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FDD6530A

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FDD6530A

## 20V 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
- Motor drives

Features

- 21 A, 20 V $R_{DS(ON)}$ = 32 mΩ @ V_{GS} = 4.5 V
  $R_{DS(ON)}$ = 47 mΩ @ V_{GS} = 2.5 V

- Low gate charge (6.5 nC typical)

- Fast switching

- High performance trench technology for extremely low $R_{DS(ON)}$

.

G   **D**   **S**   **TO-252**

D   **G**   **S**
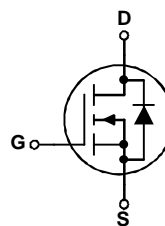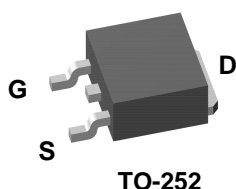
Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		20	V
V_{GSS}	Gate-Source Voltage		±8	V
I_D	Drain Current – Continuous	(Note 3)	21	A
	– Pulsed	(Note 1a)	100	
P_D	Power Dissipation	(Note 1)	33	W
		(Note 1a)	3.3	
		(Note 1b)	1.6	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		−55 to +175	°C

Thermal Characteristics

$R_{θJC}$	Thermal Resistance, Junction-to-Case	(Note 1)	4.5	°C/W
$R_{θJA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	45	°C/W
$R_{θJA}$	Thermal Resistance, Junction-to-Ambient	(Note 1b)	96	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
FDD6530A	FDD6530A	13''	16mm	2500 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} = 10 V			55	mJ
I_{AR}	Drain-Source Avalanche Current				8	A
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	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		15		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 16 V, V_{GS} = 0 V			1	µA
I_{GSSF}	Gate–Body Leakage, Forward	V_{GS} = 8 V, V_{DS} = 0 V			100	nA
I_{GSSR}	Gate–Body Leakage, Reverse	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	0.9	1.2	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 250 µA, Referenced to 25°C		–3		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 4.5 V, I_D = 8 A V_{GS} = 2.5 V, I_D = 6.6 A V_{GS} = 4.5 V, I_D = 8 A, T_J = 125°C		26 36 36	32 47 48	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = 4.5 V, V_{DS} = 5 V	20			A
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 8 A		21		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 10 V, V_{GS} = 0 V,		710		pF
C_{oss}	Output Capacitance	f = 1.0 MHz		173		pF
C_{rss}	Reverse Transfer Capacitance			84		pF
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 10 V, I_D = 1 A,		8	16	ns
t_r	Turn–On Rise Time	V_{GS} = 4.5 V, R_{GEN} = 6		7	14	ns
$t_{d(off)}$	Turn–Off Delay Time			18	32	ns
t_f	Turn–Off Fall Time			4	8	ns
Q_g	Total Gate Charge	V_{DS} = 10 V, I_D = 8 A,		6.5	9	nC
Q_{gs}	Gate–Source Charge	V_{GS} = 4.5 V		1.3		nC
Q_{gd}	Gate–Drain Charge			1.9		nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				2.7	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.7 A (Note 2)		0.8	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.
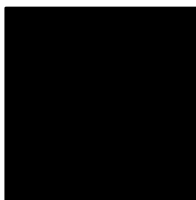
a) $R_{\theta JA}$ = 45°C/W when mounted on a 1in^2 pad of 2 oz copper

b) $R_{\theta JA}$ = 96°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

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

3. Maximum current is calculated as: $\sqrt{\frac{P_D}{R_{DS(on)}}}$

where P_D is maximum power dissipation at T_C = 25°C and $R_{DS(on)}$ is at $T_{J(max)}$ and V_{GS} = 10V. Package current limitation is 21A
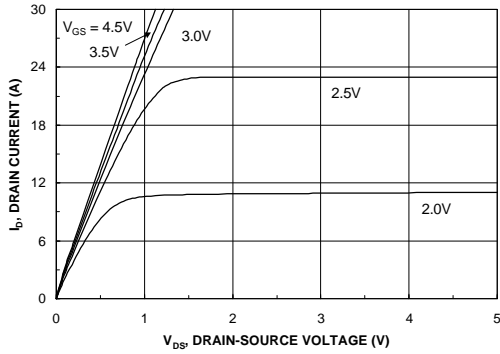
Typical Characteristics

