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# FDS86240

## N-Channel Shielded Gate PowerTrench® MOSFET

150 V, 7.5 A, 19.8 mΩ

### Features

- Shielded Gate MOSFET Technology
- Max  $r_{DS(on)}$  = 19.8 mΩ at  $V_{GS} = 10$  V,  $I_D = 7.5$  A
- Max  $r_{DS(on)}$  = 26 mΩ at  $V_{GS} = 6$  V,  $I_D = 6.4$  A
- High Performance Trench Technology for Extremely Low  $r_{DS(on)}$
- High Power and Current Handling Capability in a Widely Used Surface Mount Package
- 100% UIL Tested
- RoHS Compliant

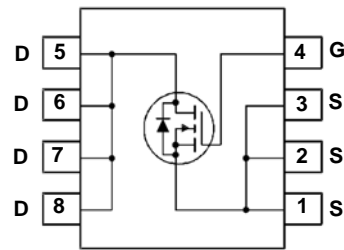
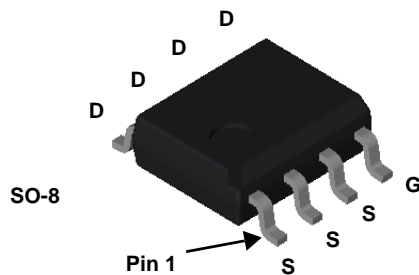


### General Description

This N-Channel MOSFET is produced using ON Semiconductor's advanced PowerTrench® process that incorporates Shielded Gate technology. This process has been optimized for  $r_{DS(on)}$ , switching performance and ruggedness.

### Applications

- DC/DC Converters and Off-Line UPS
- Distributed Power Architectures and VRMs
- Primary Switch for 24 V and 48 V Systems
- High Voltage Synchronous Rectifier



### MOSFET Maximum Ratings $T_A = 25$ °C unless otherwise noted.

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	150	V
$V_{GS}$	Gate to Source Voltage	±20	V
$I_D$	Drain Current -Continuous	7.5	A
	-Pulsed (Note 4)	199	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	220	mJ
$P_D$	Power Dissipation $T_C = 25$ °C (Note 1)	5.0	W
	Power Dissipation $T_A = 25$ °C (Note 1a)	2.5	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	°C

### Thermal Characteristics

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

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDS86240	FDS86240	SO-8	13 "	12 mm	2500 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	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	150			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		105		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	$V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$			$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$	2	2.7	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 $25\text{ }^\circ\text{C}$		-11		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 7.5\text{ A}$		17.3	19.8	m $\Omega$
		$V_{GS} = 6\text{ V}$ , $I_D = 6.4\text{ A}$		19.7	26	
		$V_{GS} = 10\text{ V}$ , $I_D = 7.5\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$		30.8	35.3	
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{ V}$ , $I_D = 7.5\text{ A}$		26		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 75\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		1930	2570	pF
$C_{oss}$	Output Capacitance			198	265	pF
$C_{rss}$	Reverse Transfer Capacitance			8.3	15	pF
$R_g$	Gate Resistance			0.84		$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75\text{ V}$ , $I_D = 7.5\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		14	26	ns	
$t_r$	Rise Time			4.2	10	ns	
$t_{d(off)}$	Turn-Off Delay Time			24	39	ns	
$t_f$	Fall Time			4.9	10	ns	
$Q_{g(TOT)}$	Total Gate Charge		$V_{GS} = 0\text{ V to }10\text{ V}$		28	40	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to }5\text{ V}$	$V_{DD} = 75\text{ V}$ , $I_D = 7.5\text{ A}$		16	22	nC
$Q_{gs}$	Gate to Source Charge				7.6		nC
$Q_{gd}$	Gate to Drain "Miller" Charge				5.3		nC

### Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 7.5\text{ A}$ (Note 2)		0.77	1.3	V
		$V_{GS} = 0\text{ V}$ , $I_S = 2\text{ A}$ (Note 2)		0.70	1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = 7.5\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		75	120	ns
$Q_{rr}$	Reverse Recovery Charge			109	175	nC

#### NOTES:

- $R_{\theta JA}$  is determined with the device mounted on a  $1\text{ in}^2$  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)  $50\text{ }^\circ\text{C}/\text{W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper.



