FAIRCHILD

October 2014

FDMS86200

N-Channel Shielded Gate PowerTrench® MOSFET

150 V, 35 A, 18 mΩ

Features

- Shielded Gate MOSFET Technology
- Max $r_{DS(on)}$ = 18 mΩ at V_{GS} = 10 V, I_D = 9.6 A
- Max $r_{DS(on)}$ = 21 mΩ at V_{GS} = 6 V, I_D = 8.8 A
- Advanced Package and Silicon combination for low $r_{DS(on)}$ and high efficiency
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

General Description

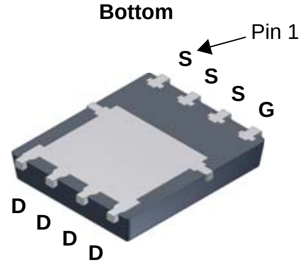
This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that incorporates Shielded Gate technology. This process has been optimized for the on-state resistance and yet maintain superior switching performance.

Application

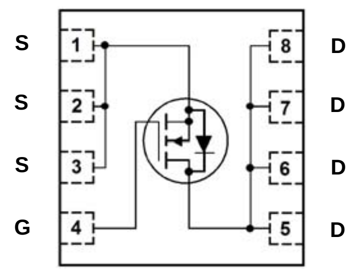
- DC-DC Conversion

Top

Bottom



Power 56



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			150	V
V_{GS}	Gate to Source Voltage			±20	V
I_D	Drain Current -Continuous	T_C = 25 °C		35	A
	-Continuous	T_A = 25 °C	(Note 1a)	9.6	
	-Pulsed			100	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	220	mJ
P_D	Power Dissipation	T_C = 25 °C		104	W
	Power Dissipation	T_A = 25 °C	(Note 1a)	2.5	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case		1.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	50	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS86200	FDMS86200	Power 56	13 ”	12 mm	3000 units

Electrical Characteristics T_J = 25 °C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units

Off Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	150			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		110		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 120 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V			100	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2.0	2.5	4.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-10		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 9.6 A		15	18	mΩ
		V_{GS} = 6 V, I_D = 8.8 A		17	21	
		V_{GS} = 10 V, I_D = 9.6 A, T_J = 125 °C		28	34	
g_{FS}	Forward Transconductance	V_{DD} = 10 V, I_D = 9.6 A		33		S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = 75 V, V_{GS} = 0 V, f = 1 MHz		2041	2715	pF
C_{oss}	Output Capacitance			203	270	pF
C_{rss}	Reverse Transfer Capacitance			10	16	pF
R_g	Gate Resistance			1.2	3	Ω

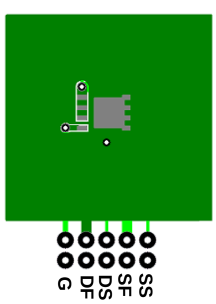
Switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 75 V, I_D = 9.6 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		13	23	ns
t_r	Rise Time			7.9	16	ns
$t_{d(off)}$	Turn-Off Delay Time			27	44	ns
t_f	Fall Time			5.8	12	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 10 V; V_{DD} = 75 V, I_D = 9.6 A		33	46	nC
	Total Gate Charge	V_{GS} = 0 V to 5 V; V_{DD} = 75 V, I_D = 9.6 A		18	26	nC
Q_{gs}	Total Gate Charge	V_{DD} = 75 V, I_D = 9.6 A		7.9		nC
Q_{gd}	Gate to Drain "Miller" Charge	V_{DD} = 75 V, I_D = 9.6 A		7.7		nC

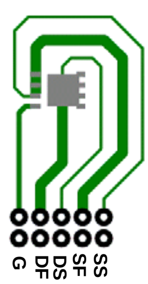
Drain-Source Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2 A (Note 2)		0.69	1.2	V
		V_{GS} = 0 V, I_S = 9.6 A (Note 2)		0.77	1.3	
t_{rr}	Reverse Recovery Time	I_F = 9.6 A, di/dt = 100 A/μs		76	120	ns
Q_{rr}	Reverse Recovery Charge			113	181	nC

NOTES:
1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. 50 °C/W when mounted on a 1 in^2 pad of 2 oz copper



b.125 °C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0 %.
3. E_{AS} of 220 mJ is based on starting T_J = 25 °C, L = 1 mH, I_{AS} = 21 A, V_{DD} = 150 V, V_{GS} = 10 V. 100% test at L = 0.1 mH, I_{AS} = 46 A.

