

# FDS6679

## 30 Volt P-Channel PowerTrench® MOSFET

### General Description

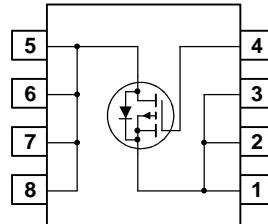
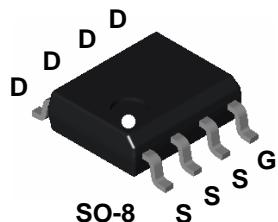
This P-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers, and battery chargers.

These MOSFETs feature faster switching and lower gate charge than other MOSFETs with comparable  $R_{DS(ON)}$  specifications.

The result is a MOSFET that is easy and safer to drive (even at very high frequencies), and DC/DC power supply designs with higher overall efficiency.

### Features

- -13 A, -30 V.  $R_{DS(ON)} = 9 \text{ m}\Omega$  @  $V_{GS} = -10 \text{ V}$   
 $R_{DS(ON)} = 13 \text{ m}\Omega$  @  $V_{GS} = -4.5 \text{ V}$
- Extended  $V_{GSS}$  range ( $\pm 25\text{V}$ ) for battery applications
- High performance trench technology for extremely low  $R_{DS(ON)}$
- High power and current handling capability



### Absolute Maximum Ratings

$T_A=25^\circ\text{C}$  unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DSS}$	Drain-Source Voltage	-30	V
$V_{GSS}$	Gate-Source Voltage	$\pm 25$	V
$I_D$	Drain Current – Continuous (Note 1a)	-13	A
	– Pulsed	-50	
$P_D$	Power Dissipation for Single Operation (Note 1a)	2.5	W
	(Note 1b)	1.2	
	(Note 1c)	1.0	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +175	°C

### Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a)	50	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	25	°C/W

### Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDS6679	FDS6679	13"	12mm	2500 units

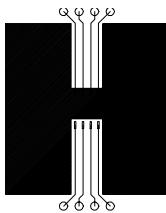
## Electrical Characteristics

$T_A = 25^\circ\text{C}$  unless otherwise noted

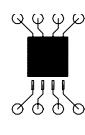
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
<b>Off Characteristics</b>						
$\text{BV}_{\text{DSS}}$	Drain–Source Breakdown Voltage	$V_{\text{GS}} = 0 \text{ V}$ , $I_D = -250 \mu\text{A}$	-30			V
$\frac{\Delta \text{BV}_{\text{DSS}}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250 \mu\text{A}$ , Referenced to $25^\circ\text{C}$		-23		$\text{mV}^\circ\text{C}$
$I_{\text{DSS}}$	Zero Gate Voltage Drain Current	$V_{\text{DS}} = -24 \text{ V}$ , $V_{\text{GS}} = 0 \text{ V}$			-1	$\mu\text{A}$
$I_{\text{GSS}}$	Gate–Body Leakage	$V_{\text{GS}} = \pm 25 \text{ V}$ , $V_{\text{DS}} = 0 \text{ V}$			$\pm 100$	nA
<b>On Characteristics</b> (Note 2)						
$V_{\text{GS(th)}}$	Gate Threshold Voltage	$V_{\text{DS}} = V_{\text{GS}}$ , $I_D = -250 \mu\text{A}$	-1	-1.6	-3	V
$\frac{\Delta V_{\text{GS(th)}}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = -250 \mu\text{A}$ , Referenced to $25^\circ\text{C}$		5		$\text{mV}^\circ\text{C}$
$R_{\text{DS(on)}}$	Static Drain–Source On–Resistance	$V_{\text{GS}} = -10 \text{ V}$ , $I_D = -13 \text{ A}$ $V_{\text{GS}} = -4.5 \text{ V}$ , $I_D = -11 \text{ A}$ $V_{\text{GS}} = -10 \text{ V}$ , $I_D = -13 \text{ A}$ , $T_J = 125^\circ\text{C}$	7.3 10 9.5	9 13 13		$\text{m}\Omega$
$I_{\text{D(on)}}$	On–State Drain Current	$V_{\text{GS}} = -10 \text{ V}$ , $V_{\text{DS}} = -5 \text{ V}$	-50			A
$g_{\text{FS}}$	Forward Transconductance	$V_{\text{DS}} = -5 \text{ V}$ , $I_D = -13 \text{ A}$	44			S
<b>Dynamic Characteristics</b>						
$C_{\text{iss}}$	Input Capacitance	$V_{\text{DS}} = -15 \text{ V}$ , $V_{\text{GS}} = 0 \text{ V}$ , $f = 1.0 \text{ MHz}$		3939		pF
$C_{\text{oss}}$	Output Capacitance			972		pF
$C_{\text{rss}}$	Reverse Transfer Capacitance			498		pF
<b>Switching Characteristics</b> (Note 2)						
$t_{\text{d(on)}}$	Turn–On Delay Time	$V_{\text{DD}} = -15 \text{ V}$ , $I_D = -1 \text{ A}$ , $V_{\text{GS}} = -10 \text{ V}$ , $R_{\text{GEN}} = 6 \Omega$		19	34	ns
$t_r$	Turn–On Rise Time			10	20	ns
$t_{\text{d(off)}}$	Turn–Off Delay Time			110	176	ns
$t_f$	Turn–Off Fall Time			65	104	ns
$Q_g$	Total Gate Charge	$V_{\text{DS}} = -15 \text{ V}$ , $I_D = -13 \text{ A}$ , $V_{\text{GS}} = -10 \text{ V}$		71	100	nC
$Q_{\text{gs}}$	Gate–Source Charge			12		nC
$Q_{\text{gd}}$	Gate–Drain Charge			15		nC
<b>Drain–Source Diode Characteristics and Maximum Ratings</b>						
$I_S$	Maximum Continuous Drain–Source Diode Forward Current			-2.1		A
$V_{\text{SD}}$	Drain–Source Diode Forward Voltage	$V_{\text{GS}} = 0 \text{ V}$ , $I_S = -2.1 \text{ A}$ (Note 2)		-0.7	-1.2	V