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

- Pulse Test: Pulse Width <  $300\text{ }\mu\text{s}$ , Duty cycle < 2.0%.
- Starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 1\text{ mH}$ ,  $I_{AS} = 21\text{ A}$ ,  $V_{DD} = 135\text{ V}$ ,  $V_{GS} = 10\text{ V}$ .
- Pulsed  $I_D$  please refer to Fig 11 SOA graph for more details.

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

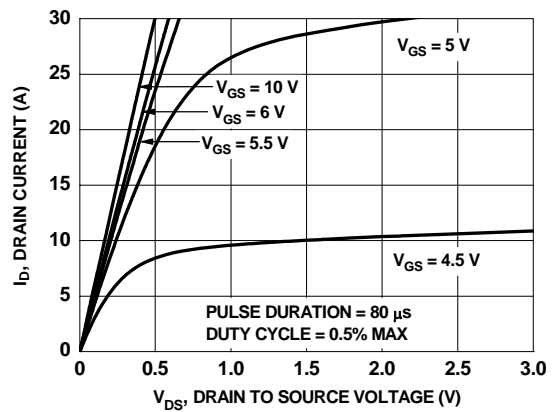


Figure 1. On Region Characteristics

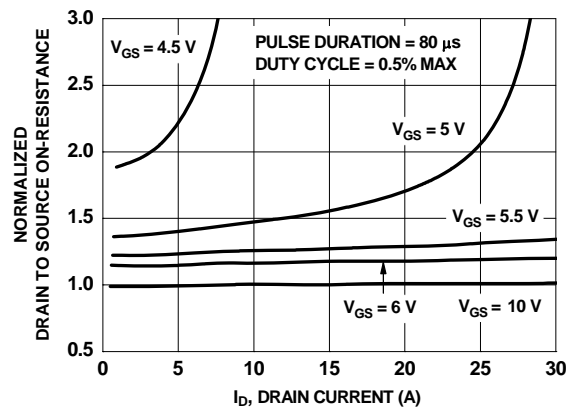


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

