

General Description

The WSR170N04G uses SGT and design to provide excellent RDS(ON) with low gate charge. It can be used in a wide variety of applications.

Features

- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high EAS
- Excellent package for good heat dissipation

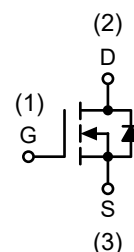
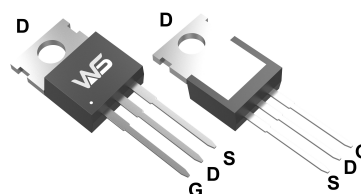
Product Summary

BV_{DSS}	$R_{DS(ON)}$	I_D
40V	1.9mΩ	170A

Application

- Load switch
- Battery protection
- Uninterruptible power supply

TO-220-3L Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	40	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	170	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	135	A
I_{DM}	Pulsed Drain Current ²	800	A
EAS	Single Pulse Avalanche Energy ³	450	mJ
$P_D @ T_C = 25^\circ C$	Total Power Dissipation ⁴	185	W
T_J, T_{STG}	Operating Junction Temperature Range	-55 to 150	$^\circ C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	50	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	0.7	$^\circ C/W$

Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	40	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =1mA	---	0.057	---	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =20A	---	1.9	3	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	1.2	1.8	2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	-5.68	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =40V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =40V, V _{GS} =0V, T _J =55°C	---	---	5	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =5V, I _D =15A	---	50	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	1.0	---	Ω
Q _g	Total Gate Charge (4.5V)	V _{DS} =20V, V _{GS} =10V, I _D =20A	---	45	---	nC
Q _{gs}	Gate-Source Charge		---	12	---	
Q _{gd}	Gate-Drain Charge		---	18	---	
T _{d(on)}	Turn-On Delay Time	V _{DS} =20V, V _{GS} =10V, I _D =20A, R _g =1Ω.	---	10	---	ns
T _r	Rise Time		---	19	---	
T _{d(off)}	Turn-Off Delay Time		---	32	---	
T _f	Fall Time		---	59	---	
C _{iss}	Input Capacitance	V _{DS} =20V, V _{GS} =0V, f=1MHz	---	3950	---	pF
C _{oss}	Output Capacitance		---	1120	---	
C _{rss}	Reverse Transfer Capacitance		---	98	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current ^{1,6}	V _G =V _D =0V, Force Current	---	---	170	A
I _{SM}	Pulsed Source Current ^{2,6}		---	---	800	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =1A, T _J =25°C	---	---	1.2	V
t _{rr}	Reverse Recovery Time	IF=20A, dI/dt=100A/μs, T _J =25°C	---	35	---	nS
Q _{rr}	Reverse Recovery Charge		---	56	---	nC

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. E_{AS} condition: T_J=25°C, V_{DD}=20V, V_G=10V, L=0.5mH, R_g=25Ω

