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ON Semiconductor®

FDB8860-F085

N-Channel Logic Level PowerTrench® MOSFET

30V, 80A, 2.6mΩ

Features

- $R_{DS(ON)}$ = 1.9mΩ (Typ), V_{GS} = 5V, I_D = 80A

- $Q_{g(5)}$ = 89nC (Typ), V_{GS} = 5V

- Low Miller Charge

- Low Q_{RR} Body Diode

- UIS Capability (Single Pulse and Repetitive Pulse)

- Qualified to AEC Q101

- RoHS Compliant

Applications

- 12V Automotive Load Control

- Start / Alternator Systems

- Electronic Power Steering Systems

- ABS

- DC-DC Converters
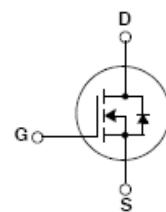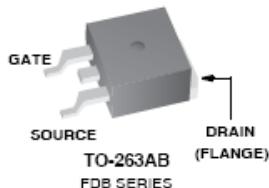
MOSFET Maximum Ratings T_C = 25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current Continuous (V_{GS} = 10V, T_C < 163°C)	80	A
	Continuous (V_{GS} = 5V, T_C < 162°C)	80	A
	Continuous (V_{GS} = 10V, T_C = 25°C, with $R_{\theta JA}$ = 43°C/W)	31	A
	Pulsed	Figure 4	A
E_{AS}	Single Pulse Avalanche Energy (Note 1)	947	mJ
P_D	Power Dissipation	254	W
	Derate above 25°C	1.7	W/°C
T_J, T_{STG}	Operating and Storage Temperature	-55 to +175	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance Junction to Case	0.59	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient (Note 2)	62	°C/W
$R_{\theta JA}$	Thermal Resistance Junction to Ambient TO-263,1in^2 copper pad area	43	°C/W

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDB8860	FDB8860-F085	TO-263AB	330mm	24mm	800units

Electrical Characteristics T_J = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 1mA, V_{GS} = 0V	30	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24V	-	-	1	μA
		V_{GS} = 0V T_J = 150°C	-	-	250	
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20V	-	-	±100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{DS} = V_{GS}, I_D = 250μA	1	1.7	3	V
$R_{DS(ON)}$	Drain to Source On Resistance	I_D = 80A, V_{GS} = 10V	-	1.6	2.3	mΩ
		I_D = 80A, V_{GS} = 5V	-	1.9	2.6	
		I_D = 80A, V_{GS} = 4.5V	-	2.1	2.7	
		I_D = 80A, V_{GS} = 10V, T_J = 175°C	-	2.5	3.6	
Dynamic Characteristics						
C_{ISS}	Input Capacitance	V_{DS} = 15V, V_{GS} = 0V, f = 1MHz	-	9460	12585	pF
C_{OSS}	Output Capacitance		-	1710	2275	pF
C_{RSS}	Reverse Transfer Capacitance		-	1050	1575	pF
R_G	Gate Resistance	f = 1MHz	-	1.8	-	Ω
$Q_{g(TOT)}$	Total Gate Charge at 10V	V_{GS} = 0V to 10V	-	165	214	nC
$Q_{g(5)}$	Total Gate Charge at 5V	V_{GS} = 0V to 5V	-	89	115	nC
$Q_{g(TH)}$	Threshold Gate Charge	V_{GS} = 0V to 1V	V_{DD} = 15V	-	9.1	12	nC
Q_{gs}	Gate to Source Gate Charge		I_D = 80A	-	26	-	nC
Q_{gs2}	Gate Charge Threshold to Plateau		I_g = 1.0mA	-	18	-	nC
Q_{gd}	Gate to Drain "Miller" Charge			-	33	-	nC

Electrical Characteristics $T_J = 25°C$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Switching Characteristics						
$t_{(on)}$	Turn-On Time		-	-	340	ns
$t_{d(on)}$	Turn-On Delay Time		-	14	-	ns
t_r	Turn-On Rise Time	$V_{DD} = 15V, I_D = 80A$	-	213	-	ns
$t_{d(off)}$	Turn-Off Delay Time	$V_{GS} = 5V, R_{GS} = 1\Omega$	-	79	-	ns
t_f	Turn-Off Fall Time		-	49	-	ns
t_{off}	Turn-Off Time		-	-	192	ns
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Voltage	$I_{SD} = 80A$	-	-	1.25	V
		$I_{SD} = 40A$	-	-	1.0	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 80A, dI_{SD}/dt = 100A/\mu s$	-	-	43	ns
Q_{rr}	Reverse Recovery Charge	$I_{SD} = 80A, dI_{SD}/dt = 100A/\mu s$	-	-	29	nC

