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June 2014

FDMC7692S

N-Channel PowerTrench® SyncFET™

30 V, 18 A, 9.3 mΩ

Features

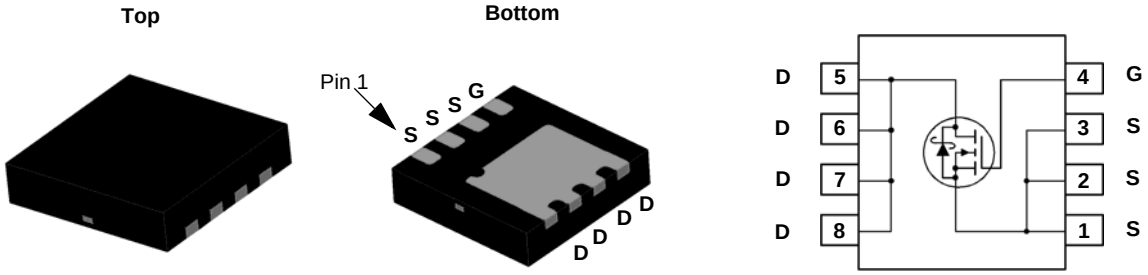
- Max $r_{DS(on)}$ = 9.3 mΩ at V_{GS} = 10 V, I_D = 12.5 A
- Max $r_{DS(on)}$ = 13.6 mΩ at V_{GS} = 4.5 V, I_D = 10.4 A
- High performance technology for extremely low $r_{DS(on)}$
- Termination is Lead-free and RoHS Compliant

General Description

This FDMC7692S is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been especially tailored to minimize the on-state resistance. This device is well suited for Power Management and load switching applications common in Notebook Computers and Portable Battery packs.

Applications

- DC - DC Buck Converters
- Notebook DC - DC application



MLP 3.3x3.3

MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			30	V
V_{GS}	Gate to Source Voltage			±20	V
I_D	Drain Current -Continuous	T_C = 25 °C		18	A
	-Continuous	T_A = 25 °C	(Note 1a)	12.5	
	-Pulsed			45	
E_{AS}	Sinlge Pulse Avalanche Energy		(Note 3)	21	mJ
P_D	Power Dissipation	T_C = 25 °C		27	W
	Power Dissipation	T_A = 25 °C	(Note 1a)	2.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	4.7	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	53	°C/W

Package Marking and Ordering Information

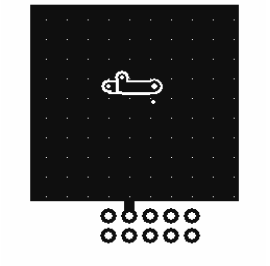
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC7692S	FDMC7692S	MLP 3.3X3.3	13 ”	12 mm	3000 units

Electrical Characteristics T_J = 25 °C unless otherwise noted

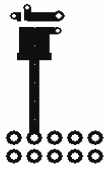
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 1 mA, V_{GS} = 0 V	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 10 mA, referenced to 25 °C		16		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V			500	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 1 mA	1.2	2.0	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 10 mA, referenced to 25 °C		-5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 12.5 A		7.8	9.3	mΩ
		V_{GS} = 4.5 V, I_D = 10.4 A		10.8	13.6	
		V_{GS} = 10 V, I_D = 12.5 A, T_J = 125 °C		9.6	13.0	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 12.5 A		62		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		1040	1385	pF
C_{oss}	Output Capacitance			445	590	pF
C_{rss}	Reverse Transfer Capacitance			40	60	pF
R_g	Gate Resistance			1.1	2.9	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15 V, I_D = 12.5 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		9	17	ns
t_r	Rise Time			3	10	ns
$t_{d(off)}$	Turn-Off Delay Time			19	34	ns
t_f	Fall Time			3	10	ns
Q_g	Total Gate Charge	V_{GS} = 0 V to 10 V; V_{DD} = 15 V, I_D = 12.5 A		16	23	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to 4.5 V; V_{DD} = 15 V, I_D = 12.5 A		8	10	nC
Q_{gs}	Gate to Source Gate Charge	V_{DD} = 15 V, I_D = 12.5 A		4		nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = 15 V, I_D = 12.5 A		2		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 12.5 A (Note 2)		0.9	1.3	V
		V_{GS} = 0 V, I_S = 0.9 A (Note 2)		0.5	0.7	
t_{rr}	Reverse Recovery Time	I_F = 12.5 A, di/dt = 300 A/μs		21	33	ns
Q_{rr}	Reverse Recovery Charge			16	29	nC

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1in^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. 53 °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 21 mJ is based on starting T_J = 25 °C, L = 0.3 mH, I_{AS} = 12.0 A, V_{DD} = 27 V, V_{GS} = 10 V. 100% test at L = 3 mH, I_{AS} = 3.2 A .

