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# FDMC86259P

## P-Channel PowerTrench® MOSFET

-150 V, -13 A, 107 mΩ

### Features

- Max  $r_{DS(on)}$  = 107 mΩ at  $V_{GS} = -10$  V,  $I_D = -3$  A
- Max  $r_{DS(on)}$  = 137 mΩ at  $V_{GS} = -6$  V,  $I_D = -2.7$  A
- Very low RDS-on mid voltage P channel silicon technology optimised for low Qg
- This product is optimised for fast switching applications as well as load switch applications
- 100% UIL Tested
- RoHS Compliant

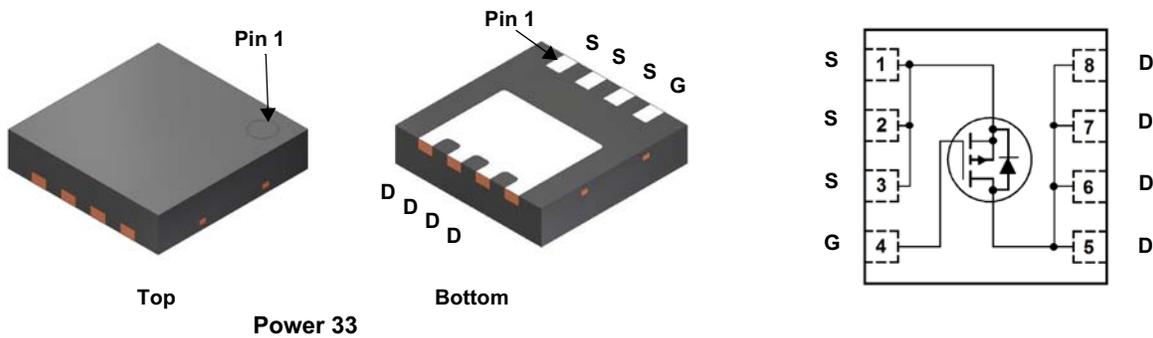


### General Description

This P-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

- Active Clamp Switch
- Load Switch



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

Symbol	Parameter	Rated	Units
$V_{DS}$	Drain to Source Voltage	-150	V
$V_{GS}$	Gate to Source Voltage	$\pm 25$	V
$I_D$	Drain Current -Continuous $T_C = 25^\circ\text{C}$	-13	A
	-Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	-3.2	
	-Pulsed	-20	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	181	mJ
$P_D$	Power Dissipation $T_C = 25^\circ\text{C}$	62	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	2.3	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to + 150	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	2.0	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	53	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC86259P	FDMC86259P	Power 33	13"	12 mm	3000 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	$I_D = -250\ \mu\text{A}, V_{GS} = 0\ \text{V}$	-150			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$		-88		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -120\ \text{V}, V_{GS} = 0\ \text{V}$			-1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 25\ \text{V}, V_{DS} = 0\ \text{V}$			$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$	-2	-2.8	-4	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/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = -10\ \text{V}, I_D = -3\ \text{A}$		87	107	m $\Omega$
		$V_{GS} = -6\ \text{V}, I_D = -2.7\ \text{A}$		99	137	
		$V_{GS} = -10\ \text{V}, I_D = -3\ \text{A}, T_J = 125^\circ\text{C}$		145	178	
$g_{FS}$	Forward Transconductance	$V_{DS} = -10\ \text{V}, I_D = -3\ \text{A}$		12		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = -75\ \text{V}, V_{GS} = 0\ \text{V}, f = 1\ \text{MHz}$		1535	2045	pF
$C_{oss}$	Output Capacitance			125	170	pF
$C_{rss}$	Reverse Transfer Capacitance			6	10	pF
$R_g$	Gate Resistance		0.1	1.4	3	$\Omega$

