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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

June 2016

FDC021N30

N-Channel PowerTrench® MOSFET

30 V, 6.1 A, 26 mΩ

Features

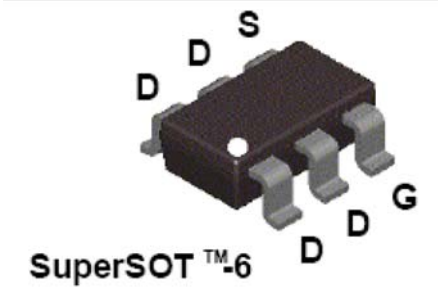
- Max $r_{DS(on)}$ = 26 mΩ at V_{GS} = 10 V, I_D = 6.1 A
- Max $r_{DS(on)}$ = 33 mΩ at V_{GS} = 4.5 V, I_D = 5.3 A
- High Performance Trench Technology for Extremely Low $r_{DS(on)}$
- High Power and Current Handling Capability in a Widely Used Surface Mount Package
- Fast Switching Speed
- RoHS Compliant

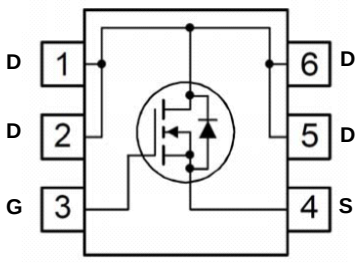
General Description

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

Applications

- Load Switch
- Battery Protection
- Power Management





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		(Note 3)	±20	V
I_D	-Continuous	T_A = 25°C	(Note 1a)	6.1	A
	-Pulsed		(Note 4)	62	
P_D	Power Dissipation		(Note 1a)	1.6	W
	Power Dissipation		(Note 1b)	0.7	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to + 150	°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	78	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	175	°C/W

Package Marking and Ordering Information

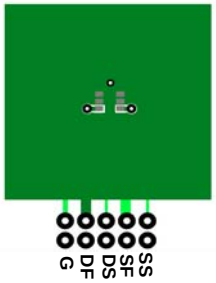
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
21N	FDC021N30	SSOT-6™	7 ”	8 mm	3000 units

Electrical Characteristics T_J = 25°C unless otherwise noted.

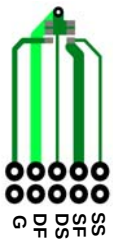
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C		16		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 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	1.0	1.8	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C		-5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 6.1 A		19	26	mΩ
		V_{GS} = 4.5 V, I_D = 5.3 A		23	33	
		V_{GS} = 10 V, I_D = 6.1 A, T_J = 125°C		26	37	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 6.1 A		30		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		510	710	pF
C_{oss}	Output Capacitance			170	240	pF
C_{rss}	Reverse Transfer Capacitance			22	30	pF
R_g	Gate Resistance		0.1	1.3	2.6	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15 V, I_D = 6.1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		6	12	ns
t_r	Rise Time			2	10	ns
$t_{d(off)}$	Turn-Off Delay Time			13	24	ns
t_f	Fall Time			2	10	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 10 V, V_{DD} = 15 V, I_D = 6.1 A		7.7	10.8	nC
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 4.5 V, V_{DD} = 15 V, I_D = 6.1 A		3.7	5.2	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 15 V, I_D = 6.1 A		1.4		nC
Q_{gd}	Gate to Drain “Miller” Charge			1.1		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 6.1 A (Note 2)		0.8	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 6.1 A, di/dt = 100 A/μs		14	25	ns
Q_{rr}	Reverse Recovery Charge			3	10	nC

Notes:

1: $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user’s board design.



a. 78 °C/W when mounted on a 1 in^2 pad of 2 oz copper



b.175 °C/W when mounted on a minimum pad of 2 oz copper

2: Pulse Test: Pulse Width<300 us, Duty Cycle<2.0%.
3. As an N-ch device, the negative Vgs rating is for low duty cycle pulse occurrence only. No continuous rating is implied.
4. Pulsed Id please refer to Fig 11 SOA graph for more details.

