

FDC3616N

100V N-Channel PowerTrench® MOSFET

General Description

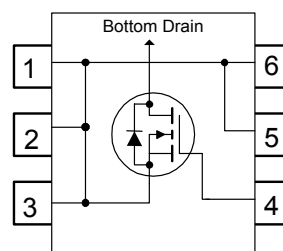
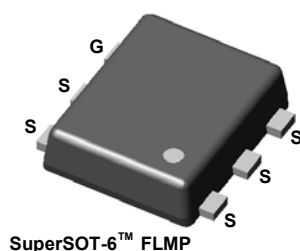
This N-Channel MOSFET has been designed specifically to improve the overall efficiency of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $R_{DS(ON)}$ and fast switching speed.

Applications

- DC/DC converter
- Load Switching

Features

- 3.7 A, 100 V. $R_{DS(ON)} = 70 \text{ m}\Omega @ V_{GS} = 10 \text{ V}$
 $R_{DS(ON)} = 80 \text{ m}\Omega @ V_{GS} = 6.0 \text{ V}$
- High performance trench technology for extremely low $R_{DS(ON)}$
- Low gate charge (23nC typical)
- High power and current handling capability
- Fast switching speed.



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DSS}	Drain-Source Voltage	100	V
V_{GSS}	Gate-Source Voltage	± 20	V
I_D	Drain Current – Continuous (Note 1a)	3.7	A
	– Pulsed	20	
P_D	Maximum Power Dissipation (Note 1a) (Note 1b)	2	W
		1.1	
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) (Note 1b)	60	°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
.616	FDC3616N	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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Drain-Source Avalanche Ratings (Note 2)

W_{DSS}	Drain-Source Avalanche Energy	Single Pulse, $V_{DD} = 50\text{ V}$, $I_D = 3.7\text{ A}$			244	mJ
I_{AR}	Drain-Source Avalanche Current				3.7	A

Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$, $I_D = 250\ \mu\text{A}$	100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C		114		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80\text{ V}$, $V_{GS} = 0\text{ V}$			10	μA
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$			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	$V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	2	2.5	4	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$, Referenced to 25°C		-7.4		mV/ $^\circ\text{C}$
$R_{DS(on)}$	Static Drain-Source On Resistance	$V_{GS} = 10\text{ V}$, $I_D = 3.7\text{ A}$ $V_{GS} = 6.0\text{ V}$, $I_D = 3.5\text{ A}$ $V_{GS} = 10\text{ V}$, $I_D = 3.7\text{ A}$, $T_J = 125^\circ\text{C}$		55 58 104	70 80 139	m Ω
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}$, $I_D = 3.7\text{ A}$		19		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 50\text{ V}$, $V_{GS} = 0\text{ V}$,		1215		pF
C_{oss}	Output Capacitance	$f = 1.0\text{ MHz}$		72		pF
C_{rss}	Reverse Transfer Capacitance			39		pF
R_G	Gate Resistance	$V_{GS} = 15\text{ mV}$, $f = 1.0\text{ MHz}$		1.1		Ω

Switching Characteristics (Note 2)

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{ V}$, $I_D = 1\text{ A}$,		9	18	ns
t_r	Turn-On Rise Time	$V_{GS} = 10\text{ V}$, $R_{GEN} = 6\ \Omega$		4	8	ns
$t_{d(off)}$	Turn-Off Delay Time			28	45	ns
t_f	Turn-Off Fall Time			10	20	ns
Q_g	Total Gate Charge	$V_{DS} = 50\text{ V}$, $I_D = 3.7\text{ A}$,		23	32	nC
Q_{gs}	Gate-Source Charge	$V_{GS} = 10\text{ V}$		4.8		nC
Q_{gd}	Gate-Drain Charge			5.4		nC