### Switching Characteristics

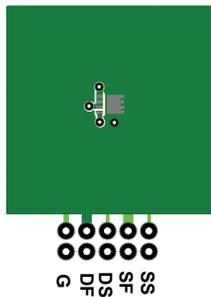
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -75\ \text{V}, I_D = -3\ \text{A}, V_{GS} = -10\ \text{V}, R_{GEN} = 6\ \Omega$		12	23	ns	
$t_r$	Rise Time			3.3	10	ns	
$t_{d(off)}$	Turn-Off Delay Time			22	36	ns	
$t_f$	Fall Time			9.6	20	ns	
$Q_{g(TOT)}$	Total Gate Charge		$V_{GS} = 0\ \text{V to } -10\ \text{V}$		22	32	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\ \text{V to } -6\ \text{V}$	$V_{DD} = -75\ \text{V}, I_D = -3\ \text{A}$		14	20	nC
$Q_{gs}$	Total Gate Charge				5.7		nC
$Q_{gd}$	Gate to Drain "Miller" Charge				4.3		nC

### Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}, I_S = -3\ \text{A}$ (Note 2)		-0.80	-1.3	V
		$V_{GS} = 0\ \text{V}, I_S = -1.9\ \text{A}$ (Note 2)		-0.78	-1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F = -3\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$		77	123	ns
$Q_{rr}$	Reverse Recovery Charge			208	333	nC

#### NOTES:

1.  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 x 1.5 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) 53  $^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



b) 125  $^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

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

3. Starting  $T_J = 25^\circ\text{C}$ ; P-ch: L = 3 mH,  $I_{AS} = -11\ \text{A}$ ,  $V_{DD} = -150\ \text{V}$ ,  $V_{GS} = -10\ \text{V}$ . 100% test at L = 0.1 mH,  $I_{AS} = -34\ \text{A}$ .

