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# FDMC8010DC

## N-Channel Dual Cool™ 33 PowerTrench® MOSFET 30 V, 157 A, 1.28 mΩ

### Features

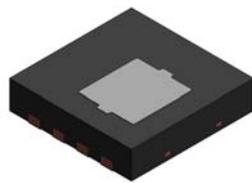
- Dual Cool™ Top Side Cooling PQFN package
- Max  $r_{DS(on)}$  = 1.28 mΩ at  $V_{GS} = 10$  V,  $I_D = 37$  A
- Max  $r_{DS(on)}$  = 1.74 mΩ at  $V_{GS} = 4.5$  V,  $I_D = 32$  A
- High Performance Technology for Extremely Low  $r_{DS(on)}$
- RoHS Compliant

### General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process. Advancements in both silicon and Dual Cool™ package technologies have been combined to offer the lowest  $r_{DS(on)}$  while maintaining excellent switching performance by extremely low Junction-to-Ambient thermal resistance.

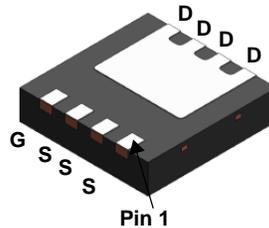
### Applications

- Load Switch
- Motor Bridge Switch
- Synchronous Rectifier

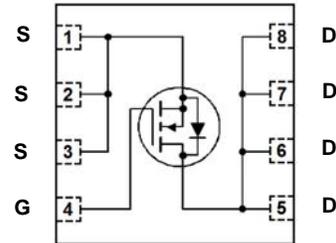


Top

Dual Cool™ 33



Pin 1  
Bottom



### MOSFET Maximum Ratings $T_A = 25$ °C unless otherwise noted.

Symbol	Parameter	Rated	Units
$V_{DS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage (Note 4)	±20	V
$I_D$	Drain Current -Continuous $T_C = 25$ °C (Note 6)	157	A
	-Continuous $T_C = 100$ °C (Note 6)	99	
	-Continuous $T_A = 25$ °C (Note 1a)	37	
	-Pulsed (Note 5)	788	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	337	mJ
$P_D$	Power Dissipation $T_C = 25$ °C	50	W
	Power Dissipation $T_A = 25$ °C (Note 1a)	3.0	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	°C

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case (Bottom Drain)	2.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	42	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
8010	FDMC8010DC	Dual Cool™ 33	13 "	12 mm	3000 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	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		17		mV/°C
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}$ , $V_{GS} = 0\text{ V}$			10	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = 20\text{ V}$ , $V_{DS} = 0\text{ V}$			100	nA

**On Characteristics**

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$	1.0	1.4	3.0	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 $25\text{ }^\circ\text{C}$		-5		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 37\text{ A}$		0.91	1.28	m $\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 32\text{ A}$		1.2	1.74	
		$V_{GS} = 10\text{ V}$ , $I_D = 37\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$		1.34	1.89	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{ V}$ , $I_D = 37\text{ A}$		231		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 15\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		4720	7080	pF
$C_{oss}$	Output Capacitance			1540	2310	pF
$C_{rss}$	Reverse Transfer Capacitance			136	205	pF
$R_g$	Gate Resistance		0.1	0.5	1.1	$\Omega$

**Switching Characteristics**

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}$ , $I_D = 37\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		15	26	ns
$t_r$	Rise Time			7	14	ns
$t_{d(off)}$	Turn-Off Delay Time			40	64	ns
$t_f$	Fall Time			5	10	ns
$Q_{g(TOT)}$	Total Gate Charge at 10 V	$V_{DD} = 15\text{ V}$ , $I_D = 37\text{ A}$		67	94	nC
$Q_{g(TOT)}$	Total Gate Charge at 4.5 V			32	44	nC
$Q_{gs}$	Total Gate Charge			10		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			7.5		nC

**Drain-Source Diode Characteristics**

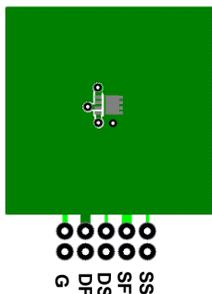
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 2.3\text{ A}$ (Note 2)		0.7	1.2	V
		$V_{GS} = 0\text{ V}$ , $I_S = 37\text{ A}$ (Note 2)		0.8	1.3	
$t_{rr}$	Reverse Recovery Time	$I_F = 37\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		55	88	ns
$Q_{rr}$	Reverse Recovery Charge			48	76	nC

## Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Top Source)	5.0	$^{\circ}\text{C}/\text{W}$
$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Bottom Drain)	2.5	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	42	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	105	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1c)	29	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1d)	40	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1e)	19	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1f)	23	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1g)	30	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1h)	79	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1i)	17	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1j)	26	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1k)	12	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1l)	16	

**Notes:**

1.  $R_{\theta JA}$  is determined with the device mounted on a FR-4 board using a specified pad of 2 oz copper as shown below.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a. 42  $^{\circ}\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



b. 105  $^{\circ}\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

- c. Still air, 20.9x10.4x12.7mm Aluminum Heat Sink, 1 in<sup>2</sup> pad of 2 oz copper
- d. Still air, 20.9x10.4x12.7mm Aluminum Heat Sink, minimum pad of 2 oz copper
- e. Still air, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, 1 in<sup>2</sup> pad of 2 oz copper
- f. Still air, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, minimum pad of 2 oz copper
- g. 200FPM Airflow, No Heat Sink, 1 in<sup>2</sup> pad of 2 oz copper
- h. 200FPM Airflow, No Heat Sink, minimum pad of 2 oz copper
- i. 200FPM Airflow, 20.9x10.4x12.7mm Aluminum Heat Sink, 1 in<sup>2</sup> pad of 2 oz copper
- j. 200FPM Airflow, 20.9x10.4x12.7mm Aluminum Heat Sink, minimum pad of 2 oz copper
- k. 200FPM Airflow, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, 1 in<sup>2</sup> pad of 2 oz copper
- l. 200FPM Airflow, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0%.

3.  $E_{AS}$  of 337 mJ is based on starting  $T_J = 25^{\circ}\text{C}$ ,  $L = 3\text{ mH}$ ,  $I_{AS} = 15\text{ A}$ ,  $V_{DD} = 30\text{ V}$ ,  $V_{GS} = 10\text{ V}$ , 100% test at  $L = 0.1\text{ mH}$ ,  $I_{AS} = 49\text{ A}$ .

4. As an N-ch device, the negative Vgs rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

5. Pulse Id measured at 250 $\mu\text{s}$ , refer to Fig 11 SOA graph for more details.

6. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.

