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FDB0190N807L N-Channel PowerTrench<sup>®</sup> MOSFET

# FDB0190N807L

## N-Channel PowerTrench<sup>®</sup> MOSFET

80 V, 270 A, 1.7 mΩ

### Features

- Max  $r_{DS(on)}$  = 1.7 mΩ at  $V_{GS} = 10$  V,  $I_D = 34$  A
- Max  $r_{DS(on)}$  = 2 mΩ at  $V_{GS} = 8$  V,  $I_D = 31$  A
- Fast Switching Speed
- Low Gate Charge
- High Performance Trench Technology for Extremely Low  $R_{DS(on)}$
- High Power and Current Handling Capability
- RoHS Compliant

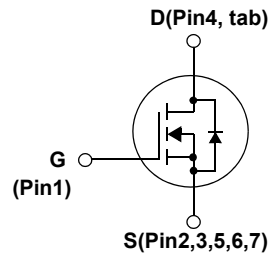
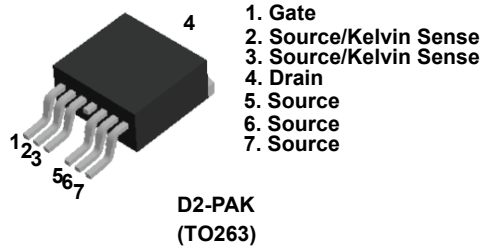


### General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advance PowerTrench<sup>®</sup> process that has been especially tailored to minimize the on-state resistance while maintaining superior ruggedness and switching performance for industrial applications.

### Applications

- Industrial Motor Drive
- Industrial Power Supply
- Industrial Automation
- Battery Operated tools
- Battery Protection
- Solar Inverters
- UPS and Energy Inverters
- Energy Storage
- Load Switch



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

Symbol	Parameter	Conditions	Rated Value	Units
$V_{DS}$	Drain to Source Voltage		80	V
$V_{GS}$	Gate to Source Voltage		±20	V
$I_D$	Drain Current	-Continuous $T_C = 25^\circ\text{C}$ (Note 5)	270	A
		-Continuous $T_C = 100^\circ\text{C}$ (Note 5)	190	
		-Pulsed (Note 4)	1440	
$E_{AS}$	Single Pulse Avalanche Energy	(Note 3)	777	mJ
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$	250	W
	Power Dissipation	$T_A = 25^\circ\text{C}$ (Note 1a)	3.8	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range		-55 to +175	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Note 1)	0.6	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	40	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB0190N807L	FDB0190N807L	D2-PAK-7L	330 mm	24 mm	800 units

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

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

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	80			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		34		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 64\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$			$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$	2	2.9	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		-13		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 34\text{ A}$		1.3	1.7	m $\Omega$
		$V_{GS} = 8\text{ V}$ , $I_D = 31\text{ A}$		1.5	2	
		$V_{GS} = 10\text{ V}$ , $I_D = 34\text{ A}$ , $T_J = 150\text{ }^\circ\text{C}$		2.3	4.3	
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{ V}$ , $I_D = 34\text{ A}$		133		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 40\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		13650	19110	pF
$C_{oss}$	Output Capacitance			1990	2790	pF
$C_{rss}$	Reverse Transfer Capacitance			235	330	pF
$R_g$	Gate Resistance			2.9		$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 40\text{ V}$ , $I_D = 34\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		60	96	ns
$t_r$	Rise Time			78	125	ns
$t_{d(off)}$	Turn-Off Delay Time			98	157	ns
$t_f$	Fall Time			50	80	ns
$Q_g$	Total Gate Charge			178	249	nC
$Q_{gs}$	Gate to Source Gate Charge	$V_{DD} = 40\text{ V}$ , $I_D = 34\text{ A}$ , $V_{GS} = 10\text{ V}$		60		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			32		nC

### Drain-Source Diode Characteristics

$I_S$	Maximum Continuous Drain to Source Diode Forward Current			270	A	
$I_{SM}$	Maximum Pulsed Drain to Source Diode Forward Current			1440	A	
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 34\text{ A}$ (Note 2)		0.8	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = 34\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		89	142	ns
$Q_{rr}$	Reverse Recovery Charge			103	165	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)  $40\text{ }^\circ\text{C}/\text{W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper.  
 b)  $62.5\text{ }^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0 %.