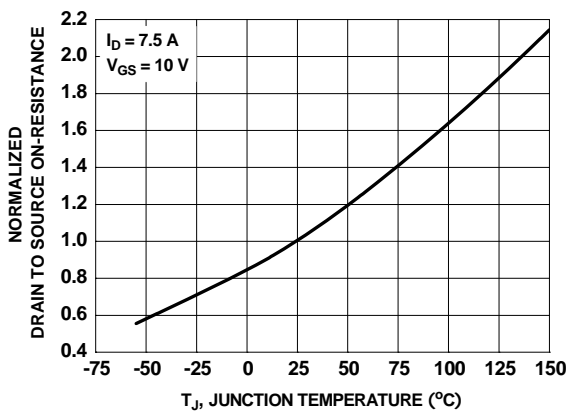


Figure 3. Normalized On Resistance vs. Junction Temperature

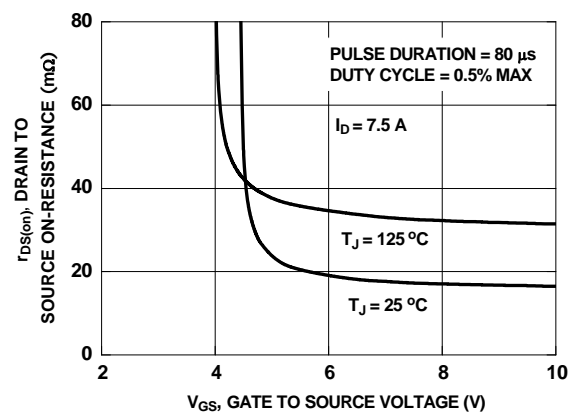


Figure 4. On-Resistance vs. Gate to Source Voltage

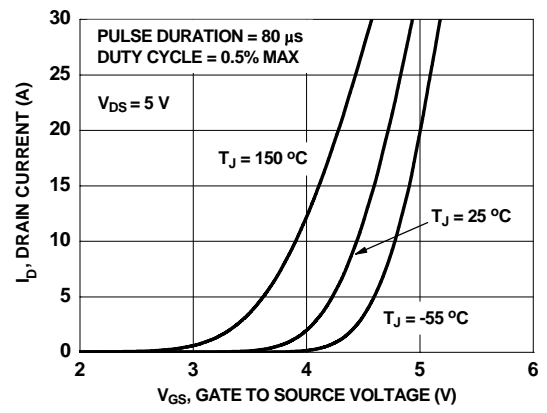


Figure 5. Transfer Characteristics

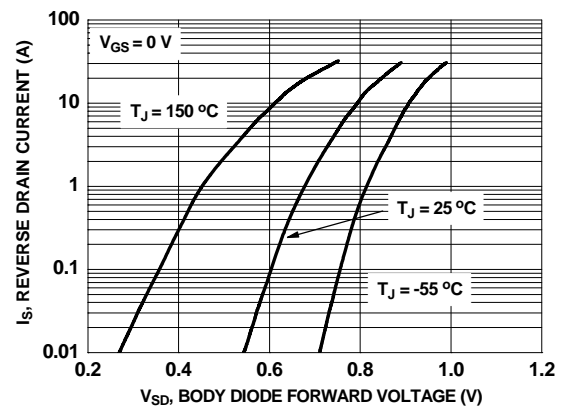
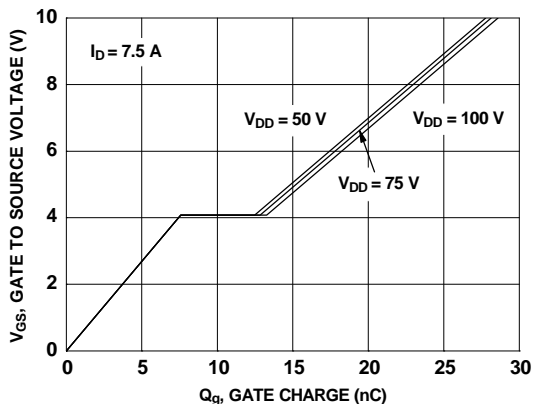
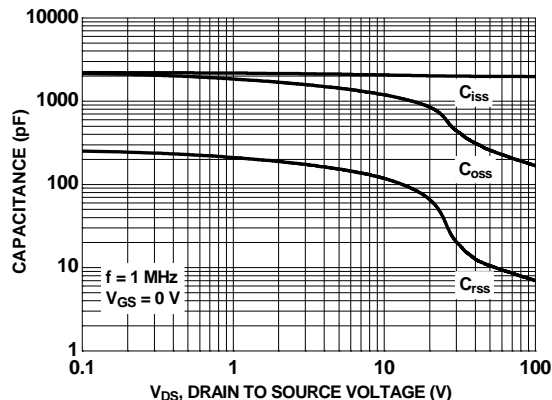


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

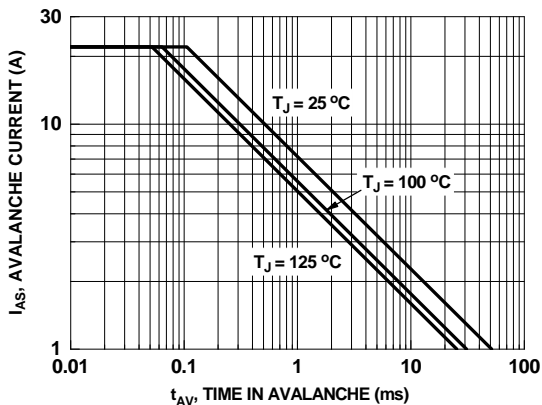
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted.



