

# FDS8813NZ

## N-Channel PowerTrench® MOSFET

30V, 18.5A, 4.5mΩ

### Features

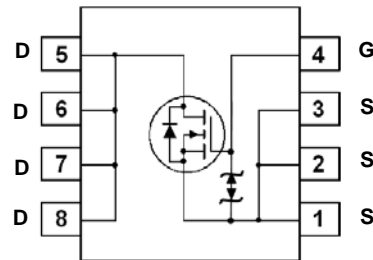
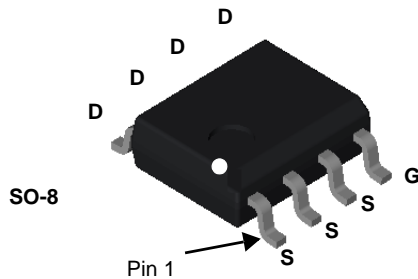
- Max  $r_{DS(on)}$  = 4.5mΩ at  $V_{GS} = 10V$ ,  $I_D = 18.5A$
- Max  $r_{DS(on)}$  = 6.0mΩ at  $V_{GS} = 4.5V$ ,  $I_D = 16A$
- HBM ESD protection level of 5.6KV typical (note 3)
- High performance trench technology for extremely low  $r_{DS(on)}$
- High power and current handling capability
- RoHS 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.

This device is well suited for Power Management and load switching applications common in Notebook Computers and Portable Battery Packs.



### MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current -Continuous (Note 1a)	18.5	A
	-Pulsed	74	
$E_{AS}$	Single Pulse Avalanche Energy (Note 4)	337	mJ
$P_D$	Power Dissipation (Note 1a)	2.5	W
	Power Dissipation (Note 1b)	1.0	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 1)	25	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	50	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	125	

### Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape Width	Quantity
FDS8813NZ	FDS8813NZ	13"	12mm	2500 units

## Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}, V_{GS} = 0\text{V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		20		mV/°C
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}, V_{GS} = 0\text{V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$			$\pm 10$	$\mu\text{A}$

### On Characteristics (Note 2)

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250\mu\text{A}$	1	1.8	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , referenced to $25^\circ\text{C}$		-6		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 18.5\text{A}$		3.8	4.5	m $\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 16\text{A}$		4.7	6.0	
		$V_{GS} = 10\text{V}, I_D = 18.5\text{A}, T_J = 125^\circ\text{C}$		5.1	6.6	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 18.5\text{A}$		74		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V}, f = 1\text{MHz}$		3115	4145	pF
$C_{oss}$	Output Capacitance			580	775	pF
$C_{rss}$	Reverse Transfer Capacitance			345	520	pF
$R_g$	Gate Resistance	$f = 1\text{MHz}$	0.1	1.8	5.6	$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{V}, I_D = 18.5\text{A}, V_{GS} = 10\text{V}, R_{GEN} = 6\Omega$		13	24	ns
$t_r$	Rise Time			8	16	ns
$t_{d(off)}$	Turn-Off Delay Time			39	63	ns
$t_f$	Fall Time			7	14	ns
$Q_g$	Total Gate Charge		$V_{GS} = 0\text{V to } 10\text{V}$	$V_{DD} = 15\text{V}, I_D = 18.5\text{A}$	55	76
$Q_g$	Total Gate Charge	$V_{GS} = 0\text{V to } 5\text{V}$	28		40	nC
$Q_{gs}$	Gate to Source Gate Charge			9		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			10		nC

### Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = 2.1\text{A}$ (Note 2)		0.7	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 18.5\text{A}, di/dt = 100\text{A}/\mu\text{s}$		32	47	ns
$Q_{rr}$	Reverse Recovery Charge			27	41	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  $R_{\theta JA}$  is determined by the user's board design.



a)  $50^\circ\text{C/W}$  when mounted on a  $1\text{in}^2$  pad of 2 oz copper



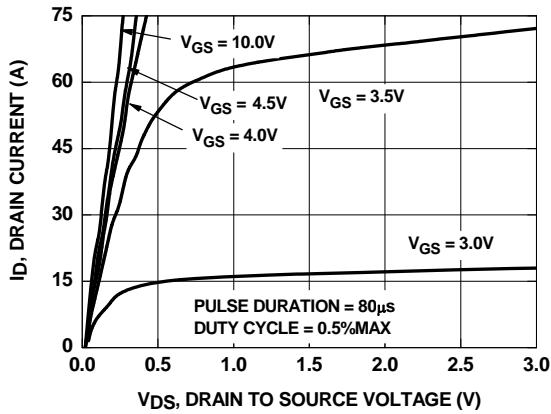
b)  $125^\circ\text{C/W}$  when mounted on a minimum pad.

2. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty Cycle < 2%.

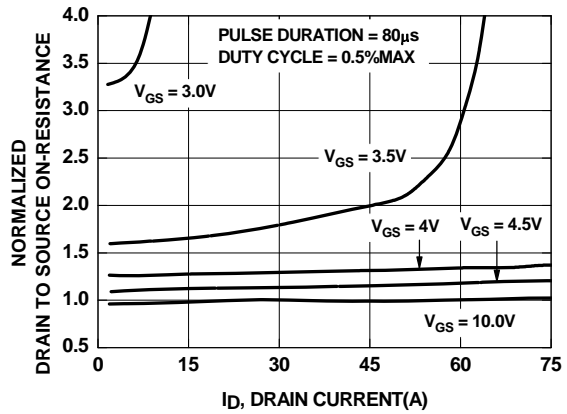
3. The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

4. Starting  $T_J = 25^\circ\text{C}$ ,  $L = 3\text{mH}$ ,  $I_{AS} = 15\text{A}$ ,  $V_{DD} = 30\text{V}$ ,  $V_{GS} = 10\text{V}$ .

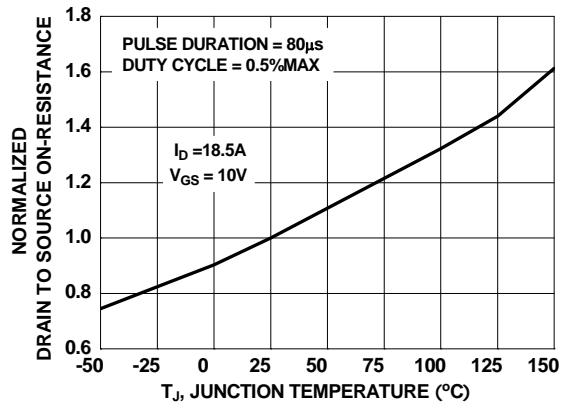
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



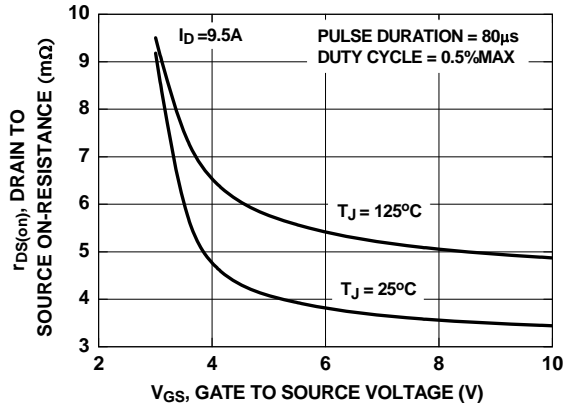
**Figure 1. On-Region Characteristics**



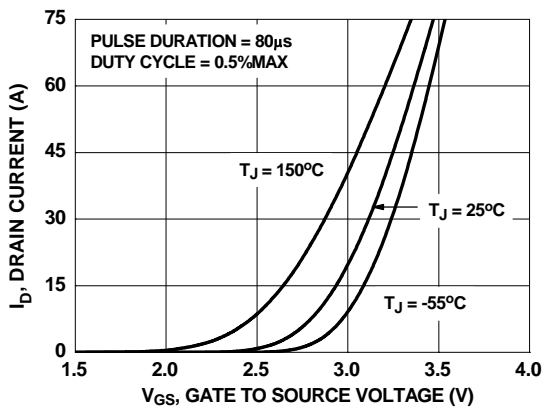
**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**



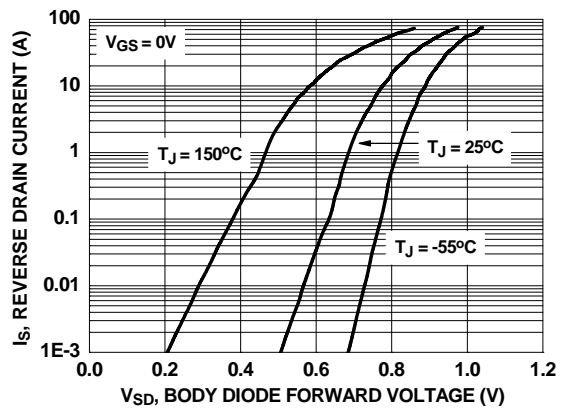
**Figure 3. Normalized On-Resistance vs Junction Temperature**