3.  $E_{AS}$  of 777 mJ is based on starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 0.3\text{ mH}$ ,  $I_{AS} = 72\text{ A}$ ,  $V_{DD} = 72\text{ V}$ ,  $V_{GS} = 10\text{ V}$ . 100% test at  $L = 0.1\text{ mH}$ ,  $I_{AS} = 104\text{ A}$ .

4. Pulsed  $I_D$  please refer to Figure "Forward Bias Safe Operating Area" for more details.

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

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

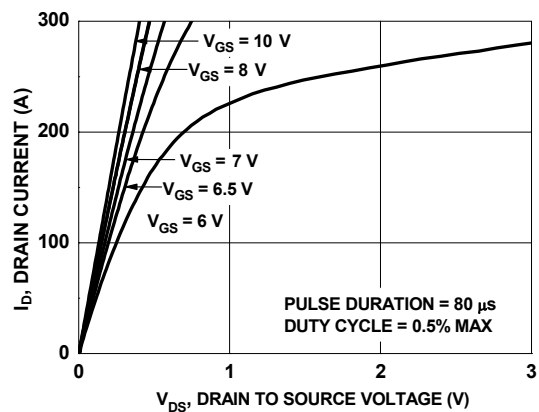


Figure 1. On Region Characteristics

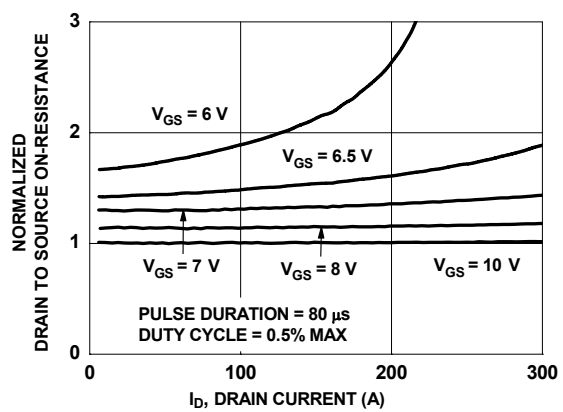


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

