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FDN028N20

N-Channel PowerTrench® MOSFET

20 V, 6.1 A, 28 mΩ

Features

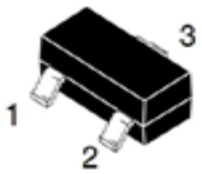
- Max $r_{DS(on)}$ = 28 mΩ at V_{GS} = 4.5 V, I_D = 5.2 A
- Max $r_{DS(on)}$ = 45 mΩ at V_{GS} = 2.5 V, I_D = 4.4 A
- High Performance Trench Technology for Extremely Low $r_{DS(on)}$
- High Power and Current Handling Capability in a Widely Used Surface Mount Package
- Fast Switching Speed
- 100% UIL Tested
- RoHS Compliant

General Description

This N-Channel PowerTrench MOSFET is produced using Fairchild's advanced PowerTrench® process that has been especially tailored to minimize on-state resistance and yet maintain low gate charge for superior switching performance.

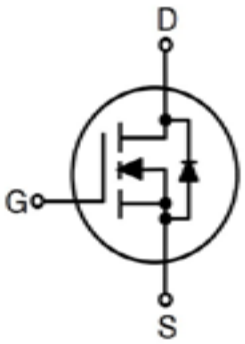
Applications

- Primary DC-DC Switch
- Load Switch



SOT-23

1 – Gate
2 – Source
3 – Drain



MOSFET Maximum Ratings T_C = 25°C unless otherwise noted.

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			20	V
V_{GS}	Gate to Source Voltage		(Note 3)	±12	V
I_D	-Continuous	T_A = 25°C	(Note 1a)	6.1	A
	-Pulsed		(Note 5)	52	
E_{AS}	Single Pulse Avalanche Energy		(Note 4)	6	mJ
P_D	Power Dissipation		(Note 1a)	1.5	W
	Power Dissipation		(Note 1b)	0.6	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to + 150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	75	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	80	°C/W

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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		15		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} = 12 V, V_{DS} = 0 V			100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	0.5	0.9	1.5	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 = 5.2 A		23	28	mΩ
		V_{GS} = 2.5 V, I_D = 4.4 A		32	45	
		V_{GS} = 4.5 V, I_D = 5.2 A, T_J = 125°C		30	41	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 5.2 A		28		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz		399	600	pF
C_{oss}	Output Capacitance			91	140	pF
C_{rss}	Reverse Transfer Capacitance			87	130	pF
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 10 V, I_D = 5.2 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		5	10	ns
t_r	Rise Time			2	10	ns
$t_{d(off)}$	Turn-Off Delay Time			15	29	ns
t_f	Fall Time			2	10	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 4.5 V; V_{DD} = 10 V, I_D=5.2 A		4.3	6.0	nC
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 2.5 V; V_{DD} = 10 V, I_D=5.2 A		2.8	3.9	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 10 V, I_D=5.2 A		0.7		nC
Q_{gd}	Gate to Drain “Miller” Charge	V_{DD} = 10 V, I_D=5.2 A		1.6		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 5.2 A (Note 2)		0.85	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 5.2 A, di/dt = 100 A/μs		13	27	ns
Q_{rr}	Reverse Recovery Charge			3	10	nC

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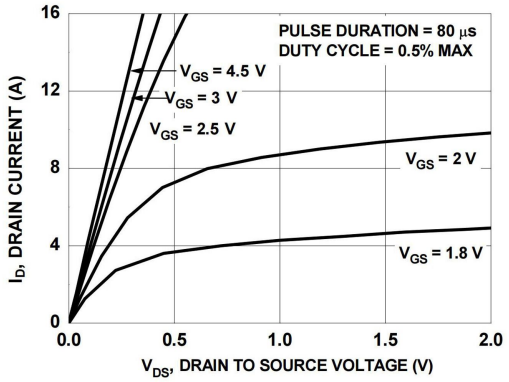