Electrical Characteristics

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Drain–Source Diode Characteristics and Maximum Ratings						
t_{rr}	Diode Reverse Recovery Time	$I_F = 3.7\text{ A}$,		41		nS
Q_{rr}	Diode Reverse Recovery Charge	$d_{IF}/d_t = 100\text{ A}/\mu\text{s}$		107		nC
I_S	Maximum Continuous Drain–Source Diode Forward Current				2.1	A
V_{SD}	Drain–Source Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 2.1\text{ A}$ (Note 2)		0.75	1.2	V

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) $60^\circ\text{C}/\text{W}$ when mounted on a 1in^2 pad of 2 oz copper



- b) $111^\circ\text{C}/\text{W}$ 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%

Typical Characteristics

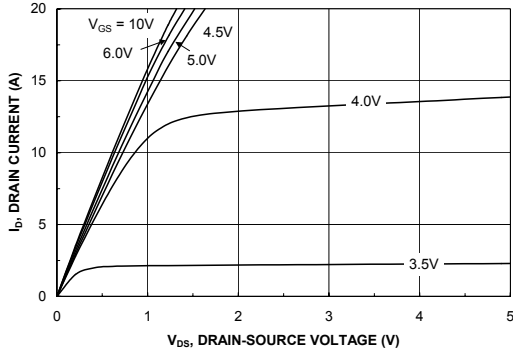


Figure 1. On-Region Characteristics.

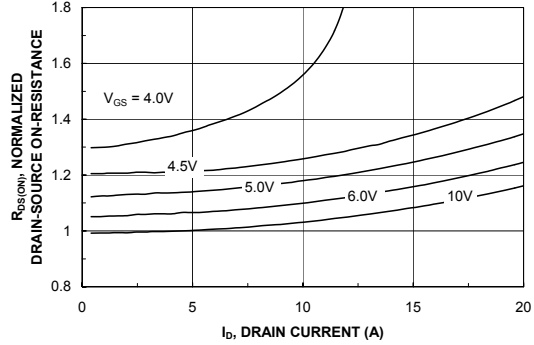


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

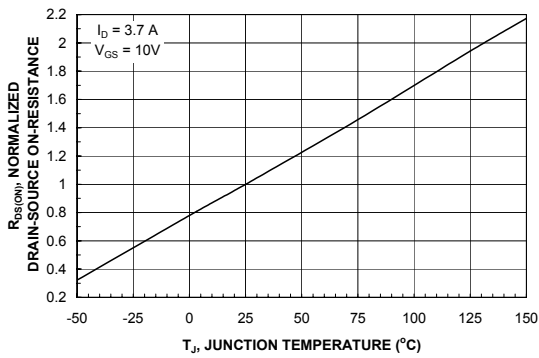


Figure 3. On-Resistance Variation with Temperature.

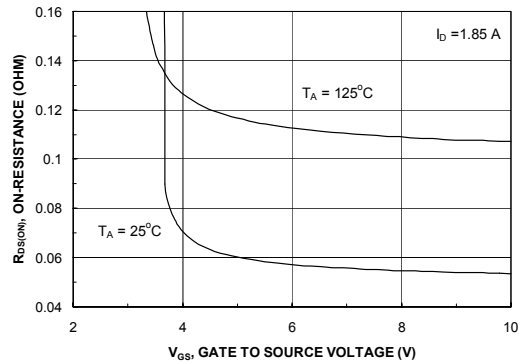


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

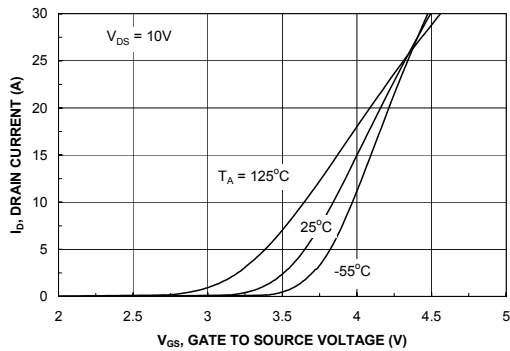


Figure 5. Transfer Characteristics.

