

FDC699P

P-Channel 2.5V PowerTrench® MOSFET

General Description

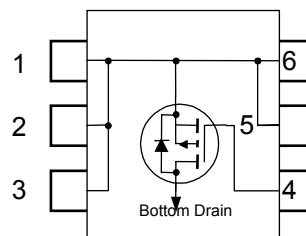
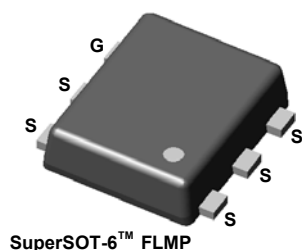
This P-Channel 2.5V specified MOSFET is a rugged gate version of Fairchild Semiconductor's advanced PowerTrench process. It has been optimized for power management applications with a wide range of gate drive voltage (2.5V – 12V).

Applications

- Battery management
- Load Switch
- Battery protection

Features

- –7 A, –20 V $R_{DS(ON)} = 22\text{ m}\Omega @ V_{GS} = -4.5\text{ V}$
 $R_{DS(ON)} = 30\text{ m}\Omega @ V_{GS} = -2.5\text{ V}$
- High performance trench technology for extremely low $R_{DS(ON)}$
- Fast switching speed
- FLMP SuperSOT-6 package: Enhanced thermal performance in industry-standard package size



Absolute Maximum Ratings

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

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain-Source Voltage	–20	V
V_{GSS}	Gate-Source Voltage	± 12	V
I_D	Drain Current – Continuous (Note 1a)	–7	A
	– Pulsed (Note 1b)	–40	
P_D	Power Dissipation (Note 1a)	2	W
	(Note 1b)	1.5	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	–55 to +150	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient (Note 1a) (Note 1b)	60	$^\circ\text{C/W}$
		111	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.5	

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
.699	FDC699P	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	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$, Referenced to 25°C		-12		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -16\text{ V}, V_{GS} = 0\text{ V}$			-1	μA
I_{GSS}	Gate–Body Leakage	$V_{GS} = \pm 12\text{ V}, V_{DS} = 0\text{ V}$			± 100	nA

On Characteristics (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = -250\text{ }\mu\text{A}$	-0.6	-0.9	-1.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$, Referenced to 25°C		3		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = -4.5\text{ V}, I_D = -7\text{ A}$ $V_{GS} = -2.5\text{ V}, I_D = -6\text{ A}$ $V_{GS} = -4.5\text{ V}, I_D = -7\text{ A}, T_J = 125^\circ\text{C}$		14 21 17	22 30 31	m Ω
g_{FS}	Forward Transconductance	$V_{DS} = -5\text{ V}, I_D = -7\text{ A}$		30		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$		2640		pF
C_{oss}	Output Capacitance			560		pF
C_{rss}	Reverse Transfer Capacitance			280		pF
R_G	Gate Resistance	$V_{GS} = 15\text{ mV}, f = 1.0\text{ MHz}$		3.6		Ω

Switching Characteristics (Note 2)

$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = -10\text{ V}, I_D = -1\text{ A},$ $V_{GS} = -4.5\text{ V}, R_{GEN} = 6\text{ }\Omega$		16	28	ns
t_r	Turn–On Rise Time			11	19	ns
$t_{d(off)}$	Turn–Off Delay Time			75	120	ns
t_f	Turn–Off Fall Time			41	65	ns
Q_g	Total Gate Charge	$V_{DS} = -10\text{ V}, I_D = -7\text{ A},$ $V_{GS} = -5\text{ V}$		27	38	nC
Q_{gs}	Gate–Source Charge			5		nC
Q_{gd}	Gate–Drain Charge			7		nC

Drain–Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain–Source Diode Forward Current			-1.6		A
V_{SD}	Drain–Source Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = -1.6\text{ A}$ (Note 2)		-0.7	-1.2	V
t_{rr}	Reverse Recovery Time	$I_F = -7\text{ A},$ $dI_F/dt = 100\text{ A}/\mu\text{s}$		28		ns
Q_{rr}	Reverse Recovery Charge			14		nC

