



ON Semiconductor®

## FDD5810-F085

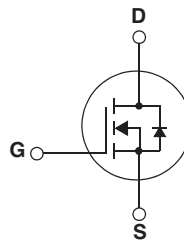
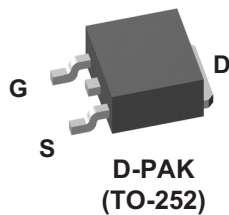
### N-Channel Logic Level Trench® MOSFET 60V, 36A, 27mΩ

#### Features

- $R_{DS(ON)} = 22m\Omega$  (Typ.),  $V_{GS} = 5V$ ,  $I_D = 29A$
- $Q_{g(5)} = 13nC$  (Typ.),  $V_{GS} = 5V$
- Low Miller Charge
- Low  $Q_{rr}$  Body Diode
- UIS Capability (Single Pulse / Repetitive Pulse)
- Qualified to AEC Q101
- RoHS Compliant

#### Applications

- Motor / Body Load Control
- ABS Systems
- Powertrain Management
- Injection System
- DC-DC converters and Off-line UPS
- Distributed Power Architecture and VRMs
- Primary Switch for 12V and 24V systems



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

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	60	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current Continuous ( $V_{GS} = 10\text{V}$ )	37	A
	Drain Current Continuous ( $V_{GS} = 5\text{V}$ )	33	A
	Continuous ( $T_A = 25^\circ\text{C}$ , $V_{GS} = 10\text{V}$ , with $R_{\theta JA} = 52^\circ\text{C/W}$ )	7.4	A
	Pulsed	Figure 4	A
$E_{AS}$	Single Pulse Avalanche Energy (Note 1)	45	mJ
$P_D$	Power Dissipation	72	W
	Derate above $25^\circ\text{C}$	0.48	W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature	-55 to 175	$^\circ\text{C}$

**Thermal Characteristics**

$R_{\theta JC}$	Maximum Thermal resistance Junction to Case TO-252	2.1	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction to Ambient TO-252, 1in <sup>2</sup> copper pad area	52	$^\circ\text{C/W}$

**Package Marking and Ordering Information**

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD5810	FDD5810-F085	TO-252AA	330mm	16mm	2500 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**

$B_{VDS}$	Drain to Source Breakdown Voltage	$I_D = 250\mu\text{A}$ , $V_{GS} = 0\text{V}$	60	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 48\text{V}$ $V_{GS} = 0\text{V}$ $T_C = 150^\circ\text{C}$	-	-	1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}$	-	-	$\pm 100$	nA

**On Characteristics**

$V_{GS(TH)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\mu\text{A}$	1	1.6	2	V
$R_{DS(ON)}$	Drain to Source On Resistance	$I_D = 32\text{A}$ , $V_{GS} = 10\text{V}$	-	18	22	m $\Omega$
		$I_D = 29\text{A}$ , $V_{GS} = 5\text{V}$	-	22	27	
		$I_D = 32\text{A}$ , $V_{GS} = 10\text{V}$ , $T_J = 175^\circ\text{C}$	-	43	53	

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 25\text{V}$ , $V_{GS} = 0\text{V}$ , $f = 1\text{MHz}$	-	1420	1890	pF
$C_{oss}$	Output Capacitance		-	150	200	pF
$C_{rss}$	Reverse Transfer Capacitance		-	65	100	pF
$R_G$	Gate Resistance	$f = 1\text{MHz}$	-	3.5	-	$\Omega$
$Q_g$	Total Gate Charge at 10V	$V_{GS} = 0\text{V}$ to 10V	-	24	34	nC
$Q_g$	Total Gate Charge at 5V	$V_{GS} = 0\text{V}$ to 5V	-	13	18	nC
$Q_{g(th)}$	Threshold Gate Charge	$V_{GS} = 0\text{V}$ to 1V	-	1.3	-	nC
$Q_{gs}$	Gate to Source Gate Charge	$V_{DD} = 30\text{V}$ $I_D = 35\text{A}$	-	4.0	-	nC
$Q_{gs2}$	Gate Charge Threshold to Plateau		-	2.7	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	5.0	-	nC

# Switching Characteristics

$t_{on}$	Turn-On Time	$V_{DD} = 30V, I_D = 35A$ $V_{GS} = 5V, R_{GS} = 11\Omega$	-	-	130	ns
$t_{d(on)}$	Turn-On Delay Time		-	12	-	ns
$t_r$	Rise Time		-	75	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	26	-	ns
$t_f$	Fall Time		-	34	-	ns
$t_{off}$	Turn-Off Time		-	-	90	ns

# Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Voltage	$I_{SD} = 32A$	-	-	1.25	V
		$I_{SD} = 16A$	-	-	1.0	V
$t_{rr}$	Reverse Recovery Time	$I_F = 35A, di/dt = 100A/\mu s$	-	-	39	ns
$Q_{rr}$	Reverse Recovery Charge	$I_F = 35A, di/dt = 100A/\mu s$	-	-	35	nC

## Notes:

1: Starting  $T_J = 25^\circ C$ ,  $L = 110\mu H$ ,  $I_{AS} = 28A$ ,  $V_{DD} = 54V$ ,  $V_{GS} = 10V$ .

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

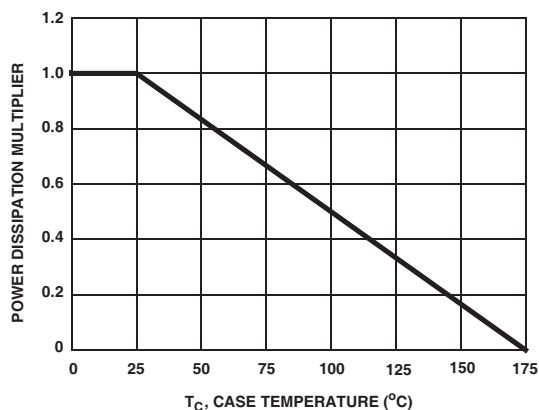


Figure 1. Normalized Power Dissipation vs Case Temperature

