FAIRCHILD SEMICONDUCTOR®

January 2004

FDC6036P

P-Channel 1.8V Specified PowerTrench® MOSFET

General Description

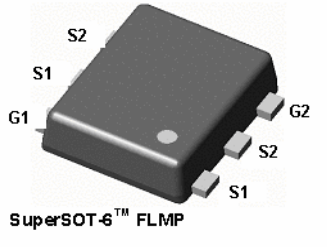
This dual P-Channel 1.8V specified MOSFET uses Fairchild's advanced low voltage PowerTrench process. Packaged in FLMP SSOT-6, the $R_{DS(ON)}$ and thermal properties of the device are optimized for battery power management applications.

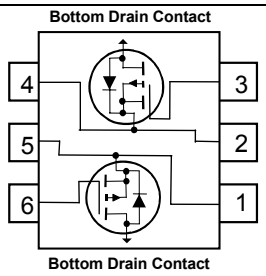
Applications

- Battery management/Charger Application
- Load switch

Features

- –5 A, –20 V. $R_{DS(ON)}$ = 44 mΩ @ V_{GS} = –4.5 V
  $R_{DS(ON)}$ = 64 mΩ @ V_{GS} = –2.5 V
  $R_{DS(ON)}$ = 95 mΩ @ V_{GS} = –1.8 V
- Low gate charge, High Power and Current handling capability
- High performance trench technology for extremely low $R_{DS(ON)}$
- FLMP SSOT-6 package: Enhanced thermal performance in industry-standard package size





MOSFET Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		–20	V
V_{GSS}	Gate-Source Voltage		±8	V
I_D	Drain Current – Continuous	(Note 1a)	–5	A
	– Pulsed		–20	
P_D	Power Dissipation for Dual Operation		1.8	W
	Power Dissipation for Single Operation	(Note 1a)	1.8	
		(Note 1b)	0.9	
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)	68	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case		1	

Package Marking and Ordering Information

.036	FDC6036P	7''	8mm	3000 units

Electrical Characteristics

T_A = 25°C unless otherwise noted

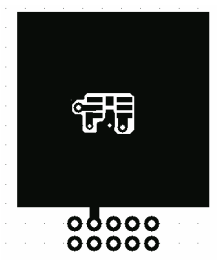
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain–Source BreakdownVoltage	V_{GS} = 0 V, I_D = –250 μA	–20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = –250 μA, Referenced to 25°C		–24		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = –16 V, V_{GS} = 0 V			–1	μA
I_{GSS}	Gate–Body Leakage	V_{GS} = ±8 V, V_{DS} = 0 V			±100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = –250 μA	–0.4	–0.7	–1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = –250 μA, Referenced to 25°C		4.4		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = –4.5 V, I_D = –5.0 A V_{GS} = –2.5 V, I_D = –4.0 A V_{GS} = –1.8 V, I_D = –3.2 A V_{GS} = –4.5 V, I_D = –5 A, T_J=125°C		37 52 74 51	44 64 95 61	mΩ
gfs	Forward Transconductance	V_{DS} = –5 V, I_D = –5 A		16		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = –10 V, V_{GS} = 0 V, f = 1.0 MHz		992		pF
C_{oss}	Output Capacitance			169		pF
C_{rss}	Reverse Transfer Capacitance			85		pF
Rg	Gate Resistance	V_{GS} = 15 mV f = 1.0 MHz		8.6		mΩ
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = –10 V, I_D = –1 A, V_{GS} = –4.5 V, R_{GEN} = 6 Ω		12	24	ns
t_r	Turn–On Rise Time			10	20	ns
$t_{d(off)}$	Turn–Off Delay Time			40	64	ns
t_f	Turn–Off Fall Time			20	36	ns
Q_g	Total Gate Charge	V_{DS} = –10 V, I_D = –5 A, V_{GS} = –4.5 V		10	14	nC
Q_{gs}	Gate–Source Charge			1.7		nC
Q_{gd}	Gate–Drain Charge			2.0		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				–1.25	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = –1.25 A (Note 2)		–0.7	–1.2	V
trr	Diode Reverse Recovery Time	I_F = –5 A, d_{iF}/d_t = 100 A/μs		19		ns
Qrr	Diode Reverse Recovery Charge			7.8		nC