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 1 in^2 pad of 2 oz copper

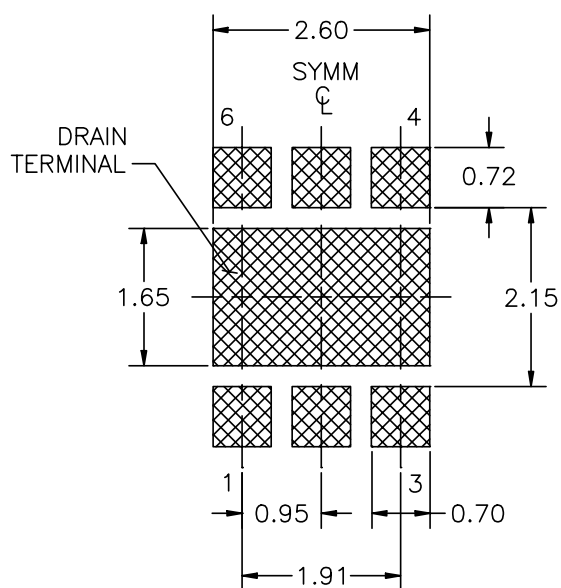
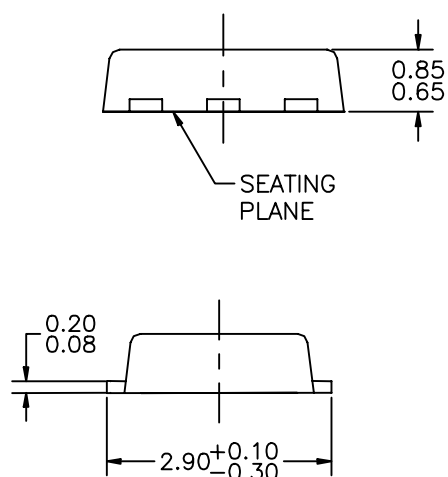
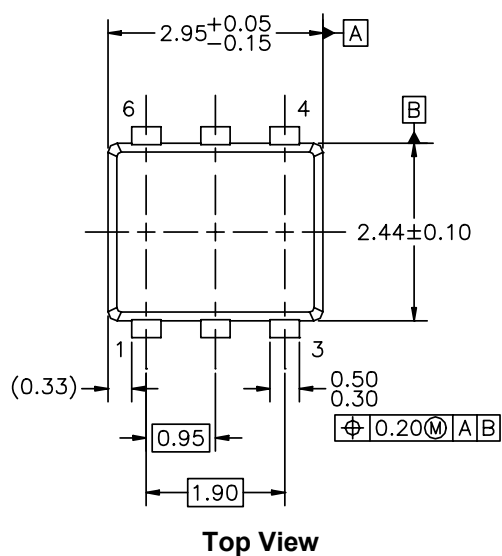
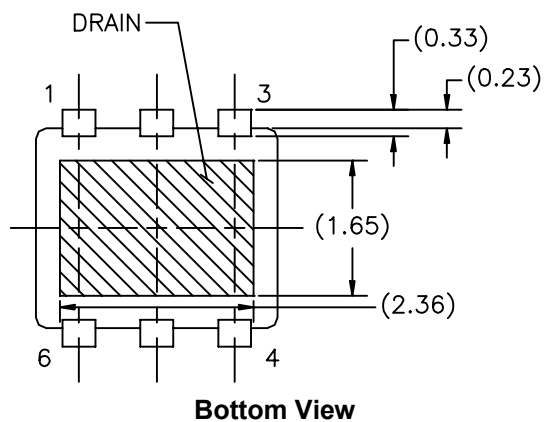


b) 111°C/W when mounted on a minimum pad of 2 oz copper

Scale 1 : 1 on letter size paper

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

Dimensional Outline and Pad Layout



Typical Characteristics

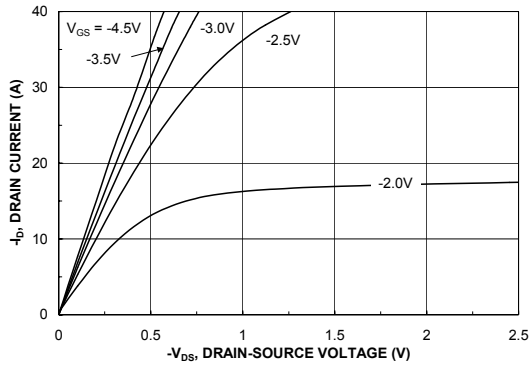


Figure 1. On-Region Characteristics.