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

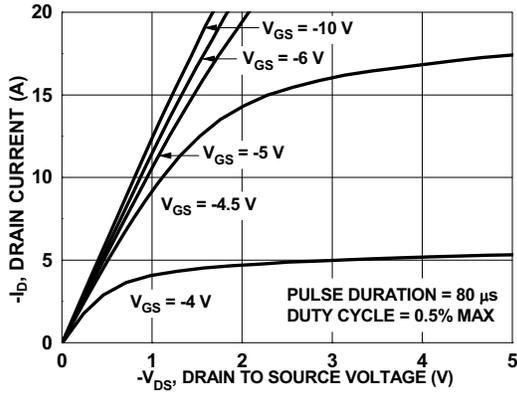


Figure 1. On Region Characteristics

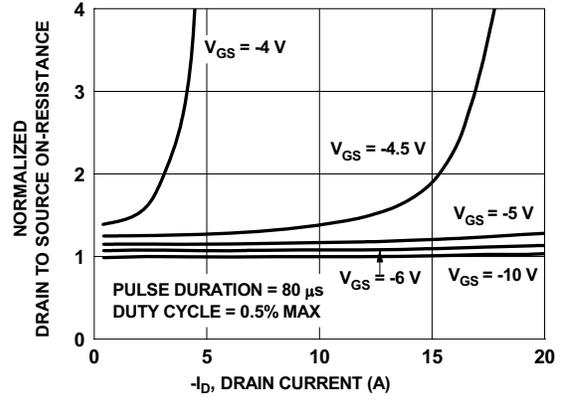


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

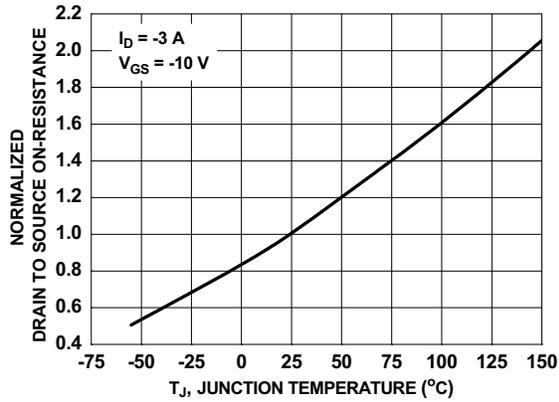


Figure 3. Normalized On Resistance vs Junction Temperature

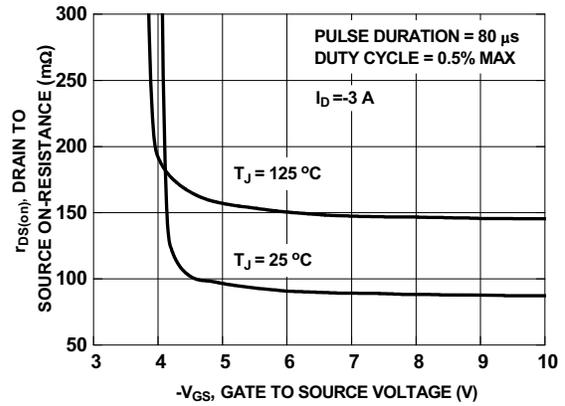


Figure 4. On-Resistance vs Gate to Source Voltage

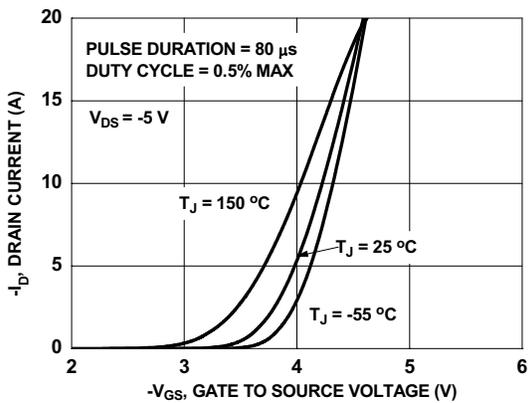


Figure 5. Transfer Characteristics

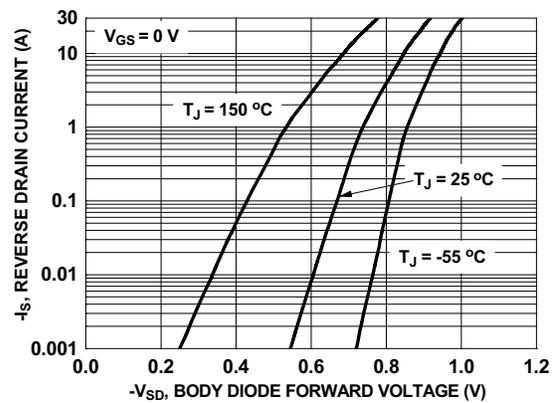
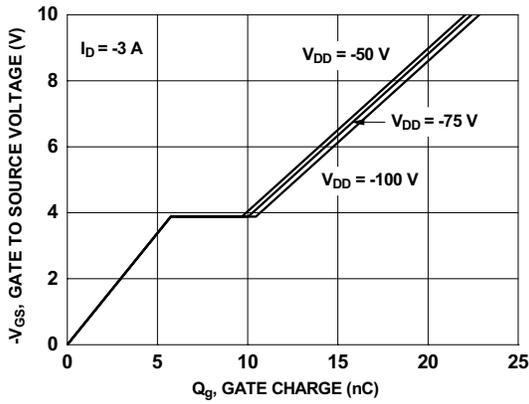
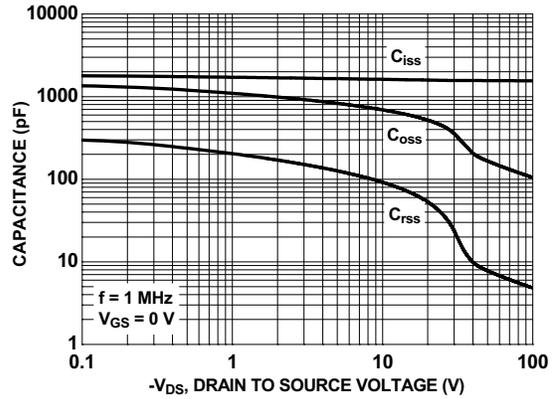