Figure 1. On Region Characteristics

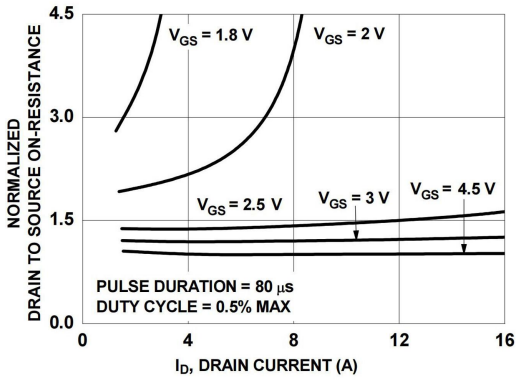


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

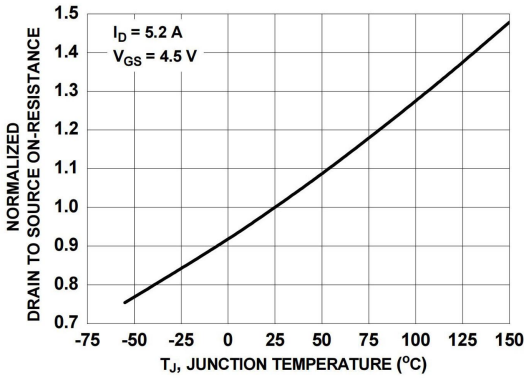


Figure 3. Normalized On Resistance vs. Junction Temperature

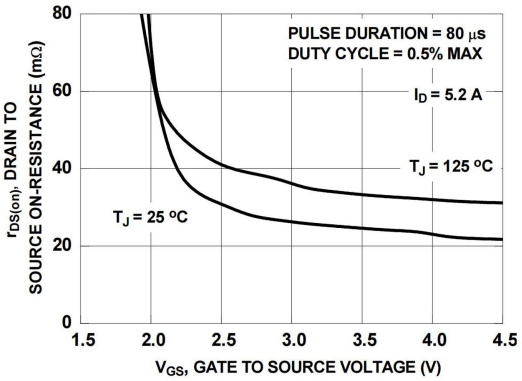


Figure 4. On-Resistance vs. Gate to Source Voltage

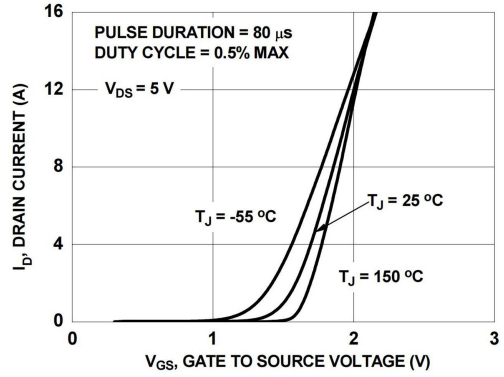


Figure 5. Transfer Characteristics

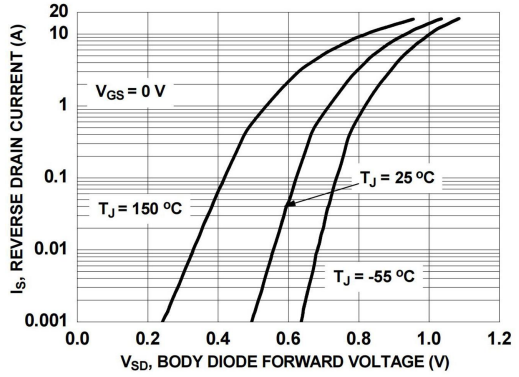


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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Typical Characteristics T_J = 25 °C unless otherwise noted.