Typical Characteristics T_J = 25 °C unless otherwise noted.

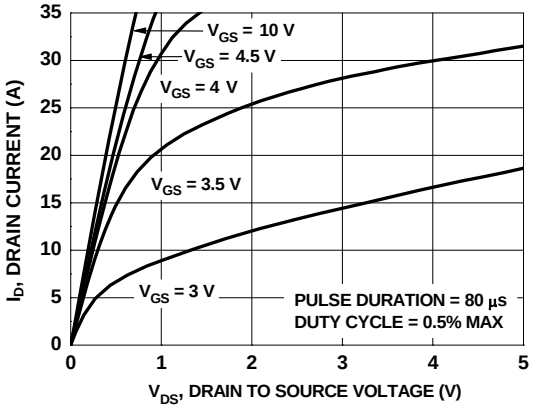


Figure 1. On-Region Characteristics

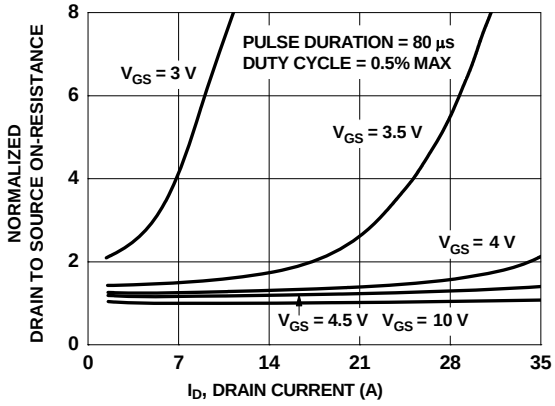


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

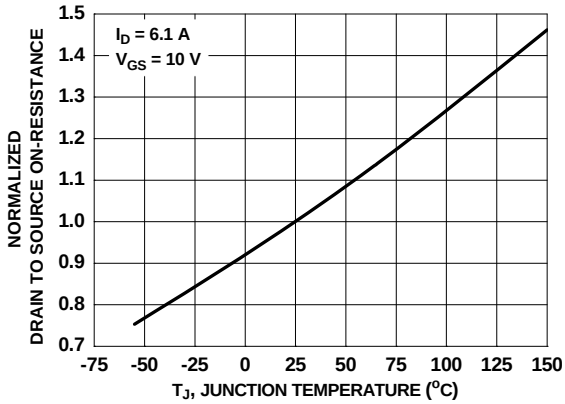


Figure 3. Normalized On-Resistance vs. Junction Temperature

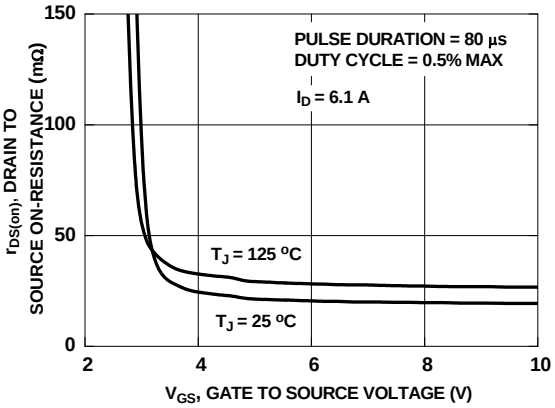


Figure 4. On-Resistance vs. Gate to Source Voltage

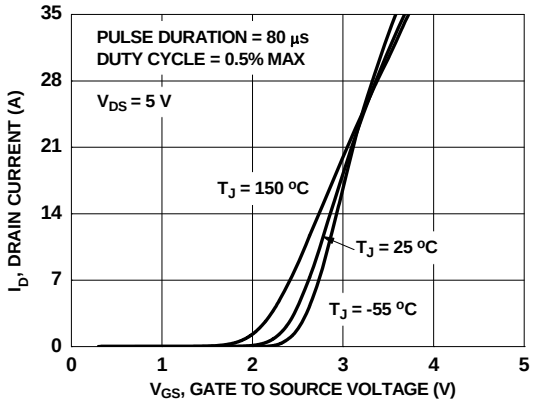


Figure 5. Transfer Characteristics

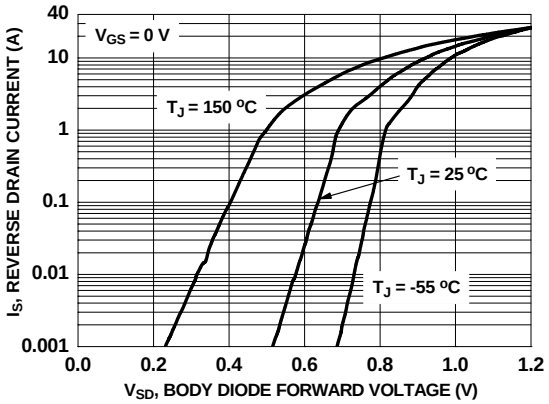


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted.