Typical Characteristics T_J = 25 °C unless otherwise noted

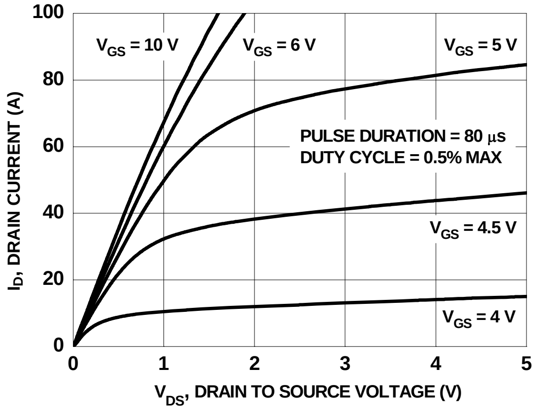


Figure 1. On-Region Characteristics

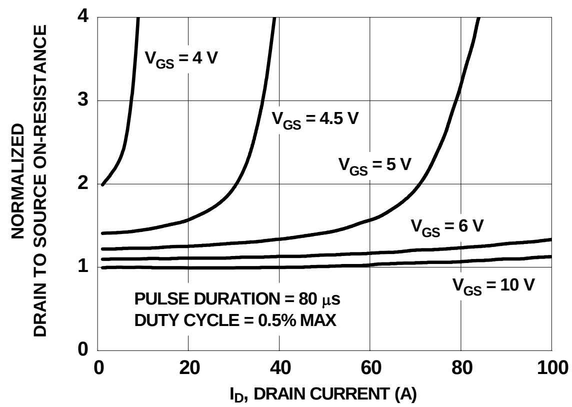


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

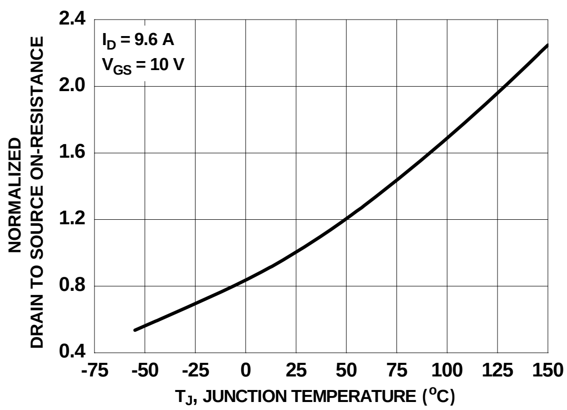


Figure 3. Normalized On-Resistance vs Junction Temperature

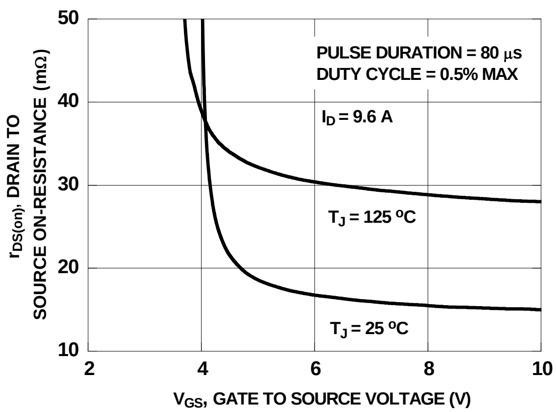


