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January 2015

FDMS86550ET60

N-Channel PowerTrench® MOSFET

60 V, 245 A, 1.65 mΩ

Features

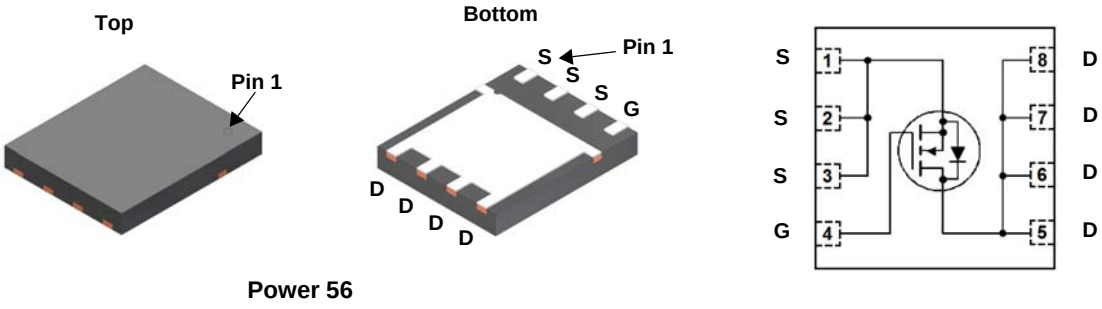
- Extended T_J rating to 175°C
- Max $r_{DS(on)}$ = 1.65 mΩ at V_{GS} = 10 V, I_D = 32 A
- Max $r_{DS(on)}$ = 2.2 mΩ at V_{GS} = 8 V, I_D = 27 A
- Advanced Package and Silicon combination for low $r_{DS(on)}$ and high efficiency
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

Applications

- Primary DC-DC MOSFET
- Secondary Synchronous Rectifier
- Load Switch



Power 56

MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			60	V
V_{GS}	Gate to Source Voltage			±20	V
I_D	Drain Current -Continuous	T_C = 25 °C	(Note 5)	245	A
	-Continuous	T_C = 100 °C	(Note 5)	173	
	-Continuous	T_A = 25 °C	(Note 1a)	32	
	-Pulsed		(Note 4)	1068	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	937	mJ
P_D	Power Dissipation	T_C = 25 °C		187	W
	Power Dissipation	T_A = 25 °C	(Note 1a)	3.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case		0.8	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	45	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS86550ET	FDMS86550ET60	Power 56	13 ”	12 mm	3000 units

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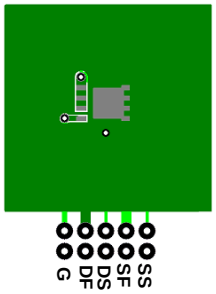
Electrical Characteristics T_J = 25 °C unless otherwise noted

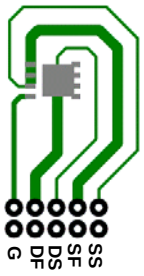
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		31		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 48 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						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	2.5	3.3	4.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-12		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 32 A		1.4	1.65	mΩ
		V_{GS} = 8 V, I_D = 27 A		1.7	2.2	
		V_{GS} = 10 V, I_D = 32 A, T_J = 125 °C		2.2	2.6	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 32 A		96		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 30 V, V_{GS} = 0 V, f = 1 MHz		8235		pF
C_{oss}	Output Capacitance			2140		pF
C_{rss}	Reverse Transfer Capacitance			70		pF
R_g	Gate Resistance		0.1	0.9	2.7	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 30 V, I_D = 32 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		43	69	ns
t_r	Rise Time			27	43	ns
$t_{d(off)}$	Turn-Off Delay Time			42	67	ns
t_f	Fall Time			11	20	ns
Q_g	Total Gate Charge	V_{GS} = 0 V to 10 V; V_{DD} = 30 V, I_D = 32 A		110	154	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to 8 V; V_{DD} = 30 V, I_D = 32 A		90	126	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 30 V, I_D = 32 A		40		nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = 30 V, I_D = 32 A		20		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.1 A (Note 2)		0.7	1.2	V
		V_{GS} = 0 V, I_S = 32 A (Note 2)		0.8	1.3	
t_{rr}	Reverse Recovery Time	I_F = 32 A, di/dt = 100 A/μs		68	109	ns
Q_{rr}	Reverse Recovery Charge			62	99	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. $R_{\theta CA}$ is determined by the user's board design.



a. 45 °C/W when mounted on a 1 in^2 pad of 2 oz copper.



b. 115 °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 937 mJ is based on starting T_J = 25 °C, L = 3 mH, I_{AS} = 25 A, V_{DD} = 60 V, V_{GS} = 10 V. 100% test at L = 0.1 mH, I_{AS} = 79 A.