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

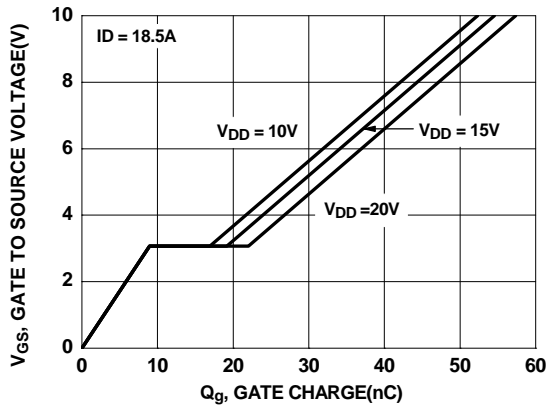


**Figure 5. Transfer Characteristics**

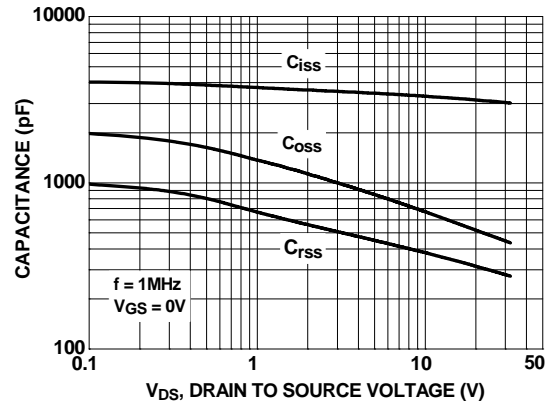


**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

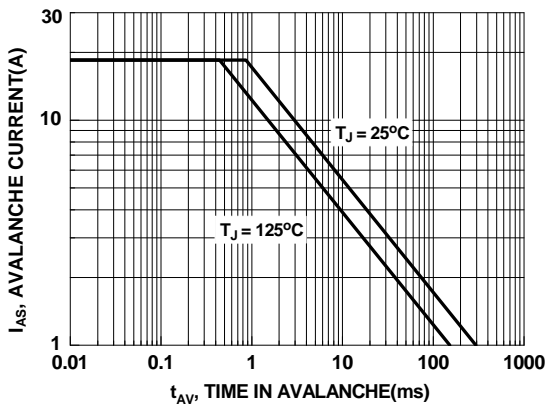
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



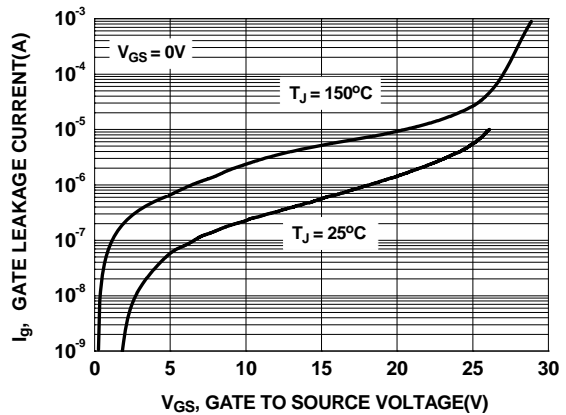
**Figure 7. Gate Charge Characteristics**



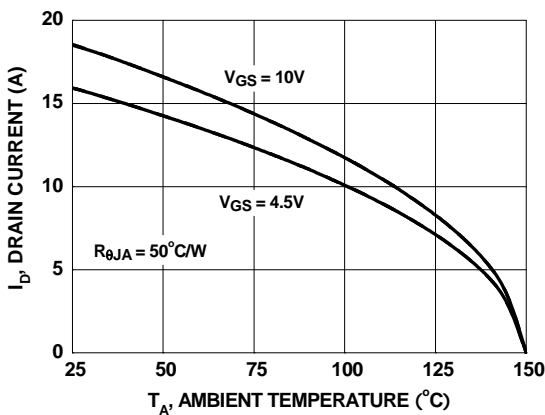
**Figure 8. Capacitance vs Drain to Source Voltage**