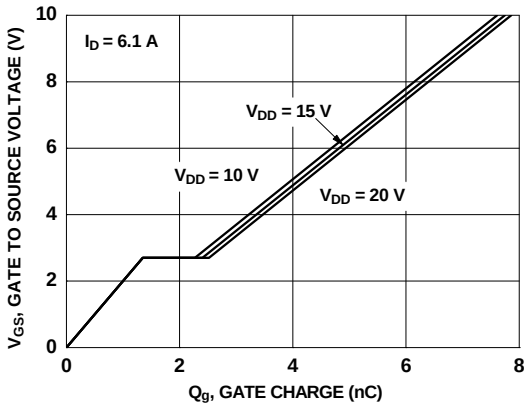


Figure 7. Gate Charge Characteristics

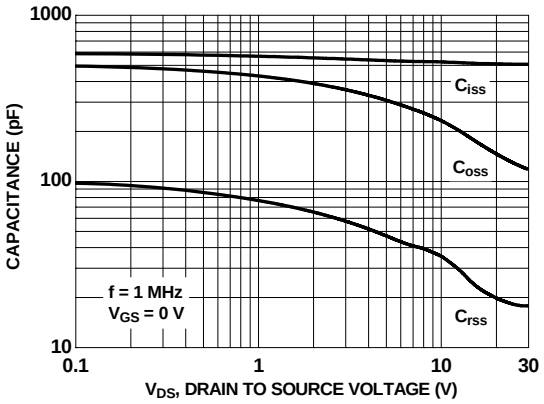


Figure 8. Capacitance vs. Drain to Source Voltage

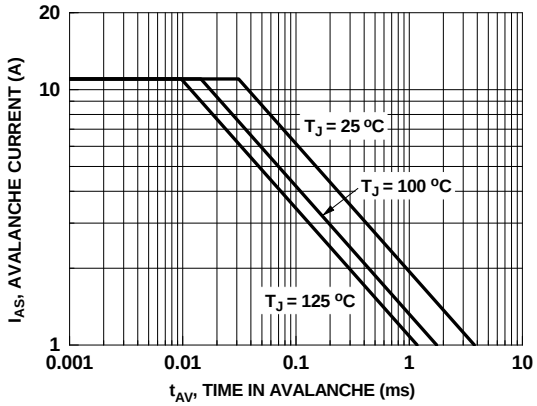


Figure 9. Unclamped Inductive Switching Capability

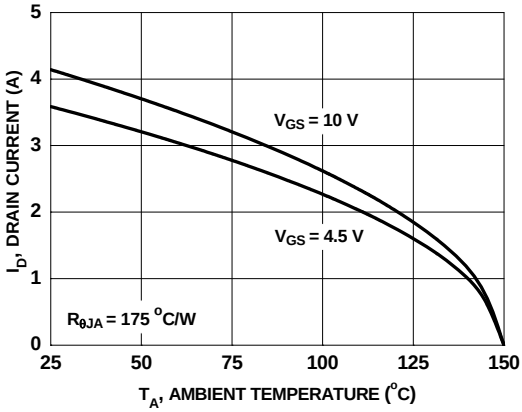


Figure 10. Maximum Continous Drain Current vs. Ambient Temperature

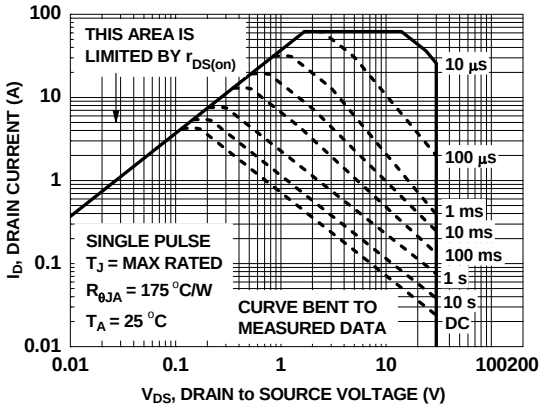


Figure 11. Forward Bias Safe Operating Area

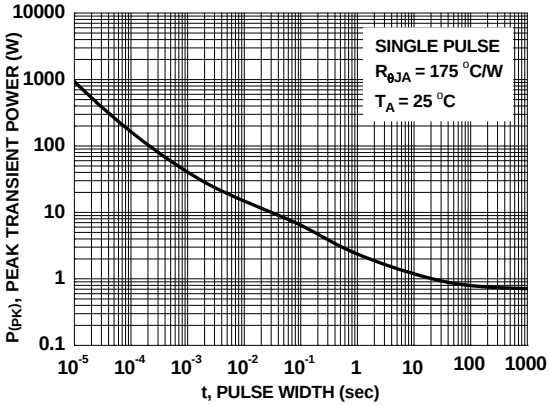


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted.

