

FDMB3900AN

Dual N-Channel Power Trench® MOSFET™ 25 V, 7.0 A, 23 mΩ

Features

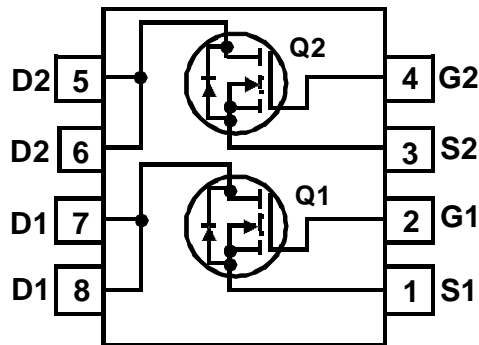
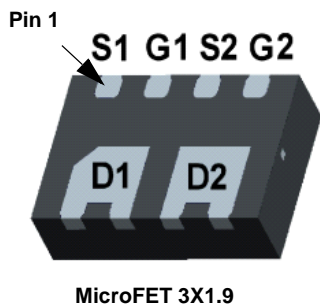
- Max $r_{DS(on)}$ = 23 mΩ at $V_{GS} = 10$ V, $I_D = 7.0$ A
- Max $r_{DS(on)}$ = 33 mΩ at $V_{GS} = 4.5$ V, $I_D = 5.5$ A
- Fast switching speed
- Low gate charge
- High performance trench technology for extremely low $r_{DS(on)}$
- High power and current handling capability
- RoHS Compliant



General Description

These N-Channel Logic Level MOSFETs are 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.

These devices are well suited for low voltage and battery powered applications where the low in-line power loss and fast switching are required.



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

Symbol	Parameter	Rated	Units
V_{DS}	Drain to Source Voltage	25	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Drain Current -Continuous	$T_A = 25^\circ\text{C}$ (Note 1a)	7.0
	-Pulsed		28
P_D	Power Dissipation	$T_A = 25^\circ\text{C}$ (Note 1a)	1.6
	Power Dissipation	$T_A = 25^\circ\text{C}$ (Note 1b)	0.8
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	80	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	165	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
3900	FDMB3900AN	MicroFET 3X1.9	7"	8 mm	3000 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	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	25			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		17		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 20\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$			± 100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\text{ }\mu\text{A}$	1.0	2.0	3.0	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 $25\text{ }^\circ\text{C}$		-6		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$, $I_D = 7.0\text{ A}$		19	23	m Ω
		$V_{GS} = 4.5\text{ V}$, $I_D = 5.5\text{ A}$		26	33	
		$V_{GS} = 10\text{ V}$, $I_D = 7.0\text{ A}$ $T_J = 125\text{ }^\circ\text{C}$		26	32	
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{ V}$, $I_D = 7.0\text{ A}$		27		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 13\text{ V}$, $V_{GS} = 0\text{ V}$ $f = 1\text{ MHz}$		650	890	pF
C_{oss}	Output Capacitance			151	200	pF
C_{rss}	Reverse Transfer Capacitance			141	215	pF
R_g	Gate Resistance			0.8		Ω

Switching Characteristics

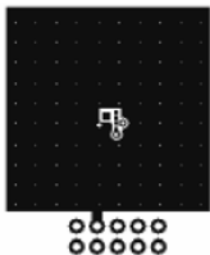
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 13\text{ V}$, $I_D = 7.0\text{ A}$ $V_{GS} = 10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		6	12	ns
t_r	Rise Time			3	10	ns
$t_{d(off)}$	Turn-Off Delay Time			15	26	ns
t_f	Fall Time			3	10	ns
$Q_g(TOT)$	Total Gate Charge		$V_{GS} = 0\text{ V to }10\text{ V}$		11	17
	Total Gate Charge	$V_{GS} = 0\text{ V to }5\text{ V}$	$V_{DD} = 13\text{ V}$ $I_D = 7.0\text{ A}$	7	10	nC
Q_{gs}	Gate to Source Charge			2.0		nC
Q_{gd}	Gate to Drain "Miller" Charge			3.0		nC

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 1.25\text{ A}$ (Note 2)		0.8	1.2	V
		$V_{GS} = 0\text{ V}$, $I_S = 7.0\text{ A}$ (Note 2)		0.9	1.2	
t_{rr}	Reverse Recovery Time	$I_F = 7.0\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		14	24	ns
Q_{rr}	Reverse Recovery Charge			3	10	nC

NOTES:

