



ON Semiconductor®

# FDPC4044-P

## Common Drain N-Channel PowerTrench® MOSFET

30 V, 27 A, 4.3 mΩ

### Features

- Max  $r_{S1S2(on)}$  = 4.3 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_{S1S2} = 27\text{ A}$
- Max  $r_{S1S2(on)}$  = 6.4 mΩ at  $V_{GS} = 4.5\text{ V}$ ,  $I_{S1S2} = 23\text{ A}$
- Package size/height: 3.3 x 3.3 x 0.8 mm
- Low inductance packaging shortens rise/fall times, resulting in lower switching losses
- MOSFET integration enables optimum layout for lower circuit inductance and reduced switch node ringing
- RoHS Compliant

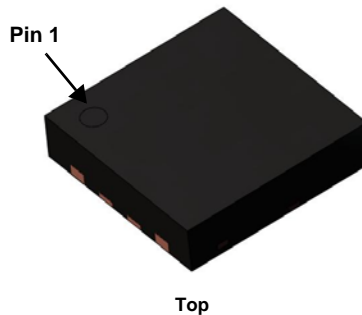
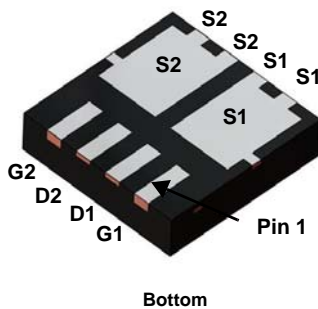


### General Description

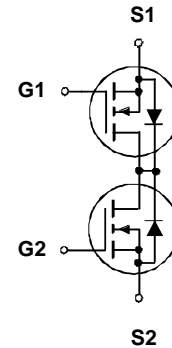
This device is designed specifically as a single package solution for Li-Ion battery pack protection circuit and other ultra-portable applications. It features two common drain N-channel MOSFETs, which enables bidirectional current flow. FDPC4044-P combines ON Semiconductor's advanced PowerTrench process with state of the art packaging process to minimize the on-state resistance.

### Applications

- Battery management
- Load switch
- Battery protection



Power Clip 33



### MOSFET Maximum Ratings $T_A = 25\text{ °C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{S1S2}$	Source1 to Source2 Voltage	30	V
$V_{GS}$	Gate to Source Voltage (Note 3)	±20	V
$I_{S1S2}$	Source1 to Source2 Current -Continuous $T_A = 25\text{ °C}$ (Note 1a)	27	A
	-Pulsed (Note 2)	120	
$P_D$	Power Dissipation $T_A = 25\text{ °C}$ (Note 1a)	2.7	W
	Power Dissipation $T_A = 25\text{ °C}$ (Note 1b)	1	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	°C

### Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	47	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1b)	127	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
40CF	FDPC4044-P	Power Clip 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

$I_{S1S2}$	Zero Gate Voltage Source1 to Source2 Current	$V_{S1S2} = 24\text{ V}, V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = 20\text{ V}, V_{S1S2} = 0\text{ V}$			100	nA

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{S1S2}, I_{S1S2} = 250\text{ }\mu\text{A}$	1.2	1.5	3	V
$r_{S1S2(on)}$	Static Source1 to Source2 On Resistance	$V_{GS} = 10\text{ V}, I_{S1S2} = 27\text{ A}$		3.2	4.3	m $\Omega$
		$V_{GS} = 4.5\text{ V}, I_{S1S2} = 23\text{ A}$		4.6	6.4	
		$V_{GS} = 10\text{ V}, I_{S1S2} = 27\text{ A}, T_J = 125\text{ }^\circ\text{C}$		4.5	7	
$g_{FS}$	Forward Transconductance	$V_{S1S2} = 10\text{ V}, I_{S1S2} = 27\text{ A}$		150		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{S1S2} = 15\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$		2295	3215	pF
$C_{oss}$	Output Capacitance			627	880	pF
$C_{riss}$	Reverse Transfer Capacitance			66	95	pF