4. Pulse Id please refers to Figure.11 SOA Curve for detail.

5. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

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Typical Characteristics T_J = 25 °C unless otherwise noted

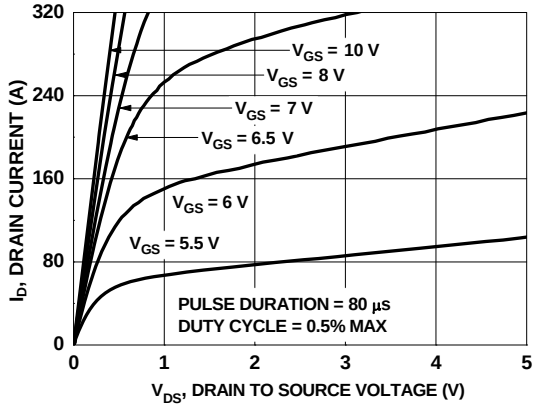

Figure 1. On-Region Characteristics

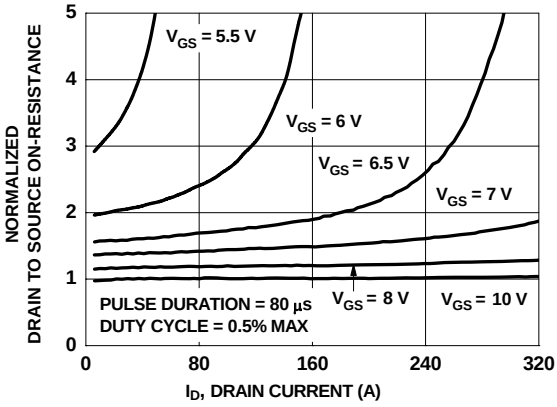

Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

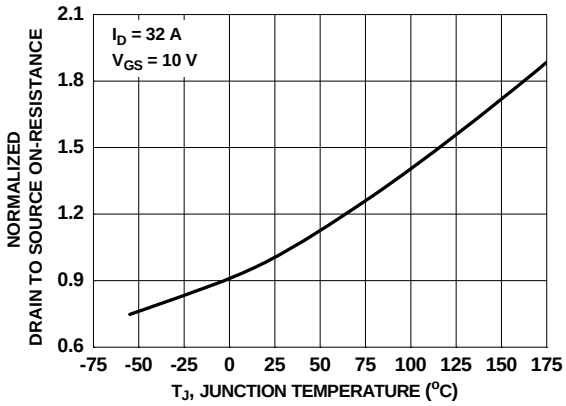

Figure 3. Normalized On-Resistance vs Junction Temperature

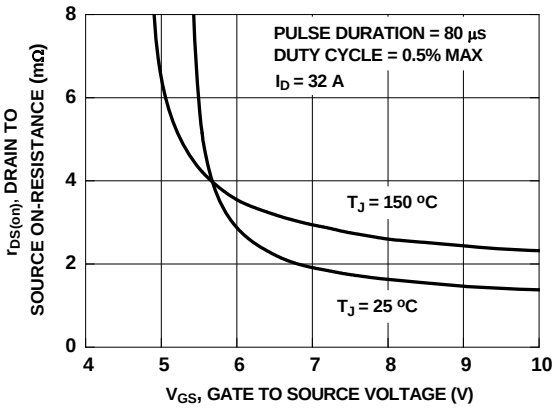

Figure 4. On-Resistance vs Gate to Source Voltage

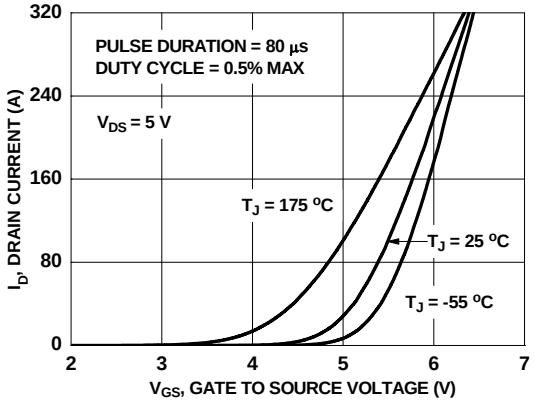

Figure 5. Transfer Characteristics

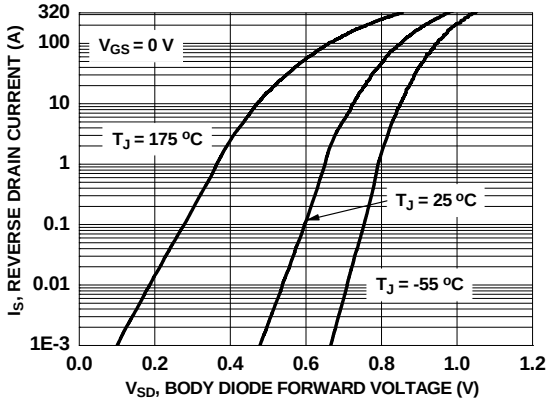

Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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Typical Characteristics T_J = 25 °C unless otherwise noted