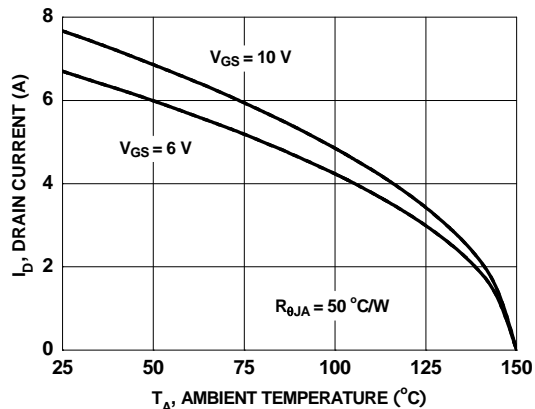
**Figure 7. Gate Charge Characteristics**



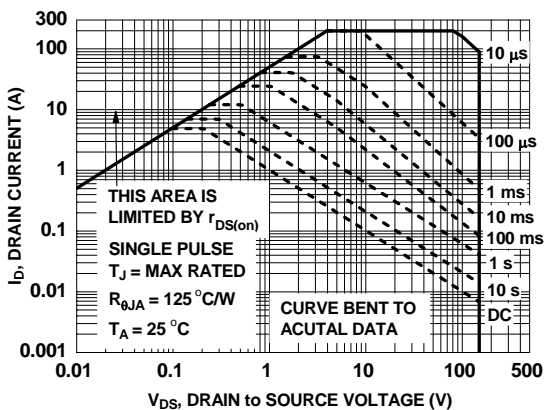
**Figure 8. Capacitance vs. Drain to Source Voltage**



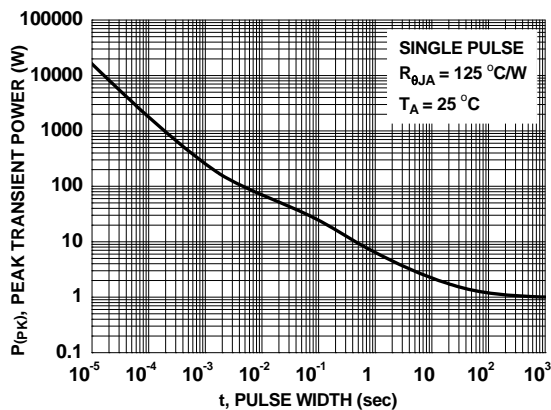
**Figure 9. Unclamped Inductive Switching Capability**