Typical Characteristics T_J = 25 °C unless otherwise noted

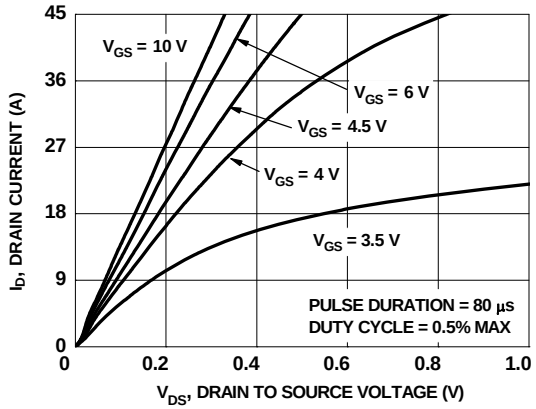


Figure 1. On-Region Characteristics

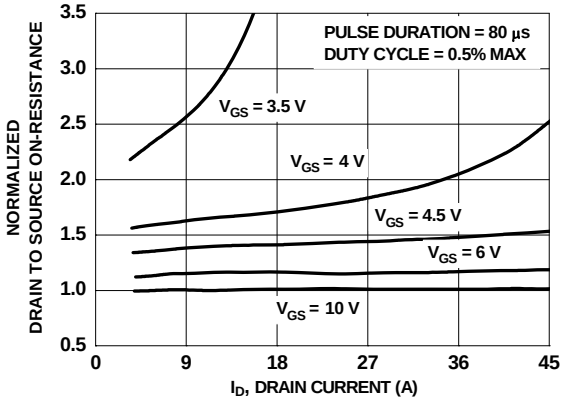


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

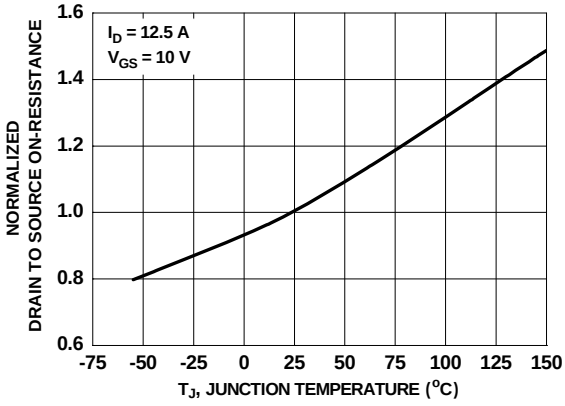


Figure 3. Normalized On-Resistance vs Junction Temperature

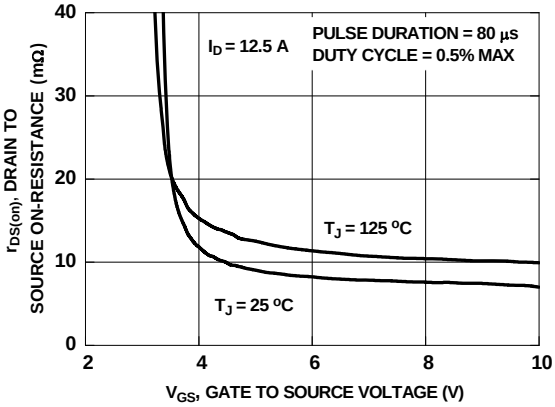


Figure 4. On-Resistance vs Gate to Source Voltage

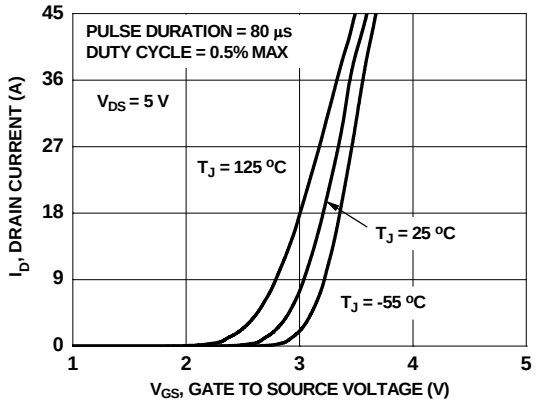


Figure 5. Transfer Characteristics

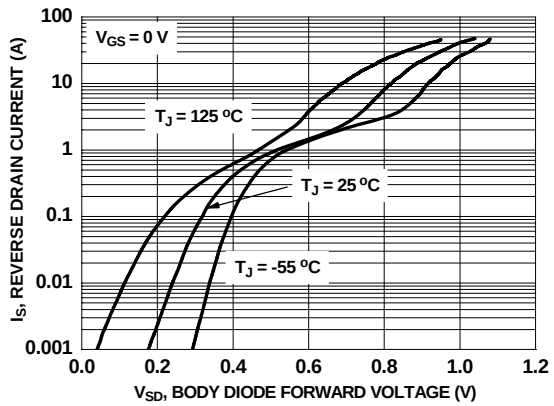


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted

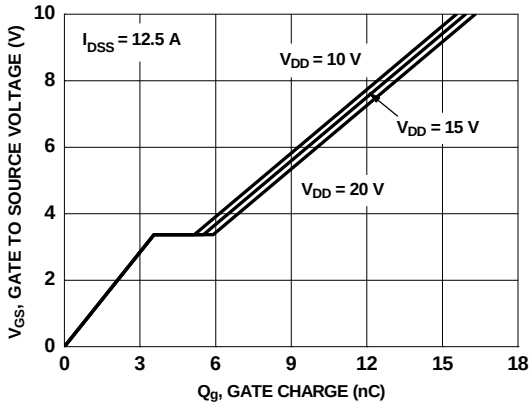


