FAIRCHILD SEMICONDUCTOR®

August 2009

FDG1024NZ

Dual N-Channel PowerTrench® MOSFET

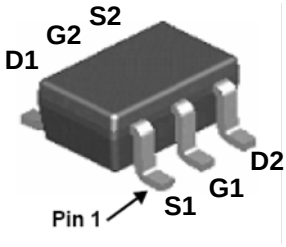
20 V, 1.2 A, 175 mΩ

Features

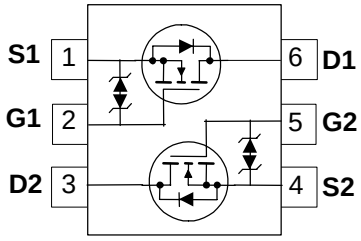
- Max $r_{DS(on)}$ = 175 mΩ at V_{GS} = 4.5 V, I_D = 1.2 A
- Max $r_{DS(on)}$ = 215 mΩ at V_{GS} = 2.5 V, I_D = 1.0 A
- Max $r_{DS(on)}$ = 270 mΩ at V_{GS} = 1.8 V, I_D = 0.9 A
- Max $r_{DS(on)}$ = 389 mΩ at V_{GS} = 1.5 V, I_D = 0.8 A
- HBM ESD protection level >2 kV (Note 3)
- Very low level gate drive requirements allowing operation in 3 V circuits ($V_{GS(th)}$ < 1.5 V)
- Very small package outline SC70-6
- RoHS Compliant

General Description

This dual N-Channel logic level enhancement mode field effect transistors are produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process is especially tailored to minimize on-state resistance. This device has been designed especially for low voltage applications as a replacement for bipolar digital transistors and small signal MOSFETs. Since bias resistors are not required, this dual digital FET can replace several different digital transistors, with different bias resistor values.



SC70-6



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			20	V
V_{GS}	Gate to Source Voltage			±8	V
I_D	-Continuous	T_A = 25°C	(Note 1a)	1.2	A
	-Pulsed			6	
P_D	Power Dissipation	T_A = 25°C	(Note 1a)	0.36	W
	Power Dissipation	T_A = 25°C	(Note 1b)	0.30	
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)	350	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	415	

Package Marking and Ordering Information

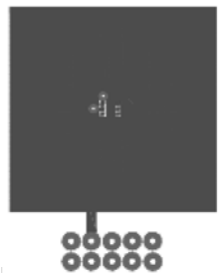
Device Marking	Device	Package	Reel Size	Tape Width	Quantity
.24	FDG1024NZ	SC70-6	7 ”	8 mm	3000 units

Electrical Characteristics T_J = 25 °C unless otherwise noted

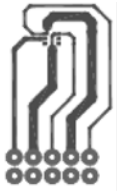
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		14		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 16 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±8 V, V_{DS} = 0 V			±10	μA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	0.4	0.8	1.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-3		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 4.5 V, I_D = 1.2 A		160	175	mΩ
		V_{GS} = 2.5 V, I_D = 1.0 A		185	215	
		V_{GS} = 1.8 V, I_D = 0.9 A		232	270	
		V_{GS} = 1.5 V, I_D = 0.8 A		321	389	
		V_{GS} = 4.5 V, I_D = 1.2 A, T_J =125 °C		220	259	
g_{FS}	Forward Transconductance	V_{DD} = 5 V, I_D = 1.2 A		4		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz		115	150	pF
C_{oss}	Output Capacitance			25	35	pF
C_{rss}	Reverse Transfer Capacitance			20	25	pF
R_g	Gate Resistance			4.6		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 10 V, I_D = 1.2 A, V_{GS} = 4.5 V, R_{GEN} = 6 Ω		3.7	10	ns
t_r	Rise Time			1.7	10	ns
$t_{d(off)}$	Turn-Off Delay Time			11	19	ns
t_f	Fall Time			1.5	10	ns
Q_g	Total Gate Charge	V_{GS} = 4.5 V, V_{DD} = 10 V, I_D = 1.2 A		1.8	2.6	nC
Q_{gs}	Gate to Source Charge			0.3		nC
Q_{gd}	Gate to Drain “Miller” Charge			0.4		nC
Drain-Source Diode Characteristics						
I_S	Maximum Continuous Drain-Source Diode Forward Current				0.3	A
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 0.3 A (Note 2)		0.7	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 1.2 A, di/dt = 100 A/μs		10	20	ns
Q_{rr}	Reverse Recovery Charge			1.9	10	nC

NOTES:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta JA}$ is determined by the user's board design.



a. 350 °C/W when mounted on a 1 in^2 pad of 2 oz copper.



b. 415 °C/W when mounted on a minimum pad of 2 oz copper.