Electrical Characteristics

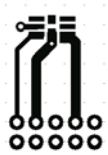
T_A = 25°C unless otherwise noted

NOTES:

1. $R_{\theta JA}$ 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) 60°C/W when mounted on a 1in^2 pad of 2 oz copper (Single Operation).

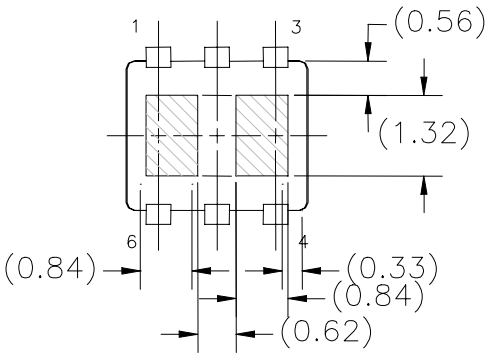


b) 130°C/W when mounted on a minimum pad of 2 oz copper (Single Operation).

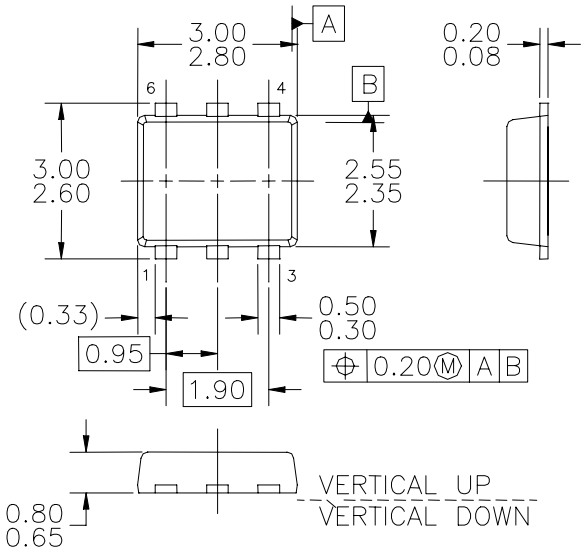
Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width < 300μs, Duty Cycle < 2.0%

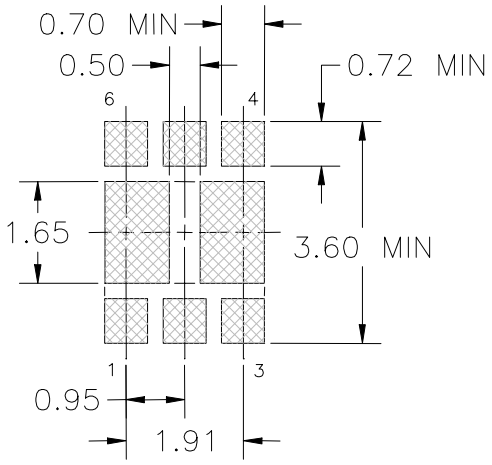
Dimensional Outline and Pad Layout



Bottom View



Top View



Recommended Landing Pattern

NOTES: UNLESS OTHERWISE SPECIFIED

ALL DIMENSIONS ARE IN MILLIMETERS.

Typical Characteristics

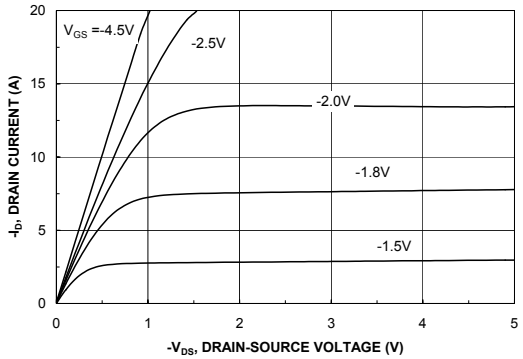


Figure 1. On-Region Characteristics.