Figure 7. Gate Charge Characteristics

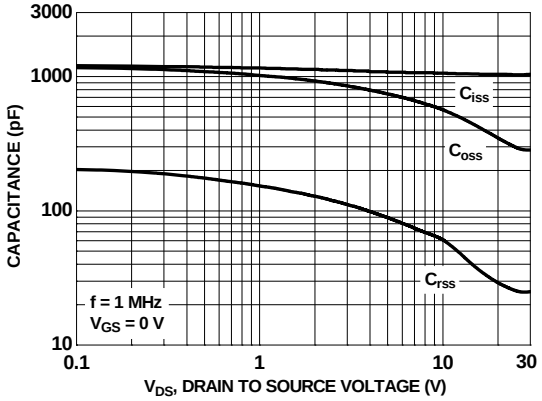


Figure 8. Capacitance vs Drain to Source Voltage

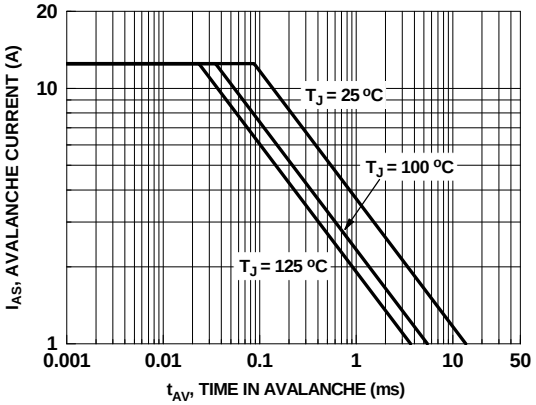


Figure 9. Unclamped Inductive Switching Capability

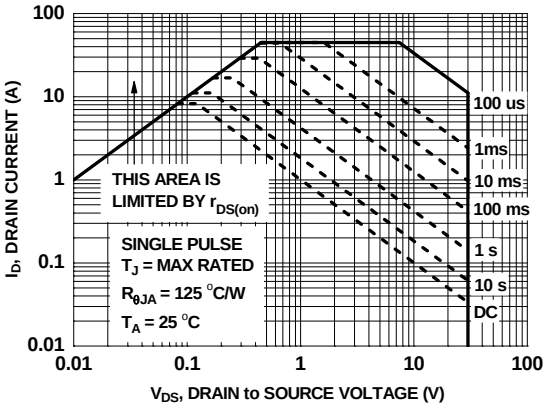


Figure 10. Forward Bias Safe Operating Area

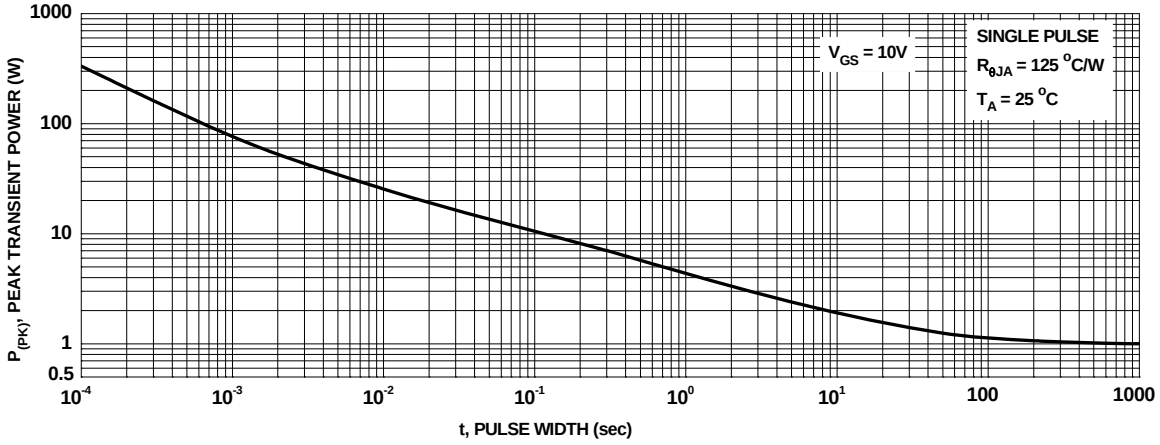


Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted

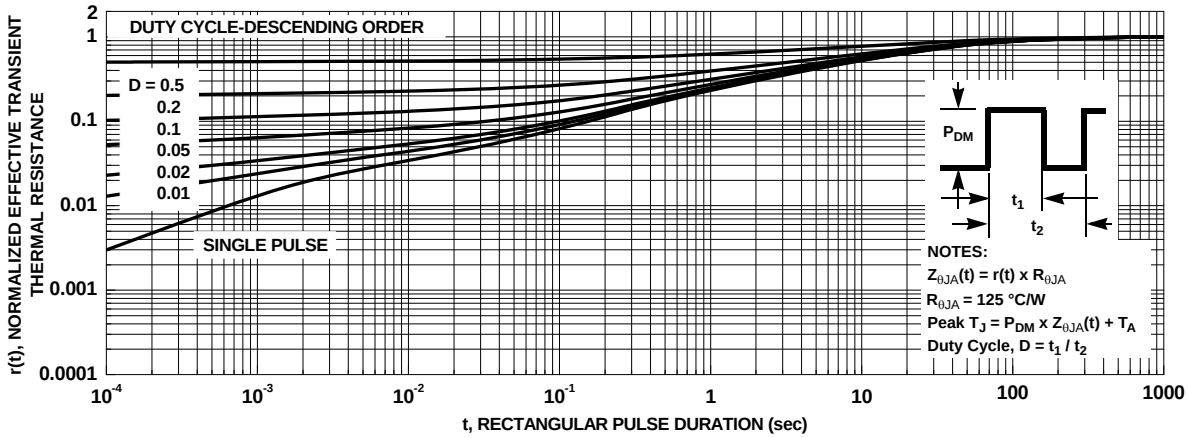


Figure 12. Junction-to-Ambient Transient Thermal Response Curve

Typical Characteristics (continued)

SyncFET Schottky body diode Characteristics