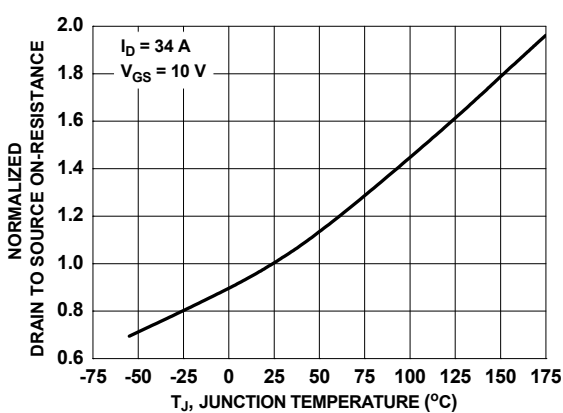


Figure 3. Normalized On Resistance vs. Junction Temperature

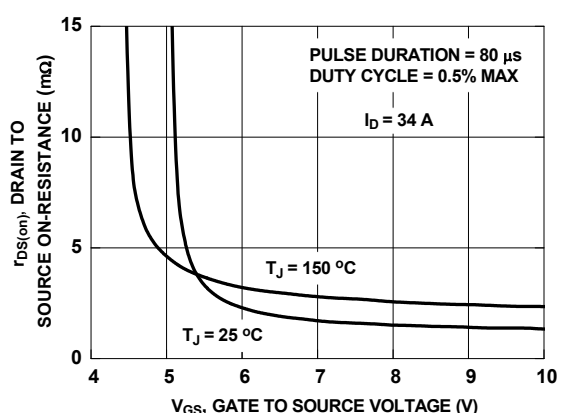


Figure 4. On-Resistance vs. Gate to Source Voltage

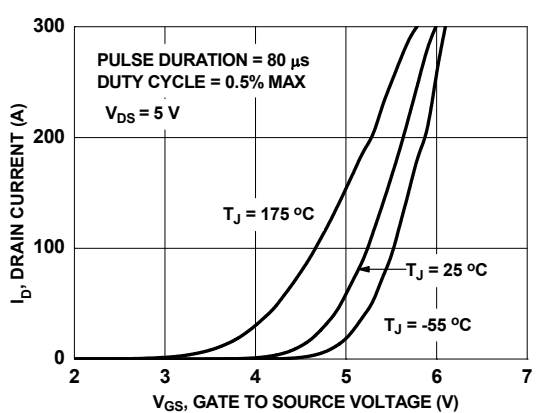


Figure 5. Transfer Characteristics

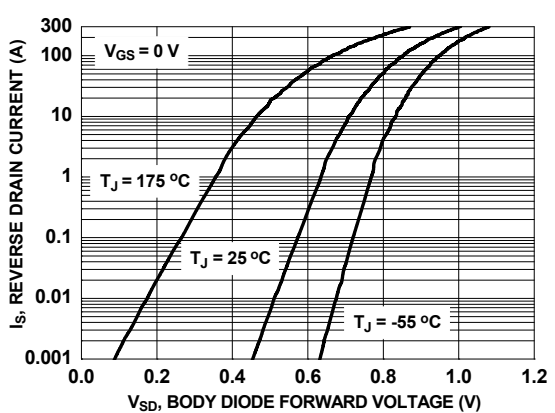
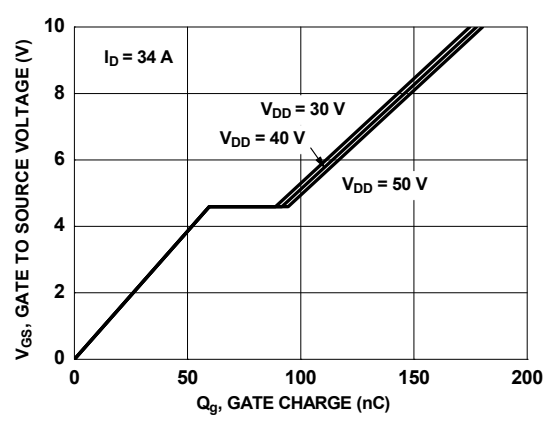
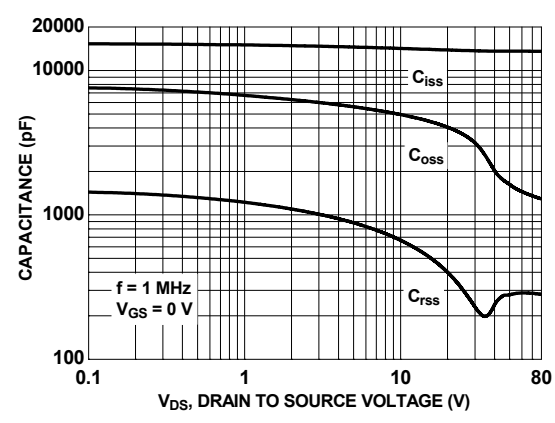


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

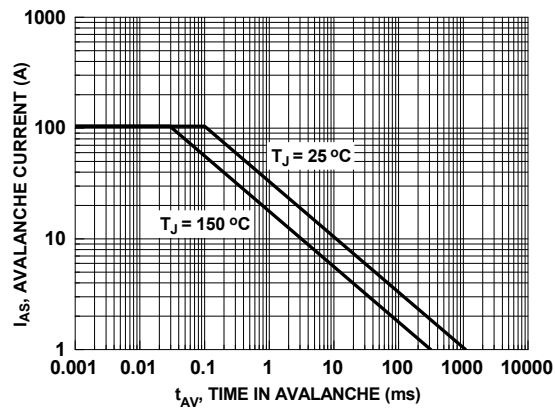
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted.



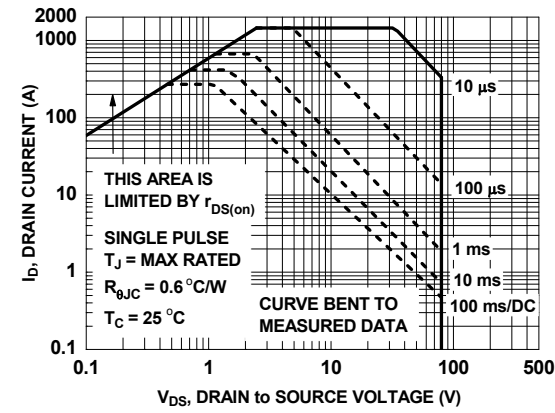
**Figure 7. Gate Charge Characteristics**