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

3: The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

Typical Characteristics T_J = 25 °C unless otherwise noted

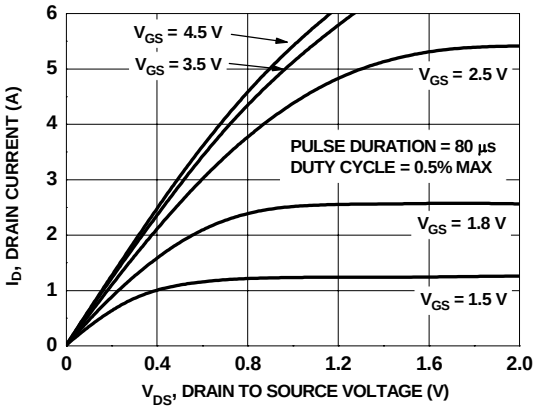


Figure 1. On-Region Characteristics

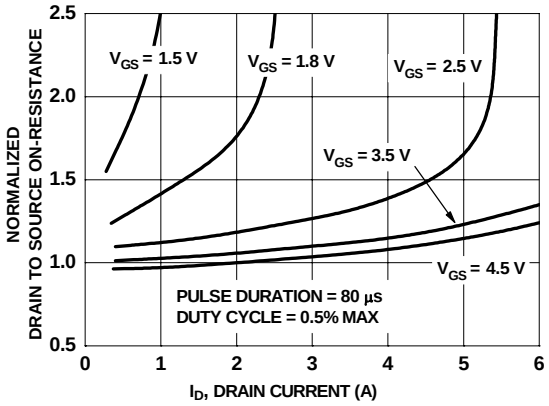


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

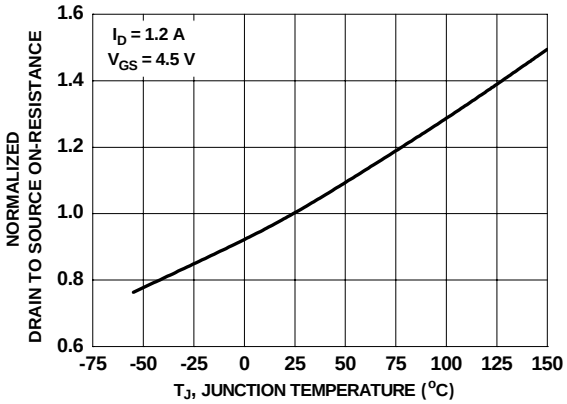