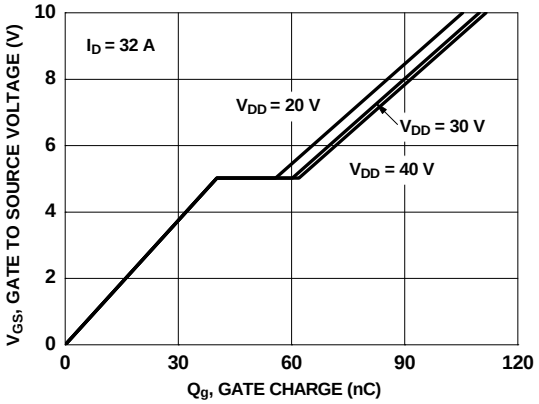


Figure 7. Gate Charge Characteristics

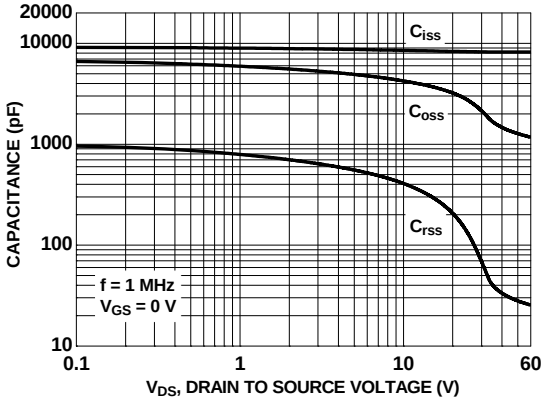


Figure 8. Capacitance vs Drain to Source Voltage

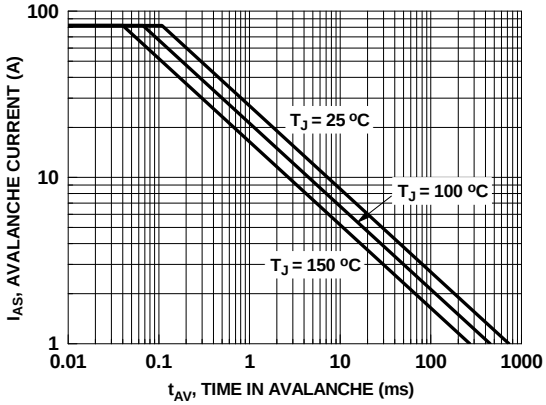


Figure 9. Unclamped Inductive Switching Capability

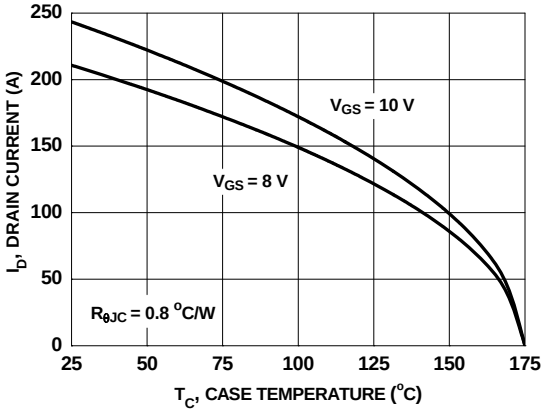


