

# ON Semiconductor

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ON Semiconductor®

## FDP2710-F085

### N-Channel PowerTrench® MOSFET

250V, 50A, 47mΩ

#### Features

- Typ  $r_{DS(on)}$  = 38mΩ at  $V_{GS} = 10V$ ,  $I_D = 50A$
- Typ  $Q_{g(TOT)}$  = 78nC at  $V_{GS} = 10V$
- Fast switching speed
- Low gate charge
- High performance trench technology for extremely low  $R_{DS(on)}$
- High power and current handling capability
- Qualified to AEC Q101
- RoHS Compliant

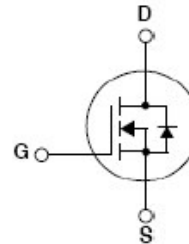


#### General Description

This N-Channel MOSFET is produced using ON Semiconductor's advanced PowerTrench process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

#### Applications

- PDP application
- Hybrid Electric Vehicle DC/DC converters



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

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain to Source Voltage	250	V
$V_{GS}$	Gate to Source Voltage	$\pm 30$	V
$I_D$	Drain Current Continuous ( $T_C < 50^\circ\text{C}$ , $V_{GS} = 10\text{V}$ )	50	A
	Continuous ( $T_{amb} = 25^\circ\text{C}$ , $V_{GS} = 10\text{V}$ , with $R_{\theta JA} = 62^\circ\text{C/W}$ )	4	
	Pulsed	See Figure 4	
$E_{AS}$	Single Pulse Avalanche Energy (Note 1)	483	mJ
$P_D$	Power Dissipation	403	W
	Derate above $25^\circ\text{C}$	3.2	$\text{W}/^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature	-55 to +150	$^\circ\text{C}$

## Thermal Characteristics

$R_{\theta JC}$	Maximum Thermal Resistance Junction to Case	0.31	$^\circ\text{C/W}$
$R_{\theta JA}$	Maximum Thermal Resistance Junction to Ambient (Note 2)	62	$^\circ\text{C/W}$

## Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDP2710	FDP2710-F085	TO220	Tube	NA	50 units

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

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

$B_{VDSS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$	250	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250\mu\text{A}$ , Referenced to $25^\circ\text{C}$	-	0.25	-	$\text{V}/^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 250\text{V}$ , $V_{GS} = 0\text{V}$ , $T_C = 125^\circ\text{C}$	-	-	1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 30\text{V}$	-	-	$\pm 100$	nA

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$	3	3.9	5	V
$r_{DS(on)}$	Drain to Source On Resistance	$I_D = 50\text{A}$ , $V_{GS} = 10\text{V}$ ,	-	38	47	m $\Omega$
		$I_D = 50\text{A}$ , $V_{GS} = 10\text{V}$ , $T_J = 150^\circ\text{C}$	-	104	129	
$g_{FS}$	Forward Transconductance	$I_D = 25\text{A}$ , $V_{DS} = 10\text{V}$	-	63	-	S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$	-	5690	-	pF
$C_{oss}$	Output Capacitance		-	425	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	115	-	pF
$Q_{g(TOT)}$	Total Gate Charge at 20V	$V_{GS} = 0$ to $10\text{V}$ $V_{DD} = 125\text{V}$ $I_D = 50\text{A}$	-	78	101	nC
$Q_{gs}$	Gate to Source Gate Charge		-	31	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	20	-	nC

**Electrical Characteristics**  $T_C = 25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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**Switching Characteristics**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 125\text{V}, I_D = 50\text{A}$ $V_{GS} = 10\text{V}, R_{GEN} = 25\Omega$	-	85	-	ns
$t_r$	Rise Time		-	183	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	140	-	ns
$t_f$	Fall Time		-	121	-	ns

**Drain-Source Diode Characteristics**

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$I_S$	Maximum Continuous Drain-Source Diode Forward Current		-	-	50	A
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current		-	-	150	A
$V_{SD}$	Source to Drain Diode Voltage	$I_{SD} = 50\text{A}$	-	0.9	1.2	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 50\text{A}, dI_{SD}/dt = 100\text{A}/\mu\text{s}$	-	166	216	ns
$Q_{rr}$	Reverse Recovery Charge		-	1	1.3	$\mu\text{C}$

**Notes:**

- 1: Starting  $T_J = 25^\circ\text{C}$ ,  $L = 1.68\text{mH}$ ,  $I_{AS} = 24\text{A}$ .
- 2: Pulse width 100s

This product has been designed to meet the extreme test conditions and environment demanded by the automotive industry. For a copy of the requirements, see AEC Q101 at: <http://www.aecouncil.com/>  
 All ON Semiconductor products are manufactured, assembled and tested under ISO9000 and QS9000 quality systems certification.