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

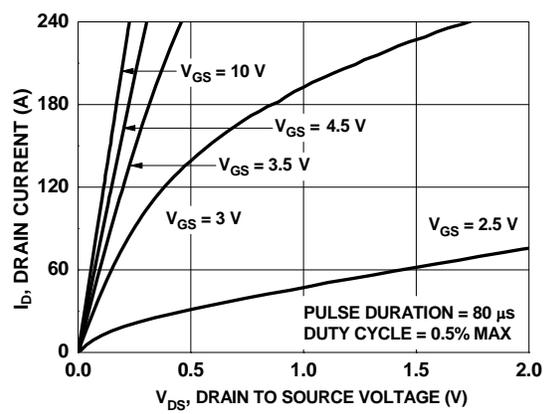


Figure 1. On Region Characteristics

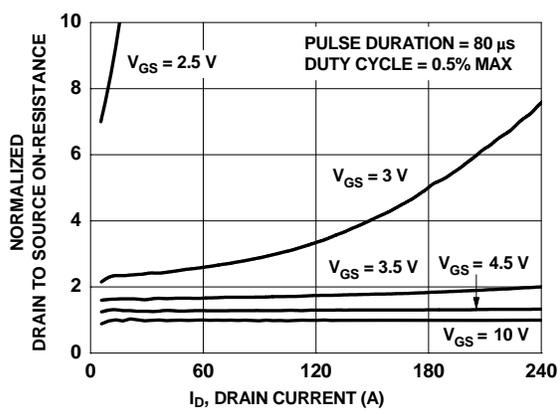


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

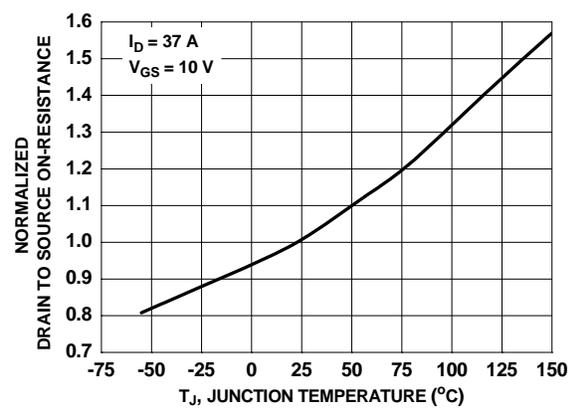


Figure 3. Normalized On Resistance vs. Junction Temperature

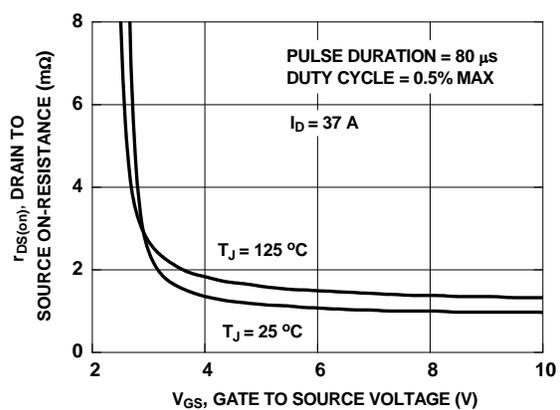


Figure 4. On-Resistance vs. Gate to Source Voltage

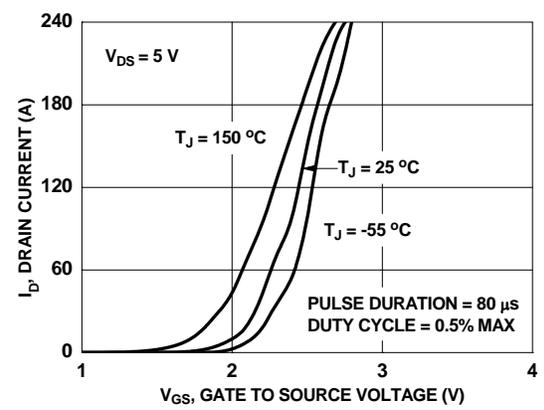


Figure 5. Transfer Characteristics

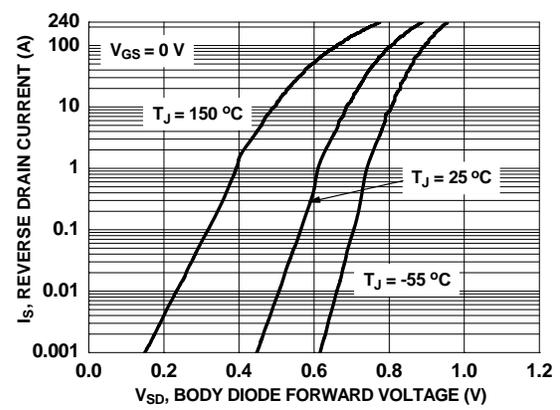
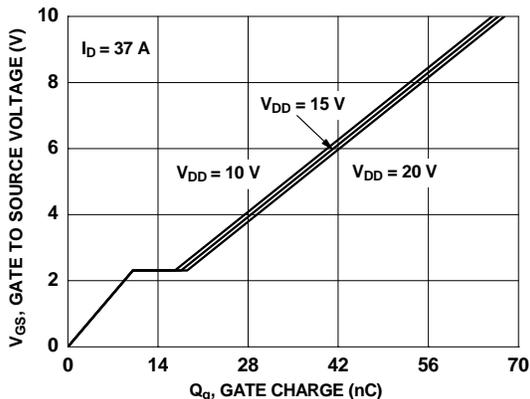
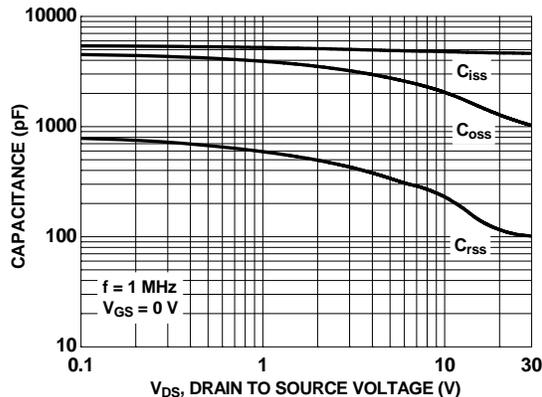


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

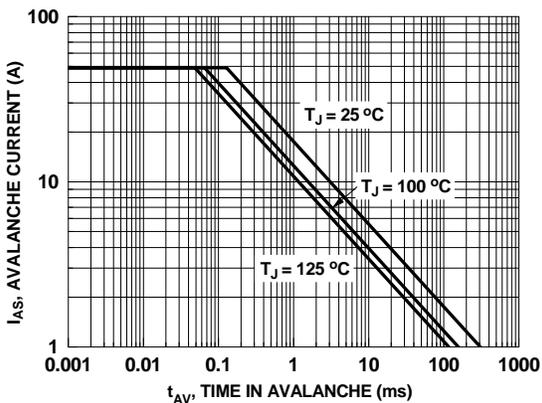
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted.