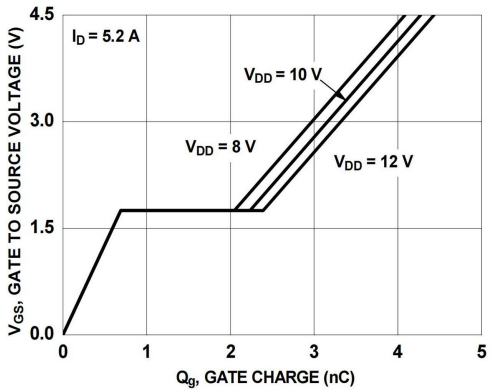


Figure 7. Gate Charge Characteristics

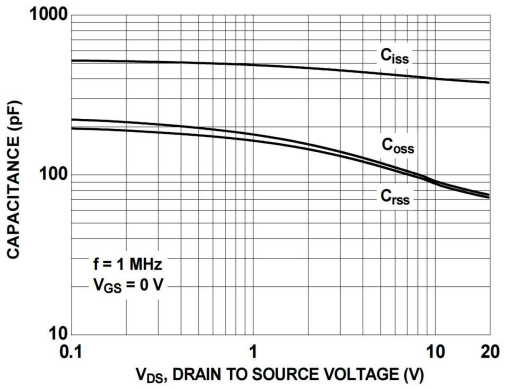


Figure 8. Capacitance vs. Drain to Source Voltage

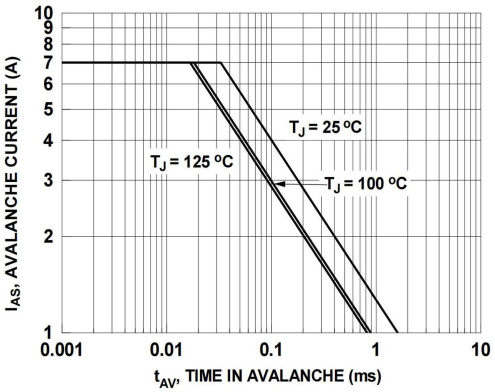


Figure 9. Unclamped Inductive Switching Capability

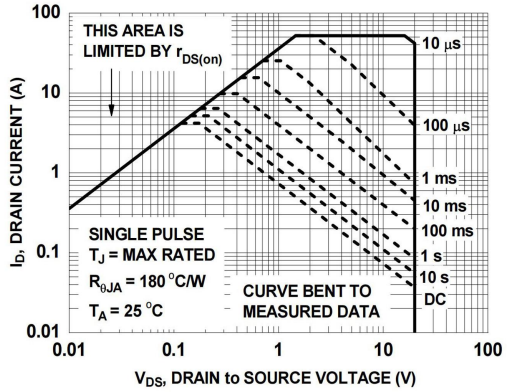


Figure 10. Forward Bias Safe Operating Area



Figure 11. Single Pulse Maximum Power Dissipation

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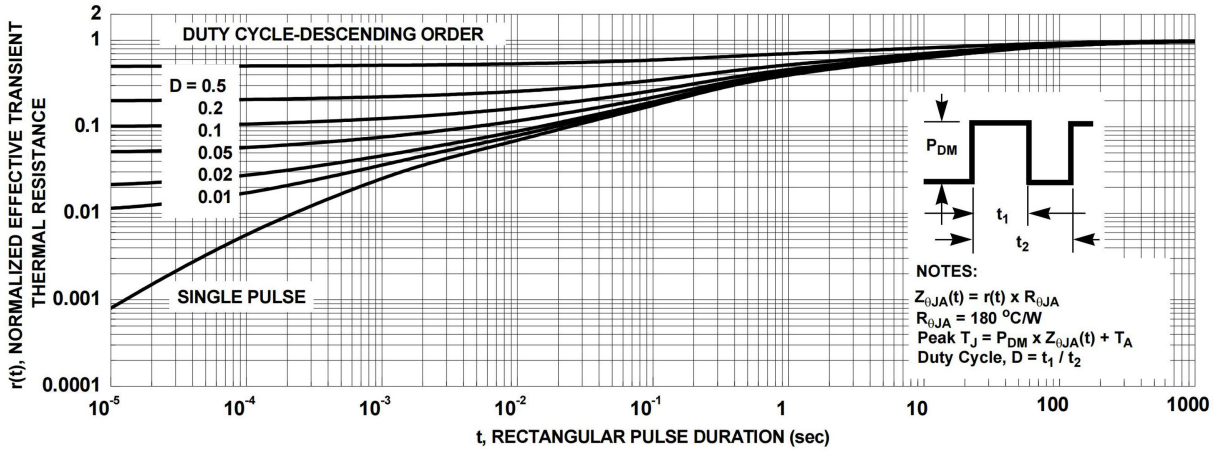


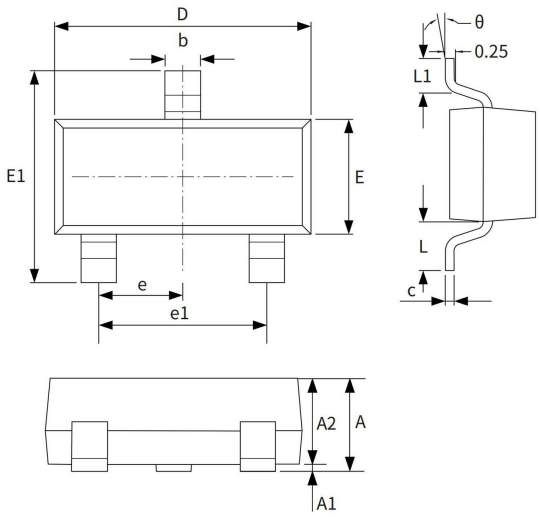
Figure 12. Junction-to-Ambient Transient Thermal Response Curve

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Ordering Information

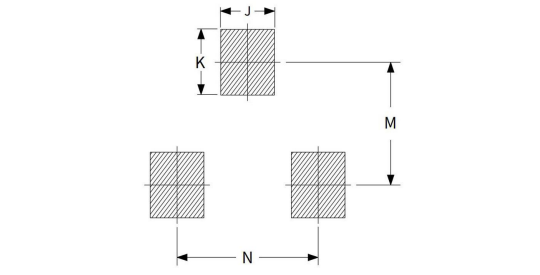
PACKAGE	PACKAGE CODE	UNIT WEIGHT(g)	REEL(pcs)	BOX(pcs)	CARTON(pcs)	DELIVERY MODE
SOT-23	R1	0.008	3000	30000	240000	7''

Package Outline Dimensions (SOT-23)



Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	0.90	1.15	0.035	0.045
A1	-	0.10	-	0.004
A2	0.90	1.05	0.035	0.041
b	0.30	0.50	0.012	0.020
c	0.10	0.20	0.004	0.008
D	2.80	3.00	0.110	0.118
E	1.20	1.40	0.047	0.055
E1	2.25	2.55	0.089	0.100
e	0.950TYP		0.037TYP	
e1	1.80	2.00	0.071	0.079
L	0.550REF		0.022REF	
L1	0.30	0.50	0.012	0.020
θ	-	8°	-	8°

Suggested Pad Layout



Symbol	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
J	0.75	0.85	0.030	0.033
K	0.85	0.95	0.033	0.037
M	1.95	2.05	0.077	0.081
N	1.85	1.95	0.073	0.077