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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

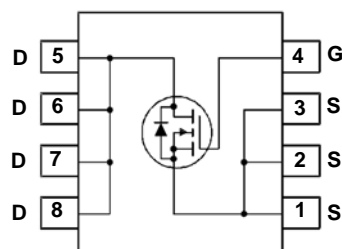
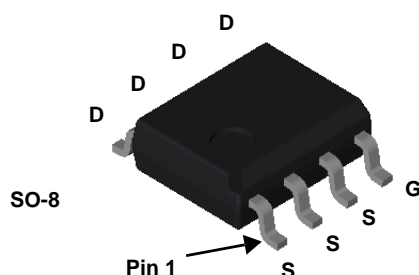


### General Description

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 $T_A = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	150	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	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 $T_C = 25^\circ\text{C}$ (Note 1)	5.0	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	2.5	
$T_J, T_{STG}$	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	

### 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	$V_{GS} = 0\text{ V to }10\text{ V}$	$V_{DD} = 75\text{ V}$ , $I_D = 7.5\text{ A}$	28	40	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to }5\text{ V}$		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:

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) 50  $^{\circ}\text{C}/\text{W}$  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.

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

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

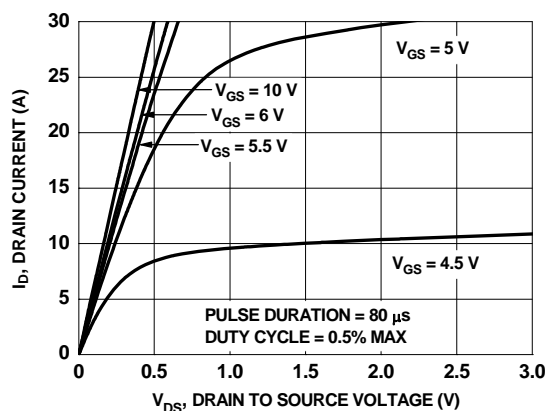


Figure 1. On Region Characteristics

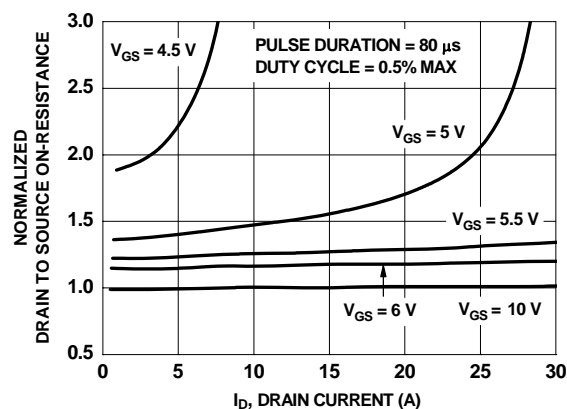


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

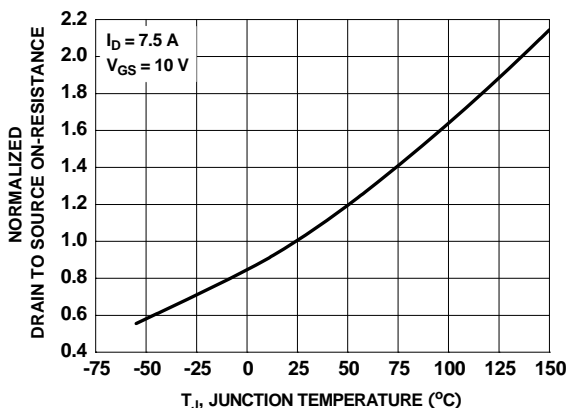


Figure 3. Normalized On Resistance vs. Junction Temperature

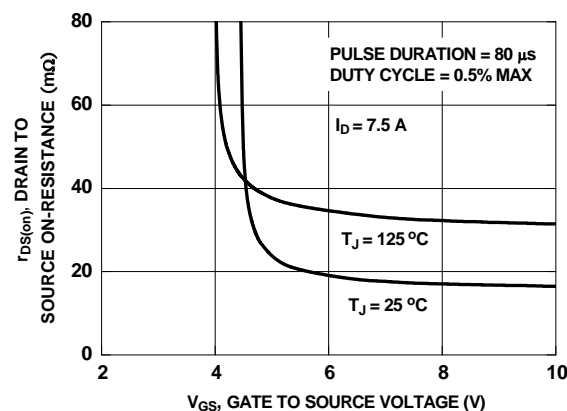


Figure 4. On-Resistance vs. Gate to Source Voltage

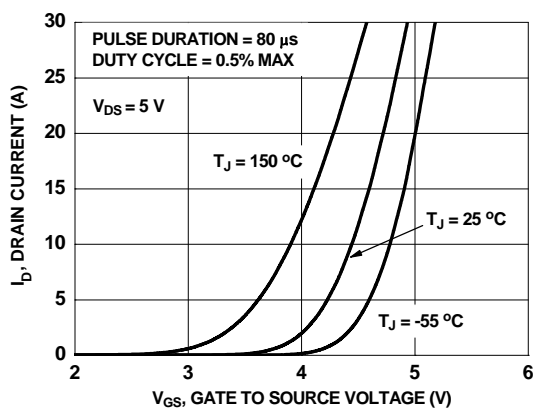


Figure 5. Transfer Characteristics

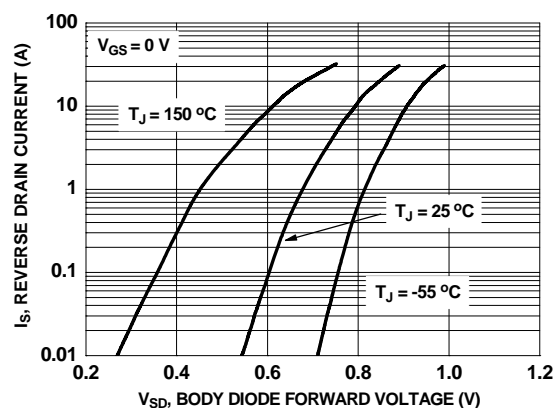


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

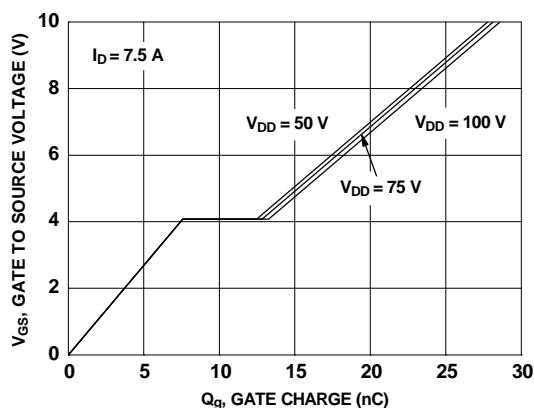