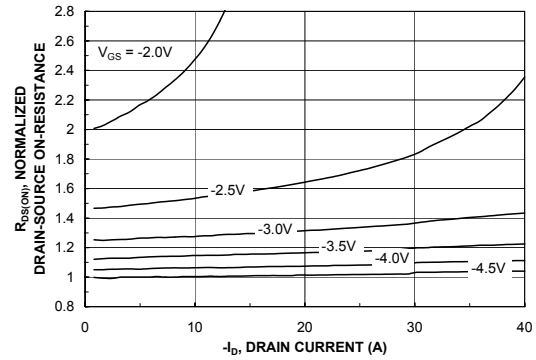


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

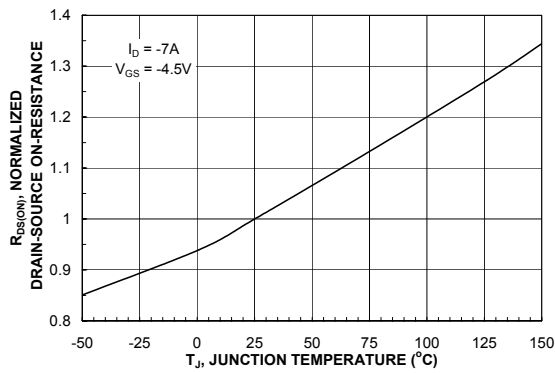


Figure 3. On-Resistance Variation with Temperature.

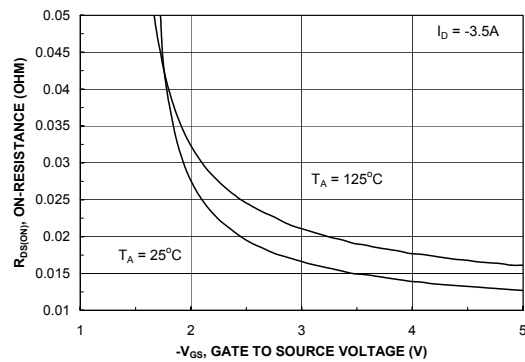


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

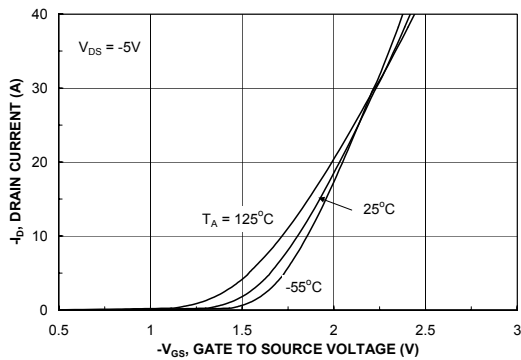


Figure 5. Transfer Characteristics.

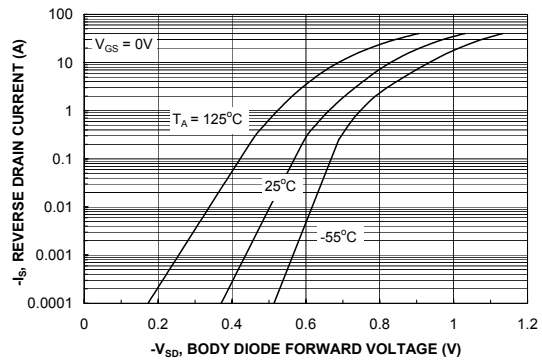


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

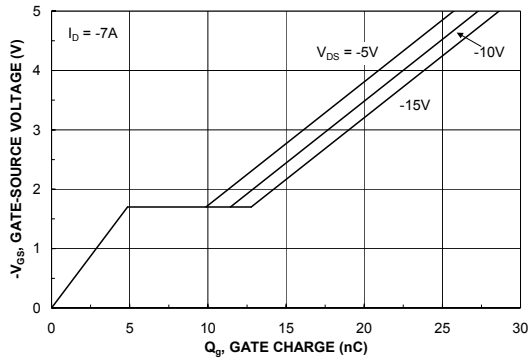


Figure 7. Gate Charge Characteristics.