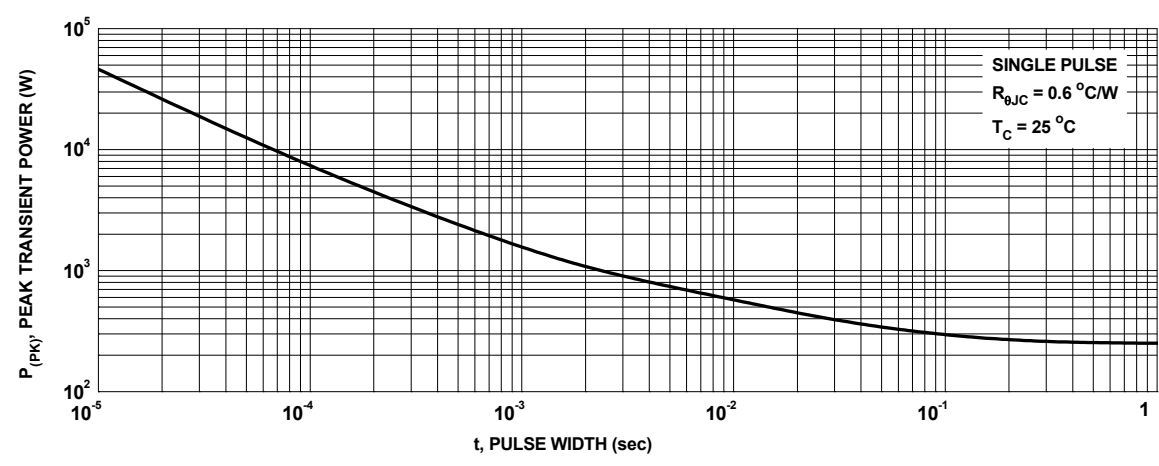
**Figure 8. Capacitance vs. Drain to Source Voltage**



