FAIRCHILD
SEMICONDUCTOR ™

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FDC3512

80V N-Channel PowerTrench® MOSFET

General Description

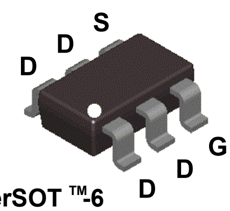
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $R_{DS(ON)}$ and fast switching speed.

Applications

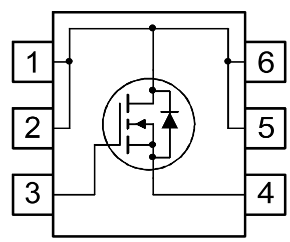
- DC/DC converter

Features

- 3.0 A, 80 V $R_{DS(ON)}$ = 77 mΩ @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 88 mΩ @ V_{GS} = 6 V
- High performance trench technology for extremely low $R_{DS(ON)}$
- Low gate charge (13nC typ)
- High power and current handling capability
- Fast switching speed



SuperSOT ™-6



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		80	V
V_{GSS}	Gate-Source Voltage		± 20	V
I_D	Drain Current – Continuous	(Note 1a)	3.0	A
	– Pulsed		20	
P_D	Maximum Power Dissipation	(Note 1a)	1.6	W
		(Note 1b)	0.8	
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)	78	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	30	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
.352	FDC3512	7''	8mm	3000 units

Electrical Characteristics

T_A = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Drain-Source Avalanche Ratings (Note 2)						
W_{DSS}	Drain-Source Avalanche Energy	Single Pulse, V_{DD} = 40 V, I_D=3.0 A			90	mJ
I_{AR}	Drain-Source Avalanche Current				3.0	A
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = 250 µA	80			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		80		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 64 V, V_{GS} = 0 V			1	µA
I_{GSSF}	Gate–Body Leakage, Forward	V_{GS} = 20 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	V_{GS} = –20 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	2	2.4	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		–6		mV/°C
$R_{DS(on)}$	Static Drain–Source On Resistance	V_{GS} = 10 V, I_D = 3.0 A V_{GS} = 6.0 V, I_D = 2.8 A V_{GS} = 10 V, I_D = 3.0 A;T_J = 125°C		56 61 97	77 88 141	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = 10 V, V_{DS} = 5 V	10			A
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 3.0 A		14		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 40 V, V_{GS} = 0 V, f = 1.0 MHz		634		pF
C_{oss}	Output Capacitance			58		pF
C_{rss}	Reverse Transfer Capacitance			28		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 40 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		7	14	ns
t_r	Turn–On Rise Time			3	6	ns
$t_{d(off)}$	Turn–Off Delay Time			24	28	ns
t_f	Turn–Off Fall Time			4	8	ns
Q_g	Total Gate Charge	V_{DS} = 40 V, I_D = 3.0 A, V_{GS} = 10 V		13	18	nC
Q_{gs}	Gate–Source Charge			2.4		nC
Q_{gd}	Gate–Drain Charge			2.8		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 V, I_S = 1.3 A (Note 2)		0.8	1.2	V
t_{rr}	Diode Reverse Recovery Time	I_F = 3.0 A, d_{iF}/d_t = 300 A/µs (Note 2)		28.2		nS
Q_{rr}	Diode Reverse Recovery Charge			48		nC

Notes:

1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient 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°C/W when mounted on a 1in^2 pad of 2oz copper on FR-4 board.

b. 156°C/W when mounted on a minimum pad.

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

Typical Characteristics

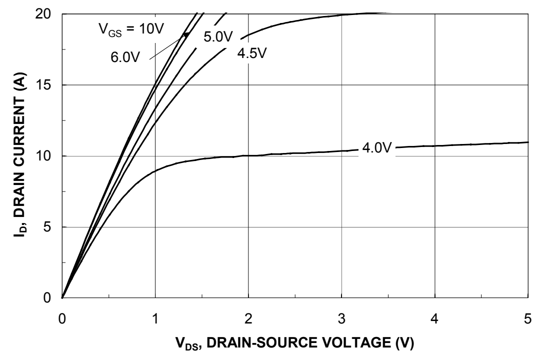


Figure 1. On-Region Characteristics.

