

# FDC634P

## P-Channel 2.5V Specified PowerTrench<sup>®</sup> MOSFET

### General Description

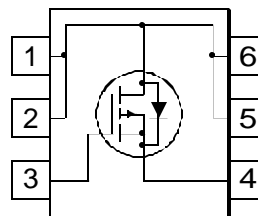
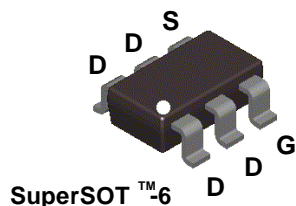
This P-Channel 2.5V specified MOSFET uses Fairchild's low voltage PowerTrench process. It has been optimized for battery power management applications.

### Applications

- Battery management
- Load switch
- Battery protection

### Features

- -3.5 A, -20 V.  $R_{DS(ON)} = 80\text{ m}\Omega$  @  $V_{GS} = -4.5\text{ V}$   
 $R_{DS(ON)} = 110\text{ m}\Omega$  @  $V_{GS} = -2.5\text{ V}$
- Low gate charge (7.2 nC typical)
- High performance trench technology for extremely low  $R_{DS(ON)}$



### Absolute Maximum Ratings T<sub>A</sub>=25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V <sub>DSS</sub>	Drain-Source Voltage	-20	V
V <sub>GSS</sub>	Gate-Source Voltage	±8	V
I <sub>b</sub>	Drain Current – Continuous (Note 1a)	-3.5	A
	– Pulsed	-20	
P <sub>D</sub>	Maximum Power Dissipation (Note 1a) (Note 1b)	1.6	W
		0.8	
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Junction Temperature Range	-55 to +150	°C

### Thermal Characteristics

R <sub>θJA</sub>	Thermal Resistance, Junction-to-Ambient (Note 1a)	78	°C/W
R <sub>θJC</sub>	Thermal Resistance, Junction-to-Case (Note 1)	30	°C/W

### Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
.634	FDC634P	7"	8mm	3000 units

## Electrical Characteristics

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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### Off Characteristics

$BV_{DSS}$	Drain–Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_b = -250\ \mu\text{A}$	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_b = -250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		-12		$\text{mV}/^\circ\text{C}$
$I_{bSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$			-1	$\mu\text{A}$
$I_{GSSF}$	Gate–Body Leakage, Forward	$V_{GS} = 8\text{ V}, V_{DS} = 0\text{ V}$			100	nA
$I_{GSSR}$	Gate–Body Leakage, Reverse	$V_{GS} = -8\text{ V}, V_{DS} = 0\text{ V}$			-100	nA

### On Characteristics (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_b = -250\ \mu\text{A}$	-0.4	-0.8	-1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_b = -250\ \mu\text{A}$ , Referenced to $25^\circ\text{C}$		3		$\text{mV}/^\circ\text{C}$
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = -4.5\text{ V}, I_b = -3.5\text{ A}$ $V_{GS} = -2.5\text{ V}, I_b = -3.1\text{ A}$ $V_{GS} = -4.5\text{ V}, I_b = -3.5\text{ A}, T_J = 125^\circ\text{C}$		60 82 77	80 110 130	$\text{m}\Omega$
$I_{b(on)}$	On–State Drain Current	$V_{GS} = -4.5\text{ V}, V_{DS} = -5\text{ V}$	-10			A
$g_{FS}$	Forward Transconductance	$V_{DS} = -5\text{ V}, I_b = -3.5\text{ A}$		11		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		779		pF
$C_{oss}$	Output Capacitance			121		pF
$C_{rss}$	Reverse Transfer Capacitance			56		pF

### Switching Characteristics (Note 2)

$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = -10\text{ V}, I_b = -1\text{ A},$ $V_{GS} = -4.5\text{ V}, R_{GEN} = 6\ \Omega$		10	20	ns
$t_r$	Turn–On Rise Time			9	19	ns
$t_{d(off)}$	Turn–Off Delay Time			27	43	ns
$t_f$	Turn–Off Fall Time			11	20	ns
$Q_g$	Total Gate Charge		$V_{DS} = -10\text{ V}, I_b = -3.5\text{ A},$ $V_{GS} = -4.5\text{ V}$		7.2	10
$Q_{gs}$	Gate–Source Charge			1.7		nC
$Q_{gd}$	Gate–Drain Charge			1.5		nC