Notes:
1: Starting $T_J = 25°C$, L =0.47mH, $I_{AS} = 64A$, $V_{DD} = 30V$, $V_{GS} = 10V$.
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 $T_J = 25°C$ unless otherwise noted
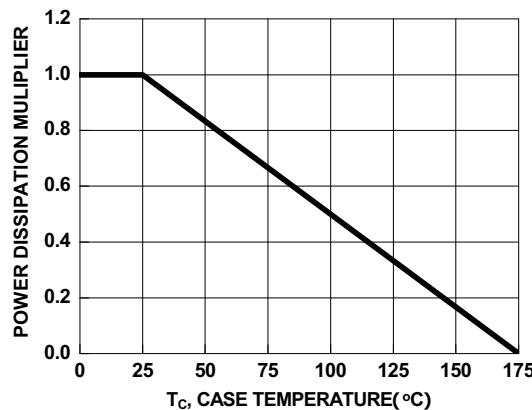
Figure 1. Normalized Power Dissipation vs Case Temperature
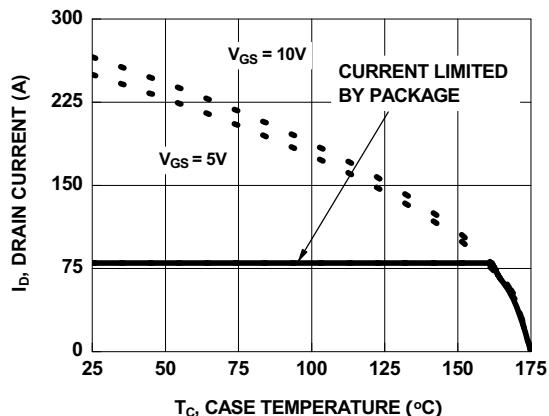

**Figure 2. Maximum Continuous Drain Current vs Case Temperature**

NOTES:
DUTY FACTOR: $D = t_1/t_2$
PEAK $T_J = P_{DM} \times Z_{\theta JC} \times R_{\theta JC} + T_C$
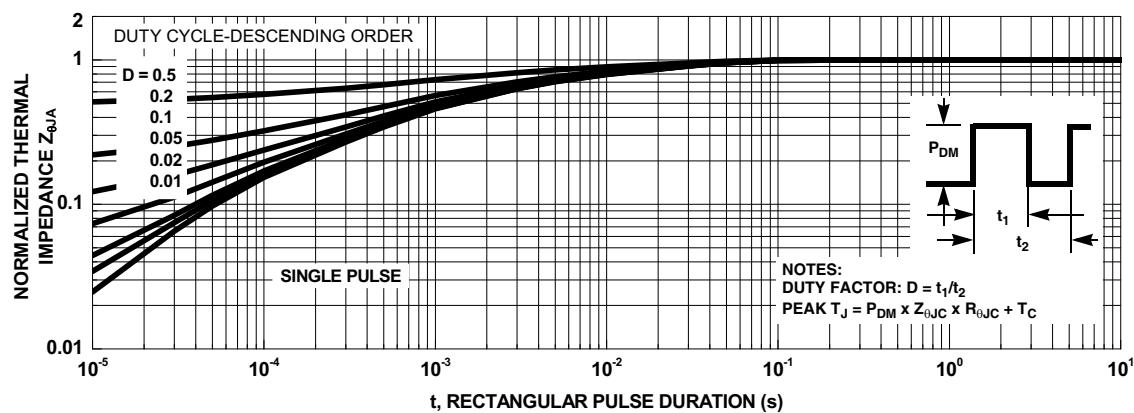
Figure 3. Normalized Maximum Transient Thermal Impedance

$T_C = 25°C$

FOR TEMPERATURES ABOVE 25°C DERATE PEAK CURRENT AS FOLLOWS:

$$I = I_{25}\left[\sqrt{\frac{175 - T_C}{150}}\right]$$
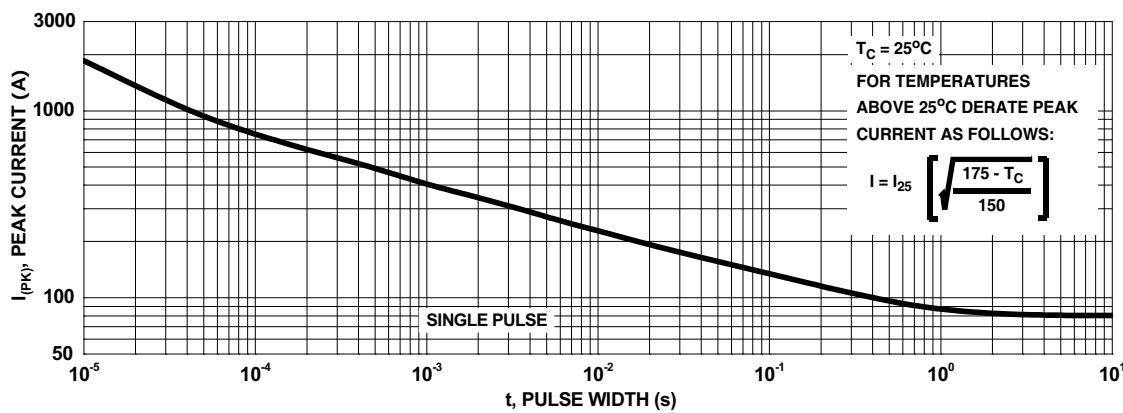
Figure 4. Peak Current Capability