Figure 4. On-Resistance vs Gate to Source Voltage

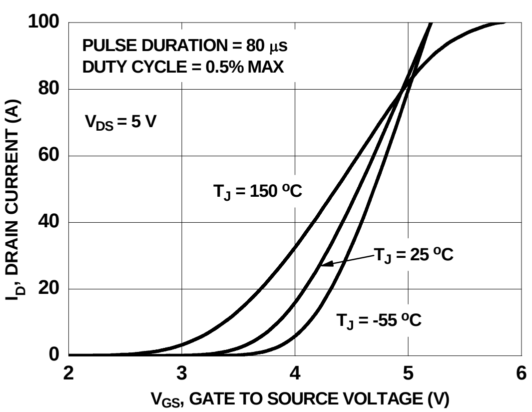


Figure 5. Transfer Characteristics

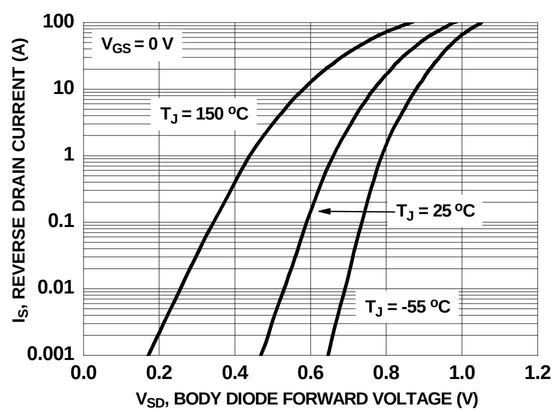


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted

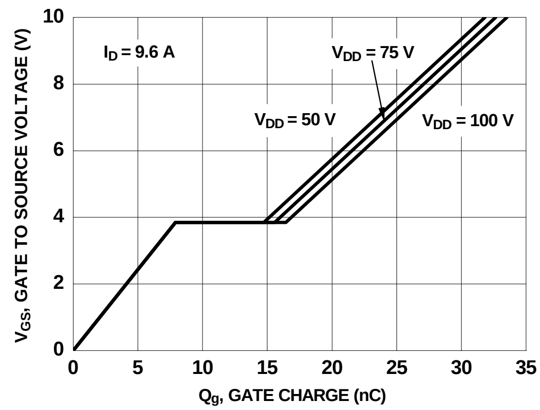


Figure 7. Gate Charge Characteristics

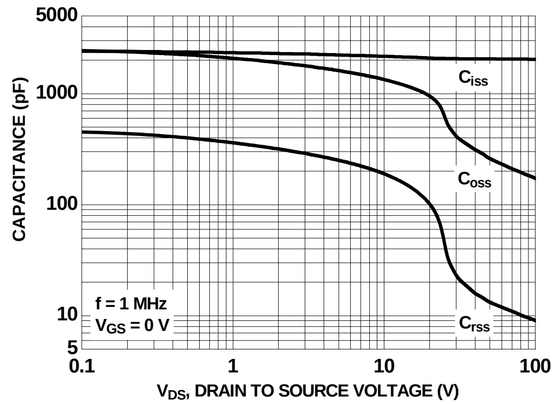


Figure 8. Capacitance vs Drain to Source Voltage