Fairchild's SyncFET process embeds a Schottky diode in parallel with PowerTrench MOSFET. This diode exhibits similar characteristics to a discrete external Schottky diode in parallel with a MOSFET. Figure 13 shows the reverse recovery characteristic of the FDMC7692S.

Schottky barrier diodes exhibit significant leakage at high temperature and high reverse voltage. This will increase the power in the device.

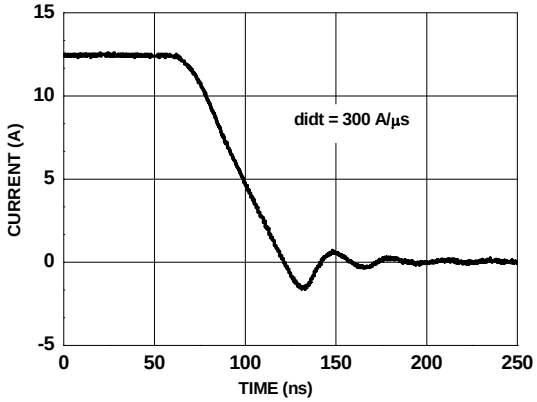


Figure 13. SyncFET body diode reverse recovery characteristic

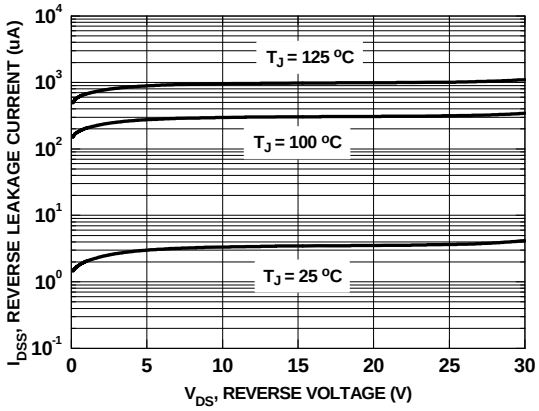
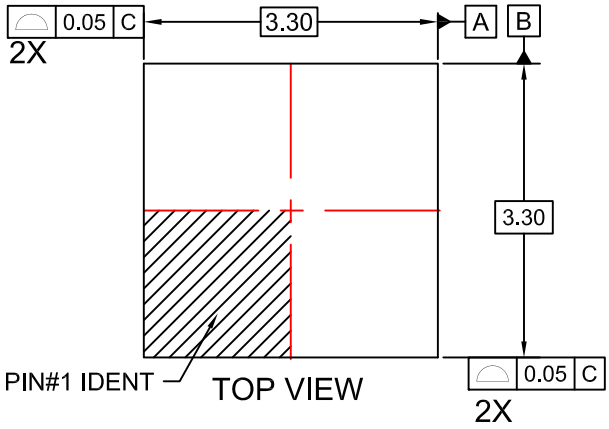
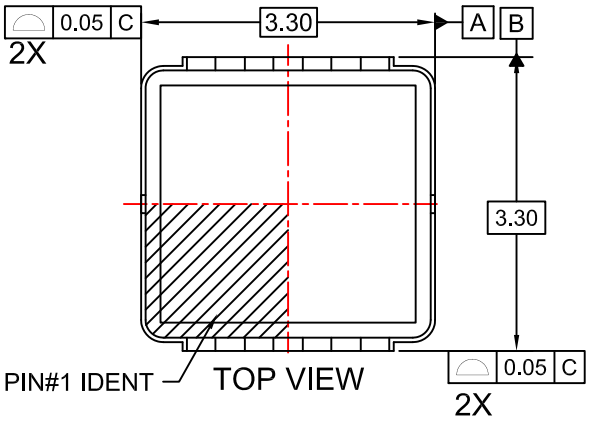
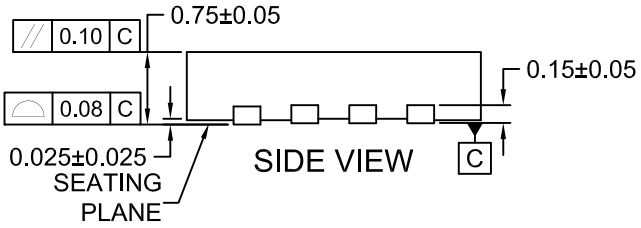
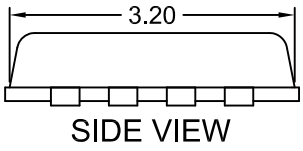