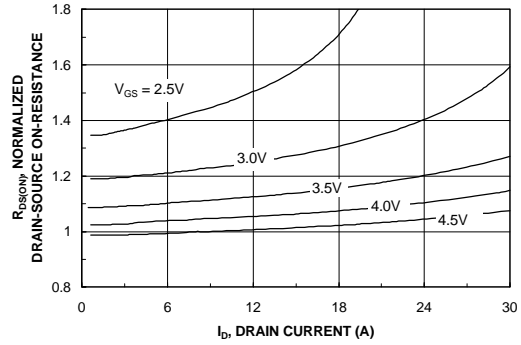Figure 1. On-Region Characteristics.

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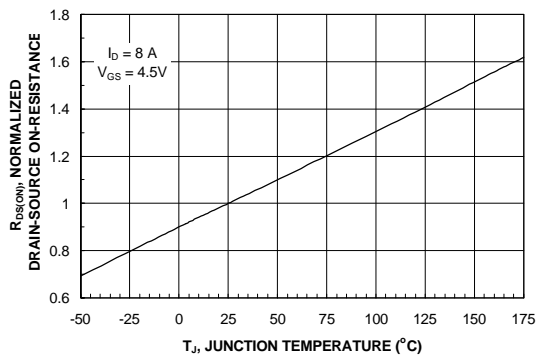Drain Current and Gate Voltage.

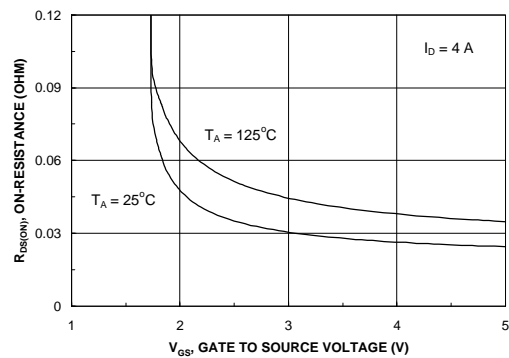Figure 3. On-Resistance Variation with
Temperature.

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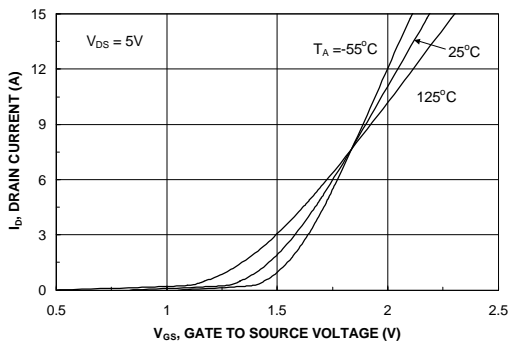Gate-to-Source Voltage.
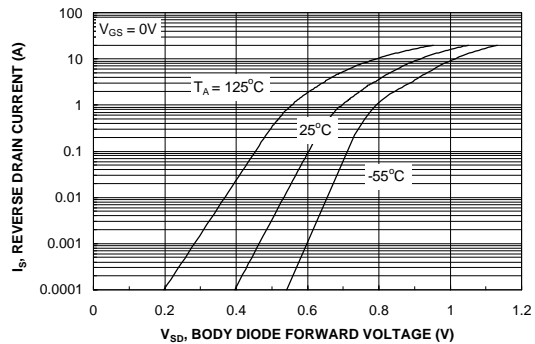

Figure 5. Transfer Characteristics.