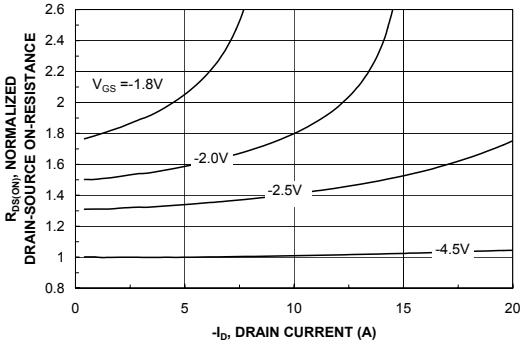


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

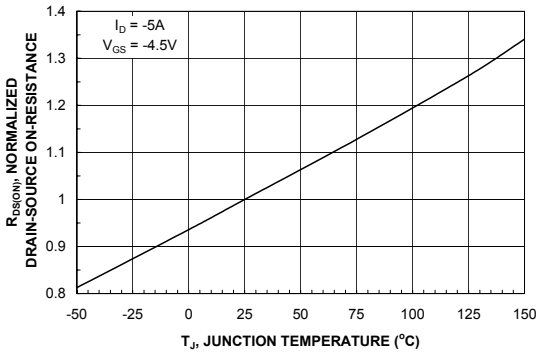


Figure 3. On-Resistance Variation with Temperature.

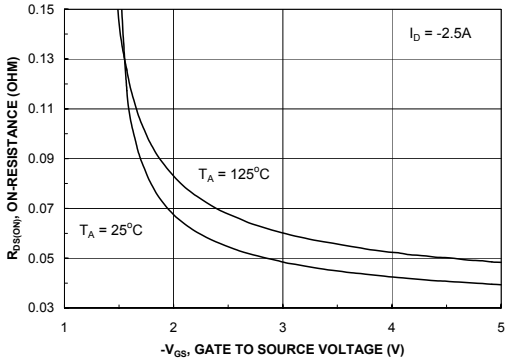


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

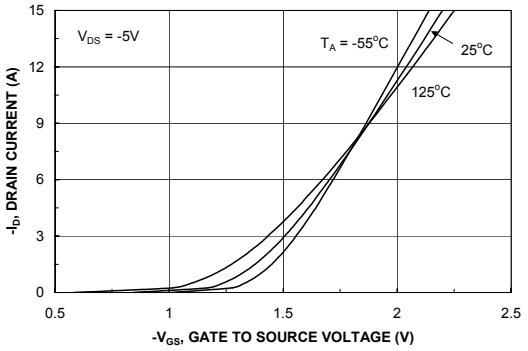


Figure 5. Transfer Characteristics.

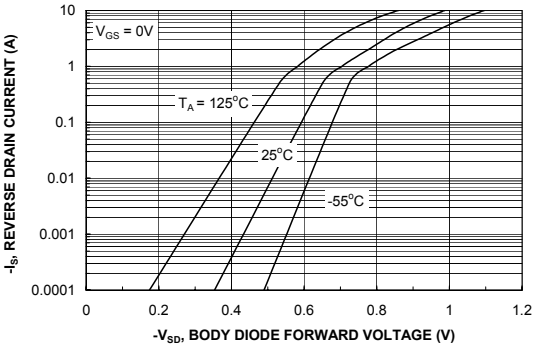


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

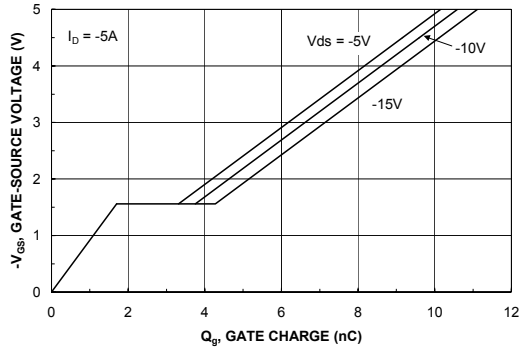


Figure 7. Gate Charge Characteristics.