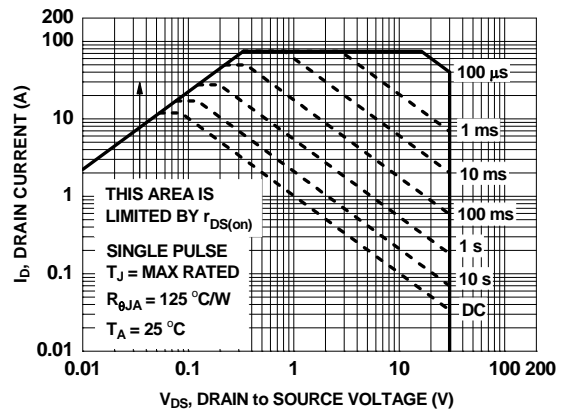
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Gate Leakage Current vs Gate to Source Voltage**



**Figure 11. Maximum Continuous Drain Current vs Ambient Temperature**



**Figure 12. Forward Bias Safe Operating Area**

**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted

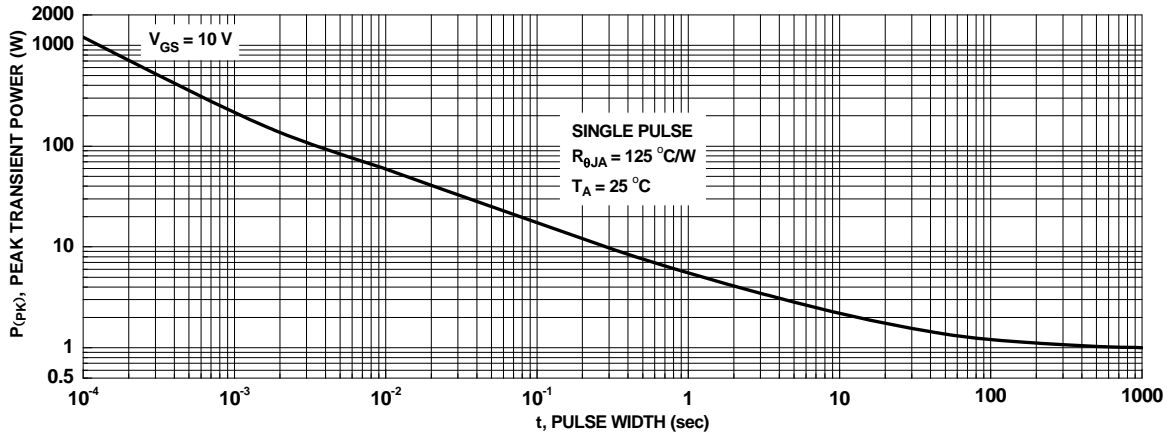


Figure 13. Single Pulse Maximum Power Dissipation