Typical Characteristics $T_J = 25°C$ unless otherwise noted
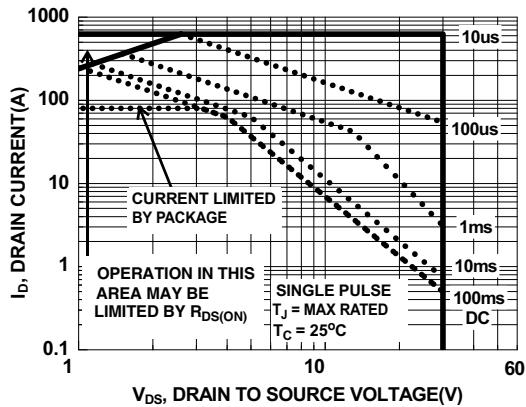
Figure 5. Forward Bias Safe Operating Area

If R = 0
$t_{AV} = (L)(I_{AS})/(1.3 \cdot \text{RATED BV}_{DSS} - V_{DD})$
If R ≠ 0
$t_{AV} = (L/R)\ln[(I_{AS} \cdot R)/(1.3 \cdot \text{RATED BV}_{DSS} - V_{DD}) + 1]$
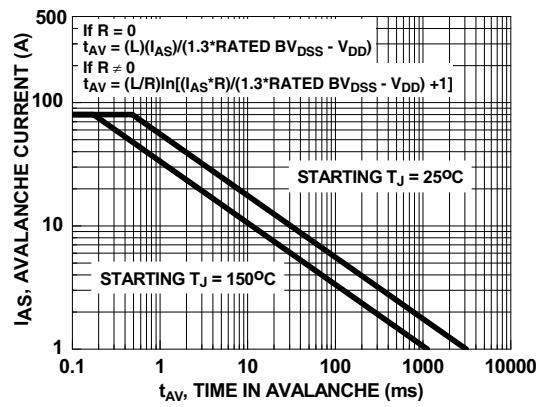
NOTE: Refer to ON Semiconductor Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching Capability
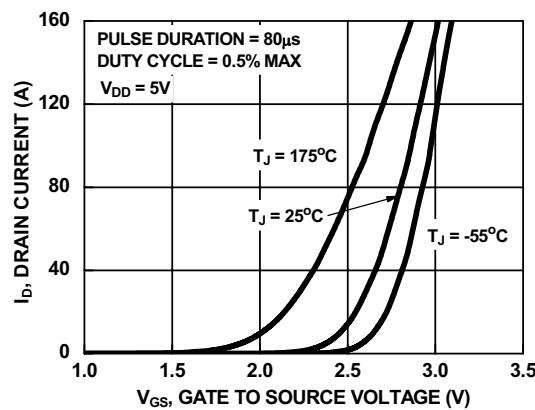
Figure 7. Transfer Characteristics
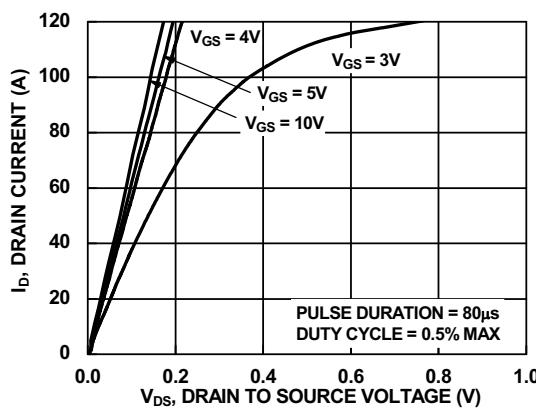
Figure 8. Saturation Characteristics
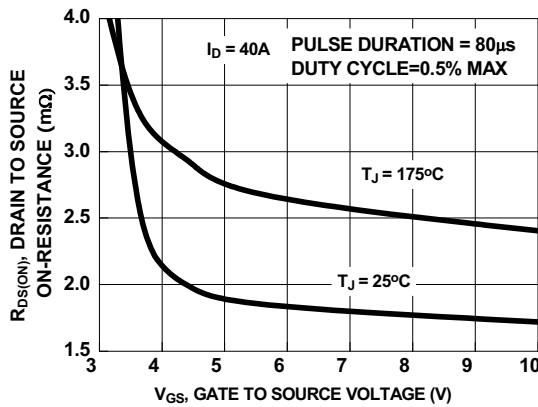
Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage
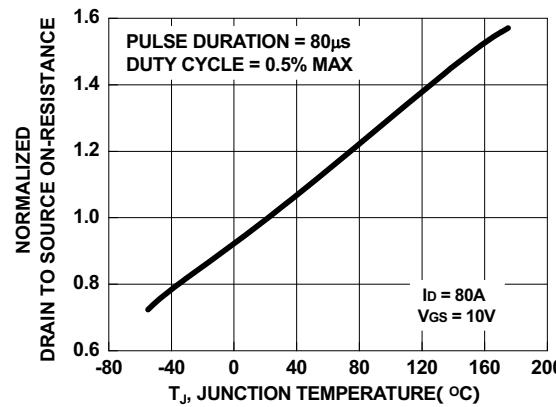
Figure 10. Normalized Drain to Source On Resistance vs Junction Temperature