Typical Characteristics

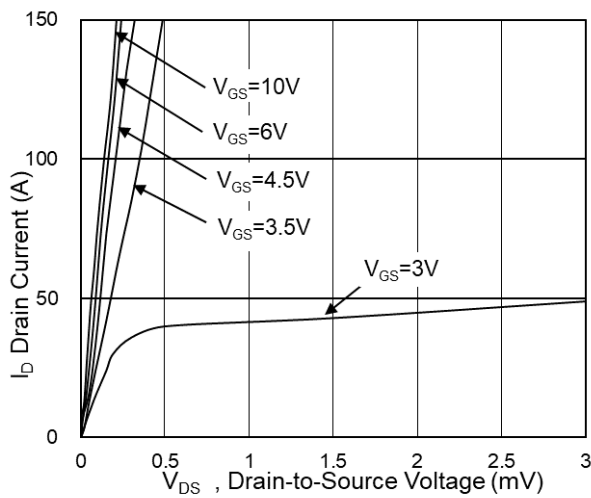


Fig.1 Typical Output Characteristics

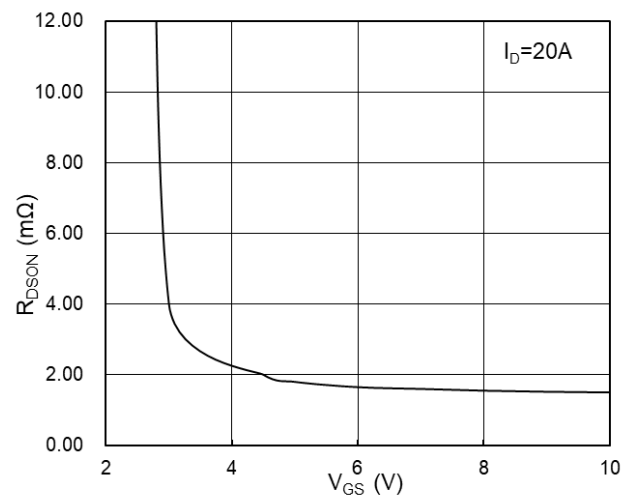


Fig.2 On-Resistance vs G-S Voltage

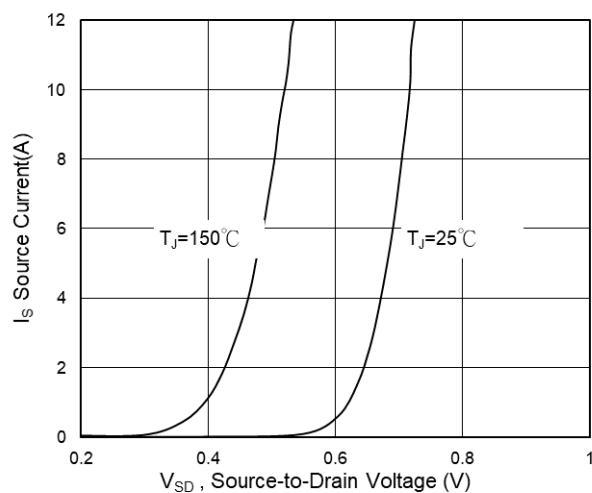


Fig.3 Source Drain Forward Characteristics

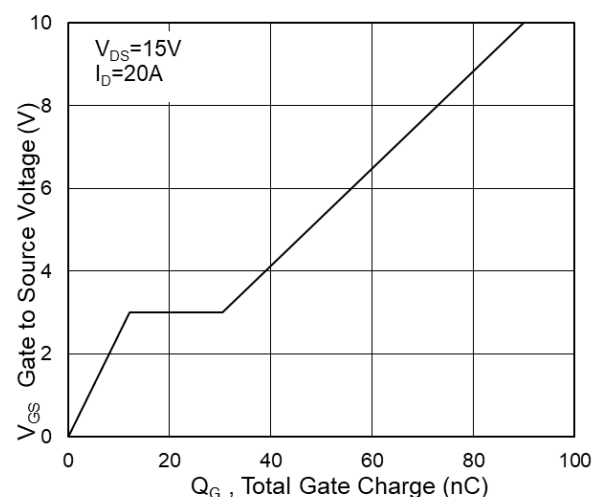


Fig.4 Gate-Charge Characteristics

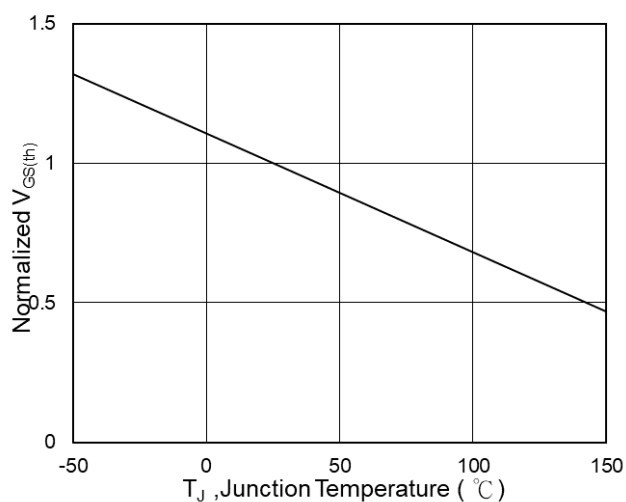


Fig.5 Normalized $V_{GS(th)}$ vs T_J

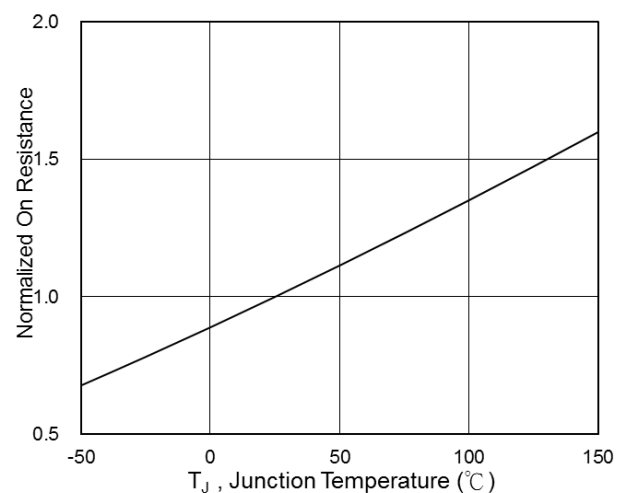