Figure 10. Maximum Continuous Drain Current vs Case Temperature

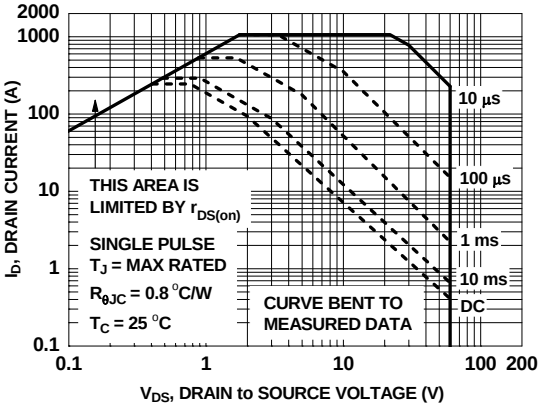


Figure 11. Forward Bias Safe Operating Area

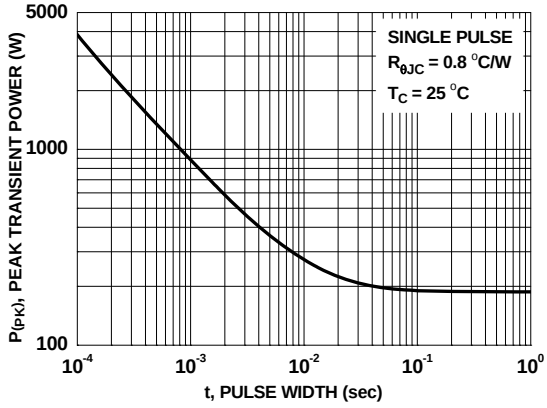


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted

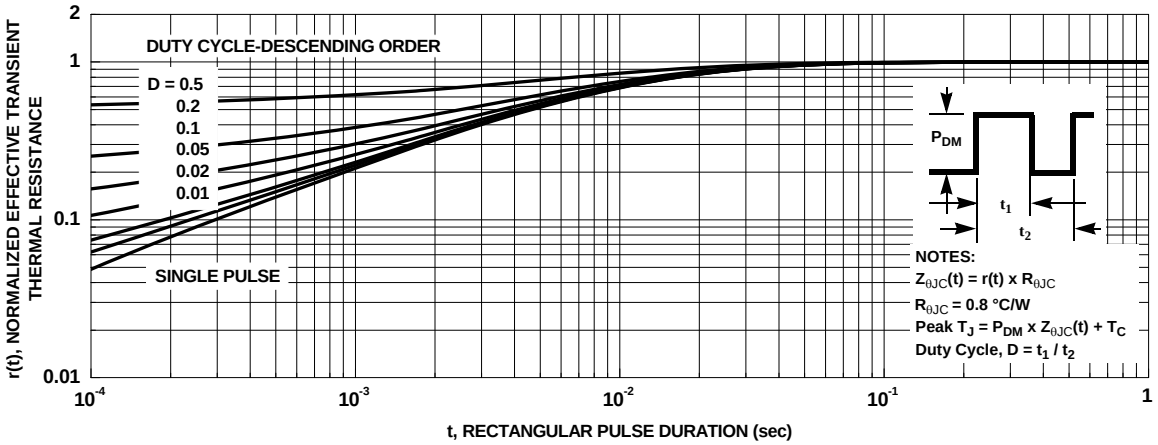
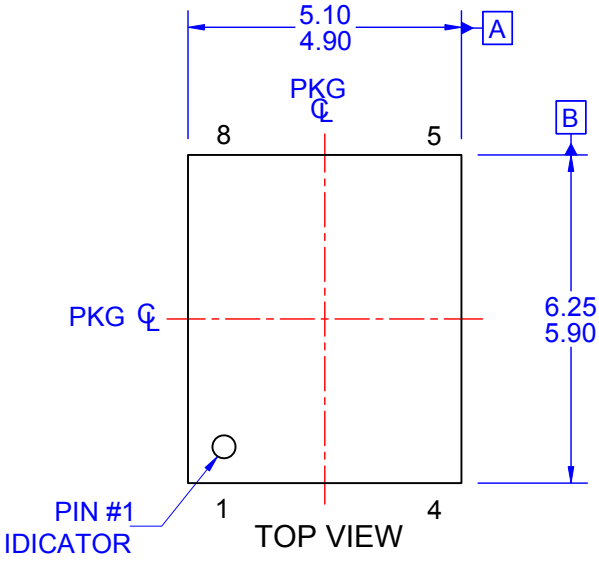