### Typical Characteristics

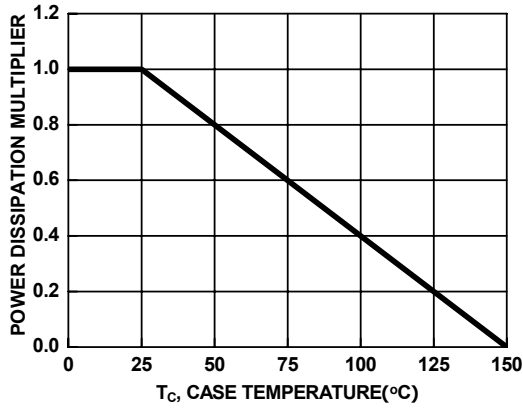


Figure 1. Normalized Power Dissipation vs Case Temperature

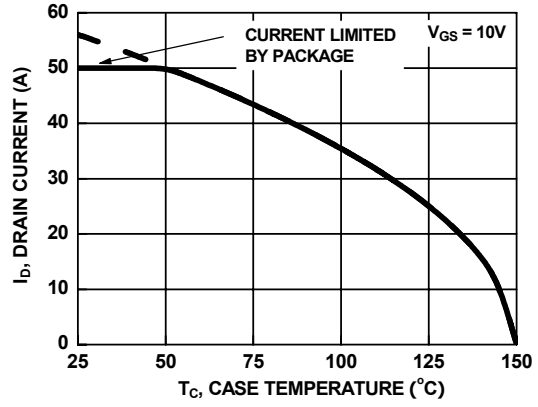


Figure 2. Maximum Continuous Drain Current vs Case Temperature

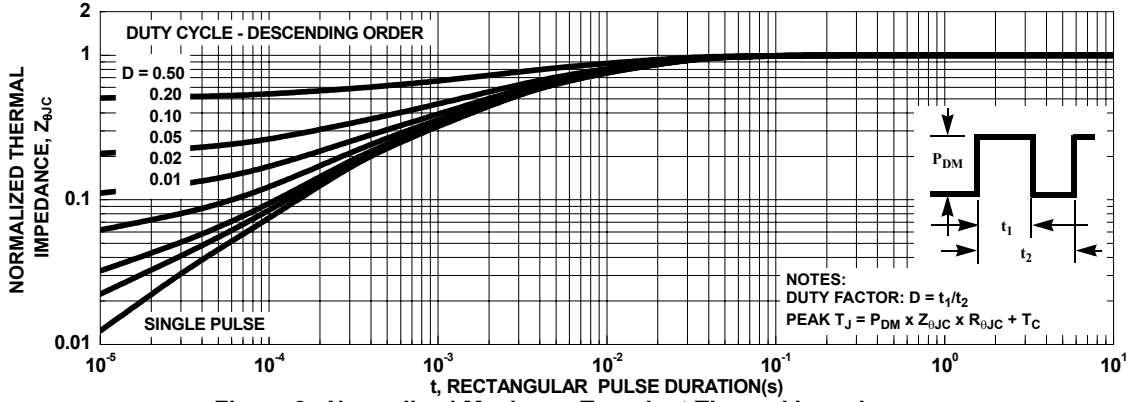


Figure 3. Normalized Maximum Transient Thermal Impedance