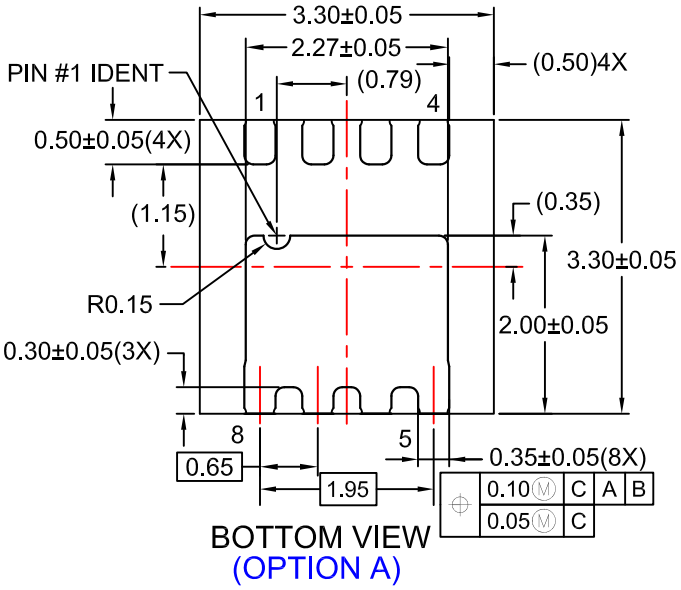
Figure 14. SyncFET body diode reverse leakage versus drain-source voltage