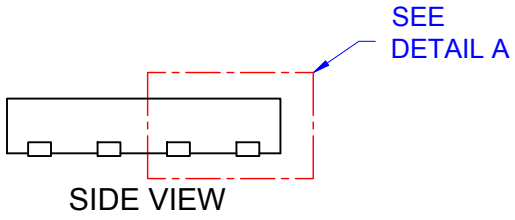
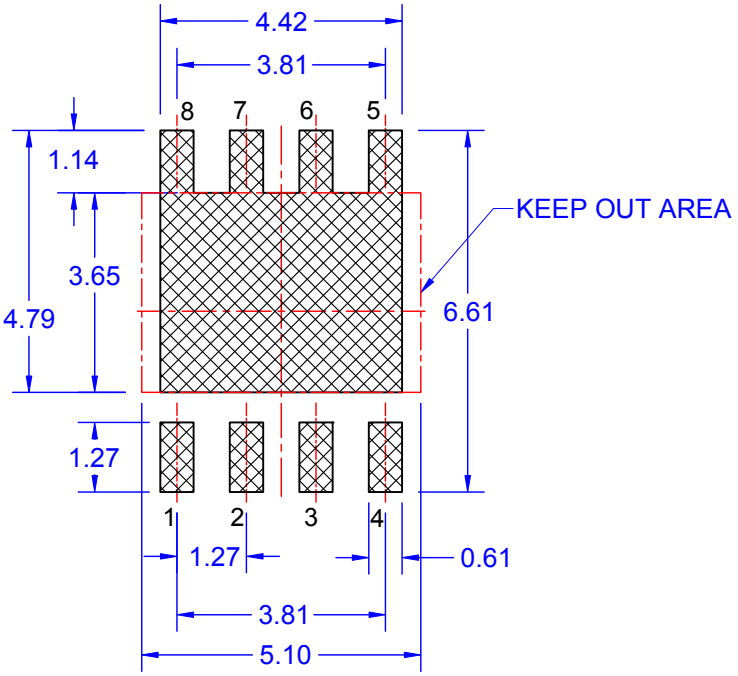
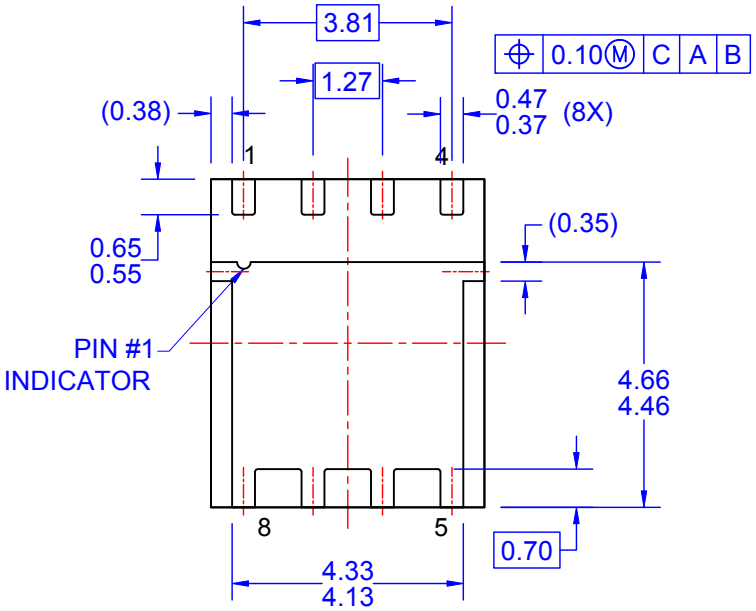


Figure 13. Transient Thermal Response Curve









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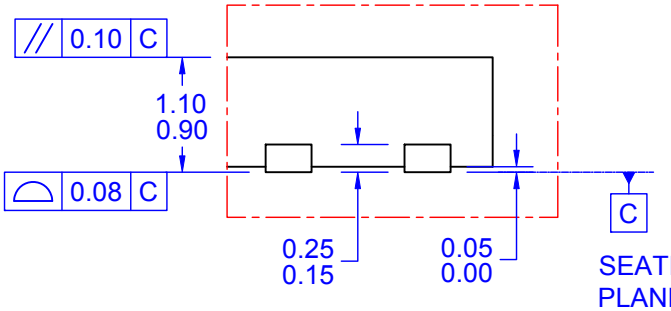

DETAIL A

SCALE: 2:1

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