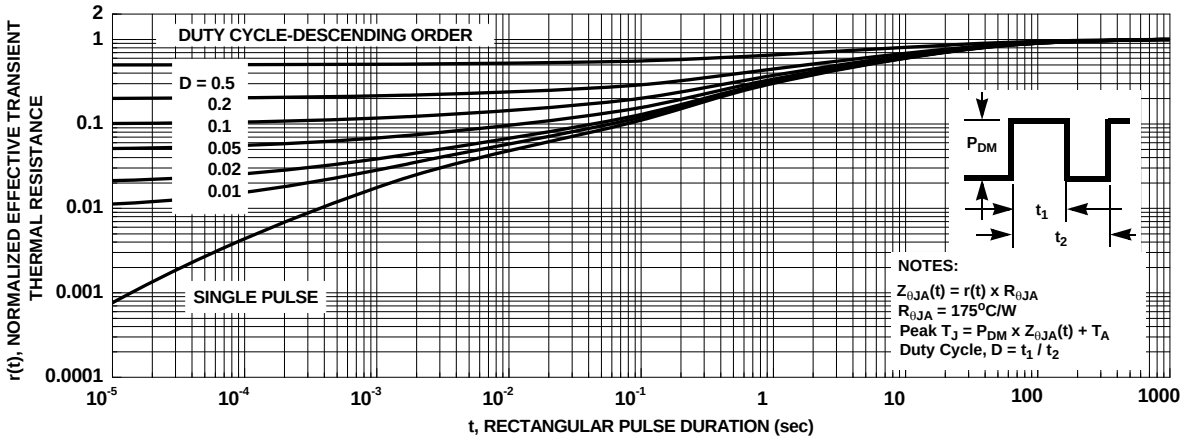