### Notes:

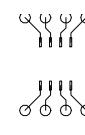
- $R_{\text{JJA}}$  is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins.  $R_{\text{JJC}}$  is guaranteed by design while  $R_{\text{JCA}}$  is determined by the user's board design.



a)  $50^\circ\text{C}/\text{W}$  (10 sec)  
 $62.5^\circ\text{C}/\text{W}$  steady state  
when mounted on a  
 $1\text{in}^2$  pad of 2 oz  
copper



b)  $105^\circ\text{C}/\text{W}$  when  
mounted on a  $.04 \text{ in}^2$   
pad of 2 oz copper

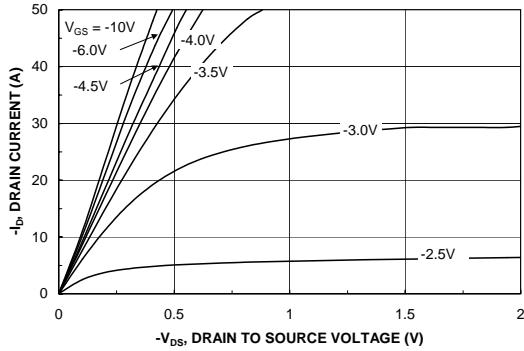


c)  $125^\circ\text{C}/\text{W}$  when mounted on a  
minimum pad.

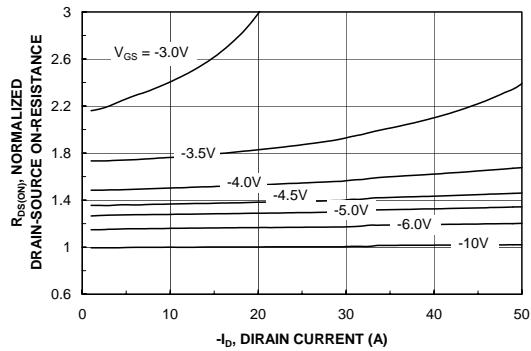
Scale 1 : 1 on letter size paper

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

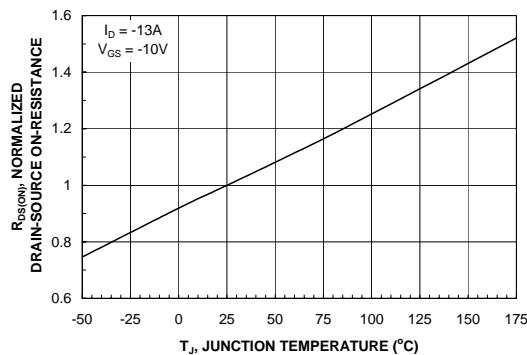
## Typical Characteristics



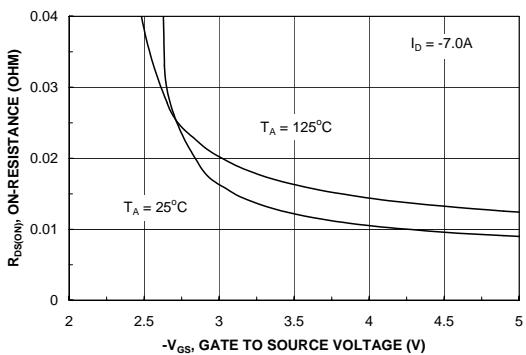
**Figure 1. On-Region Characteristics.**



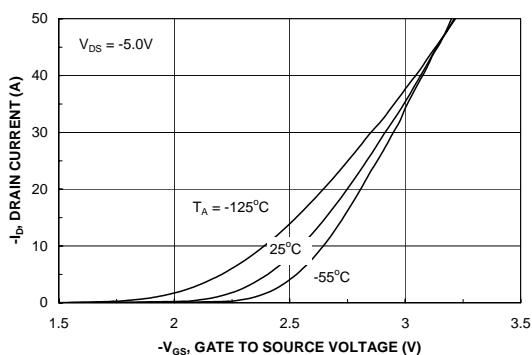
**Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.**