Typical Characteristics T_J = 25°C unless otherwise noted
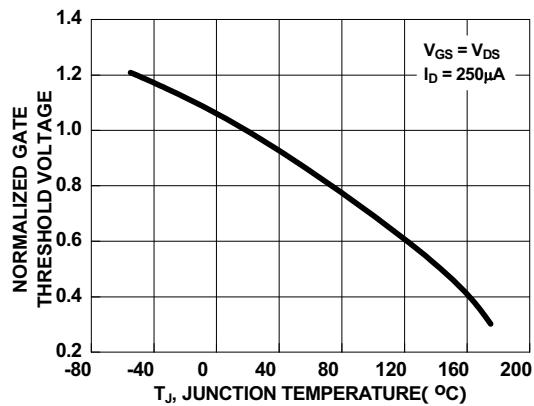
Figure 11. Normalized Gate Threshold Voltage vs Junction Temperature
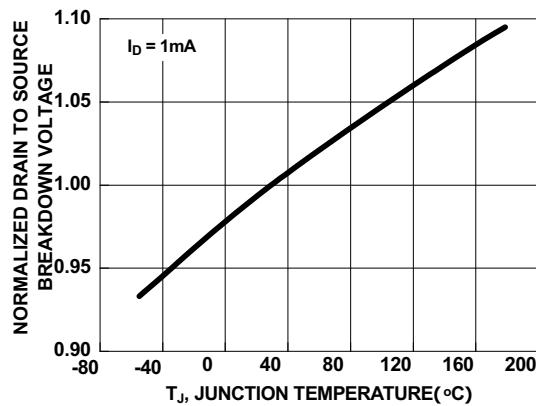
Figure 12. Normalized Drain to Source Breakdown Voltage vs Junction Temperature
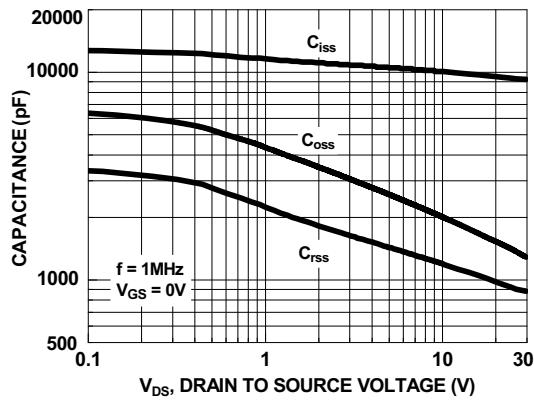
Figure 13. Capacitance vs Drain to Source Voltage
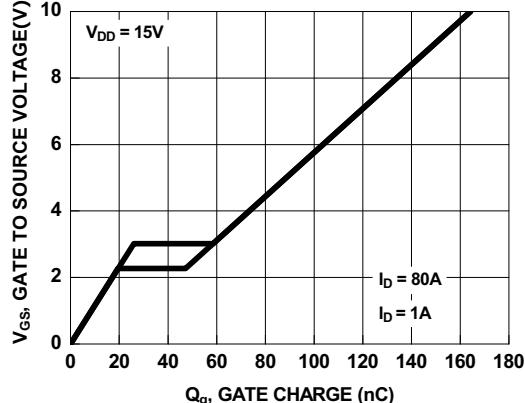
Figure 14. Gate Charge vs Gate to Source Voltage

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