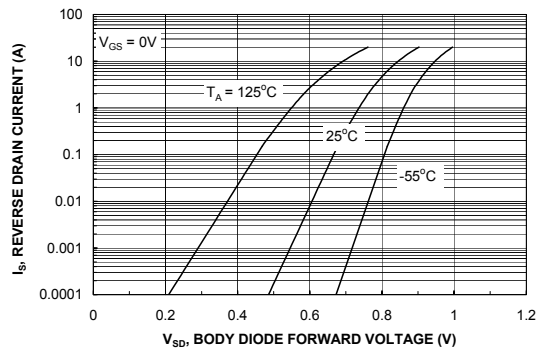


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

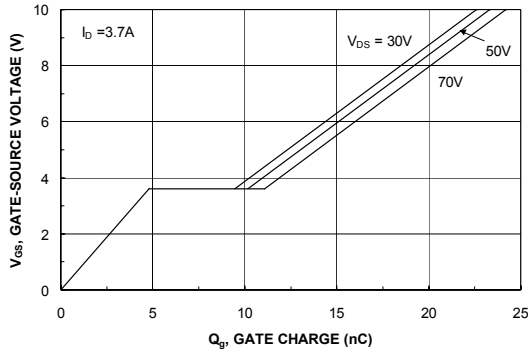


Figure 7. Gate Charge Characteristics.

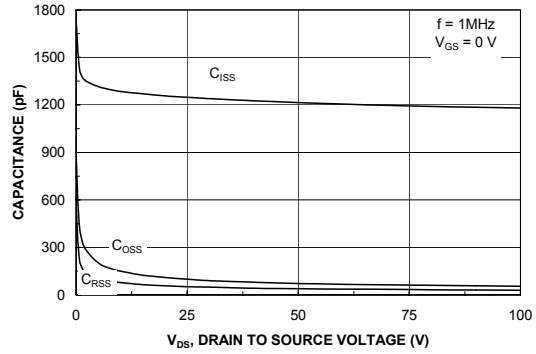


Figure 8. Capacitance Characteristics.

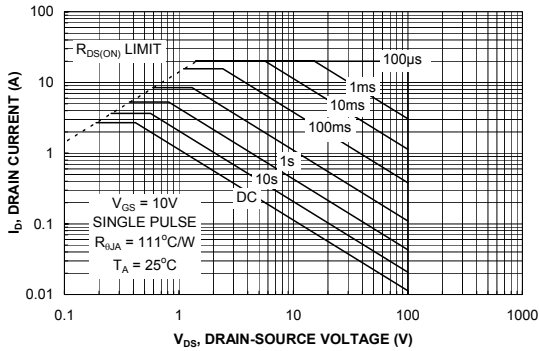


Figure 9. Maximum Safe Operating Area.

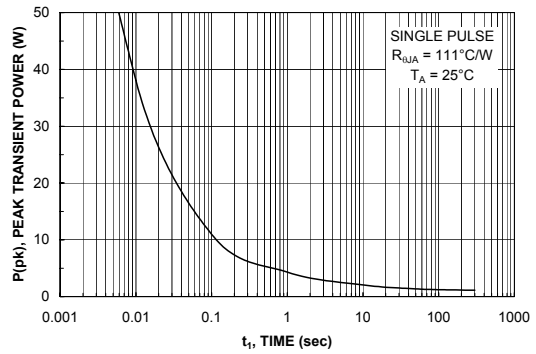


Figure 10. Single Pulse Maximum Power Dissipation.