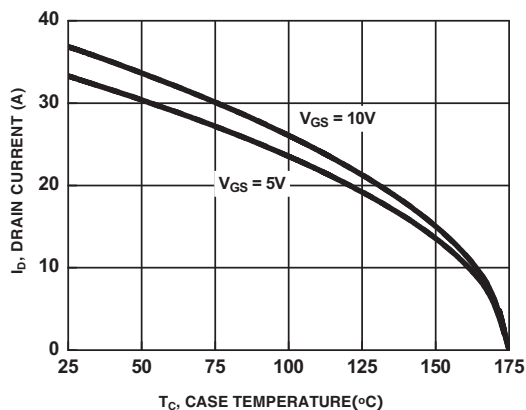


Figure 2. Maximum Continuous Drain Current vs Case Temperature

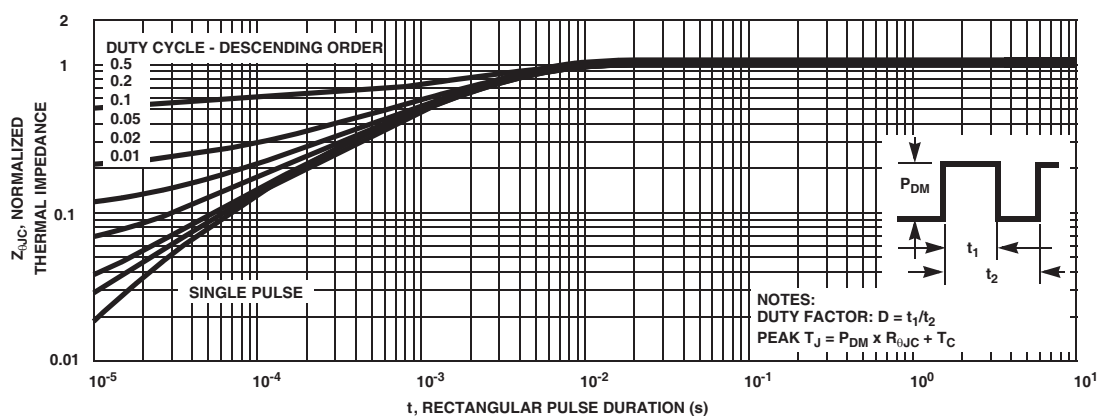


Figure 3. Normalized Maximum Transient Thermal Impedance

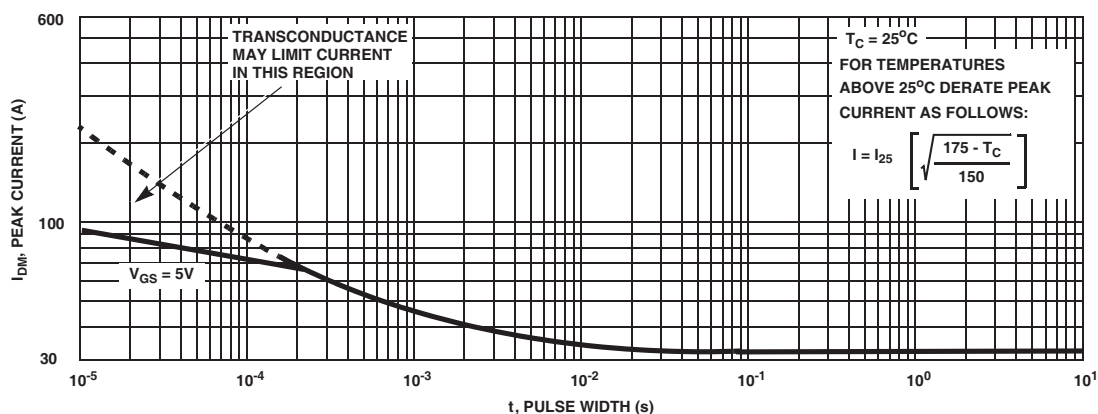


Figure 4. Peak Current Capability

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

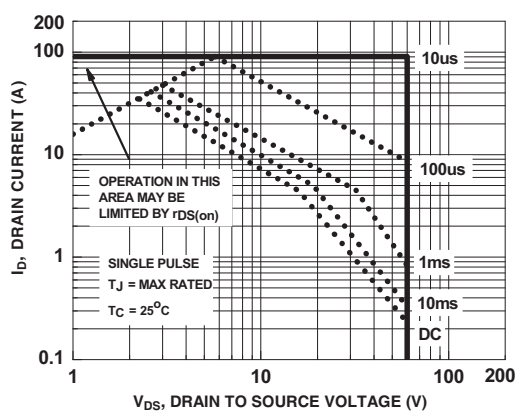
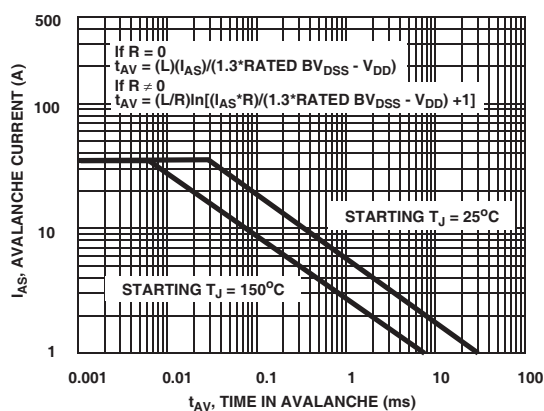


Figure 5. Forward Bias Safe Operating Area



NOTE: Refer to ON Semiconductor Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability

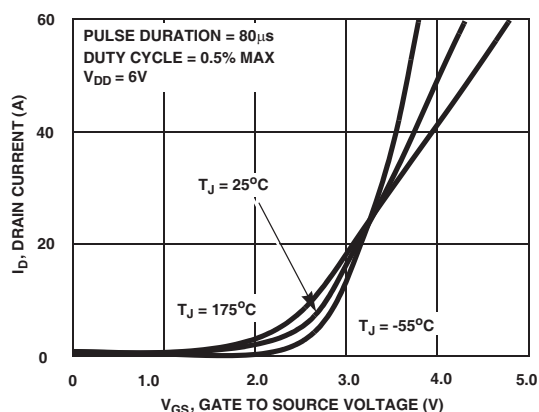


Figure 7. Transfer Characteristics

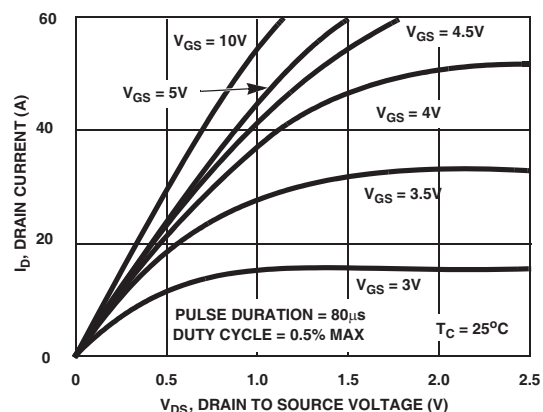


Figure 8. Saturation Characteristics

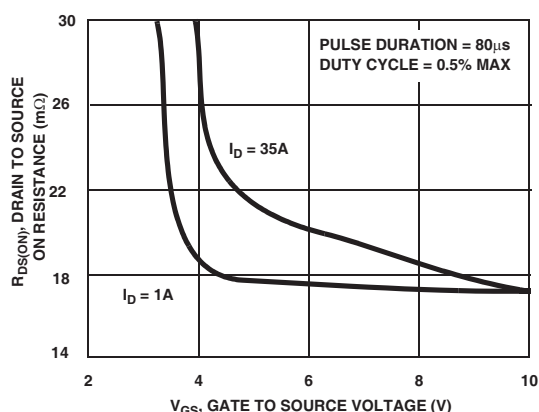


Figure 9. Drain to Source On Resistance vs Gate Voltage and Drain Current

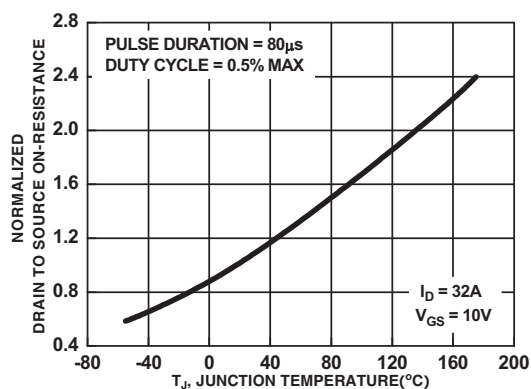
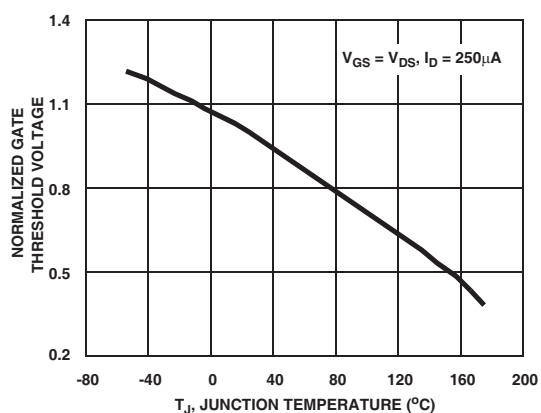
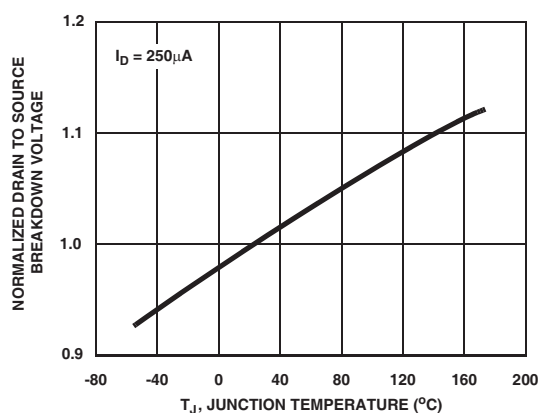


Figure 10. Normalized Drain to Source On Resistance vs Junction Temperature

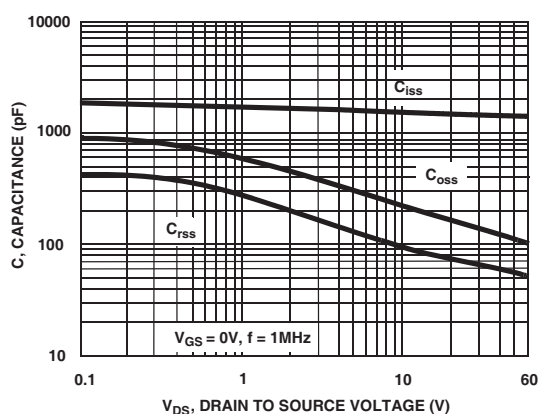
# **Typical Characteristics** $T_J = 25^\circ\text{C}$ unless otherwise noted



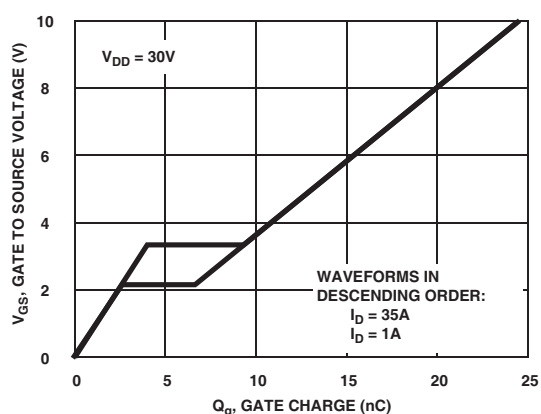
**Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature**



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



**Figure 13. Capacitance vs Drain to Source Voltage**



**Figure 14. Gate Charge Waveforms for Constant Gate Current**

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