### Drain–Source Diode Characteristics and Maximum Ratings

$I_S$	Maximum Continuous Drain–Source Diode Forward Current				-1.3	A
$V_{SD}$	Drain–Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = -1.3\text{ A}$ (Note 2)		-0.8	-1.2	V

#### Notes:

- $R_{\theta JA}$  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.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



- a)  $78^\circ\text{C}/\text{W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper



- b)  $156^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

Scale 1 : 1 on letter size paper

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

### Typical Characteristics

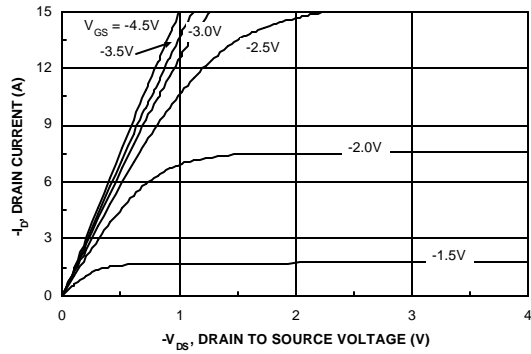


Figure 1. On-Region Characteristics.

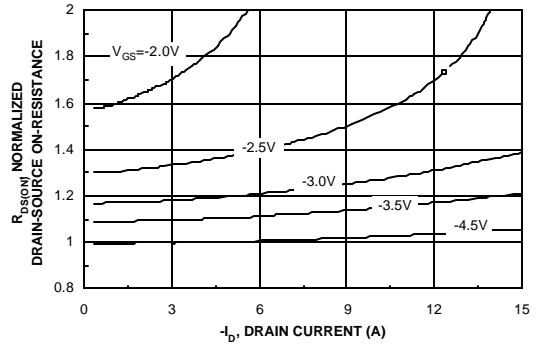


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

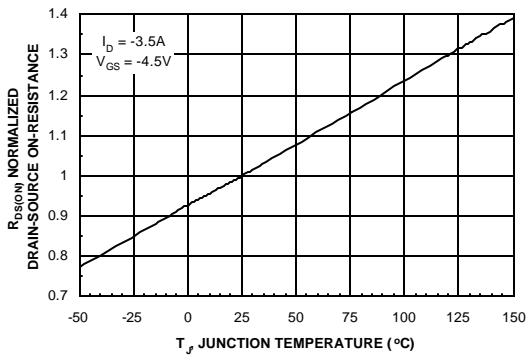


Figure 3. On-Resistance Variation with Temperature.

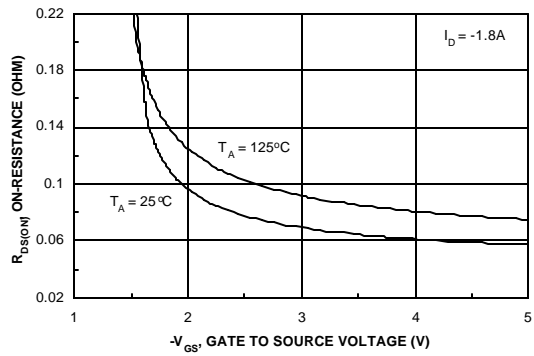


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

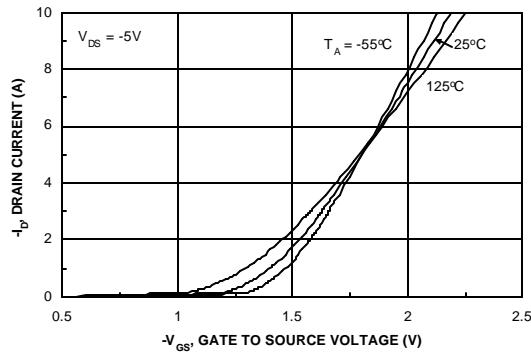


Figure 5. Transfer Characteristics.