**Figure 9. Unclamped Inductive Switching Capability**

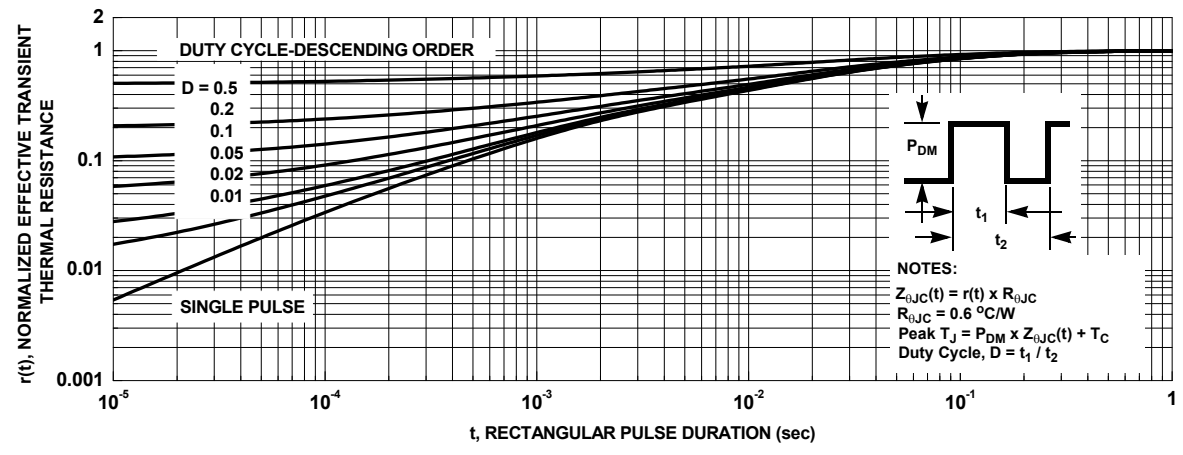


**Figure 10. Forward Bias Safe Operating Area**



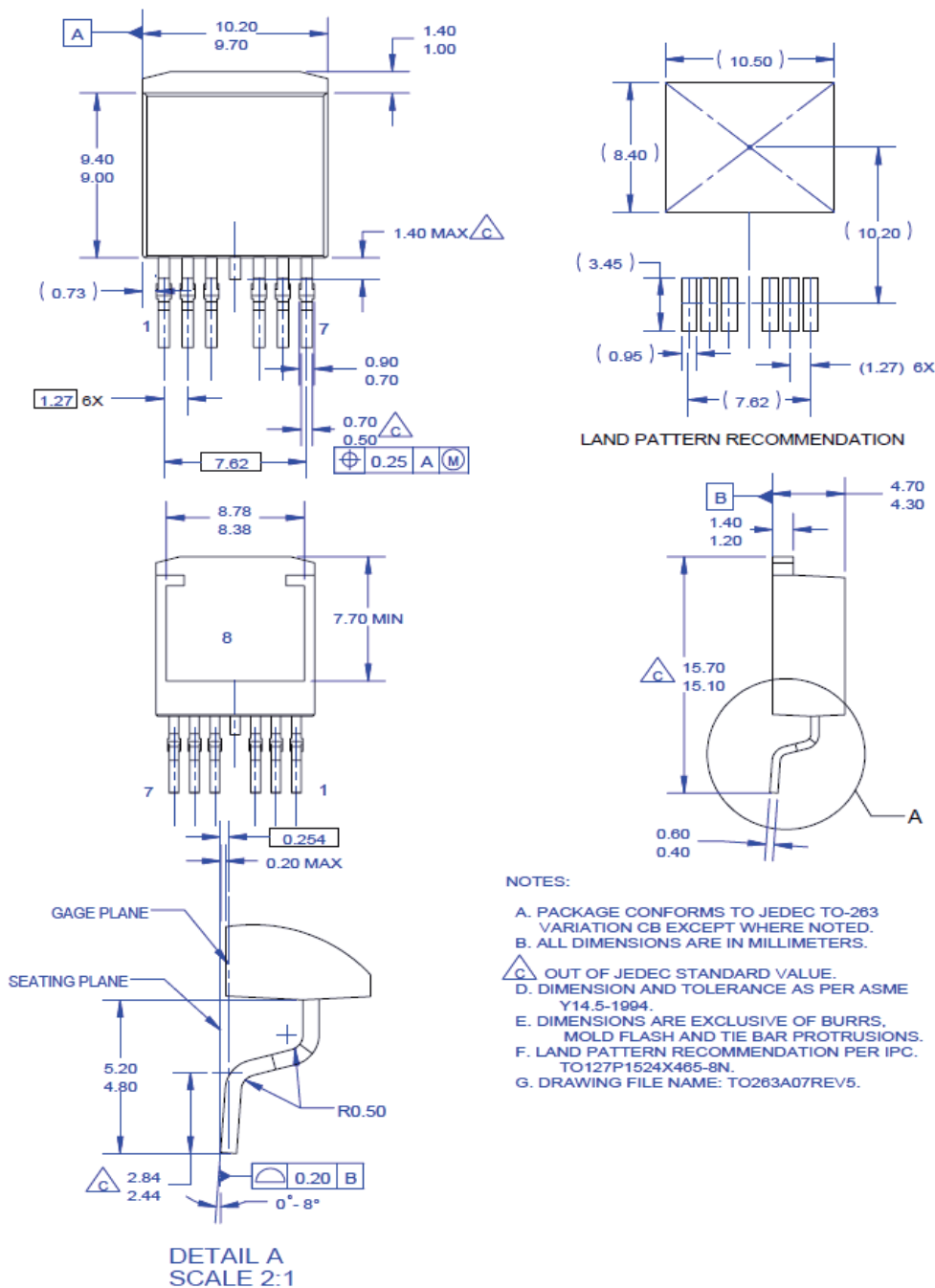
**Figure 11. Single Pulse Maximum Power Dissipation**