Figure 7. Gate Charge Characteristics

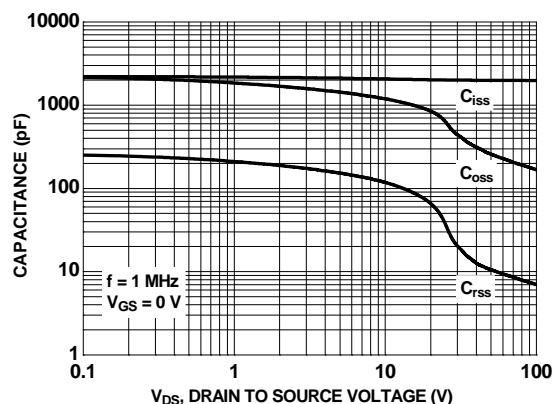


Figure 8. Capacitance vs. Drain to Source Voltage

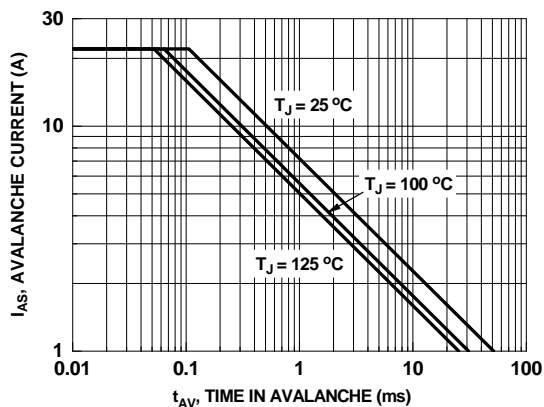


Figure 9. Unclamped Inductive Switching Capability

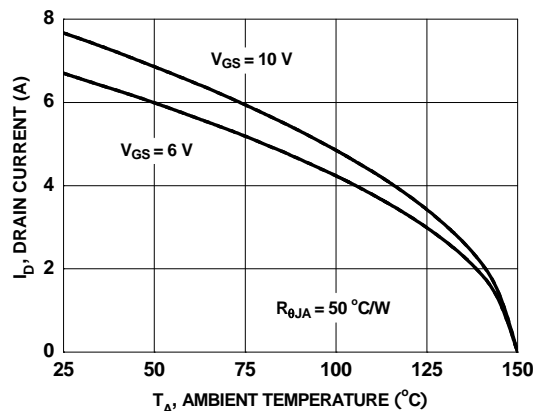


Figure 10. Maximum Continuous Drain Current vs. Ambient Temperature

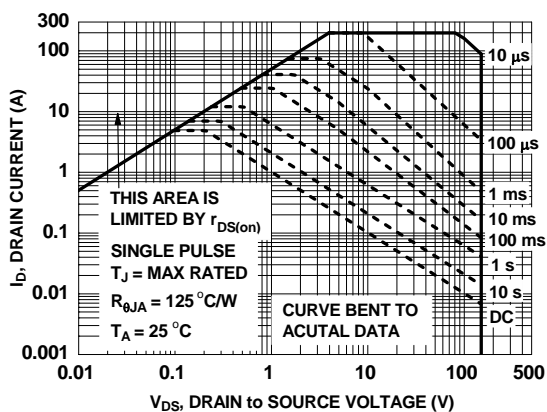


Figure 11. Forward Bias Safe Operating Area

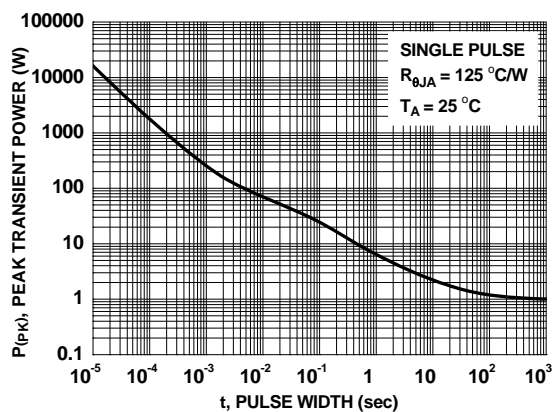


Figure 12. Single Pulse Maximum Power Dissipation

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

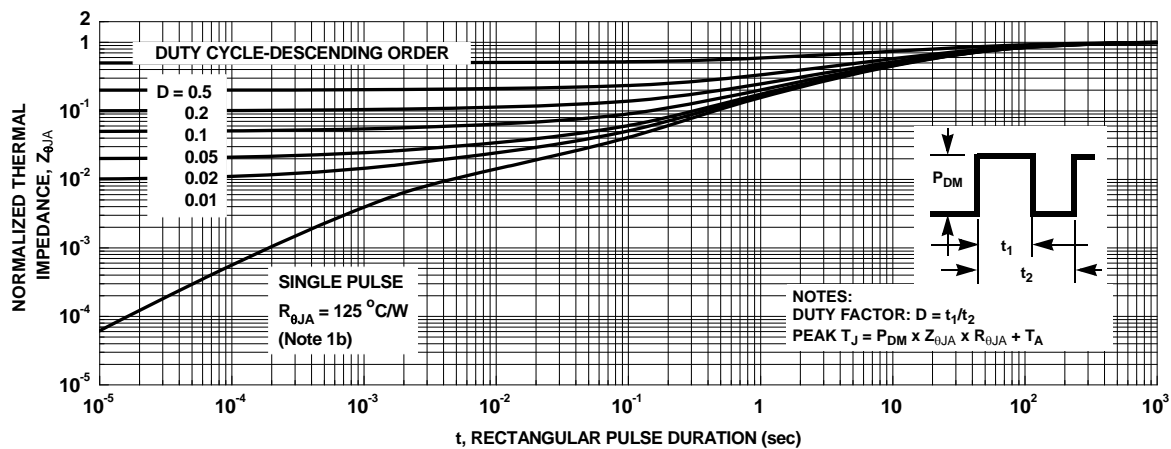
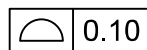
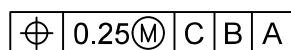


Figure 13. Junction-to-Ambient Transient Thermal Response Curve



- 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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