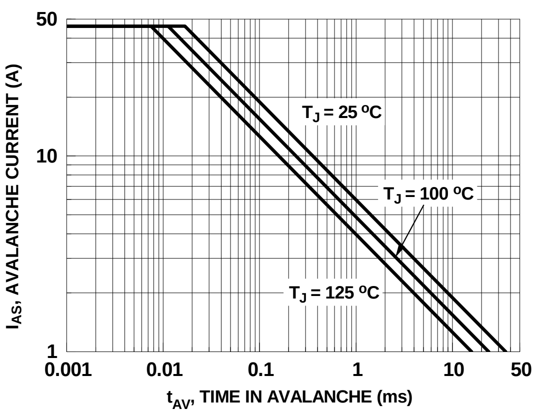


Figure 9. Unclamped Inductive Switching Capability

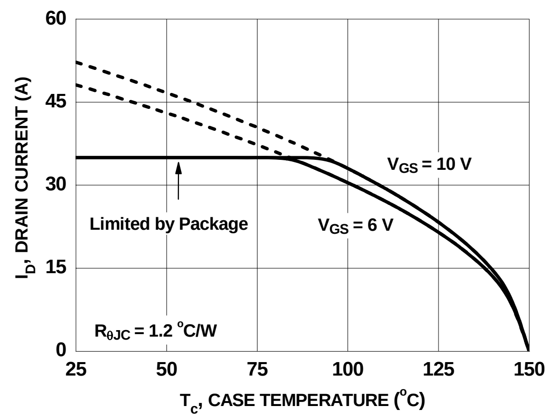


Figure 10. Maximum Continuous Drain Current vs Case Temperature

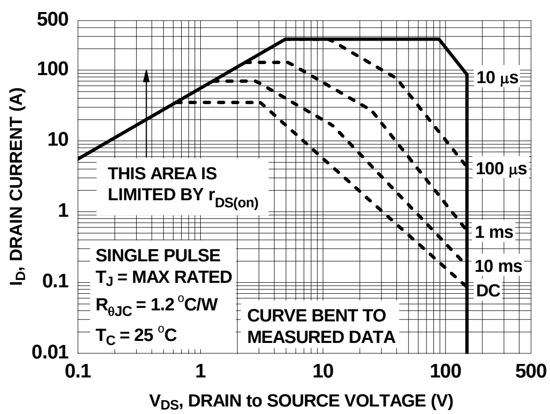


Figure 11. Forward Bias Safe Operating Area

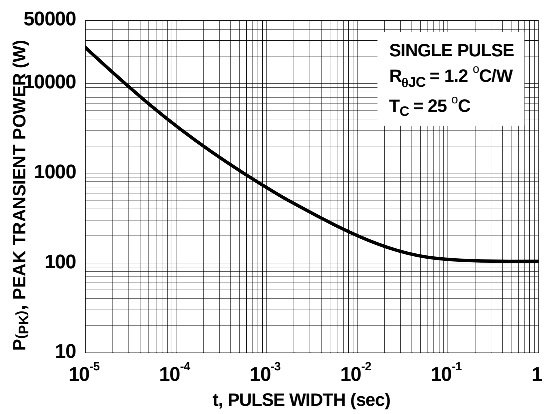


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted