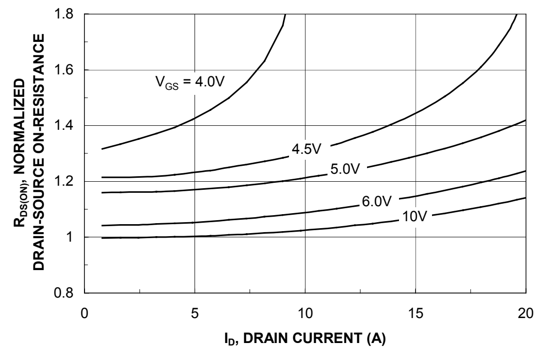


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

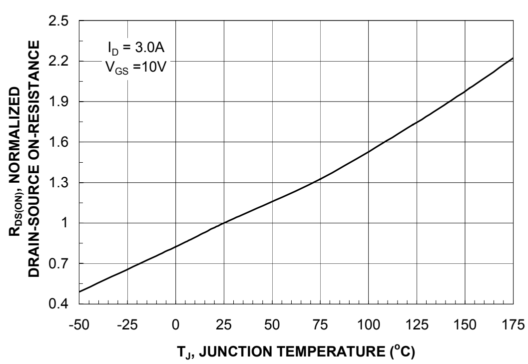


Figure 3. On-Resistance Variation with Temperature.

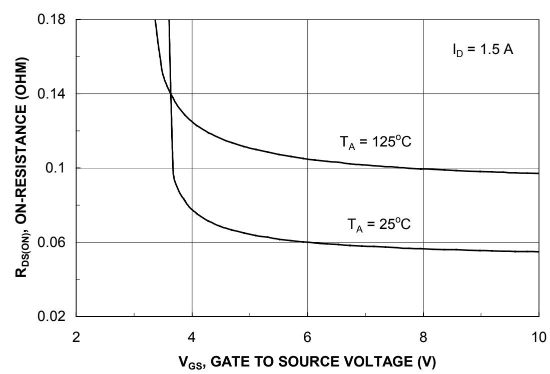


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

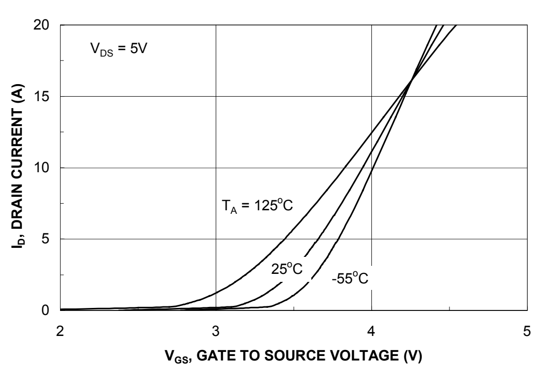


Figure 5. Transfer Characteristics.

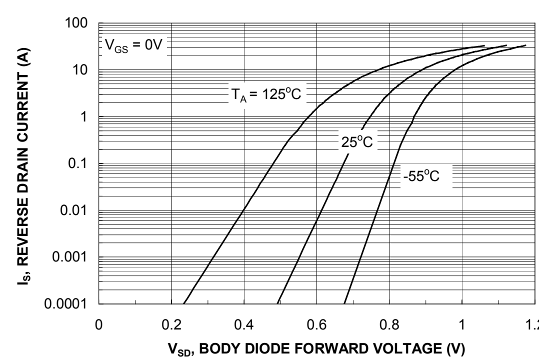


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

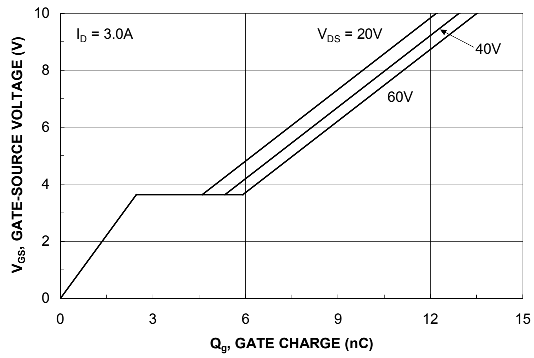


Figure 7. Gate Charge Characteristics.