- $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a $1.5 \times 1.5\text{ in.}$ 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. $80\text{ }^\circ\text{C/W}$ when mounted on a 1 in^2 pad of 2oz copper



b. $165\text{ }^\circ\text{C/W}$ when mounted on a minimum pad of 2 oz copper

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

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

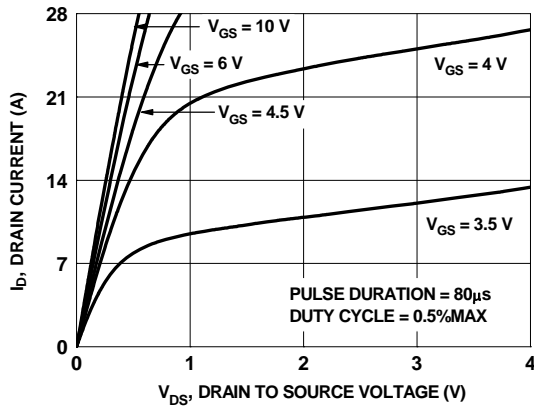


Figure 1. On-Region Characteristics

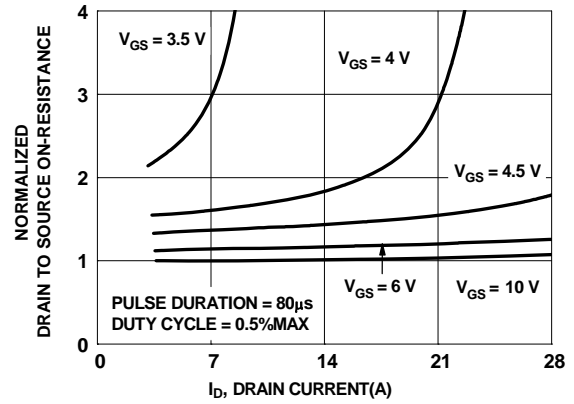


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

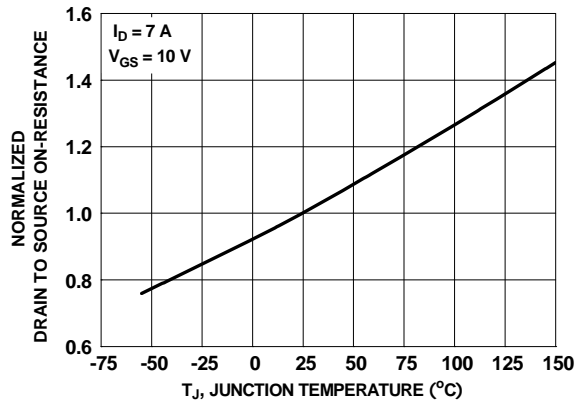


Figure 3. Normalized On-Resistance vs Junction Temperature

