

May 2008

# FDB8860

# N-Channel Logic Level PowerTrench® MOSFET 30V, 80A, 2.6m $\Omega$

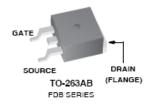
#### **Features**

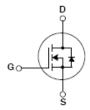
- $R_{DS(ON)} = 1.9m\Omega$  (Typ),  $V_{GS} = 5V$ ,  $I_D = 80A$
- $Q_{g(5)} = 89nC (Typ), V_{GS} = 5V$
- Low Miller Charge
- Low Q<sub>RR</sub> Body Diode
- UIS Capability (Single Pulse and Repetitive Pulse)
- Qualified to AEC Q101
- RoHS Compliant

# **Applications**

- 12V Automotive Load Control
- Start / Alternator Systems
- Electronic Power Steering Systems
- ABS
- DC-DC Converters







MOSFET Maximum	Ratings	$T_C = 25^{\circ}C$ unless otherwise noted
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Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage	±20	V
	Drain Current Continuous (V <sub>GS</sub> = 10V, T <sub>C</sub> < 163°C)	80	А
I <sub>D</sub>	Continuous $(V_{GS} = 5V, T_C < 162^{\circ}C)$	80	Α
	Continuous ( $V_{GS} = 10V$ , $T_C = 25^{\circ}C$ , with $R_{\theta JA} = 43^{\circ}C/W$ )	31	Α
	Pulsed	Figure 4	Α
E <sub>AS</sub>	Single Pulse Avalanche Energy (Note 1)	947	mJ
П	Power Dissipation	254	W
$P_{D}$	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 <sup>2</sup> copper pad area	43	°C/W

# **Package Marking and Ordering Information**

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

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

Parameter

Off Characteristics							
BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	$I_D = 1mA, V_{GS}$	= 0V	30	-	-	V
ı	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 24V		-	-	1	μА
DSS	Zero Gate Voltage Drain Current	$V_{GS} = 0V$	$T_J = 150$ °C	-	-	250	μА
I <sub>GSS</sub>	Gate to Source Leakage Current	$V_{GS} = \pm 20V$		-	-	±100	nA

**Test Conditions** 

Min

Тур

Max

Units

#### On Characteristics

Symbol

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250 \mu A$	1	1.7	3	V
	$I_D = 80A, V_{GS} = 10V$	-	1.6	2.3		
		$I_D = 80A, V_{GS} = 5V$	-	1.9	2.6	
R <sub>DS(ON)</sub>	Drain to Source On Resistance	$I_D = 80A, V_{GS} = 4.5V$	-	2.1	2.7	mΩ
	I <sub>D</sub> = 80A, V <sub>GS</sub> = 10V, T <sub>J</sub> = 175°C	-	2.5	3.6		

#### **Dynamic Characteristics**

C <sub>ISS</sub>	Input Capacitance	V 45V V	0)/	-	9460	12585	pF
C <sub>OSS</sub>	Output Capacitance	√V <sub>DS</sub> = 15V, V <sub>GS</sub> : - f = 1MHz	= UV,	-	1710	2275	pF
C <sub>RSS</sub>	Reverse Transfer Capacitance	1 - 1101112		-	1050	1575	pF
$R_{G}$	Gate Resistance	f = 1MHz		-	1.8	-	Ω
$Q_{g(TOT)}$	Total Gate Charge at 10V	V <sub>GS</sub> = 0V to 10V		-	165	214	nC
$Q_{g(5)}$	Total Gate Charge at 5V	$V_{GS} = 0V \text{ to } 5V$		-	89	115	nC
$Q_{g(TH)}$	Threshold Gate Charge	$V_{GS} = 0V \text{ to } 1V$	$V_{DD} = 15V$ $I_D = 80A$	-	9.1	12	nC
$Q_{gs}$	Gate to Source Gate Charge		$I_0 = 60A$ $I_0 = 1.0mA$	-	26	-	nC
Q <sub>gs2</sub>	Gate Charge Threshold to Plateau		.g	-	18	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge			-	33	-	nC

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

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Switching	g Characteristics					
t <sub>(on)</sub>	Turn-On Time		-	-	340	ns
t <sub>d(on)</sub>	Turn-On Delay Time		-	14	-	ns
t <sub>r</sub>	Turn-On Rise Time	$V_{DD} = 15V, I_{D} = 80A$ $V_{GS} = 5V, R_{GS} = 1\Omega$	-	213	-	ns
t <sub>d(off)</sub>	Turn-Off Delay Time	$V_{GS} = 5V, R_{GS} = 1\Omega$	-	79	-	ns
t <sub>f</sub>	Turn-Off Fall Time		-	49	-	ns
t <sub>off</sub>	Turn-Off Time		-	-	192	ns

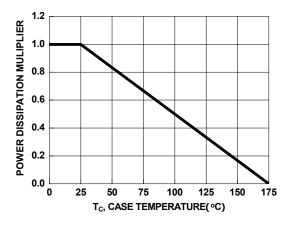
#### **Drain-Source Diode Characteristics**

V	Source to Drain Diode Voltage	I <sub>SD</sub> = 80A	-	-	1.25	V
v <sub>SD</sub>	Source to Drain Diode Voltage	I <sub>SD</sub> = 40A	-	-	1.0	V
t <sub>rr</sub>	Reverse Recovery Time	$I_{SD} = 80A$ , $dI_{SD}/dt = 100A/\mu s$	-	-	43	ns
Q <sub>rr</sub>	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 Fairchild Semiconductor products are manufactured, assembled and tested under ISO9000 and QS9000 quality systems certification.