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

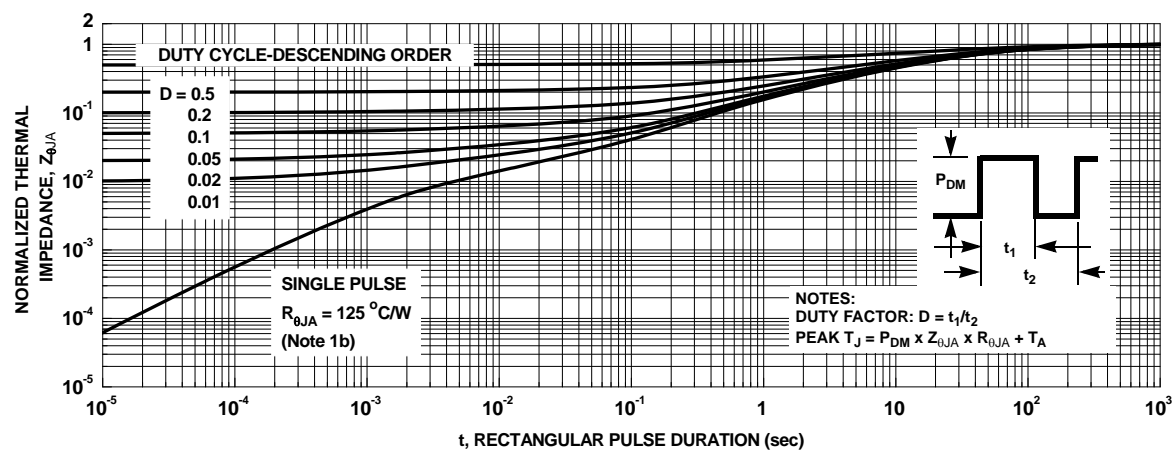


**Figure 11. Forward Bias Safe Operating Area**

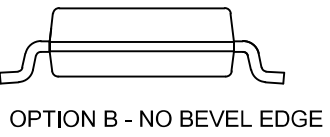
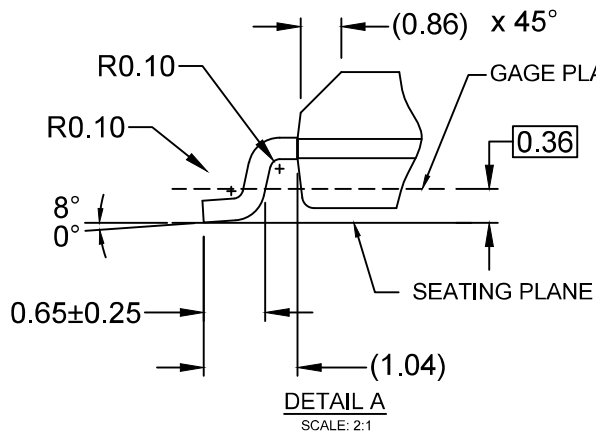
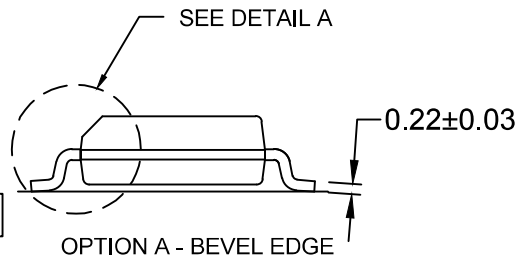
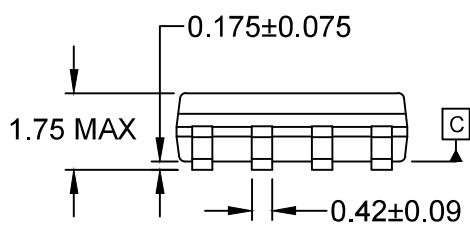
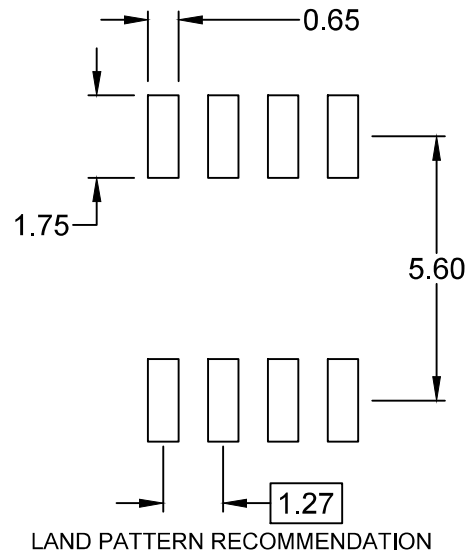
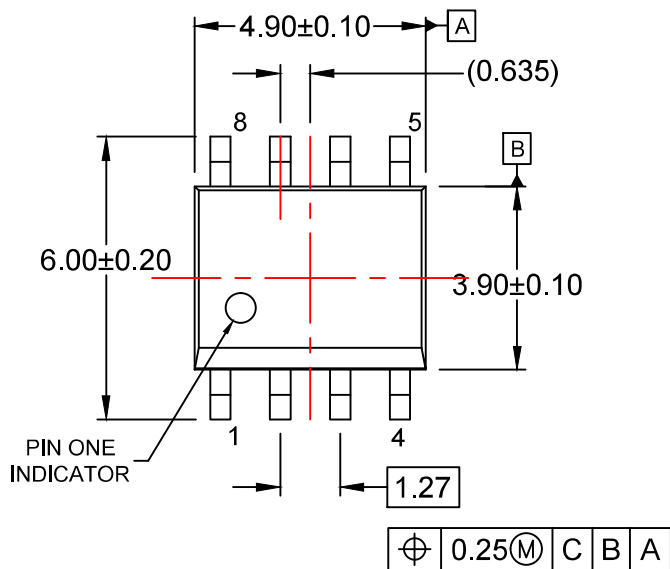


**Figure 12. Single Pulse Maximum Power Dissipation**

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



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



- NOTES:
- A) THIS PACKAGE CONFORMS TO JEDEC MS-012, VARIATION AA.
  - B) ALL DIMENSIONS ARE IN MILLIMETERS.
  - C) DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.
  - D) LANDPATTERN STANDARD: SOIC127P600X175-8M
  - E) DRAWING FILENAME: M08Arev16



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