Figure 3. Normalized On- Resistance vs Junction Temperature

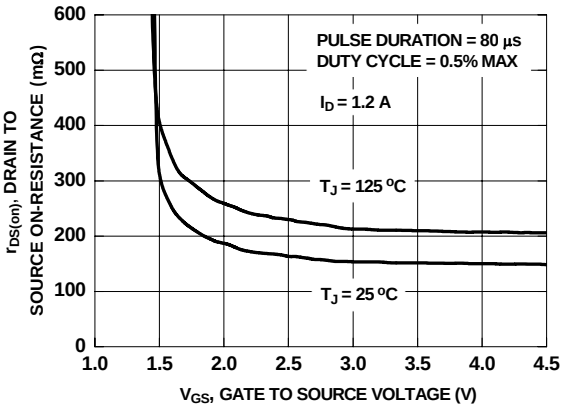


Figure 4. On-Resistance vs Gate to Source Voltage

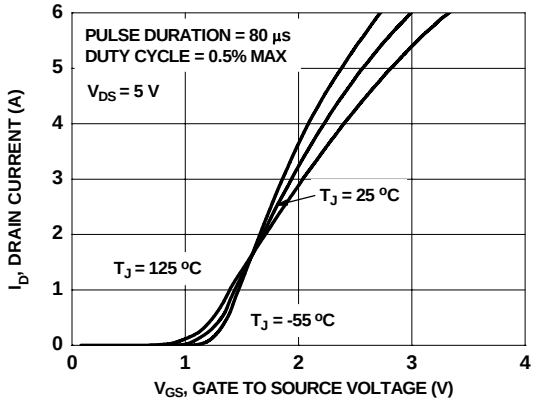


Figure 5. Transfer Characteristics

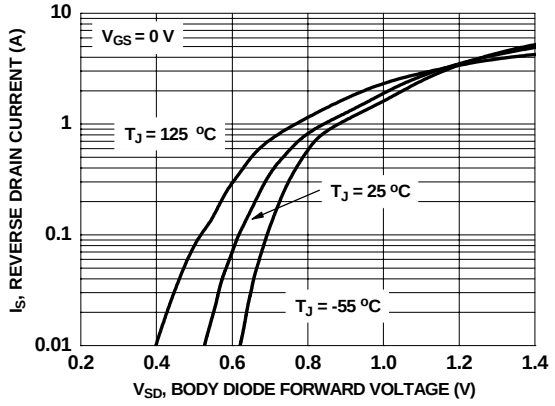


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted

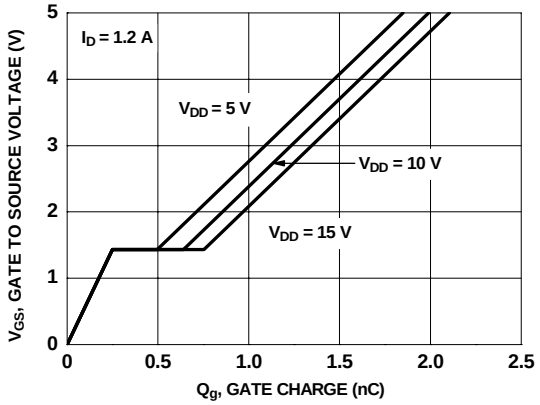