### Switching Characteristics

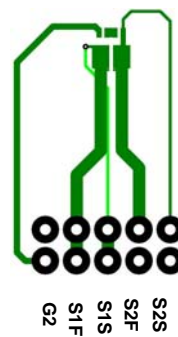
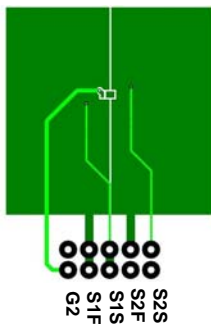
$t_{d(on)}$	Turn-On Delay Time	$V_{S1S2} = 15\text{ V}, I_{S1S2} = 27\text{ A}, V_{GS} = 10\text{ V}, R_{GEN} = 6\text{ }\Omega$		8.5	17	ns
$t_r$	Rise Time			4.8	10	ns
$t_{d(off)}$	Turn-Off Delay Time			32	52	ns
$t_f$	Fall Time			5.2	10	ns
$Q_g$	Total Gate Charge	$V_{S1S2} = 15\text{ V}, I_{S1S2} = 27\text{ A}, V_{G1S1} = 10\text{ V}, V_{G2S2} = 0\text{ V}$		35	49	nC
$Q_{gs}$	Gate to Source1 Gate Charge			5.7		nC
$Q_{gd}$	Gate to Source2 "Miller" Charge			4.7		nC

### Source1 to Source2 Diode Characteristics

$I_{fss}$	Maximum Continuous Source1 to Source2 Diode Forward Current			1	A
$V_{fss}$	Source1 to Source2 Diode Forward Voltage	$V_{G1S1} = 0\text{ V}, V_{G2S2} = 4.5\text{ V}, I_{fss} = 27\text{ A}$ (Note 2)	0.8	1.2	V

#### Notes:

- $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



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

- As an N-ch device, the negative  $V_{gs}$  rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

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

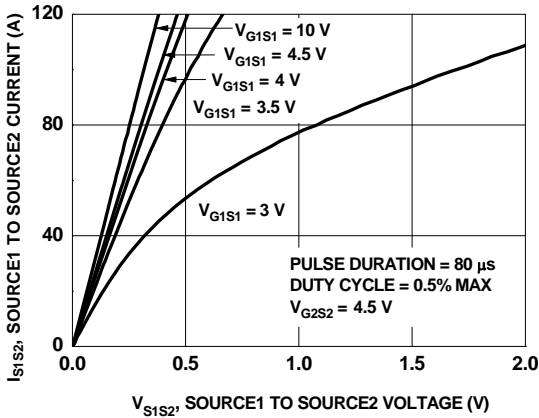


Figure 1. On-Region Characteristics

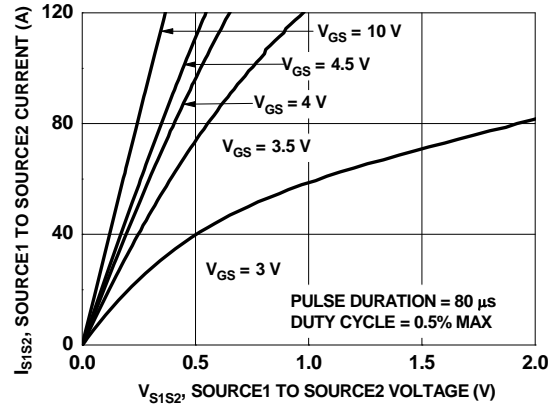


Figure 2. On-Region Characteristics

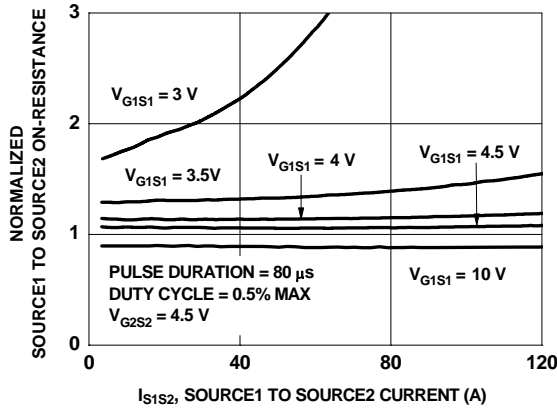


Figure 3. Normalized On-Resistance vs Source1 to Source2 Current and Gate Voltage