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

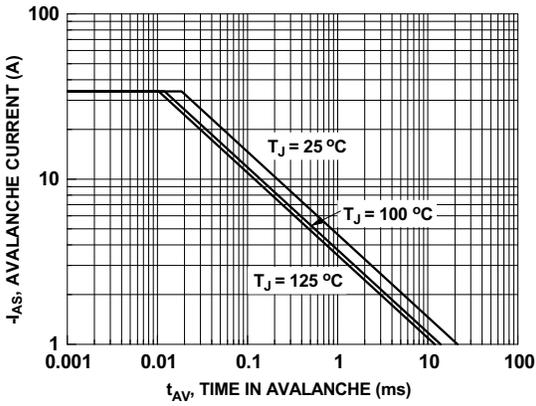
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



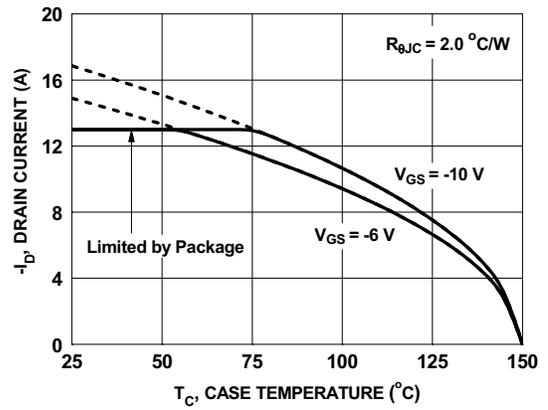
**Figure 7. Gate Charge Characteristics**



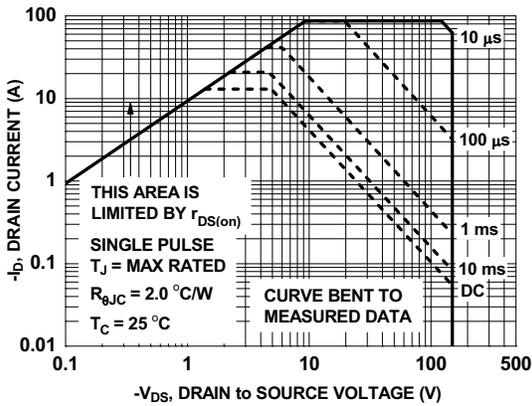
**Figure 8. Capacitance vs Drain to Source Voltage**



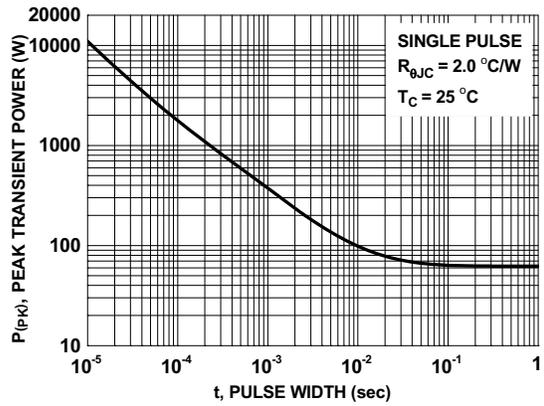
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs Case Temperature**