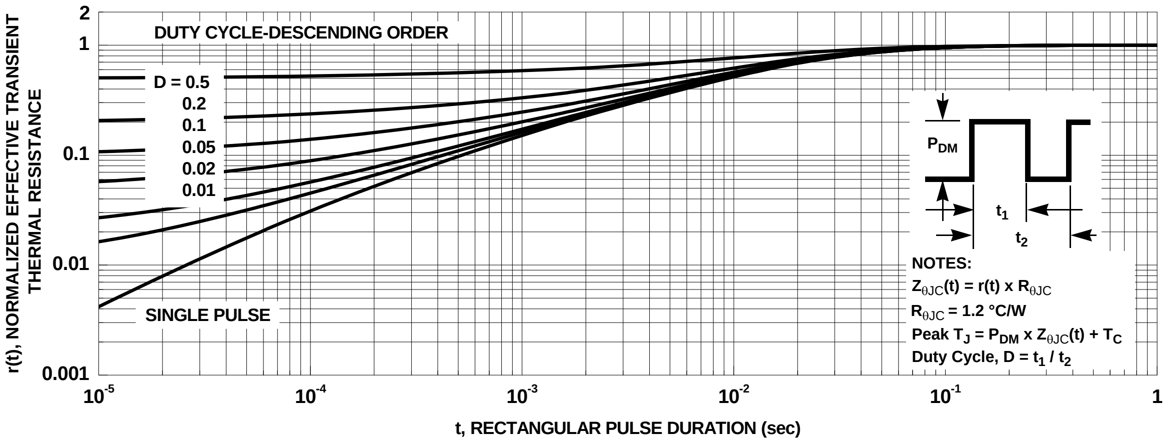
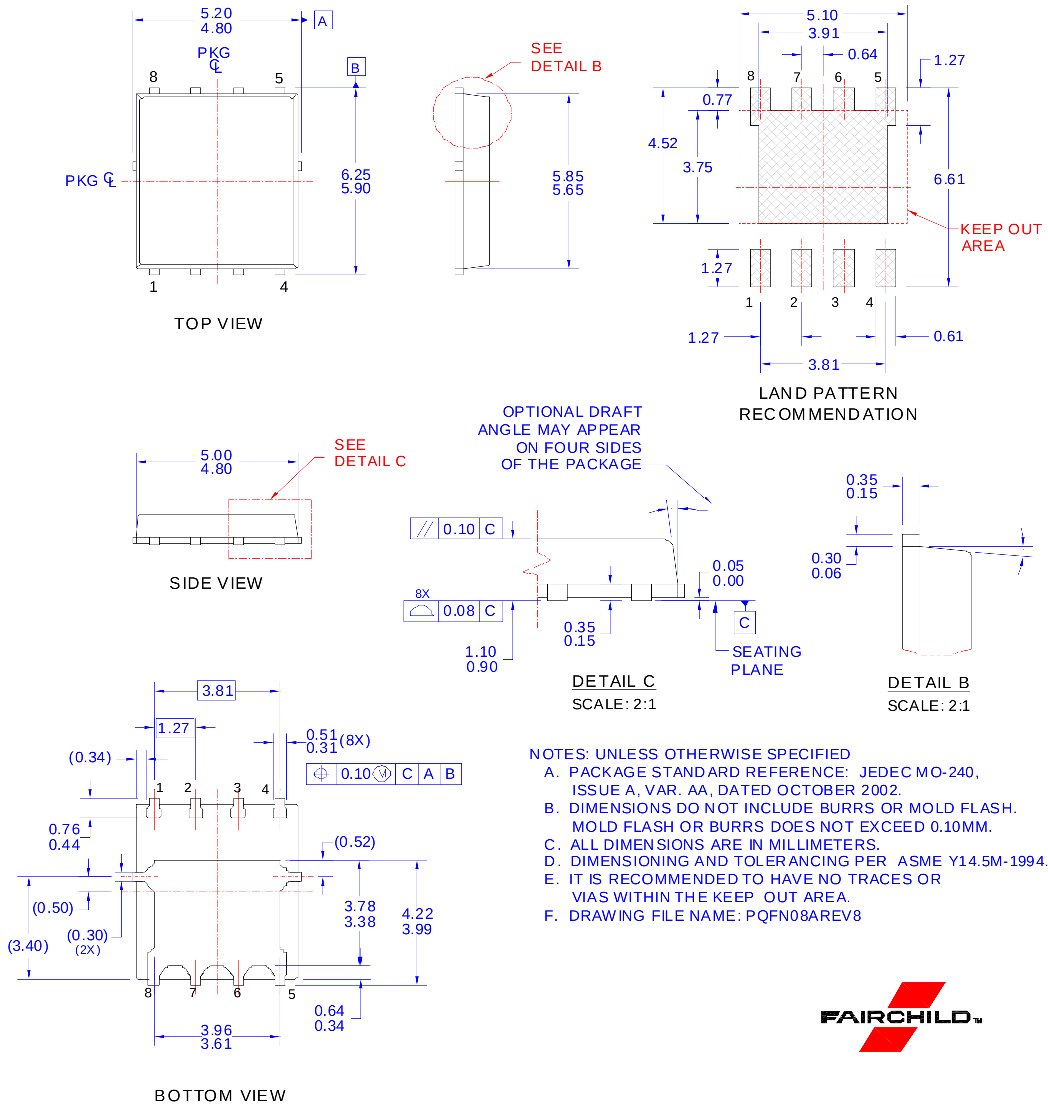


Figure 13. Transient Thermal Response Curve

Dimensional Outline and Pad Layout



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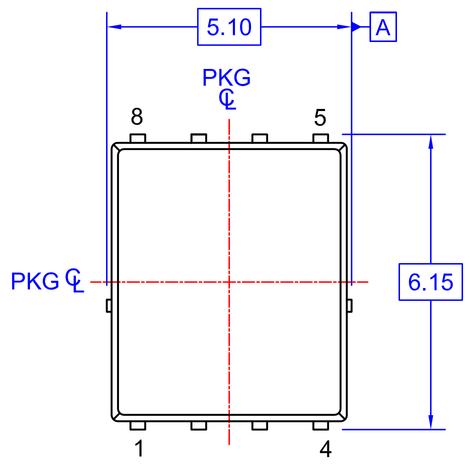
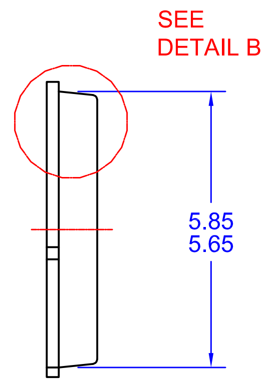
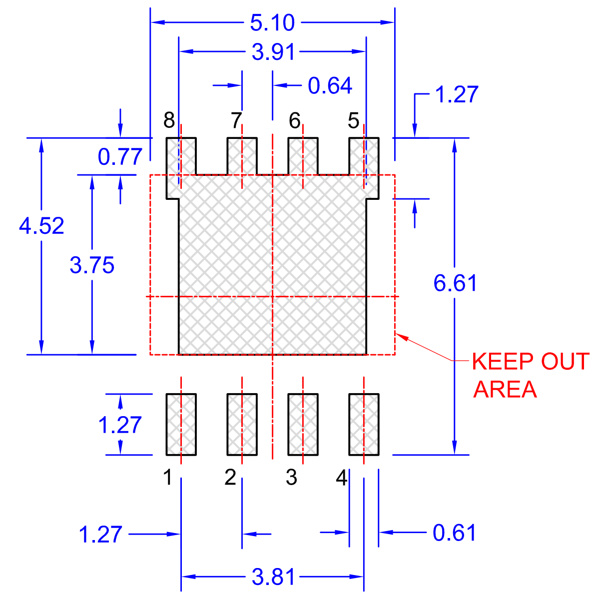
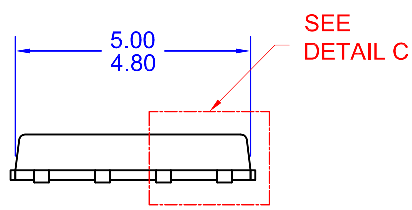