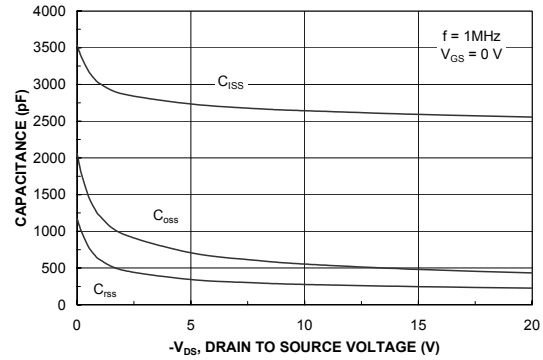


Figure 8. Capacitance Characteristics.

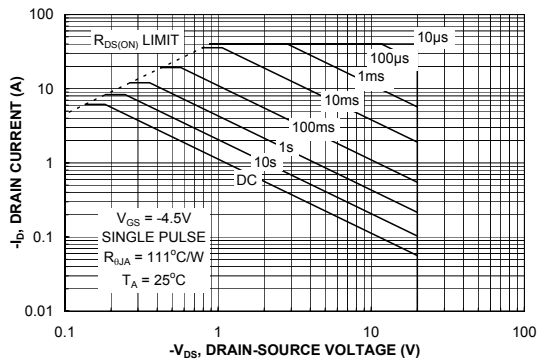


Figure 9. Maximum Safe Operating Area.

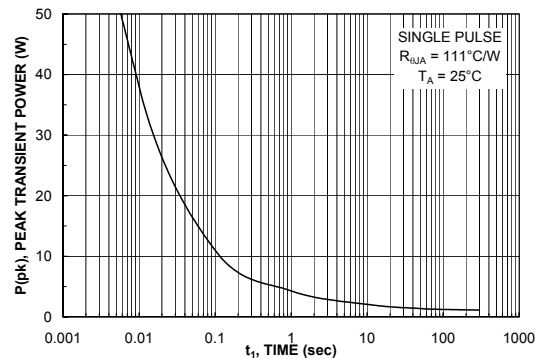


Figure 10. Single Pulse Maximum Power Dissipation.

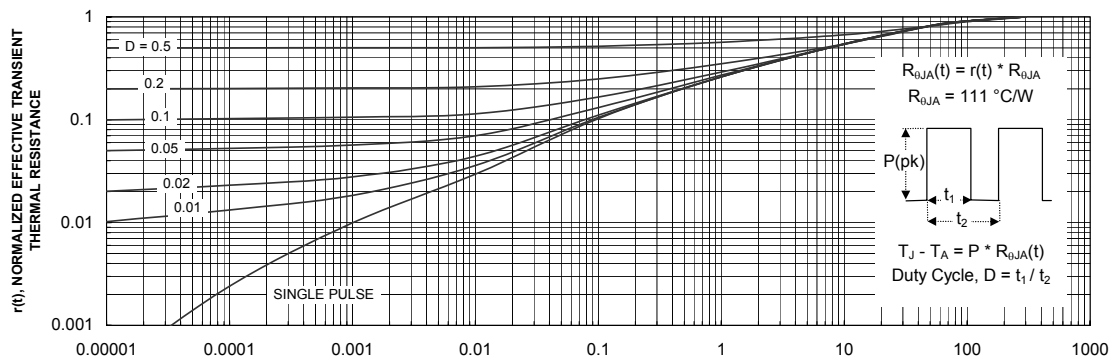


Figure 11. Transient Thermal Response Curve.

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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