Figure 7. Gate Charge Characteristics

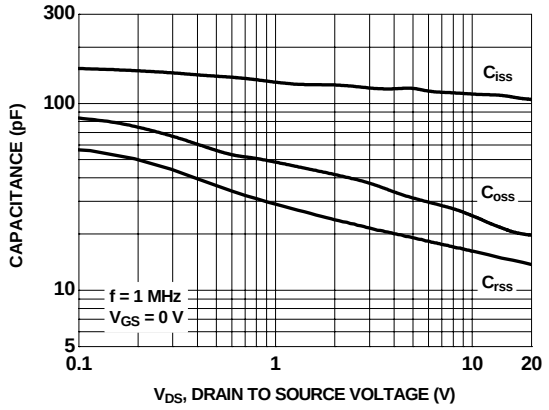


Figure 8. Capacitance vs Drain to Source Voltage

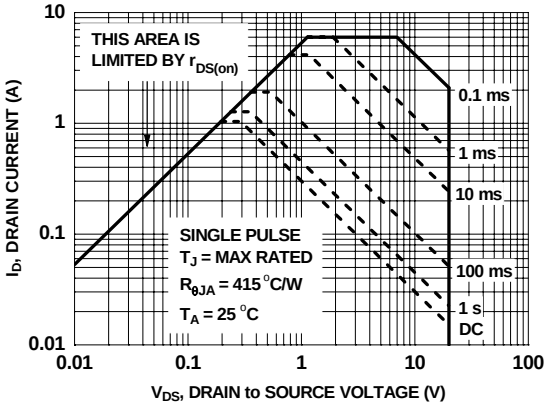


Figure 9. Forward Bias Safe Operating Area

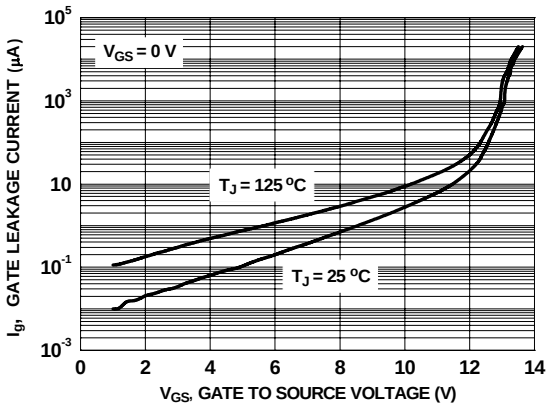


Figure 10. Gate Leakage Current vs Gate to Source Voltage

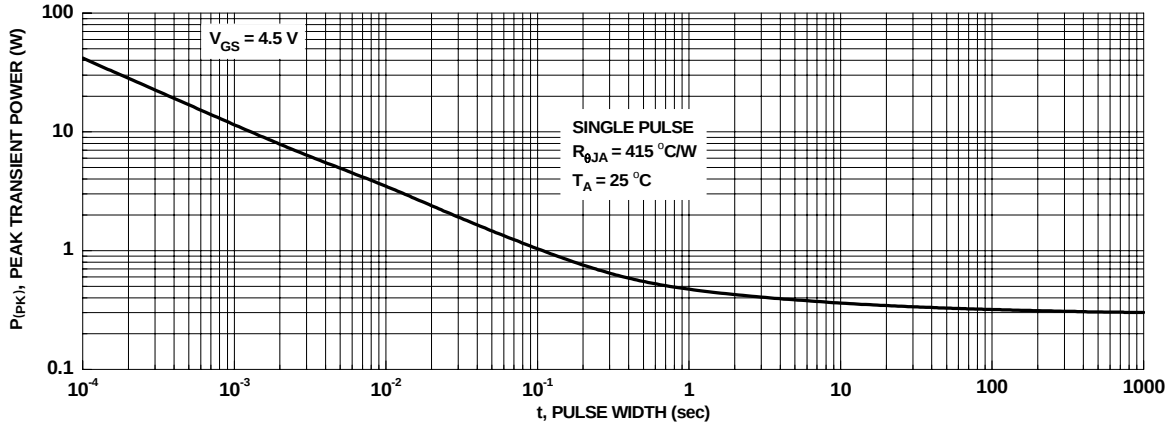


Figure 11. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted

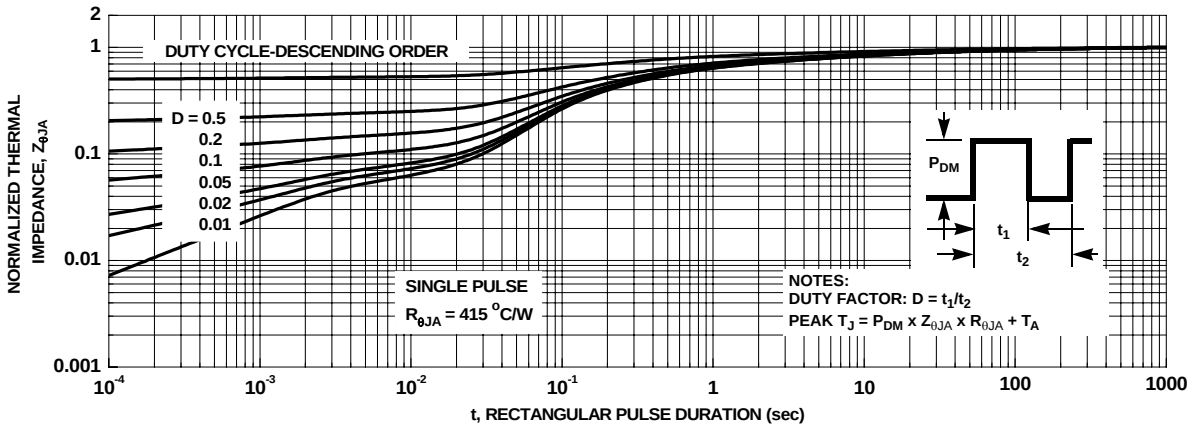
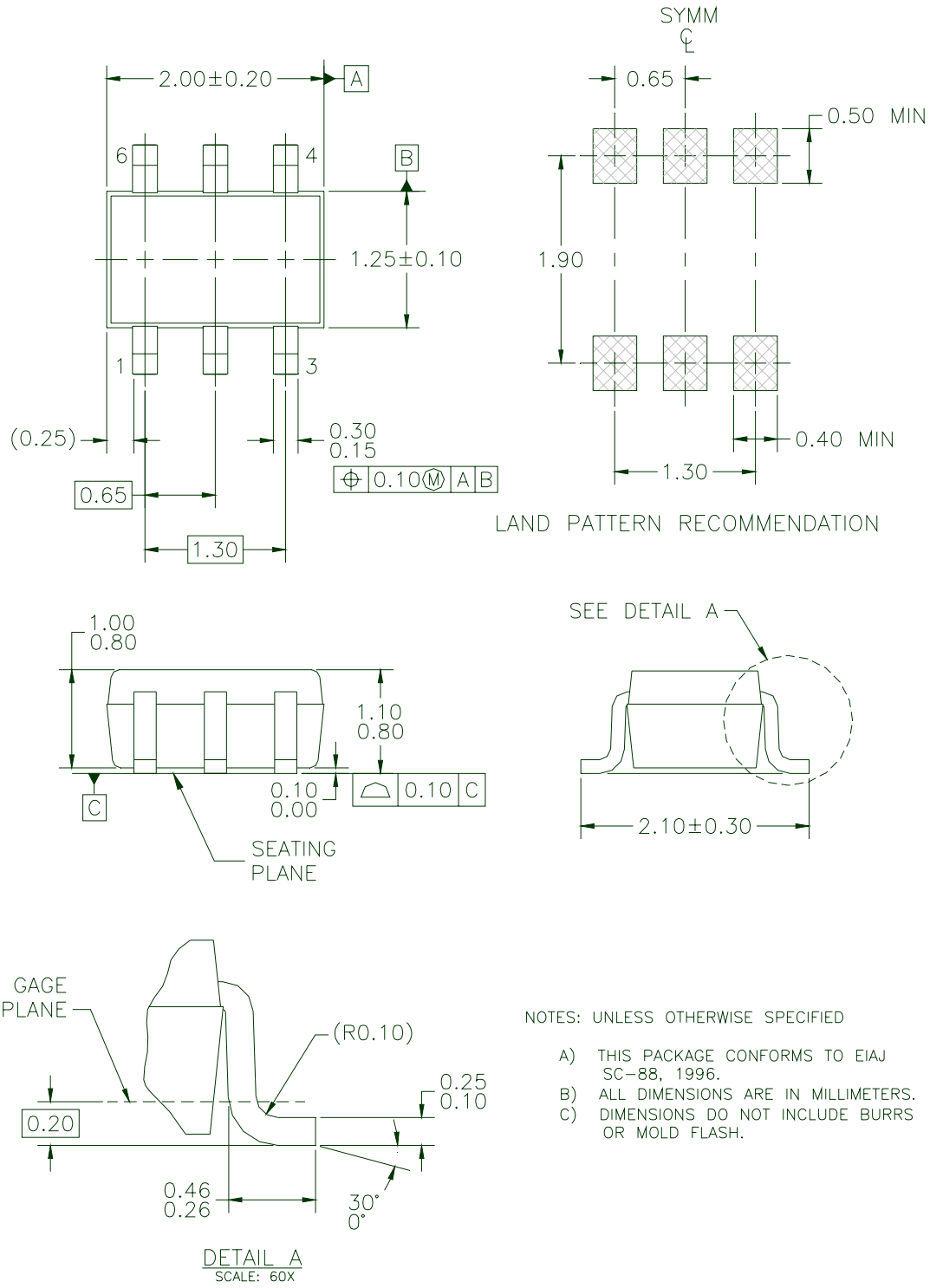


Figure 12. Transient Thermal Response Curve

Dimensional Outline and Pad Layout



NOTES: UNLESS OTHERWISE SPECIFIED

A) THIS PACKAGE CONFORMS TO EIAJ SC-88, 1996.
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH.

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