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



**Figure 12. Junction-to-Case Transient Thermal Response Curve**

## Dimensional Outline and Pad Layout



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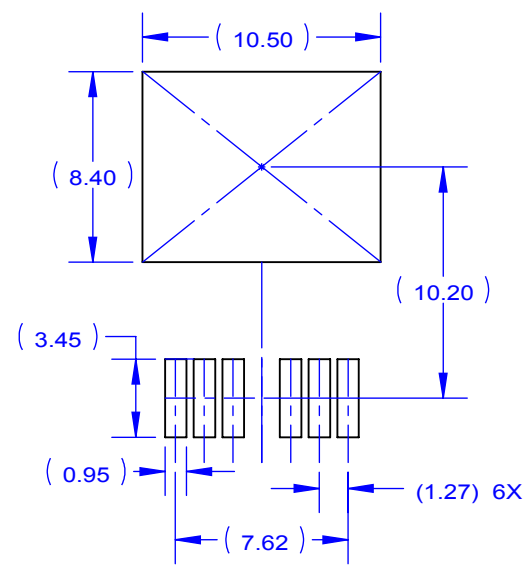
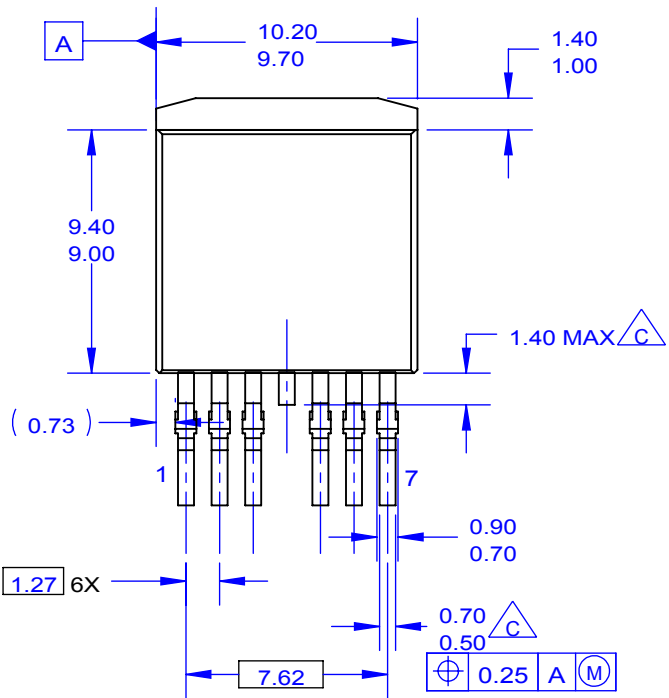
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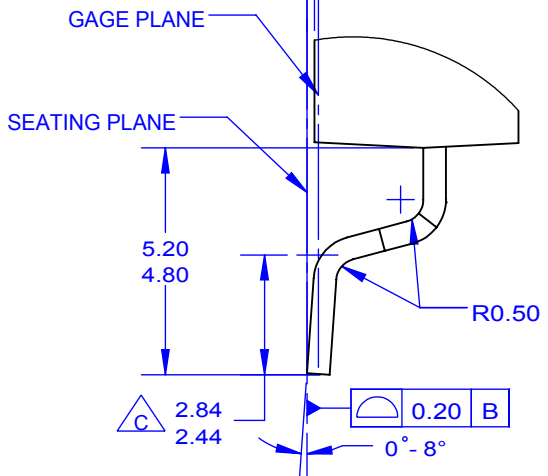
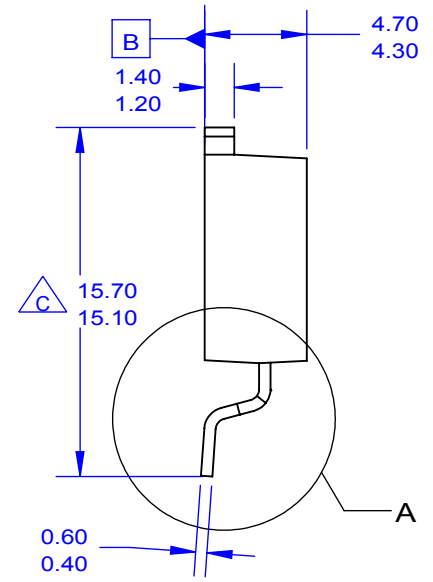
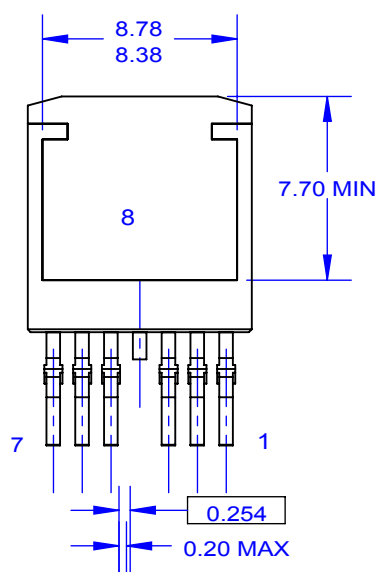
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Table with 3 columns: Datasheet Identification, Product Status, Definition. Rows include Advance Information, Preliminary, No Identification Needed, and Obsolete.






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