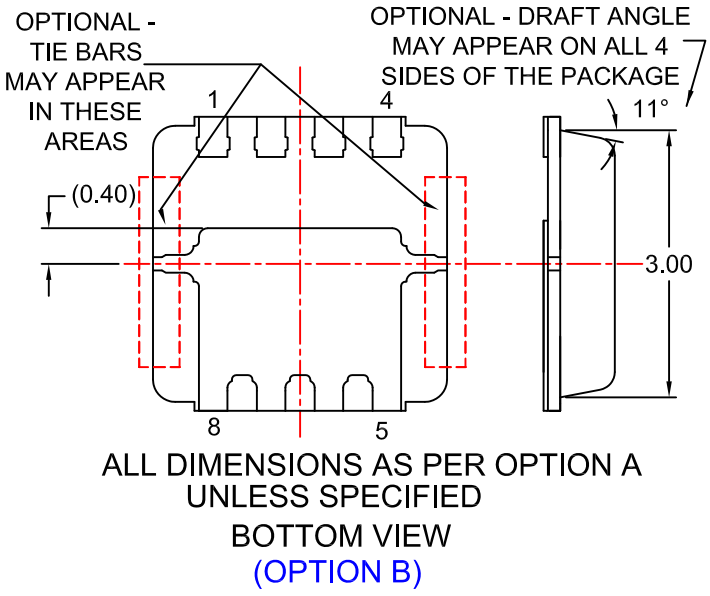

0.05 C
2X
3.30
A
B
3.30
PIN#1 IDENT
TOP VIEW
0.05 C
2X

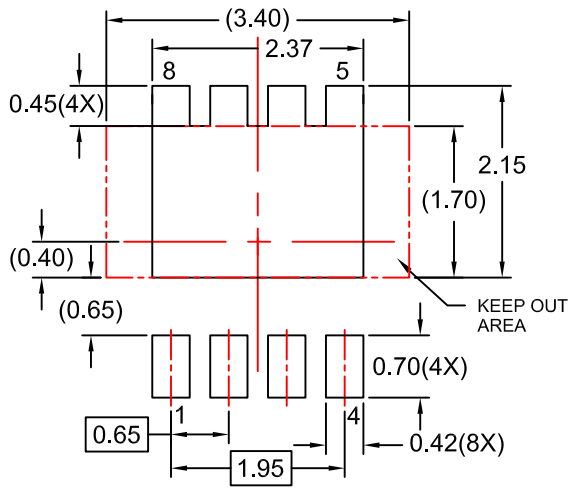

0.05 C
2X
3.30
A
B
3.30
PIN#1 IDENT
TOP VIEW
0.05 C
2X


0.10 C
0.75±0.05
0.08 C
0.15±0.05
0.025±0.025
SEATING
PLANE
SIDE VIEW
C

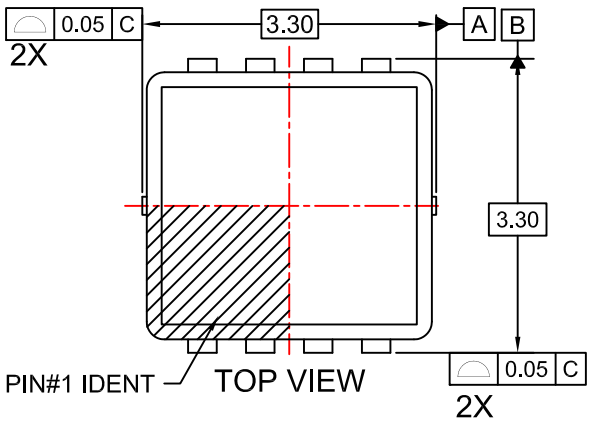

3.20
SIDE VIEW

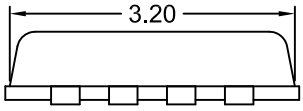

3.30±0.05
2.27±0.05
(0.79)
(0.50)4X
PIN #1 IDENT
1
4
0.50±0.05(4X)
(1.15)
(0.35)
3.30±0.05
R0.15
2.00±0.05
0.30±0.05(3X)
8
5
0.65
1.95
0.35±0.05(8X)
0.10 M C A B
0.05 M C
BOTTOM VIEW
(OPTION A)


OPTIONAL -
TIE BARS
MAY APPEAR
IN THESE
AREAS
OPTIONAL - DRAFT ANGLE
MAY APPEAR ON ALL 4
SIDES OF THE PACKAGE
1
4
11°
(0.40)
3.00
8
5
ALL DIMENSIONS AS PER OPTION A
UNLESS SPECIFIED
BOTTOM VIEW
(OPTION B)

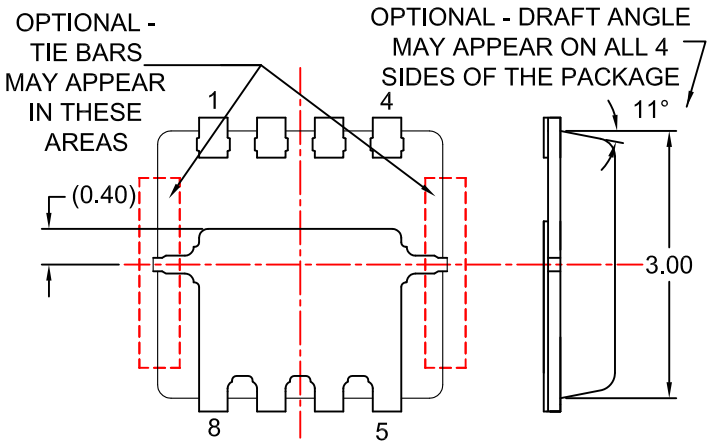

(3.40)
2.37
8
5
0.45(4X)
2.15
(1.70)
(0.40)
(0.65)
KEEP OUT
AREA
0.70(4X)
0.65
1
4
0.42(8X)
1.95
RECOMMENDED LAND PATTERN

FAIRCHILD.





SIDE VIEW



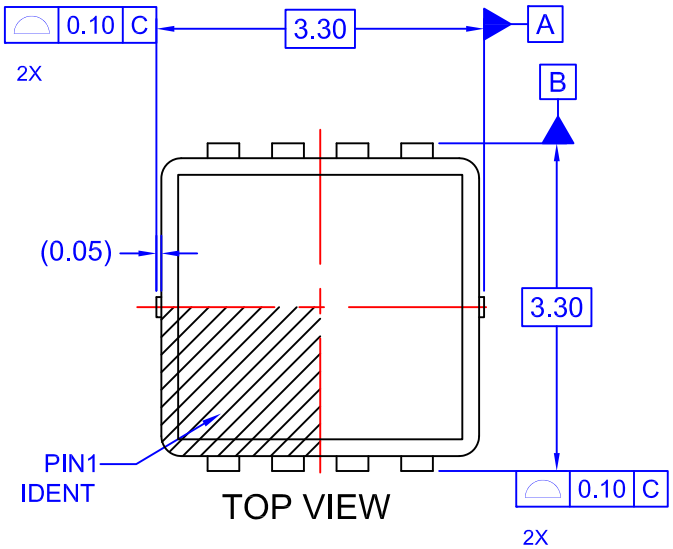
ALL DIMENSIONS AS PER OPTION A
UNLESS SPECIFIED

BOTTOM VIEW
(OPTION C)