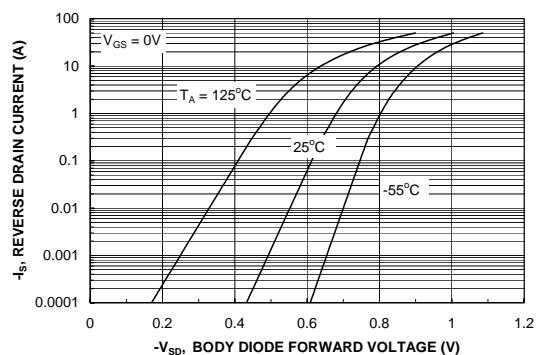
**Figure 3. On-Resistance Variation with Temperature.**



**Figure 4. On-Resistance Variation with Gate-to-Source Voltage.**

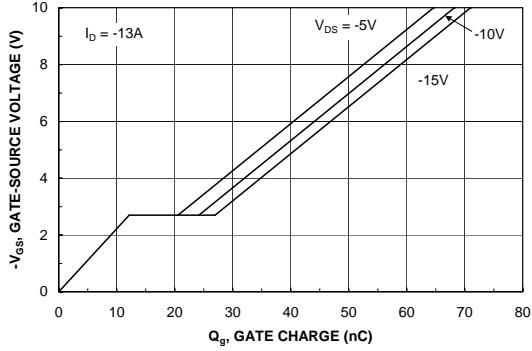


**Figure 5. Transfer Characteristics.**

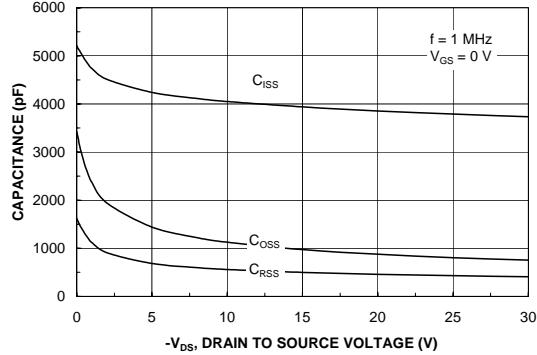


**Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.**

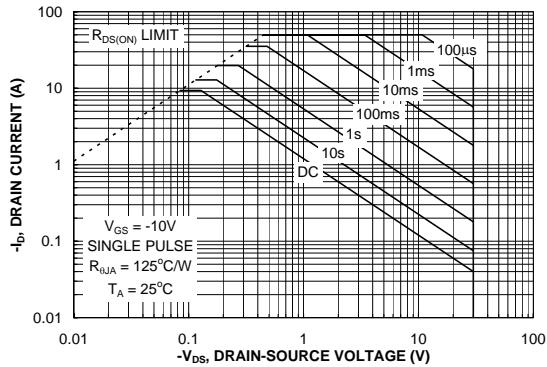
## Typical Characteristics



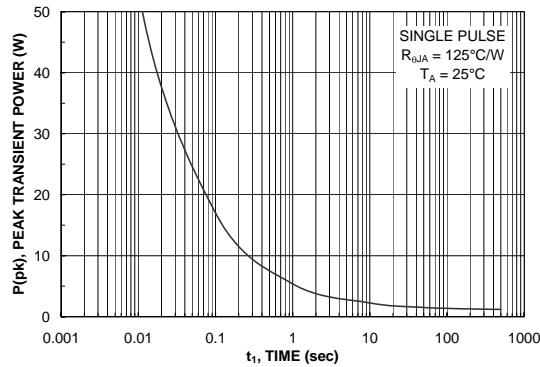
**Figure 7. Gate Charge Characteristics.**



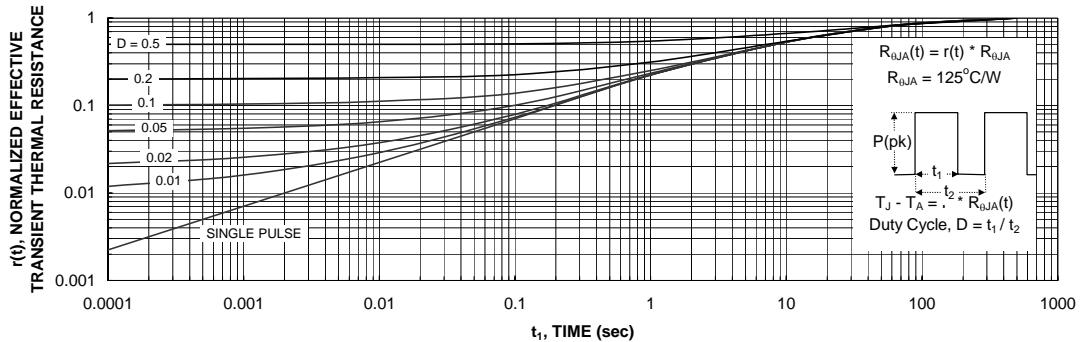
**Figure 8. Capacitance Characteristics.**



**Figure 9. Maximum Safe Operating Area.**



**Figure 10. Single Pulse Maximum Power Dissipation.**



**Figure 11. Transient Thermal Response Curve.**

Thermal characterization performed using the conditions described in Note 1c.  
Transient thermal response will change depending on the circuit board design.

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