TOP VIEW

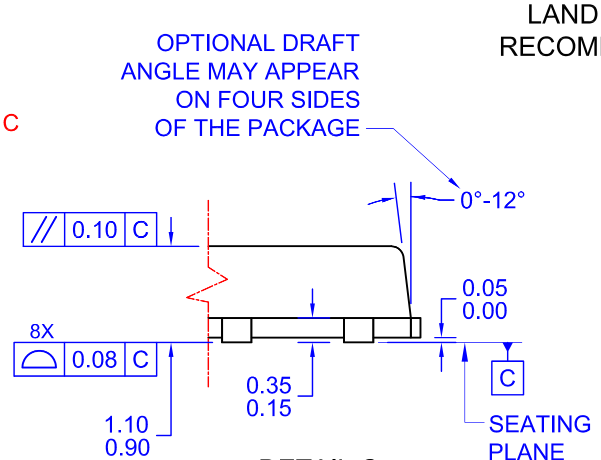




LAND PATTERN RECOMMENDATION



SIDE VIEW



DETAIL C

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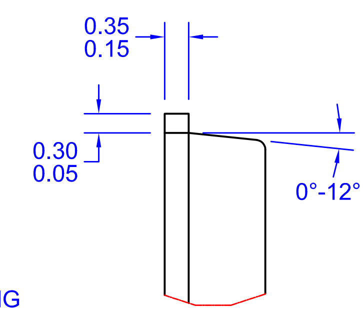
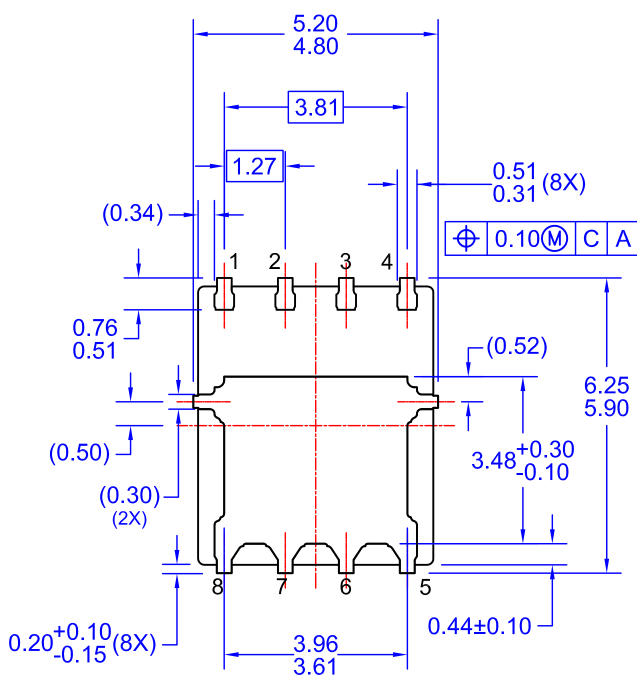


DETAIL B

SCALE: 2:1



BOTTOM VIEW

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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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