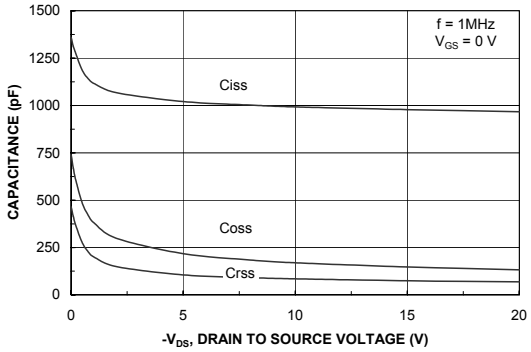


Figure 8. Capacitance Characteristics.

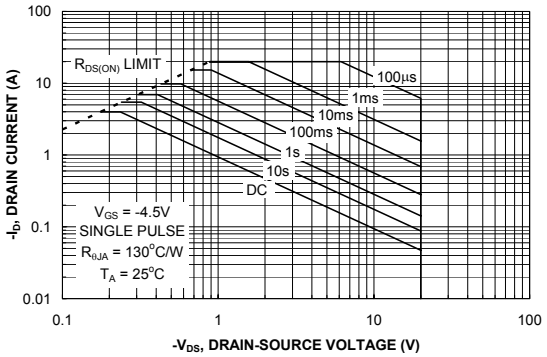


Figure 9. Maximum Safe Operating Area.

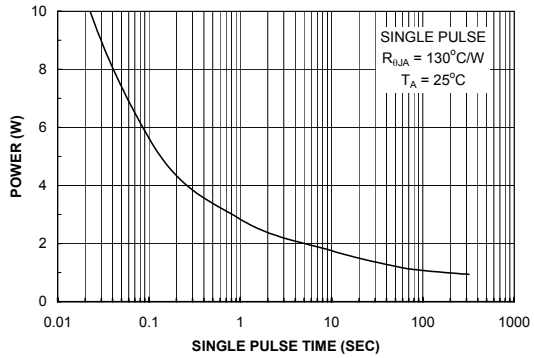


Figure 10. Single Pulse Maximum Power Dissipation.

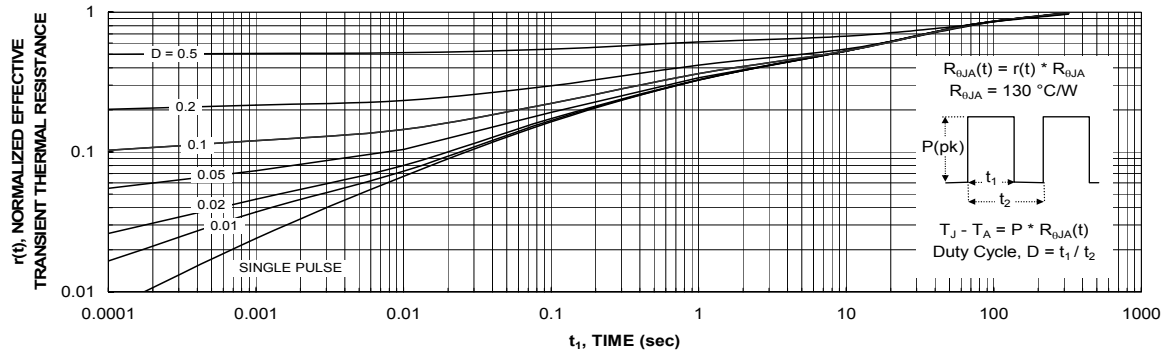


Figure 11. Transient Thermal Response Curve.

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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