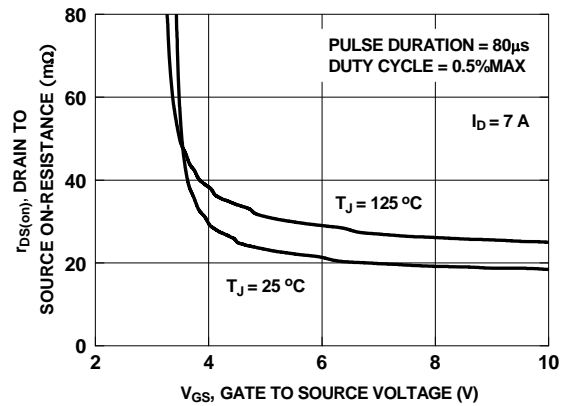


Figure 4. On-Resistance vs Gate to Source Voltage

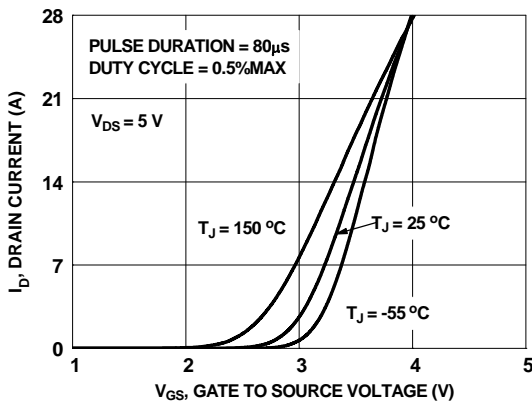


Figure 5. Transfer Characteristics

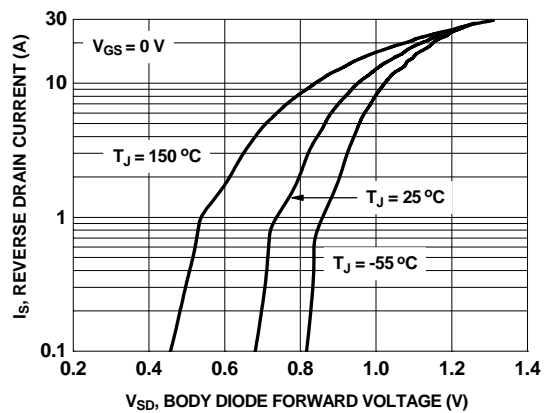


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

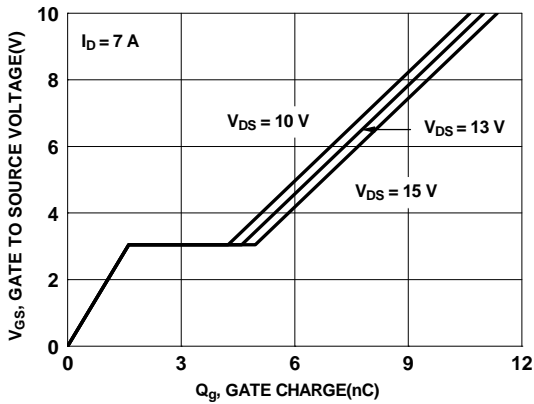


Figure 7. Gate Charge Characteristics

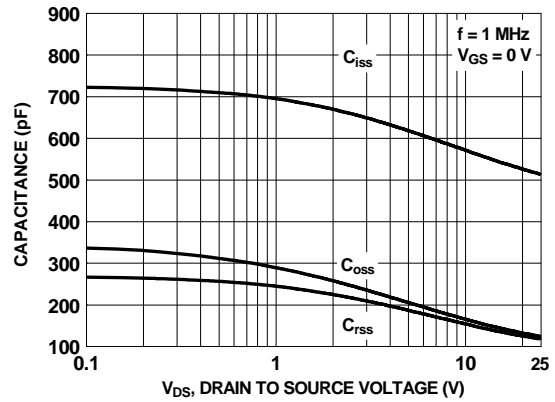


Figure 8. Capacitance vs Drain to Source Voltage

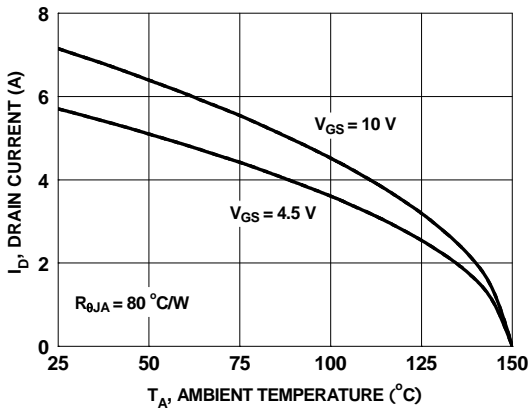


Figure 9. Maximum Continuous Drain Current vs Ambient Temperature

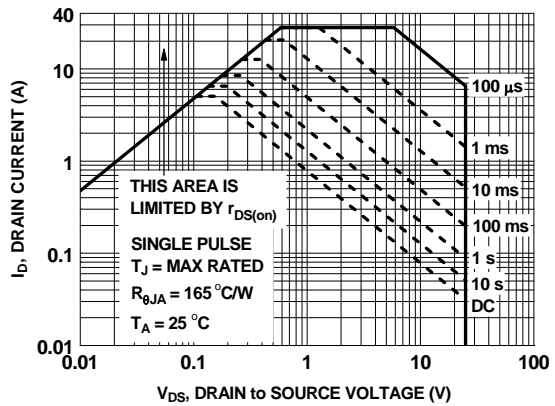


Figure 10. Forward Bias Safe Operating Area

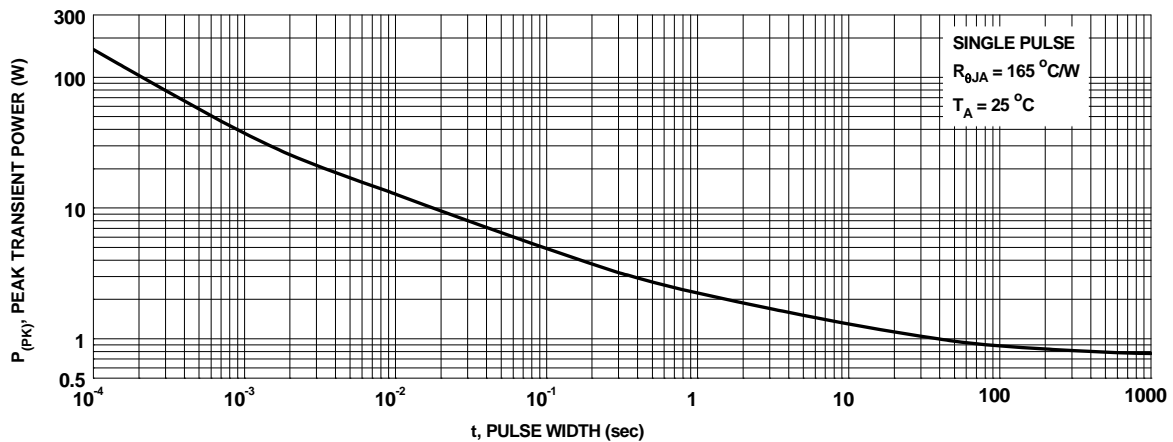