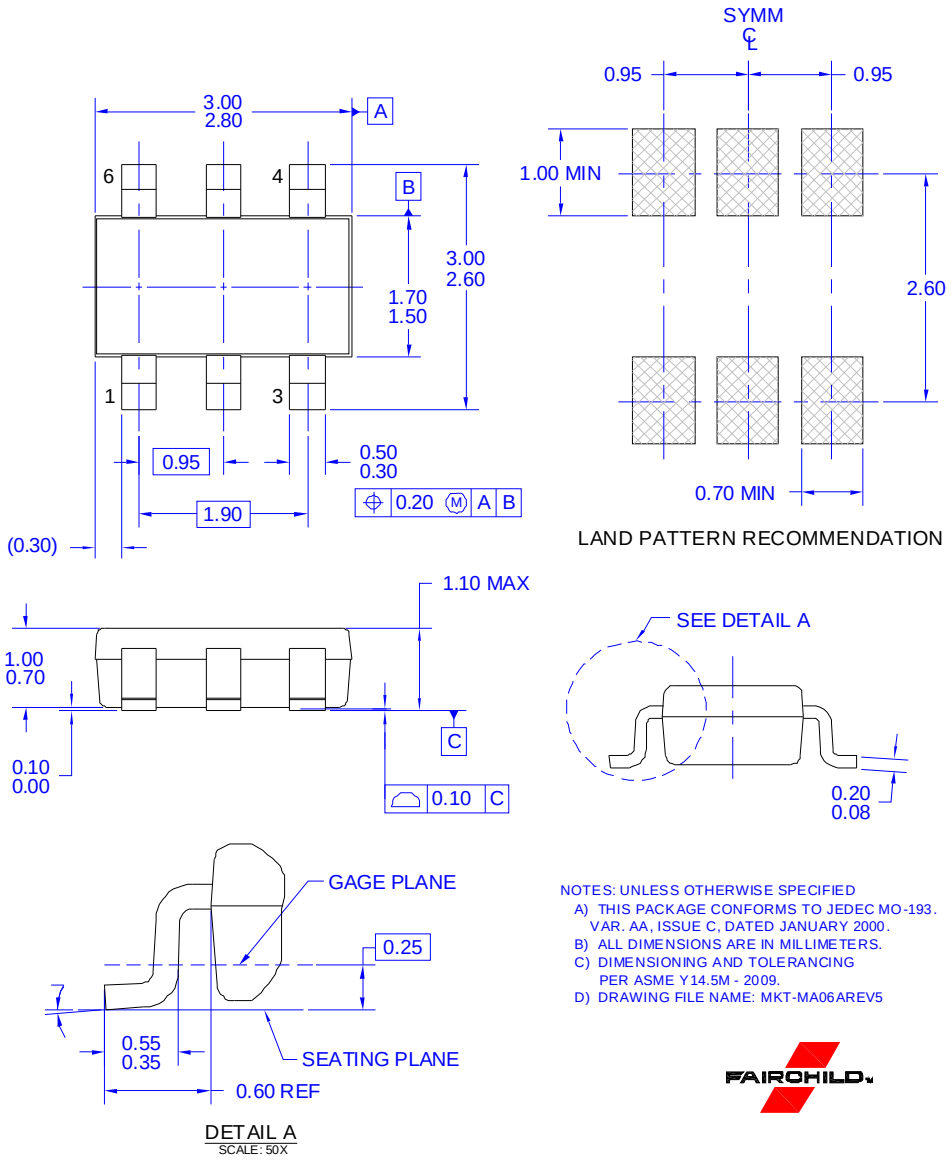