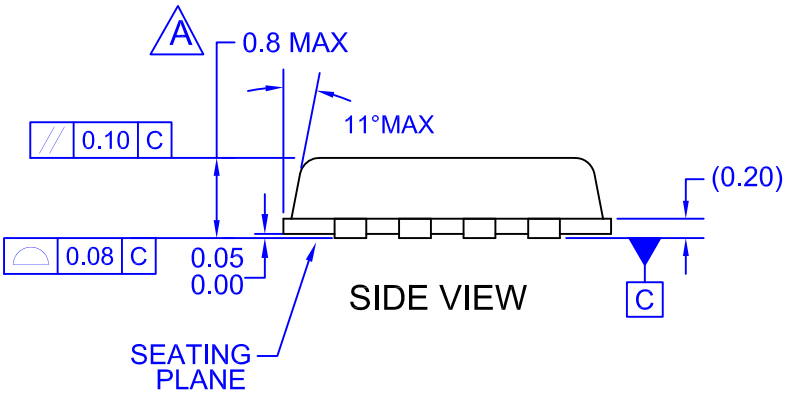
NOTES:

A. PACKAGE DOES NOT FULLY CONFORM TO JEDEC REGISTRATION MO-240.
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN
E. DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. BURRS OR MOLD FLASH SHALL NOT EXCEED 0.10MM.
F. DRAWING FILENAME: MKT-MLP08Wrev3.
G. OPTION A - SAWN MLP, OPTIONS B & C - PUNCH MLP.

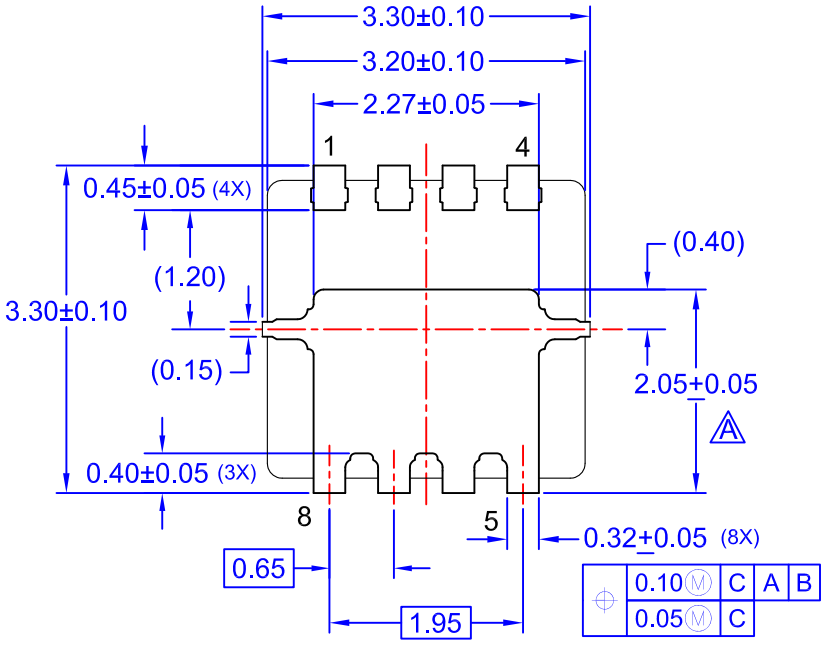
FAIRCHILD.