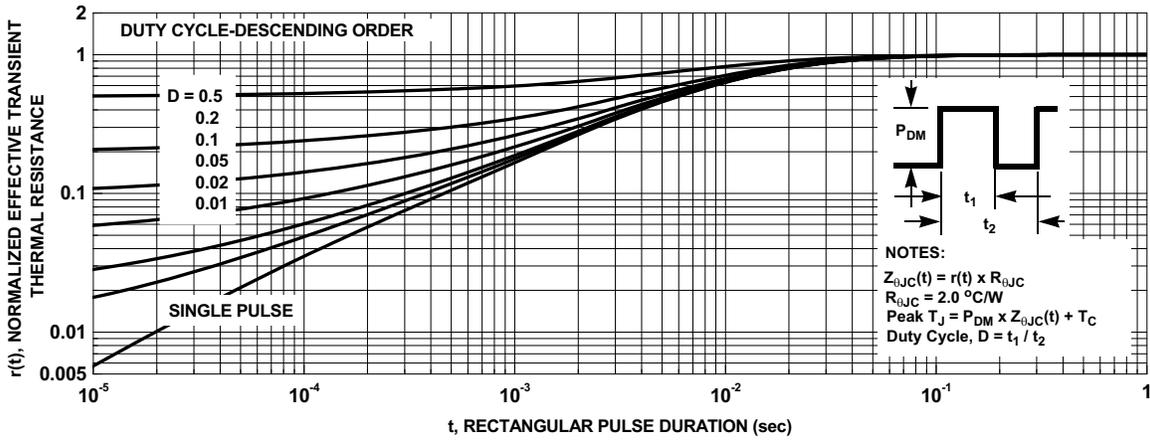


**Figure 11. Forward Bias Safe Operating Area**



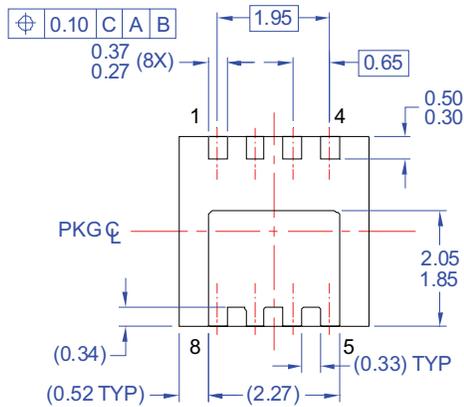
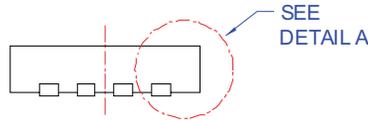
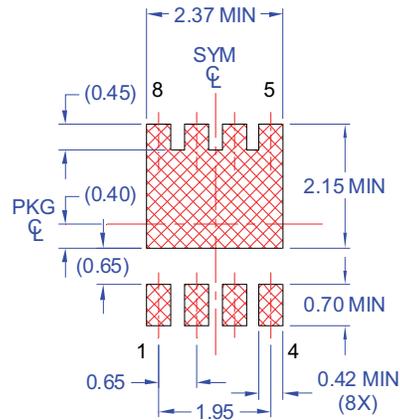
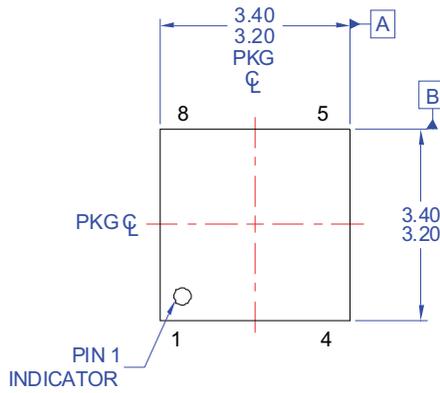
**Figure 12. Single Pulse Maximum Power Dissipation**

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



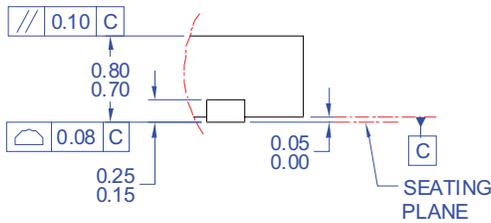
**Figure 13. Junction-to-Case Transient Thermal Response Curve**

## Dimensional Outline and Pad Layout



NOTES: UNLESS OTHERWISE SPECIFIED

- A) PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. BA, DATED OCTOBER 2002.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
- D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
- E) DRAWING FILE NAME: PQFN08HREV1



**DETAIL A**  
SCALE: 2X

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| BitSiC™  | Global Power ResourceSM                         | Programmable Active Droop™  | TinyBoost®   |
| Build it Now™  | GreenBridge™                                    | QFET®   | TinyBuck®  |
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| Fairchild Semiconductor®   | MicroPak2™                                      | SuperSOT™_3   | Ultra FRFET™   |
| FACT Quiet Series™   | MillerDrive™                                    | SuperSOT™_6   | UniFET™  |
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| FAST®  | mWSaver®  | SupreMOS®   | VisualMax™   |
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