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

Dimensional Outline and Pad Layout



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Datasheet Identification	Product Status	Definition
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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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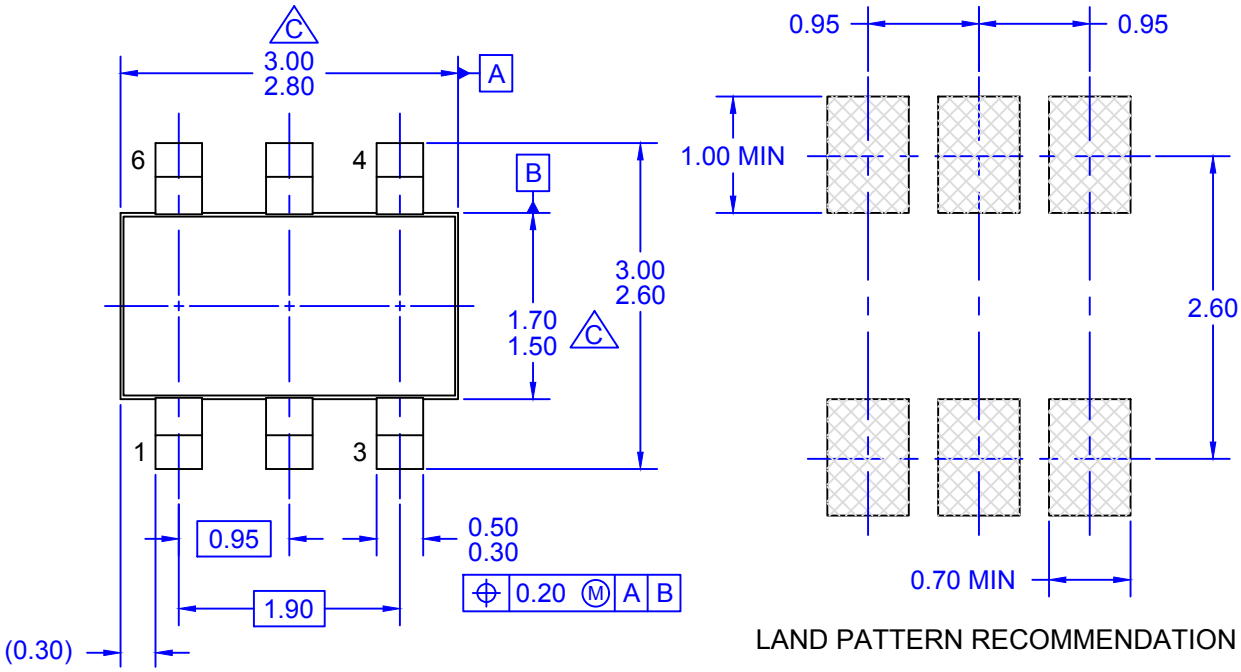

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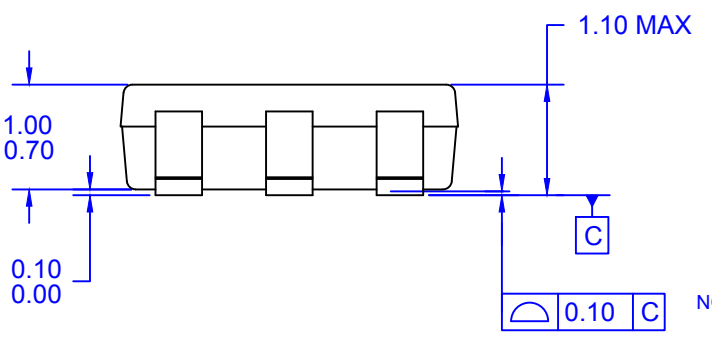

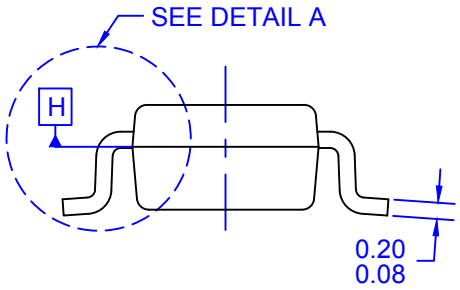

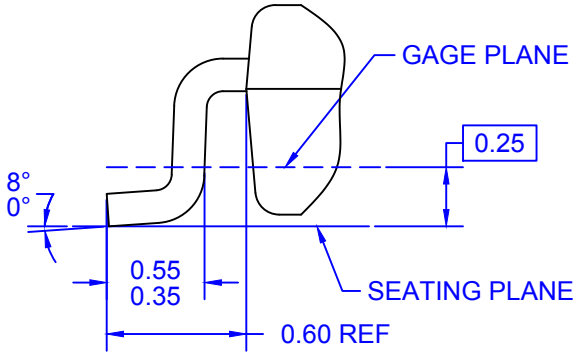

DETAIL A
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B) ALL DIMENSIONS ARE IN MILLIMETERS.

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