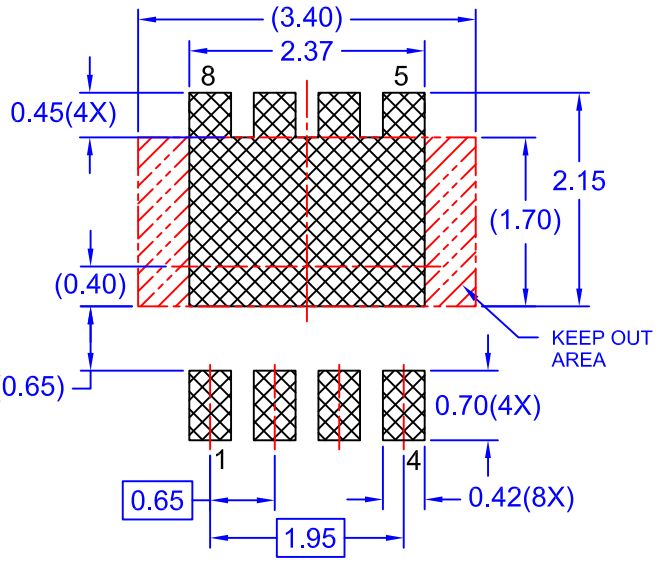
TOP VIEW



SIDE VIEW



BOTTOM VIEW

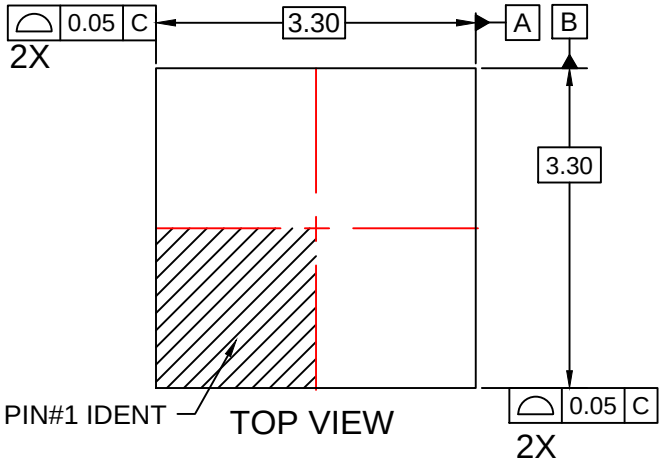


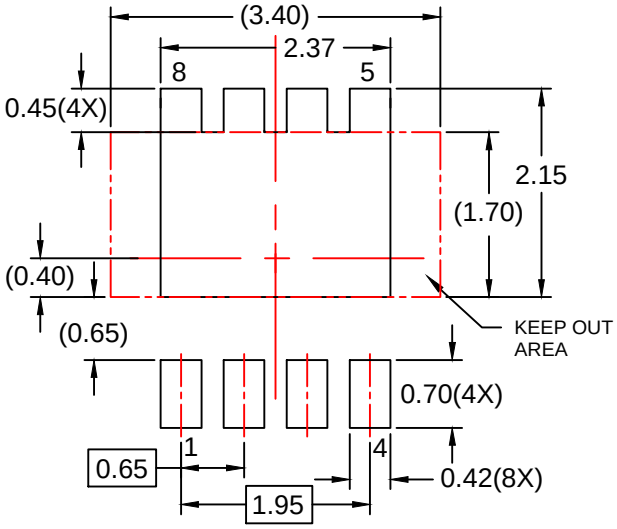
RECOMMENDED LAND PATTERN

NOTES:

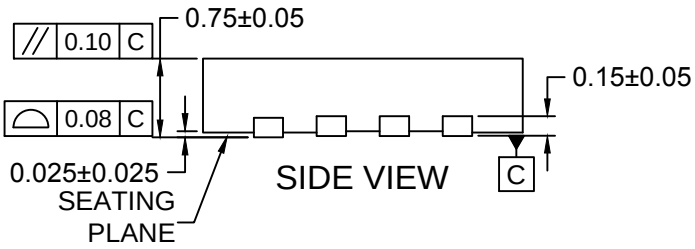
A. EXCEPT AS NOTED, PACKAGE CONFORMS TO JEDEC REGISTRATION MO-240 VARIATION BA.
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
D. SEATING PLANE IS DEFINED BY TERMINAL TIPS ONLY
E. BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH PROTRUSIONS NOR GATE BURRS.
F. FLANGE DIMENSIONS INCLUDE INTERTERMINAL FLASH OR PROTRUSION. INTERTERMINAL FLASH OR PROTRUSION SHALL NOT EXCEED 0.25MM PER SIDE.
G. IT IS RECOMMENDED TO HAVE NO TRACES OR VIA WITHIN THE KEEP OUT AREA.
H. DRAWING FILENAME: MKT-MLP08Trev4.
I. GENERAL RADII FOR ALL CORNERS SHALL BE 0.20MM MAX.

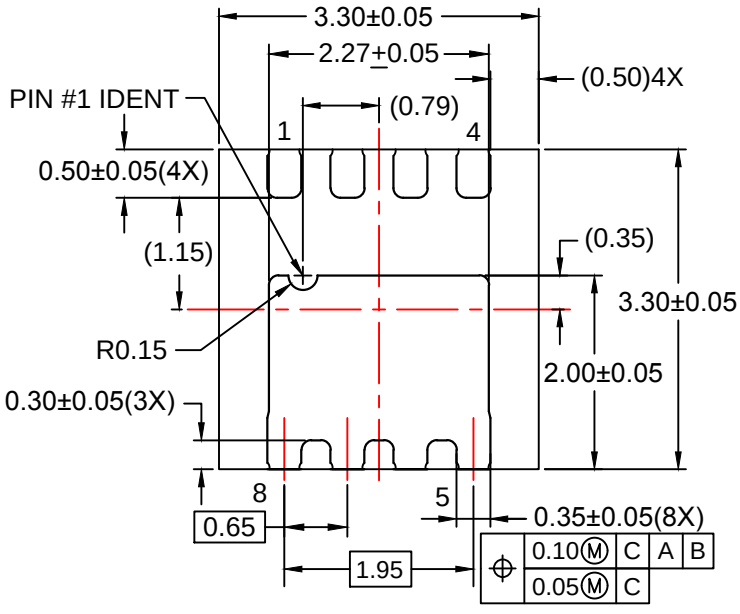
FAIRCHILD™





RECOMMENDED LAND PATTERN





BOTTOM VIEW

NOTES:

A. DOES NOT CONFORM TO JEDEC REGISTRATION MO-229

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.

D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN.

E. DRAWING FILENAME: MKT-MLP08Srev3.

FAIRCHILD.

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