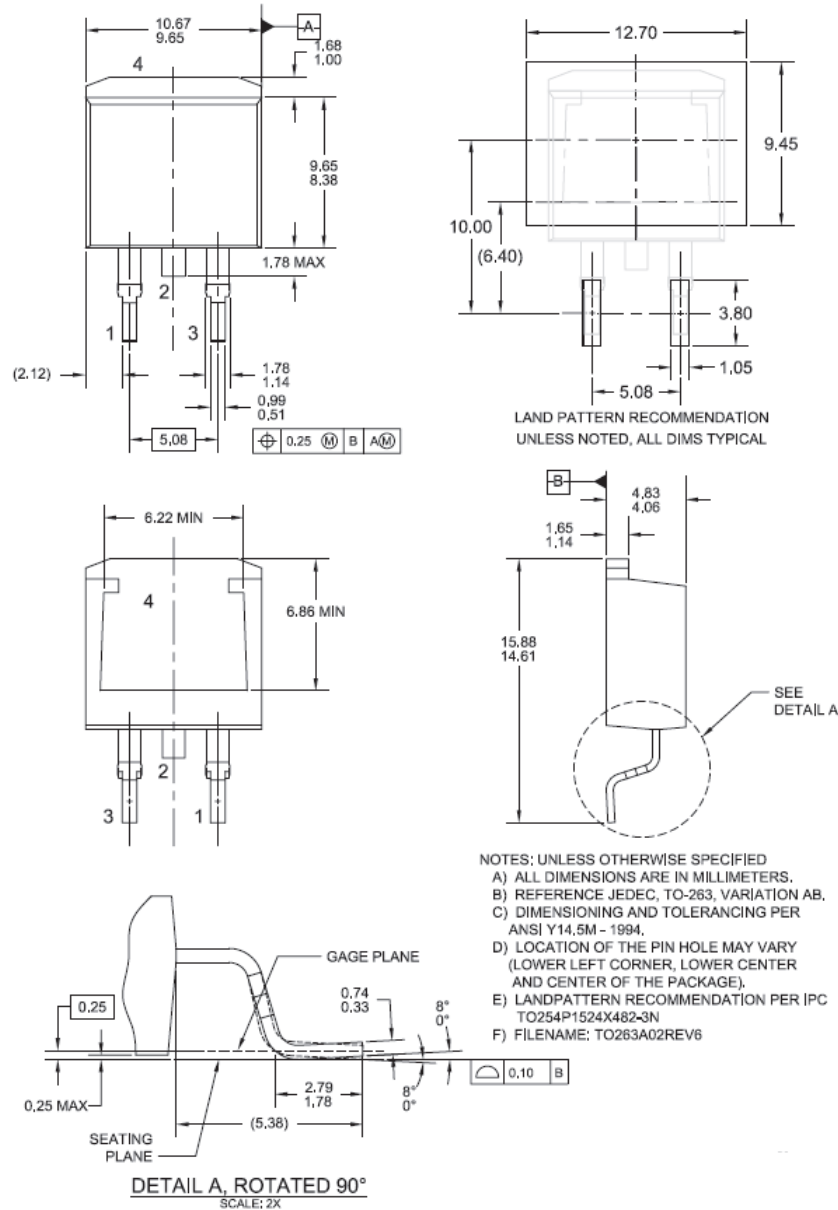


Figure 16. TO263 (D²PAK), Molded, 2-Lead, Surface Mount

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