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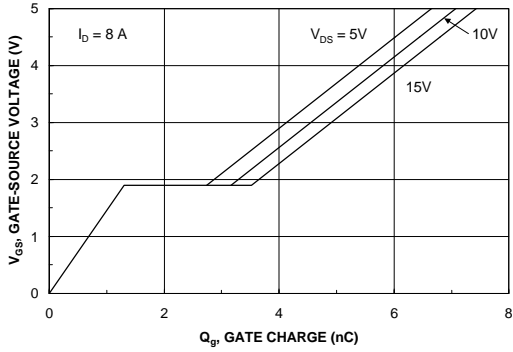
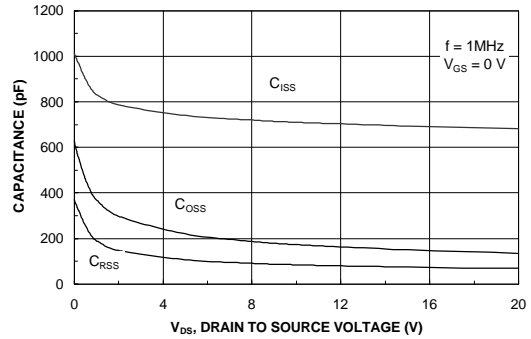# Typical Characteristics

Figure 7. Gate Charge Characteristics.

Figure 8. Capacitance Characteristics.
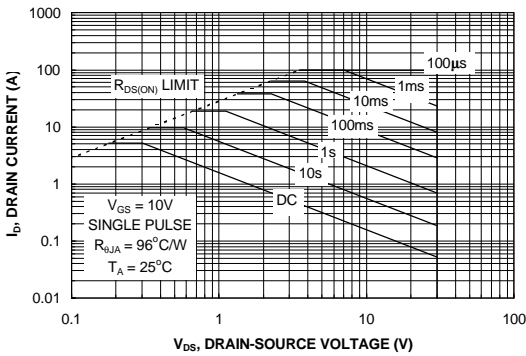
Figure 9. Maximum Safe Operating Area.
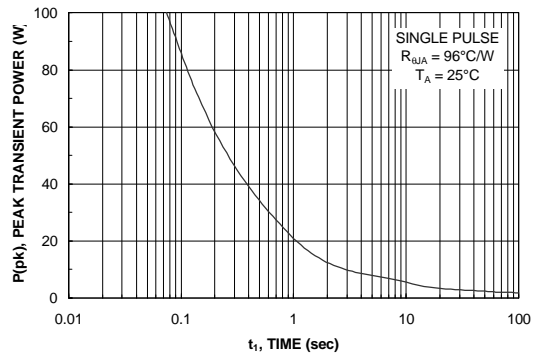
Figure 10. Single Pulse Maximum Power Dissipation.

$$R_{\theta JA}(t) = r(t) + R_{\theta JA}$$
$$R_{\theta JA} = 96 \text{ °C/W}$$

$$T_J - T_A = P * R_{\theta JA}(t)$$
Duty Cycle, $D = t_1 / t_2$
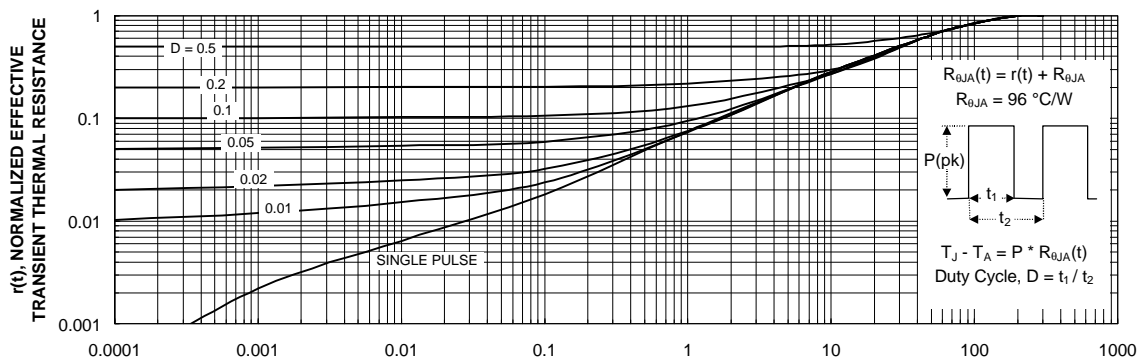
Figure 11. Transient Thermal Response Curve.

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

PUBLICATION ORDERING INFORMATION

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