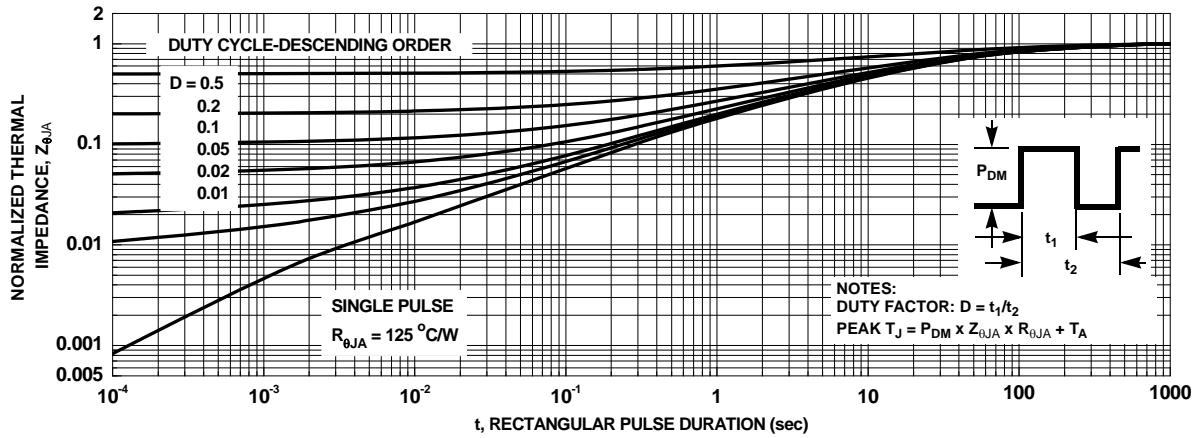


Figure 14. Junction-to-Ambient Transient Thermal Response Curve



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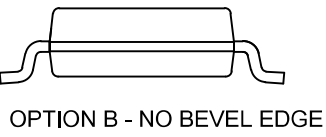
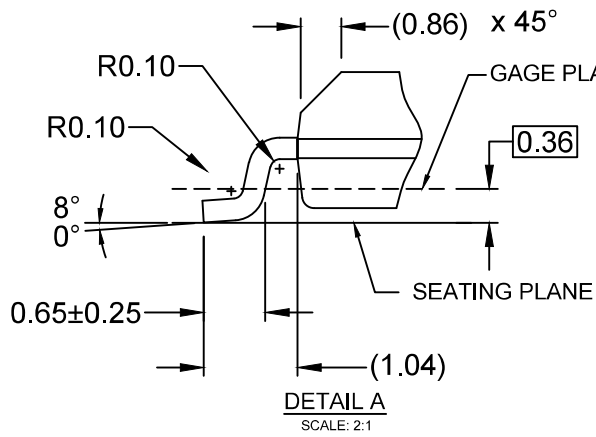
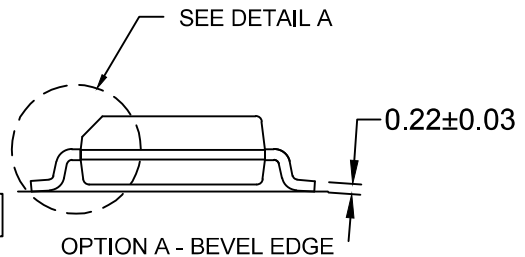
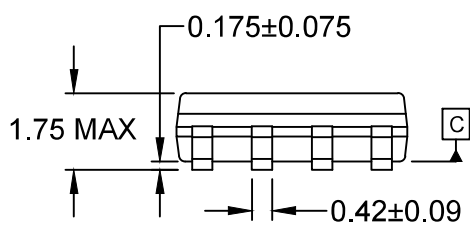
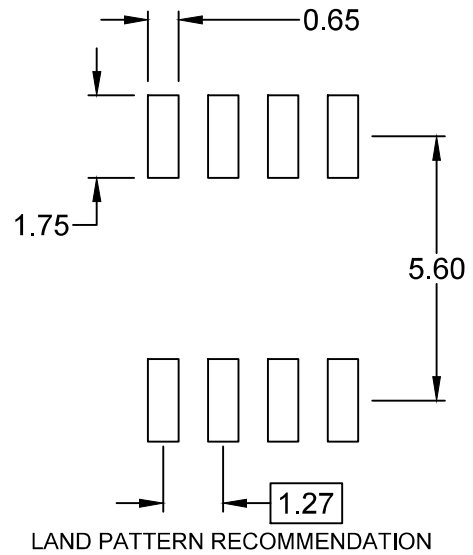
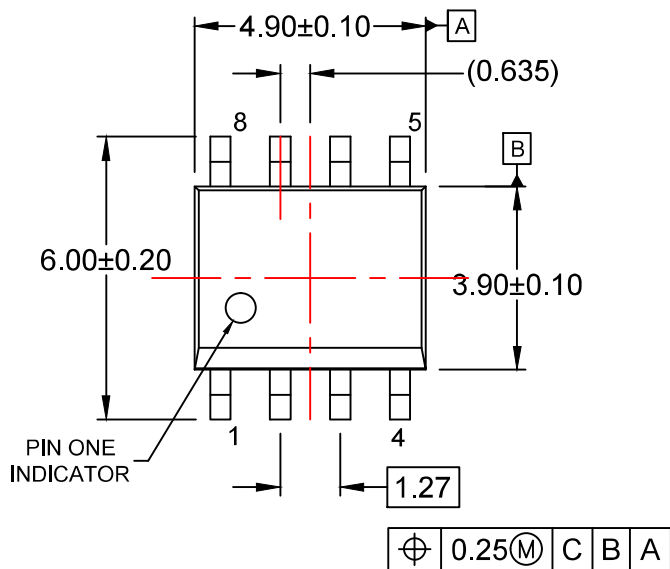
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