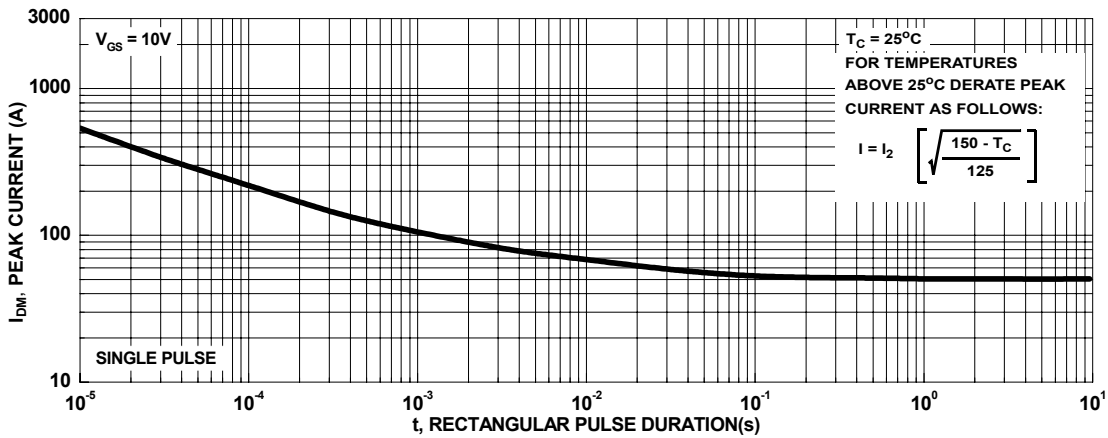


Figure 4. Peak Current Capability

## Typical Characteristics

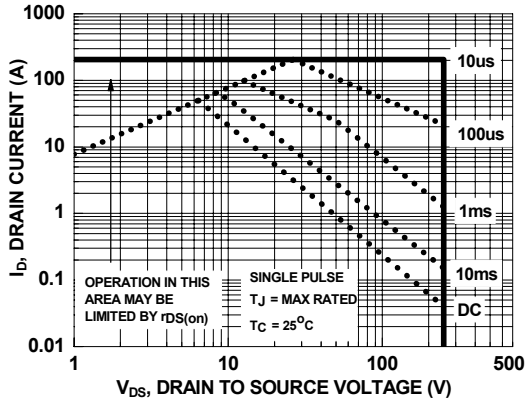
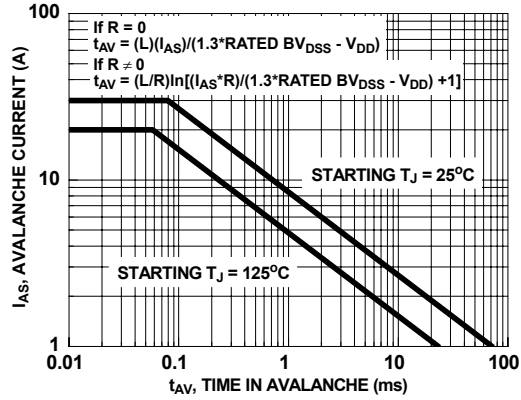


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to ON Semiconductor Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