Fig.6 Normalized $R_{DS(on)}$ vs T_J

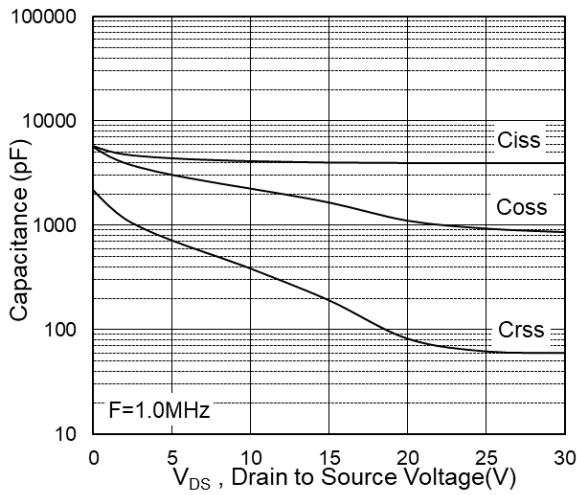


Fig.7 Capacitance

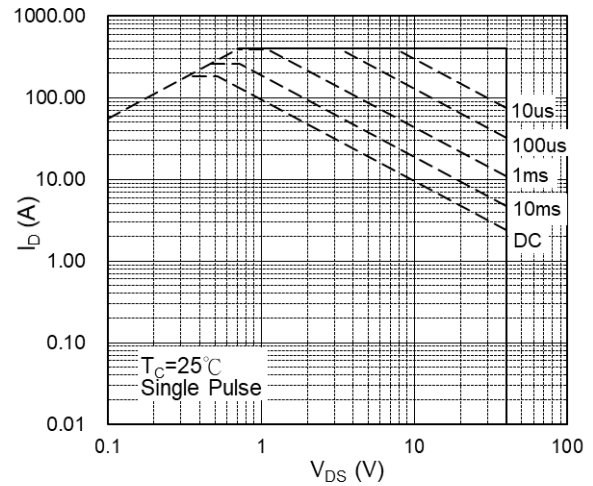


Fig.8 Safe Operating Area

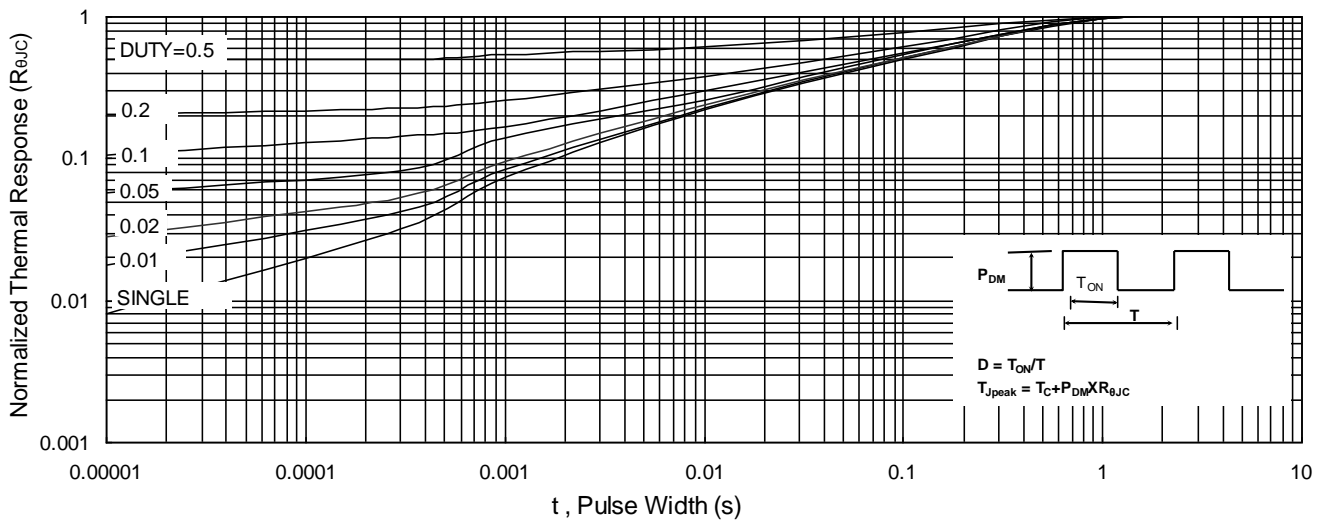


Fig.9 Normalized Maximum Transient Thermal Impedance

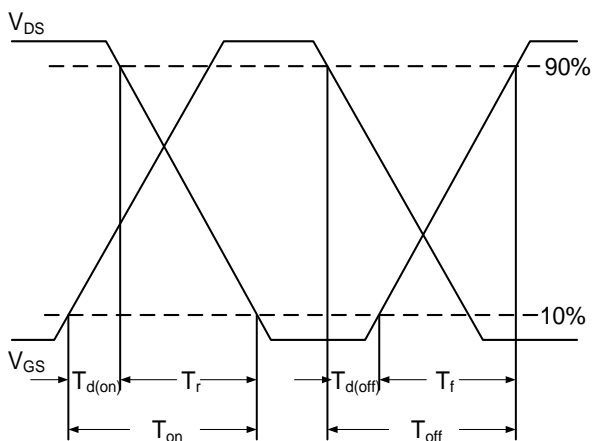


Fig.10 Switching Time Waveform

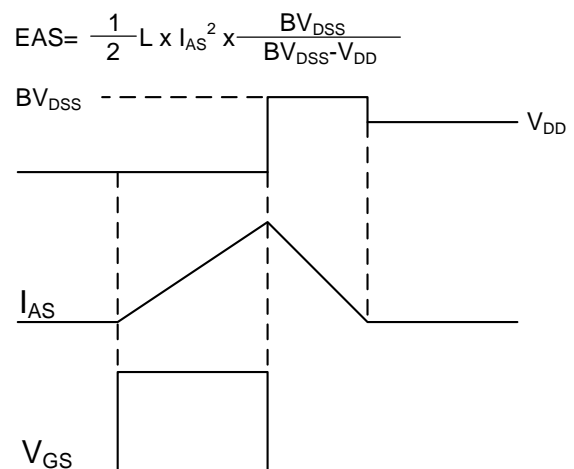
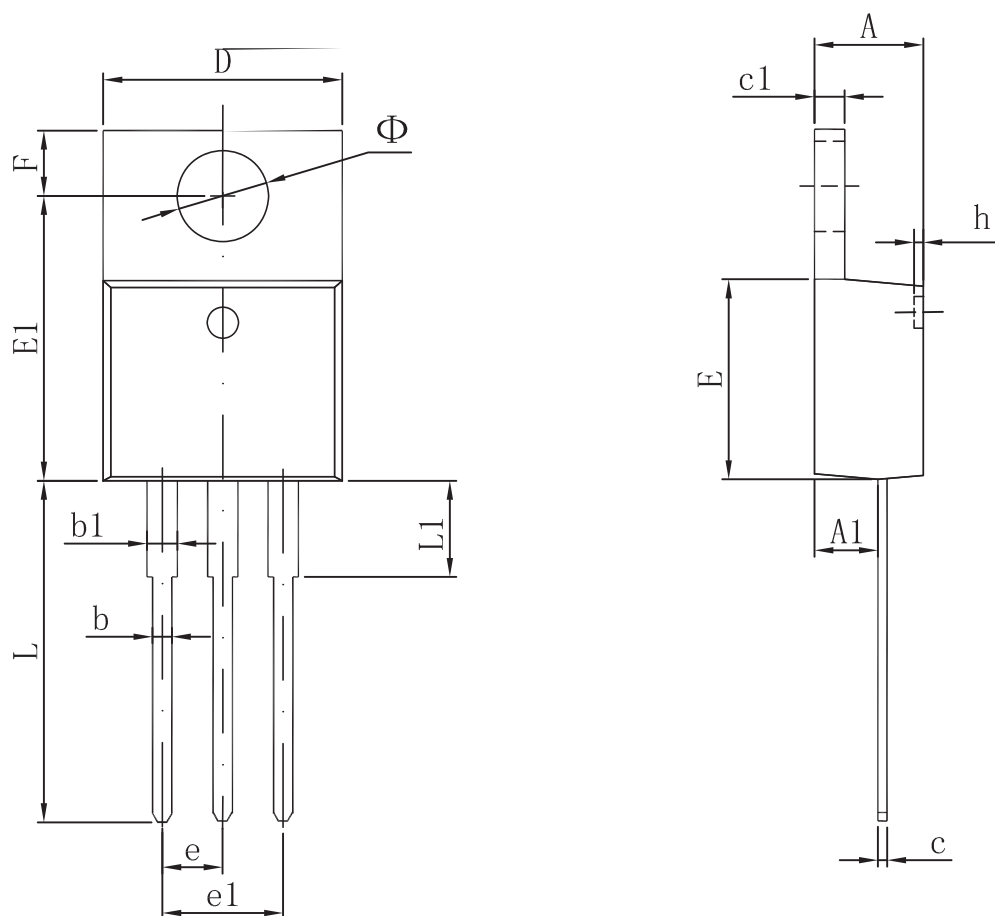


Fig.11 Unclamped Inductive Switching Waveform

Packaging information


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.470	4.670	0.176	0.184
A1	2.520	2.820	0.099	0.111
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
E1	12.060	12.460	0.475	0.491
e	2.540 TYP		0.100 TYP	
e1	4.980	5.180	0.196	0.204
F	2.590	2.890	0.102	0.114
h	0.000	0.300	0.000	0.012
L	13.400	13.800	0.528	0.543
L1	3.560	3.960	0.140	0.156
Φ	3.735	3.935	0.147	0.155

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