



ON Semiconductor®

FDC3512

FDC3512

80V N-Channel PowerTrench® MOSFET Features

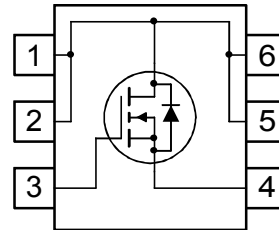
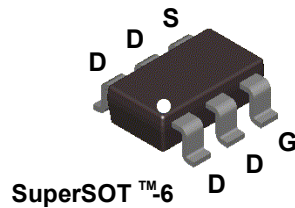
General Description

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

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



Absolute Maximum Ratings $T_A = 25^\circ\text{C}$ 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) (Note 1b)	1.6	W
		0.8	
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)	78	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case (Note 1)	30	$^\circ\text{C/W}$

Package Marking and Ordering Information

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

Electrical Characteristics $T_A = 25^\circ\text{C}$ 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, $V_{DD} = 40\text{ V}$, $I_D = 3.0\text{ A}$			90	mJ
I_{AR}	Drain-Source Avalanche Current				3.0	A
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	$V_{GS} = 0\text{ V}$, $I_D = 250\text{ }\mu\text{A}$	80			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, Referenced to 25°C		80		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 64\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
I_{GSSF}	Gate–Body Leakage, Forward	$V_{GS} = 20\text{ V}$, $V_{DS} = 0\text{ V}$			100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	$V_{GS} = -20\text{ V}$, $V_{DS} = 0\text{ V}$			–100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$	2	2.4	4	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		–6		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain–Source On Resistance	$V_{GS} = 10\text{ V}$, $I_D = 3.0\text{ A}$ $V_{GS} = 6.0\text{ V}$, $I_D = 2.8\text{ A}$ $V_{GS} = 10\text{ V}$, $I_D = 3.0\text{ A}$; $T_J = 125^\circ\text{C}$		56 61 97	77 88 141	m Ω
$I_{D(on)}$	On–State Drain Current	$V_{GS} = 10\text{ V}$, $V_{DS} = 5\text{ V}$	10			A
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}$, $I_D = 3.0\text{ A}$		14		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS} = 40\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$		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	$V_{DD} = 40\text{ V}$, $I_D = 1\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		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	$V_{DS} = 40\text{ V}$, $I_D = 3.0\text{ A}$, $V_{GS} = 10\text{ V}$		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	$V_{GS} = 0\text{ V}$, $I_S = 1.3\text{ A}$ (Note 2)		0.8	1.2	V
t_{rr}	Diode Reverse Recovery Time	$I_F = 3.0\text{ A}$,		28.2		nS
Q_{rr}	Diode Reverse Recovery Charge	$dI_F/dt = 300\text{ A}/\mu\text{s}$ (Note 2)		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.

- 78°C/W when mounted on a 1in² pad of 2oz copper on FR-4 board.
- 156°C/W when mounted on a minimum pad.

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

Typical Characteristics

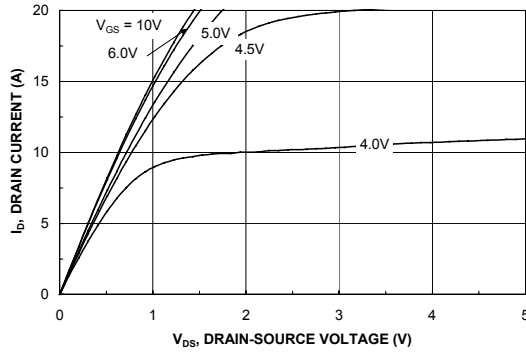


Figure 1. On-Region Characteristics.

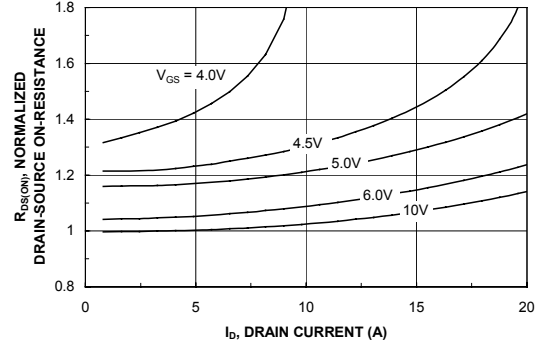


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

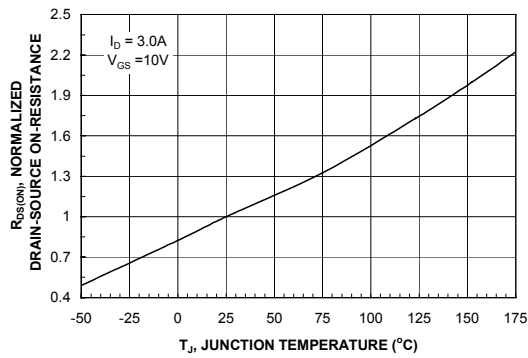


Figure 3. On-Resistance Variation with Temperature.

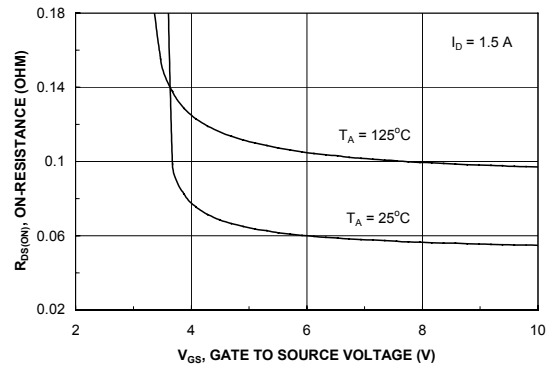


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

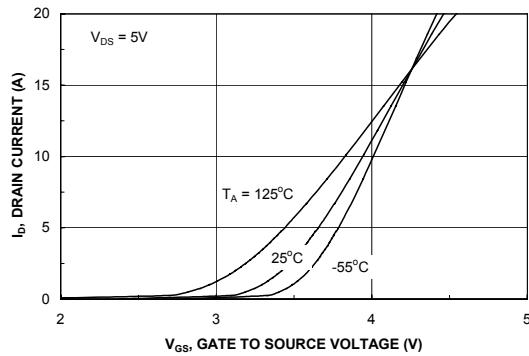


Figure 5. Transfer Characteristics.