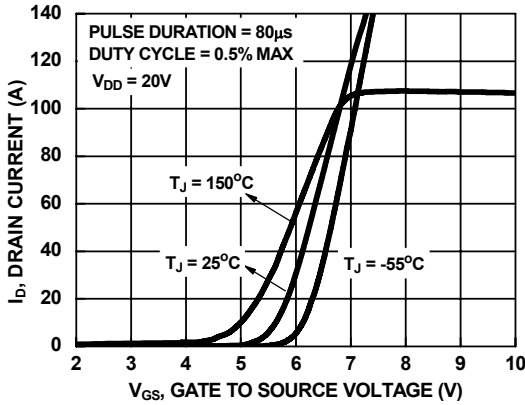


Figure 7. Transfer Characteristics

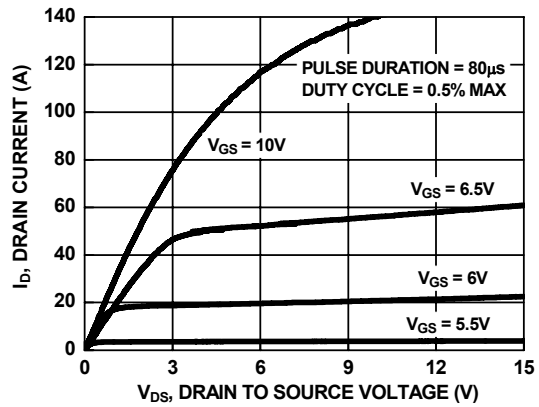


Figure 8. Saturation Characteristics

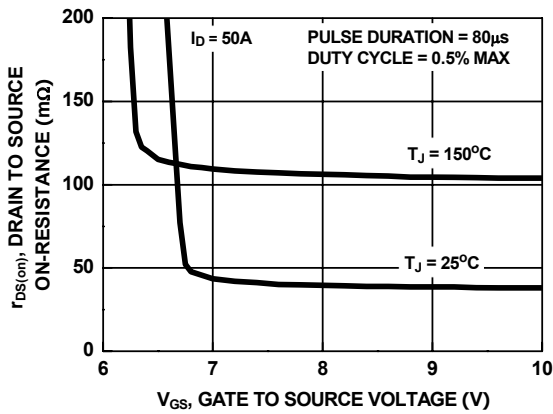


Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

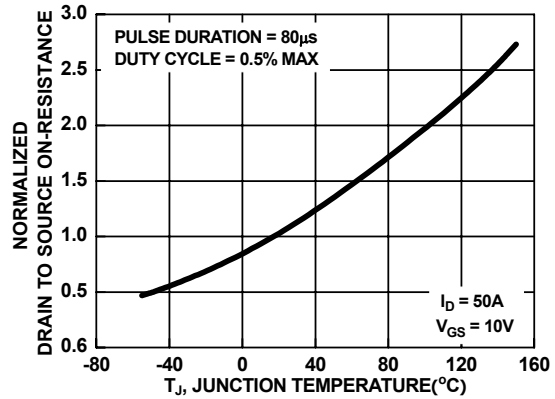


Figure 10. Normalized Drain to Source On-Resistance vs Junction Temperature

## Typical Characteristics

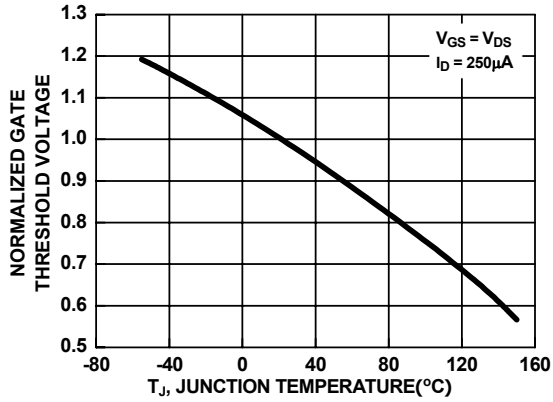


Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature

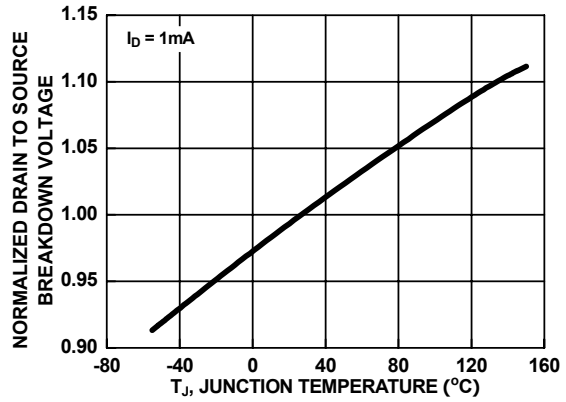


Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature

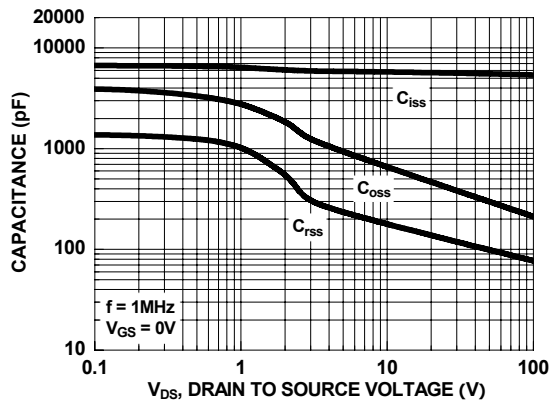


Figure 13. Capacitance vs Drain to Source Voltage

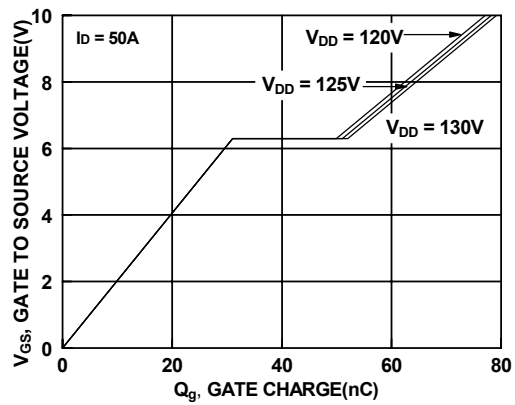


Figure 14. Gate Charge vs Gate to Source Voltage

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