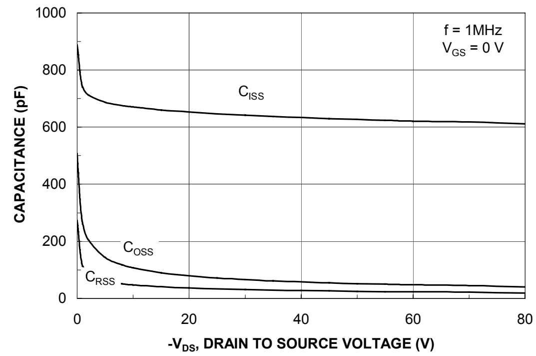


Figure 8. Capacitance Characteristics.

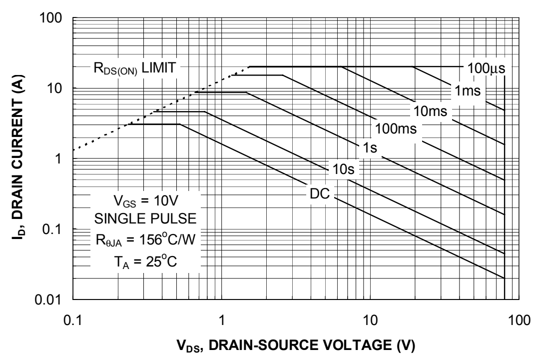


Figure 9. Maximum Safe Operating Area.

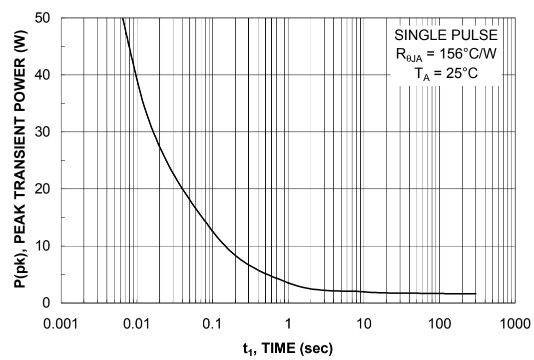


Figure 10. Single Pulse Maximum Power Dissipation.

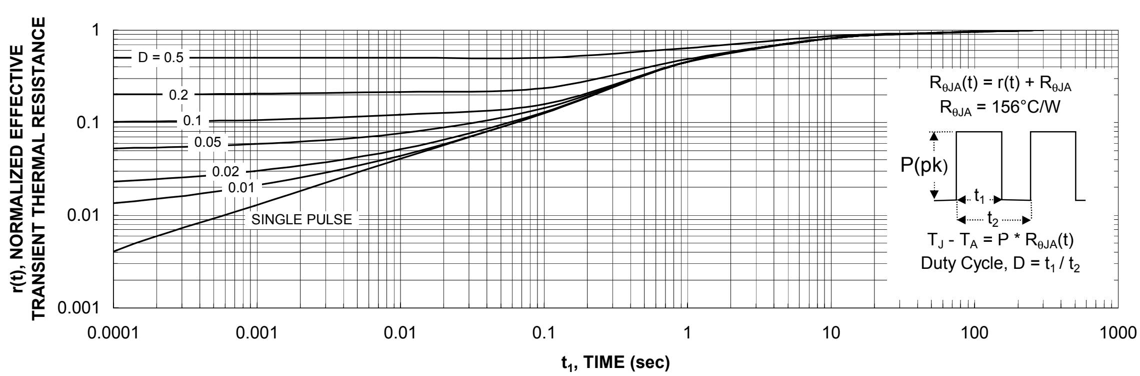


Figure 11. Transient Thermal Response Curve.

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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