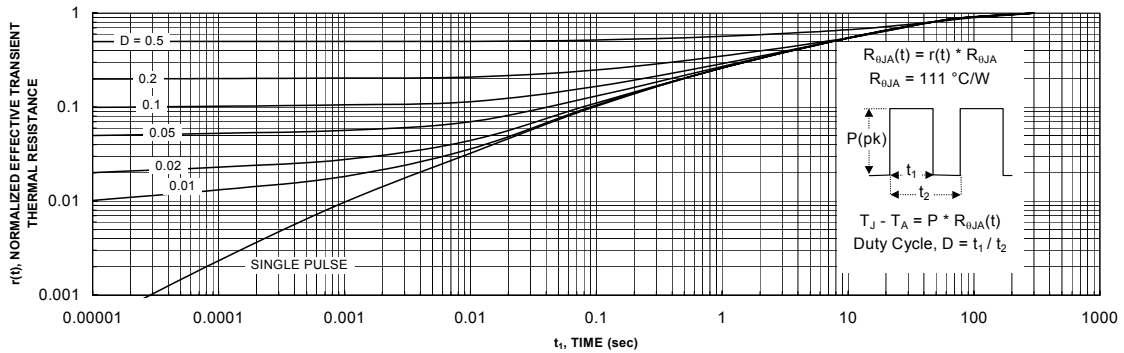
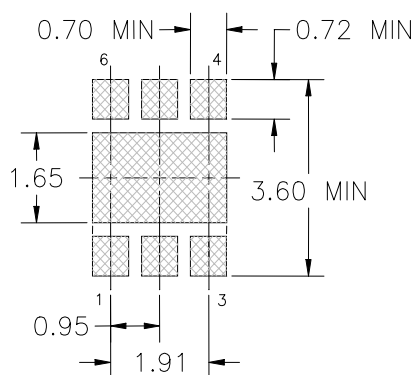
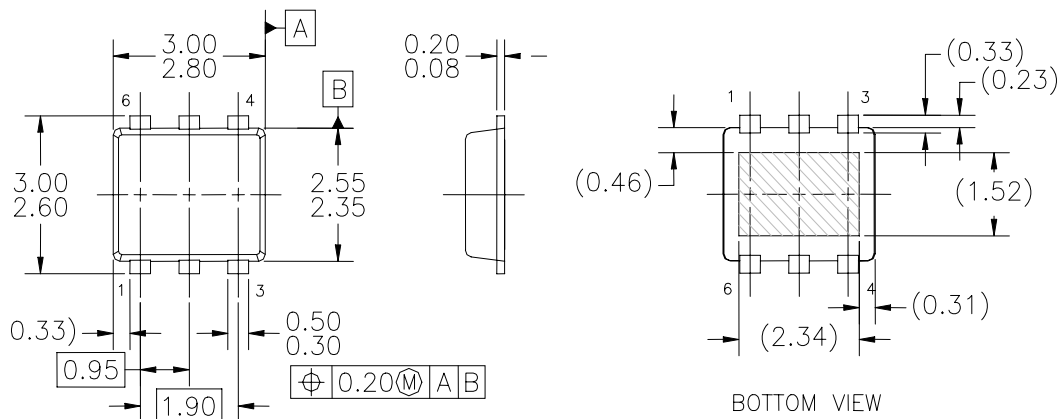


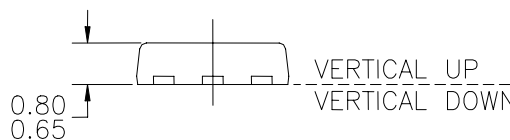
Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b.
Transient thermal response will change depending on the circuit board design.

Dimensional Outline and Pad Layout



LAND PATTERN
RECOMMENDATION



NOTES: UNLESS OTHERWISE SPECIFIED

- A) NO PACKAGE STANDARD REFERENCE AS OF MARCH, 2001.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DIMENSIONS DO NOT INCLUDE MOLD FLASH AND CUTTING BURRS.
- D) LEAD TIP BURR:
 HORIZONTAL: 0.20 mm MAX
 VERTICAL UP: 0.20 mm MAX
 VERTICAL DOWN: 0.05 mm MAX

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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