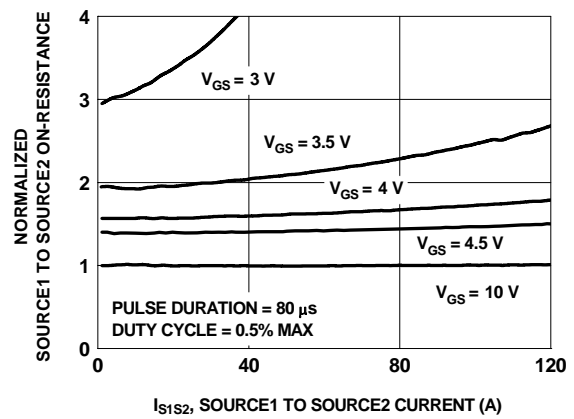


Figure 4. Normalized On-Resistance vs Source1 to Source2 Current and Gate Voltage

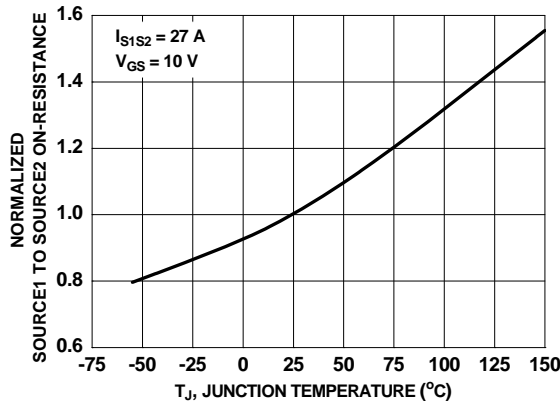


Figure 5. Normalized On-Resistance vs Junction Temperature

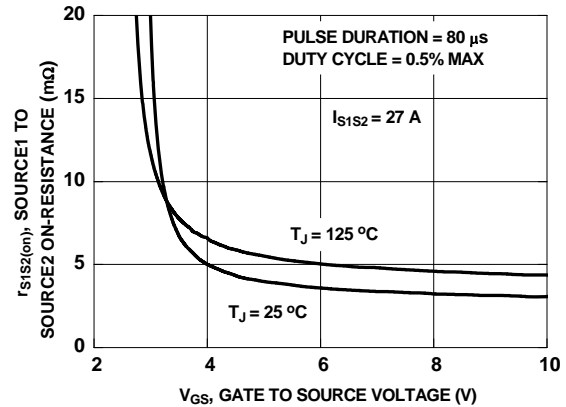


Figure 6. On-Resistance vs Gate to Source Voltage

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

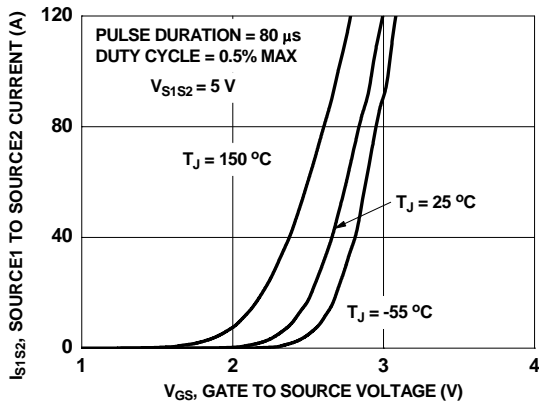


Figure 7. Transfer Characteristics

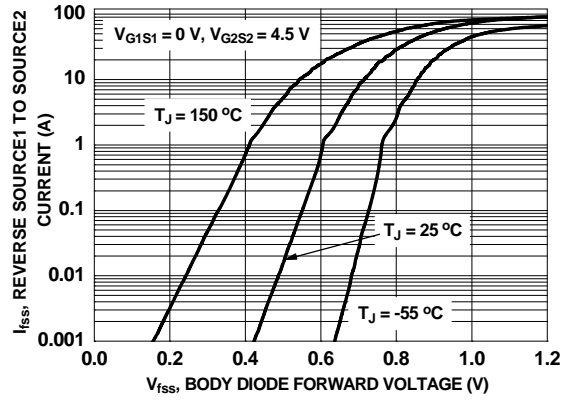


Figure 8. Source1 to Source2 Diode Forward Voltage vs Source Current