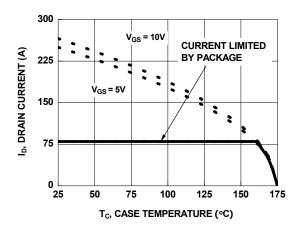


Figure 1. Normalized Power Dissipation vs Case Temperature

Figure 2. Maximum Continuous Drain Current vs Case Temperature

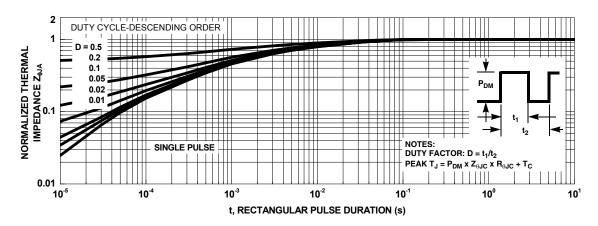


Figure 3. Normalized Maximum Transient Thermal Impedance

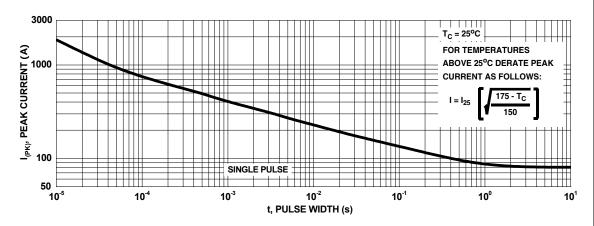
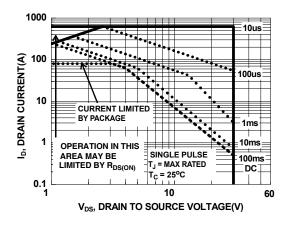


Figure 4. Peak Current Capability

# **Typical Characteristics** T<sub>J</sub> = 25°C unless otherwise noted



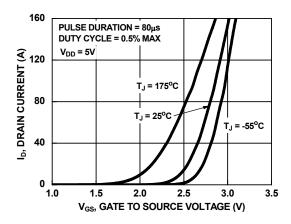
 $\begin{array}{c} 500 \\ \text{If R = 0} \\ \text{$^{1}_{\text{LAV}} = (\text{L})(\text{I}_{\text{AS}})'(1.3\text{*RATED BV}_{\text{DSS}} - \text{V}_{\text{DD}})} \\ \text{If R $\neq 0$} \\ \text{$^{1}_{\text{LAV}} = (\text{L}/\text{R})|\text{In}[(\text{I}_{\text{AS}}\text{*R})/(1.3\text{*RATED BV}_{\text{DSS}} - \text{V}_{\text{DD}}) + 1]} \\ \text{STARTING T}_{\text{J}} = 150^{\circ}\text{C} \\ \text{STARTING T}_{\text{J}} = 150^{\circ}\text{C} \\ \text{10.1} \\ \text{10.1} \\ \text{10} \\ \text{100} \\ \text{1000} \\ \text{10000} \\ \text{10000$ 

Figure 5. Forward Bias Safe Operating Area

NOTE: Refer to Fairchild Application Notes AN7514 and AN7515

Figure 6. Unclamped Inductive Switching

Capability



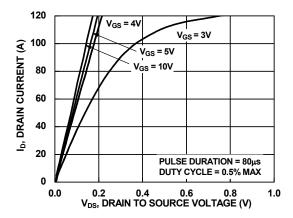
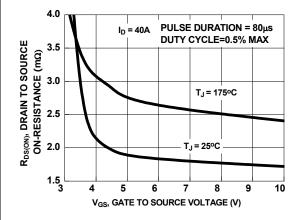


Figure 7. Transfer Characteristics

Figure 8. Saturation Characteristics



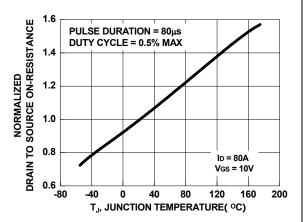


Figure 9. Drain to Source On-Resistance Variation vs Gate to Source Voltage

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

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

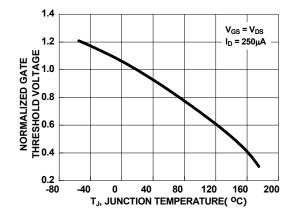


Figure 11. Normalized Gate Threshold Voltage vs **Junction Temperature** 

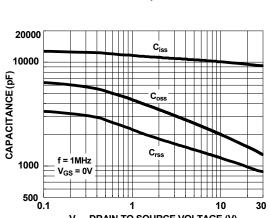


Figure 13. Capacitance vs Drain to Source Voltage

V<sub>DS</sub>, DRAIN TO SOURCE VOLTAGE (V)

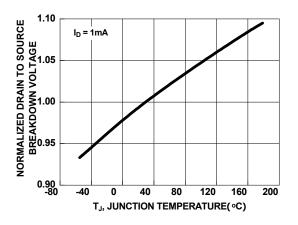


Figure 12. Normalized Drain to Source **Breakdown Voltage vs Junction Temperature** 

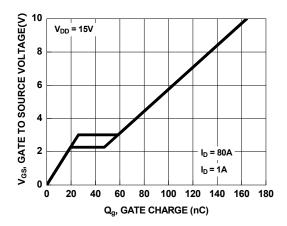


Figure 14. Gate Charge vs Gate to Source Voltage

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