Figure 11. Single Pulse Maximum Power Dissipation

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

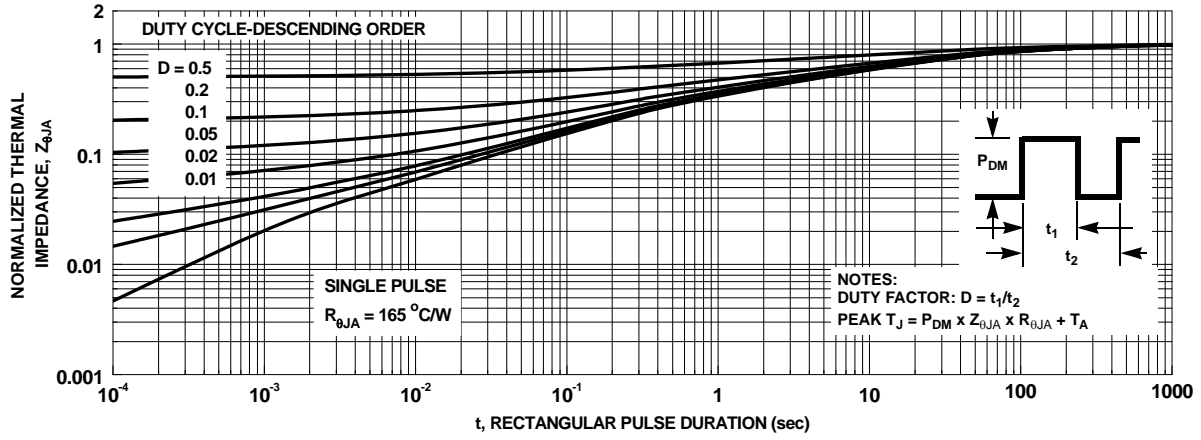
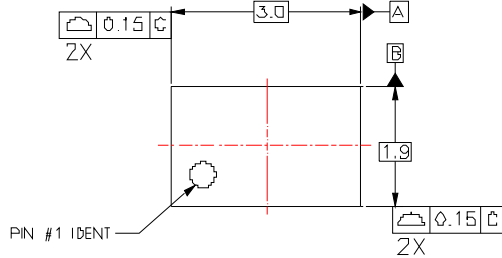
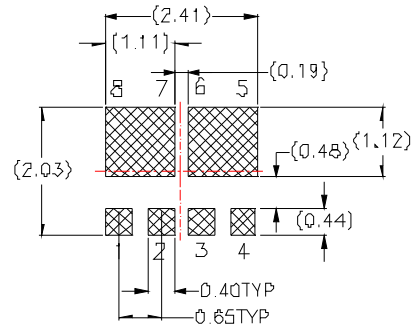


Figure 12. Junction-to-Ambient Transient Thermal Response Curve

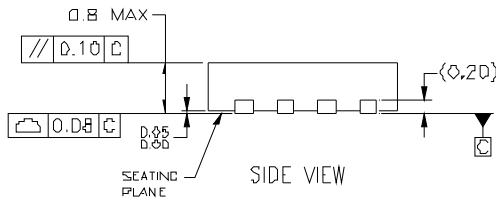
Dimensional Outline and Pad Layout



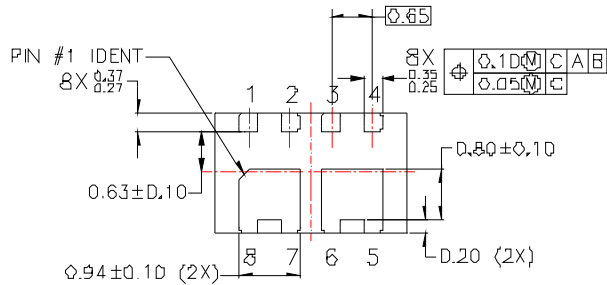
TOP VIEW



RECOMMENDED LAND PATTERN



SIDE VIEW



BOTTOM VIEW






NOTES:

- A. DOES NOT FULLY CONFORM TO JEDEC REGISTRATION, MQ-229, DATED 11/2001.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994
- D. DRAWING FILE NAME:



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