



# FDD6780A / FDU6780A\_F071

## N-Channel PowerTrench® MOSFET

**25 V, 8.6 mΩ**

### Features

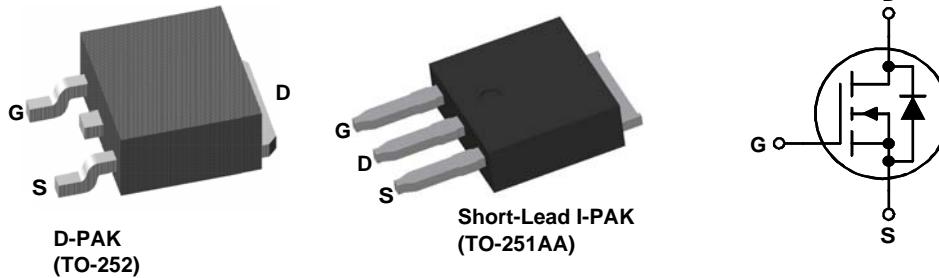
- Max  $r_{DS(on)}$  = 8.6 mΩ at  $V_{GS} = 10$  V,  $I_D = 16.4$  A
- Max  $r_{DS(on)}$  = 19.0 mΩ at  $V_{GS} = 4.5$  V,  $I_D = 12.2$  A
- 100% UIL test
- RoHS Compliant

### General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low  $r_{DS(on)}$  and fast switching speed.

### Applications

- Vcore DC-DC for Desktop Computers and Servers
- VRM for Intermediate Bus Architecture



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

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	25	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current -Continuous (Package limited) $T_C = 25$ °C	30	A
	-Continuous (Silicon limited) $T_C = 25$ °C	48	
	-Continuous $T_A = 25$ °C (Note 1a)	16.4	
	-Pulsed	100	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	24	mJ
$P_D$	Power Dissipation $T_C = 25$ °C	32.6	W
	Power Dissipation $T_A = 25$ °C (Note 1a)	3.7	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +175	°C

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case TO-252, TO-251	4.6	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient TO-252 (Note 1a)	40	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDD6780A	FDD6780A	D-PAK (TO-252)	13 "	12 mm	2500 units
FDU6780A	FDU6780A_F071	TO-251AA	N/A(Tube)	N/A	75 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

$\text{BV}_{\text{DSS}}$	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}, V_{GS} = 0 \text{ V}$	25			V
$\frac{\Delta \text{BV}_{\text{DSS}}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , referenced to $25^\circ\text{C}$		14		$\text{mV}/^\circ\text{C}$
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{DS} = 20 \text{ V}, V_{GS} = 0 \text{ V}$			1	$\mu\text{A}$
$I_{\text{GSS}}$	Gate to Source Leakage Current	$V_{GS} = \pm 20 \text{ V}, V_{DS} = 0 \text{ V}$			$\pm 100$	nA

### On Characteristics

$V_{GS(\text{th})}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu\text{A}$	1.0	1.9	3.0	V
$\frac{\Delta V_{GS(\text{th})}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , referenced to $25^\circ\text{C}$		-5		$\text{mV}/^\circ\text{C}$
$r_{DS(\text{on})}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 16.4 \text{ A}$		6.8	8.6	$\text{m}\Omega$
		$V_{GS} = 10 \text{ V}, I_D = 16.4 \text{ A}$ Short-Lead I-PAK version		7.0	8.8	
		$V_{GS} = 4.5 \text{ V}, I_D = 12.2 \text{ A}$		14.1	19.0	
		$V_{GS} = 4.5 \text{ V}, I_D = 12.2 \text{ A}$ Short-Lead I-PAK version		14.3	19.2	
		$V_{GS} = 10 \text{ V}, I_D = 16.4 \text{ A}, T_J = 150^\circ\text{C}$		10.3	13.0	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5 \text{ V}, I_D = 16.4 \text{ A}$		70		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 13 \text{ V}, V_{GS} = 0 \text{ V}, f = 1\text{MHz}$		927	1235	pF
$C_{oss}$	Output Capacitance			197	265	pF
$C_{rss}$	Reverse Transfer Capacitance			181	275	pF
$R_g$	Gate Resistance	f = 1MHz		1.2		$\Omega$

### Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 13 \text{ V}, I_D = 16.4 \text{ A}, V_{GS} = 10 \text{ V}, R_{\text{GEN}} = 6 \Omega$		7	14	ns
$t_r$	Rise Time			3	10	ns
$t_{d(off)}$	Turn-Off Delay Time			16	29	ns
$t_f$	Fall Time			3	10	ns
$Q_g$	Total Gate Charge			17	24	nC
$Q_g$	Total Gate Charge	$V_{GS} = 0 \text{ V to } 5 \text{ V}$	$V_{DD} = 13 \text{ V}, I_D = 16.4 \text{ A}$	9.2	13	nC
$Q_{gs}$	Gate to Source Charge	$V_{GS} = 0 \text{ V to } 10 \text{ V}$	$V_{DD} = 13 \text{ V}, I_D = 16.4 \text{ A}$	2.8		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			4.0		nC

### Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_S = 3.1 \text{ A}$ (Note 2)		0.8	1.2	V
		$V_{GS} = 0 \text{ V}, I_S = 16.4 \text{ A}$ (Note 2)		0.9	1.3	
$t_{rr}$	Reverse Recovery Time	$I_F = 16.4 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}$		15	27	ns
				4	10	

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

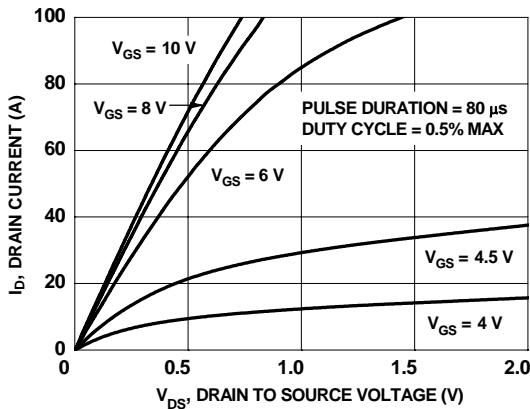


Figure 1. On-Region Characteristics

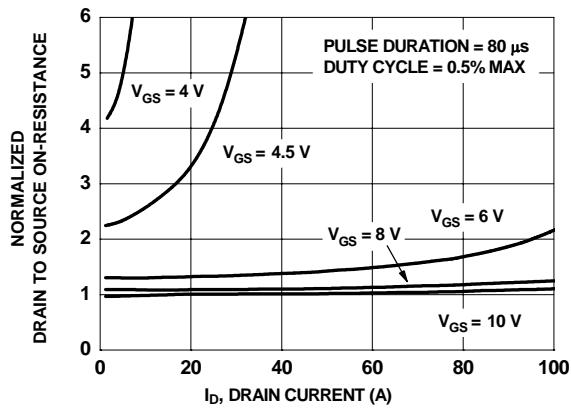


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

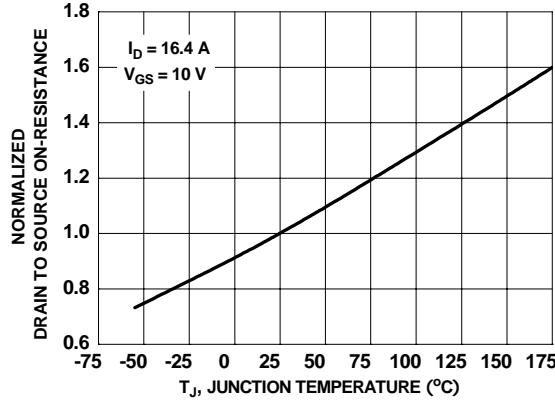


Figure 3. Normalized On-Resistance vs Junction Temperature

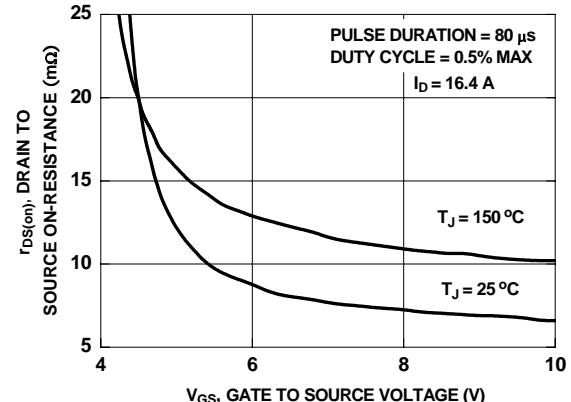


Figure 4. On-Resistance vs Gate to Source Voltage

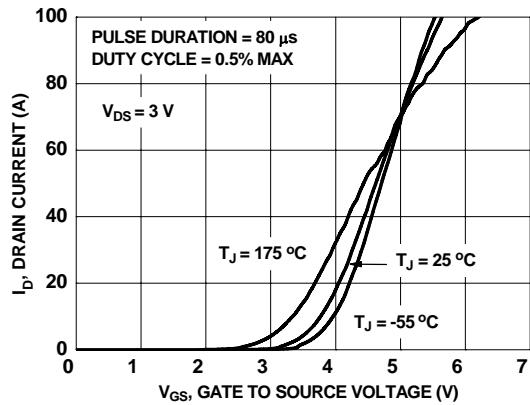


Figure 5. Transfer Characteristics

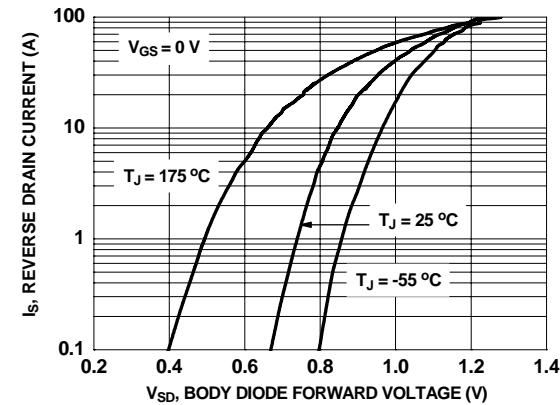


Figure 6. Source to Drain Diode Forward Voltage vs Source Current