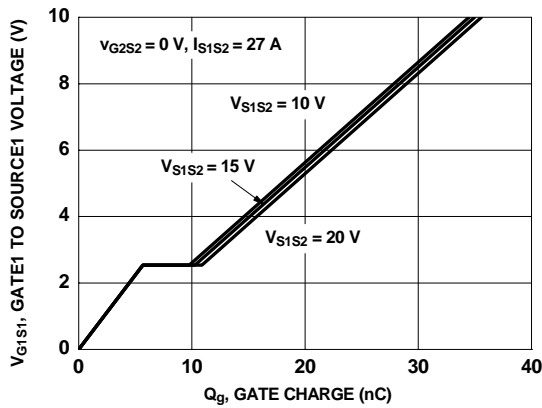


Figure 9. Gate Charge Characteristics

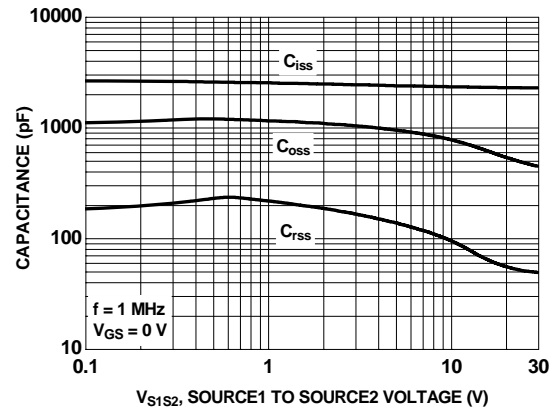


Figure 10. Capacitance vs Source1 to Source2 Voltage

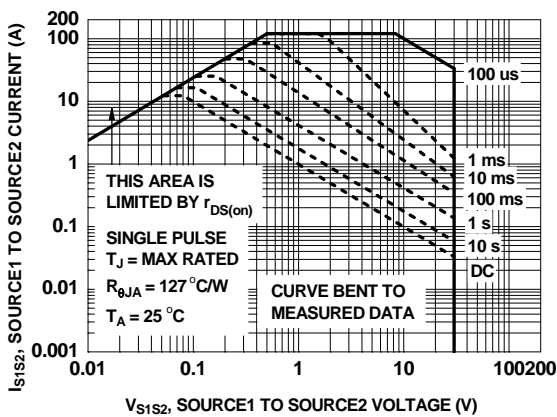


Figure 11. Forward Bias Safe Operating Area

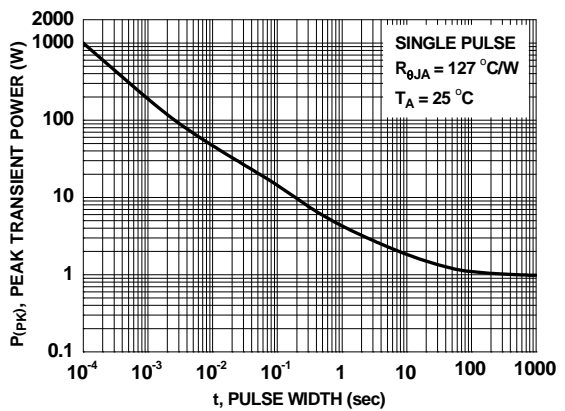
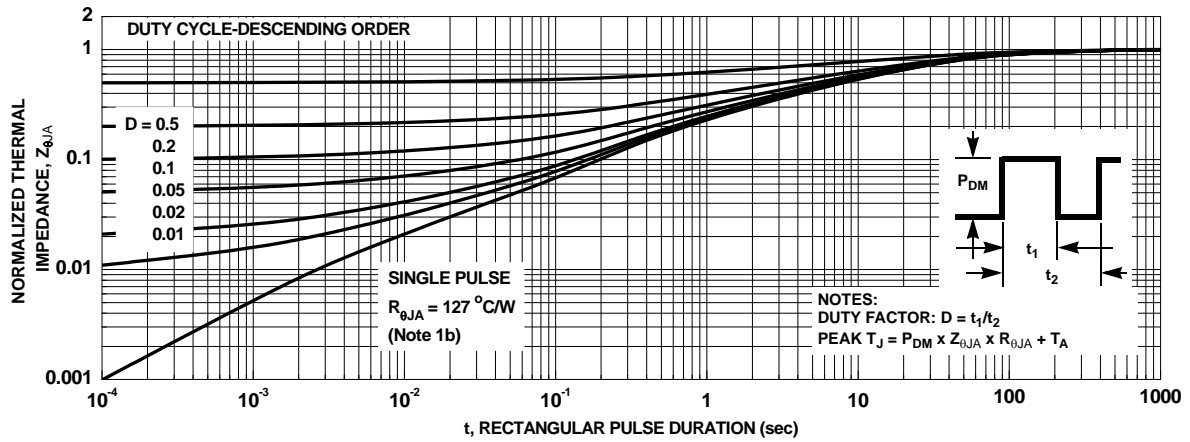


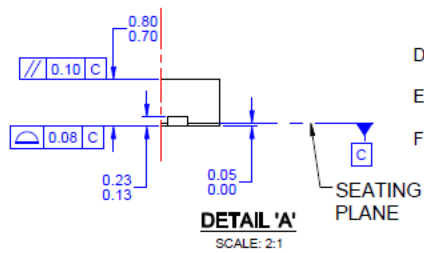
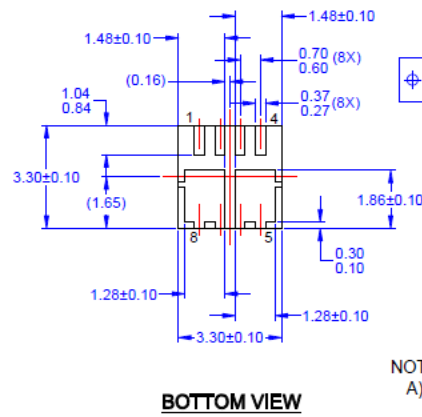
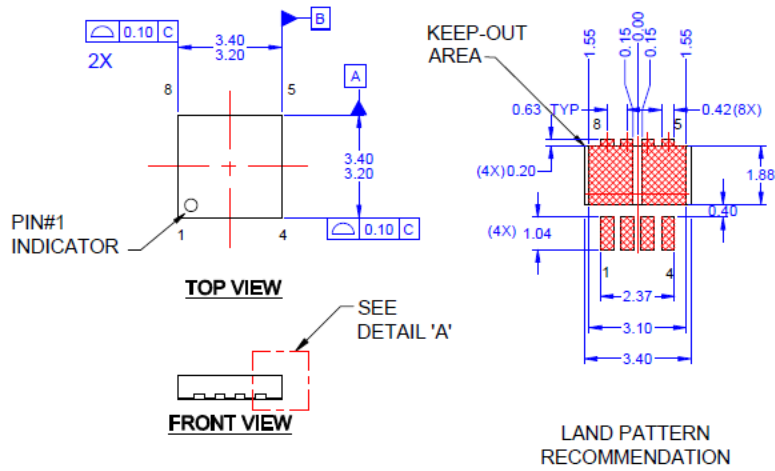
Figure 12. Single Pulse Maximum Power Dissipation

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




**Figure 13. Junction-to-Ambient Transient Thermal Response Curve**

## Dimensional Outline and Pad Layout



- NOTES: UNLESS OTHERWISE SPECIFIED
- DOES NOT FULLY CONFORM TO JEDEC REGISTRATION MO-229, DATED 08/2012
  - ALL DIMENSIONS ARE IN MILLIMETERS.
  - DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
  - DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.
  - IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.
  - DRAWING FILE NAME: MKT-PQFN08LREV2

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