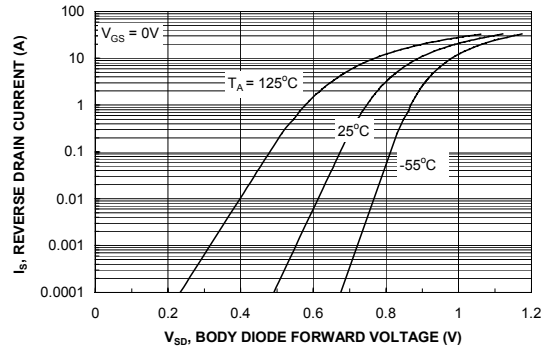


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

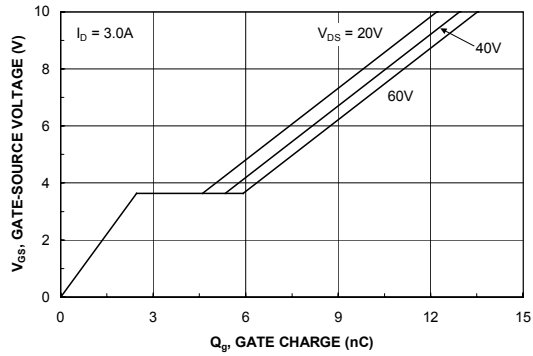


Figure 7. Gate Charge Characteristics.

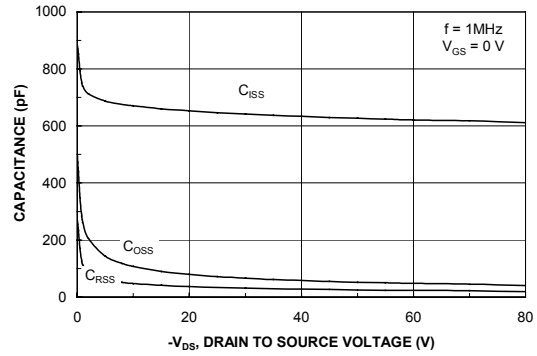


Figure 8. Capacitance Characteristics.

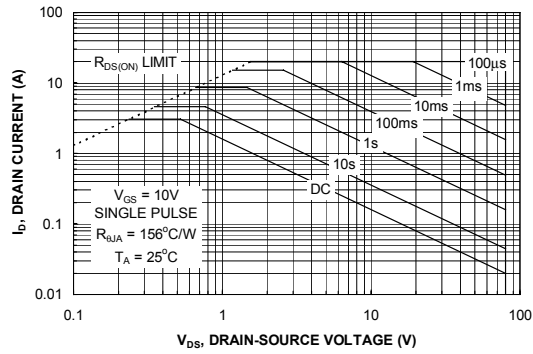


Figure 9. Maximum Safe Operating Area.

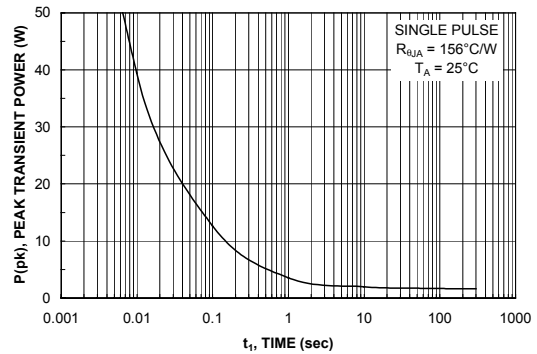


Figure 10. Single Pulse Maximum Power Dissipation.

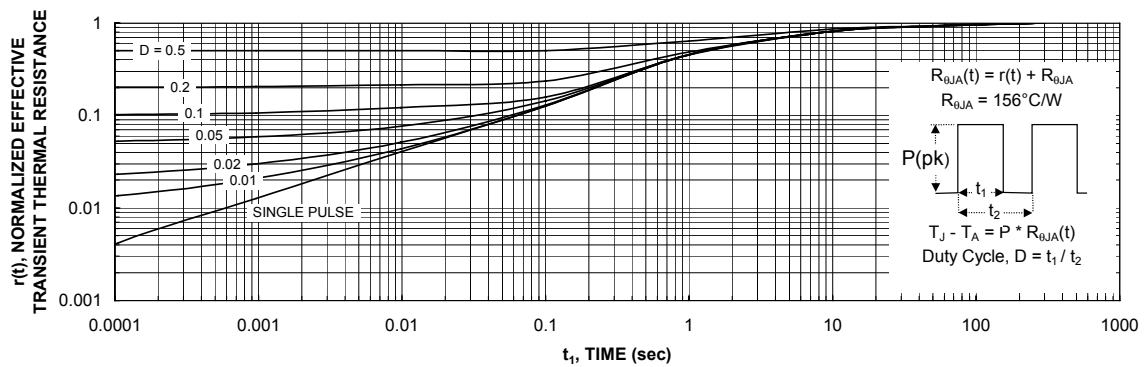



Figure 11. Transient Thermal Response Curve.

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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