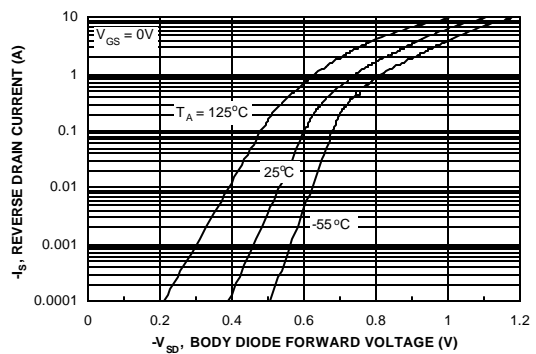
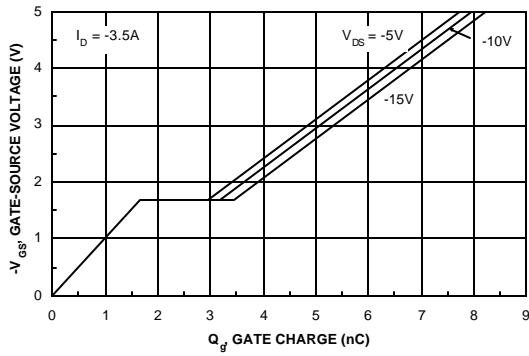
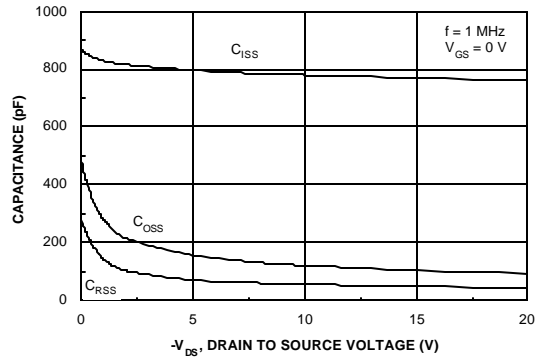


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

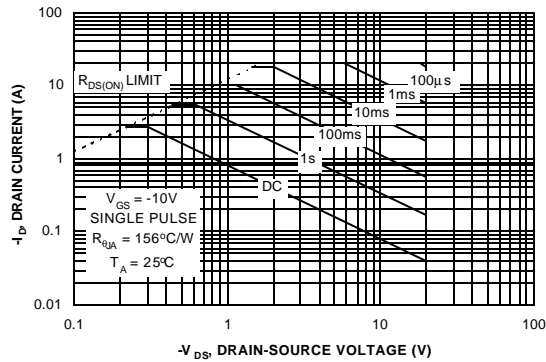
### Typical Characteristics



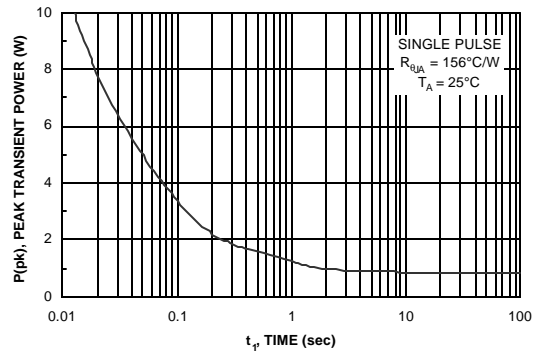
**Figure 7. Gate Charge Characteristics.**



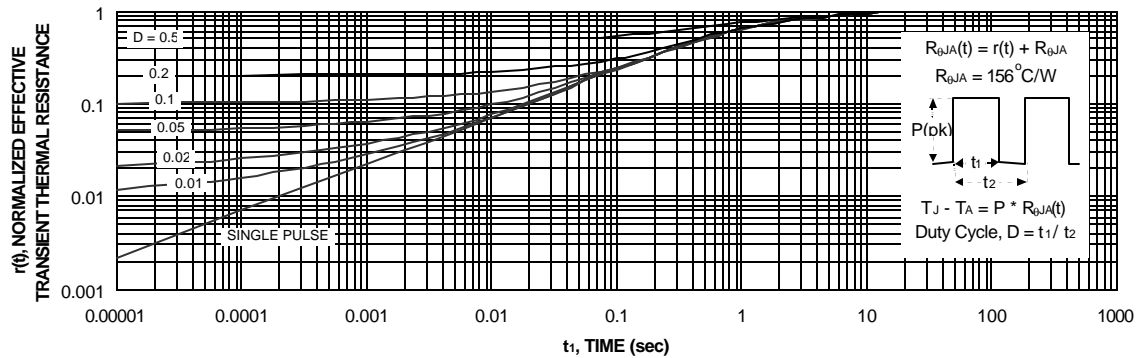
**Figure 8. Capacitance Characteristics.**



**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 1b.  
Transient thermal response will change depending on the circuit board design.

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