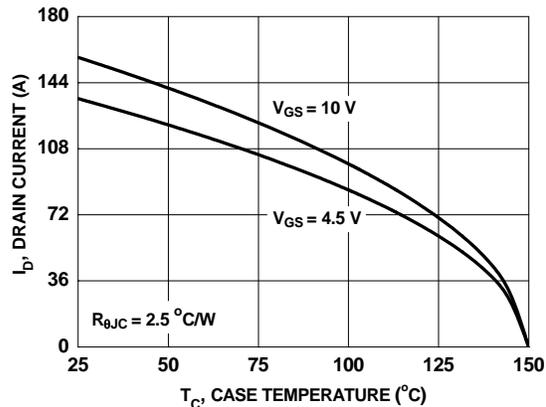
**Figure 7. Gate Charge Characteristics**



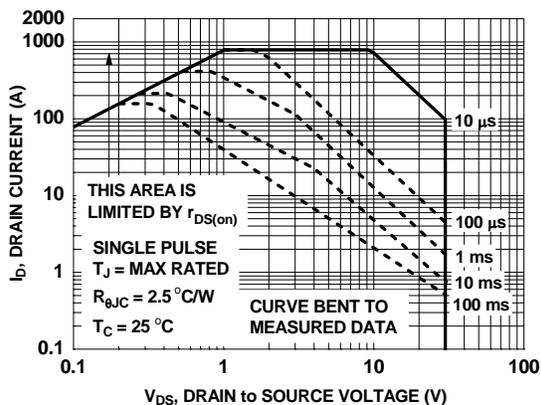
**Figure 8. Capacitance vs. Drain to Source Voltage**



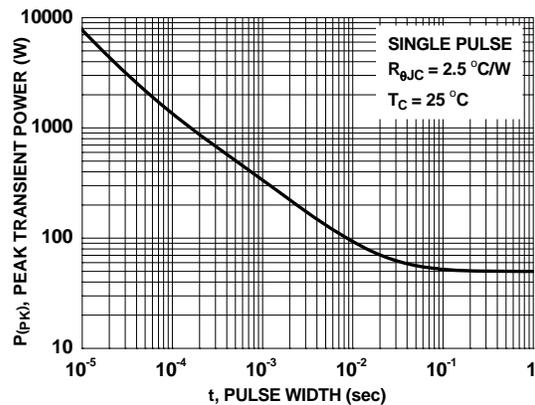
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs. Case Temperature**

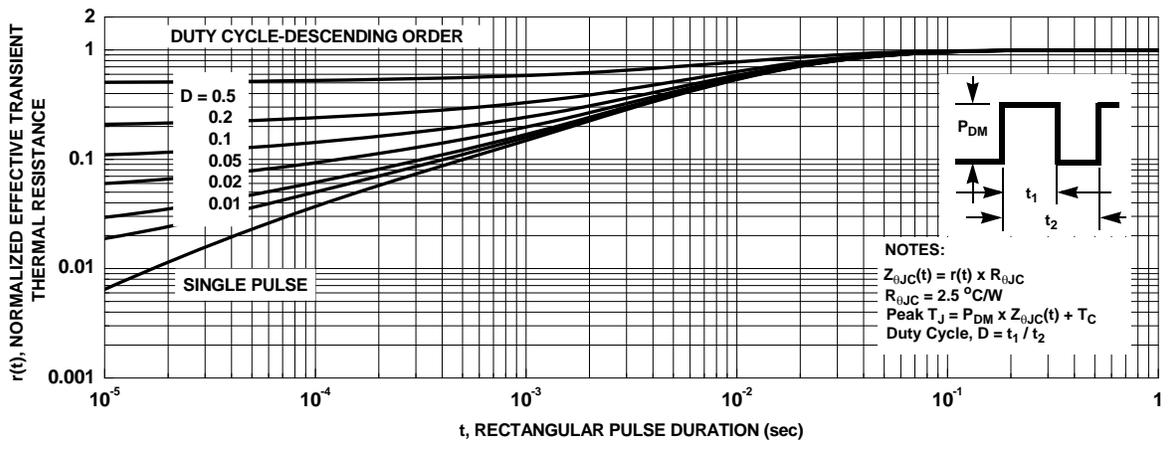


**Figure 11. Forward Bias Safe Operating Area**



**Figure 12. Single Pulse Maximum Power Dissipation**

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



**Figure 13. Junction to Case Transient Thermal Response Curve**



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