

SE4020B

N-Channel Enhancement-Mode MOSFET

Revision: A

General Description

Thigh Density Cell Design For Ultra Low On-Resistance Fully Characterized Avalanche Voltage and Current Improved Shoot-Through FOM

- Simple Drive Requirement
- Small Package Outline
- Surface Mount Device

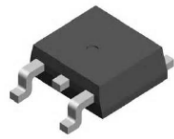
Features

For a single MOSFET

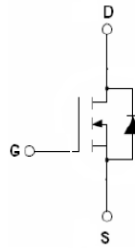
- $V_{DS} = 40V$
- $R_{DS(ON)} = 15m\Omega @ V_{GS}=10V$

Pin configurations

See Diagram below



TO-252



Absolute Maximum Ratings

Parameter		Symbol	Rating	Units
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	± 20	V
Drain Current	Continuous	I_D	20	A
	Pulsed ¹		40	
Total Power Dissipation	@TA=25°C	P_D	20	W
Single Pulse Avalanche Energy ²		EAS	22	mJ
Avalanche Current@L=0.3mH		IAR	10	A
Operating Junction Temperature Range		T_J	-55 to 175	°C

Thermal Resistance

Symbol	Parameter	Typ	Max	Units
$R_{\theta JC}$	Thermal Resistance Junction to Case	-	7.5	°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 (Note 2)						
B _V DSS	Drain-Source Breakdown Voltage	I _D =250μA, V _{GS} =0 V	40			V
I _{DSS}	Drain to Source Leakage Current	V _{DS} = 40V, V _{GS} =0V			1	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =20V			100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D =250μA	1		2	V
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =5A	-	15	23	mΩ
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =20V, f=1MHz		410		pF
C _{oss}	Output Capacitance			95		pF
C _{rss}	Reverse Transfer Capacitance			35		pF
SWITCHING PARAMETERS						
Q _g	Total Gate Charge ²	V _{GS} =10V, V _{DS} =20V, I _D =12A		9.5		nC
Q _{gs}	Gate Source Charge			4.5		nC
Q _{gd}	Gate Drain Charge			1.5		nC
t _{d(on)}	Turn-On Delay Time	V _{GS} =10V, V _{DS} =20V, R _{GEN} =1.7Ω I _D =12A		3.5		ns
t _{d(off)}	Turn-Off Delay Time			13.5		ns
t _{d(r)}	Turn-On Rise Time			6		ns
t _{d(f)}	Turn-Off Fall Time			3.5		ns
Source-Drain Diode						
Symbol	Parameter	Test Condition	Min	Typ	Max	Units
I _S	Source Current	I _F =1A, V _{DD} =20V, dI/dt=100A/μs			12	A
V _{SD}	Diode Forward Voltage				0.75	1.0
t _{rr}	Reverse Recovery Time	I _F =12A, V _{DD} =20V, dI/dt=100A/μs		23		ns
Q _{rr}	Reverse Recovery Charge				18.5	

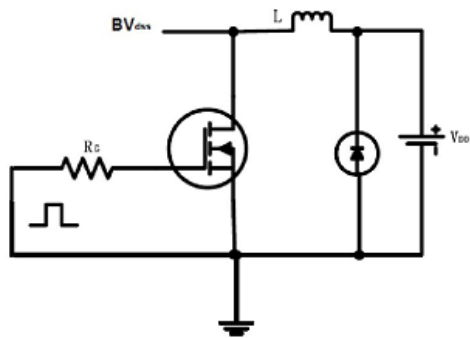
Note 1: Repetitive rating: pulse width limited by max. junction temperature

Note 2: Limited by T_{Jmax}, starting T_J=25°C, L=0.3mH, R_G=50Ω, I_{AS}=82A, V_{GS}=10V.

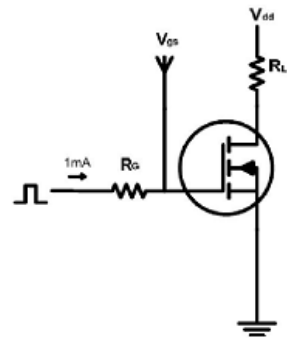
Note 3: Pulse width < 1.0ms; duty cycle<2%.

Test Circuits and Waveform

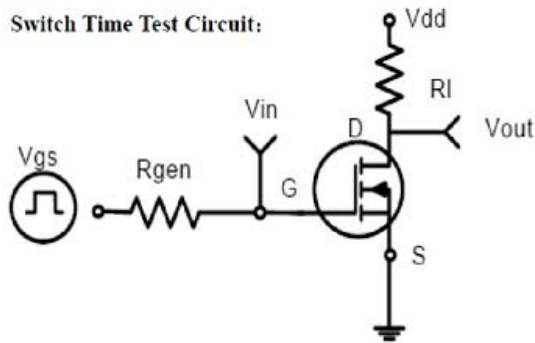
EAS test circuits:



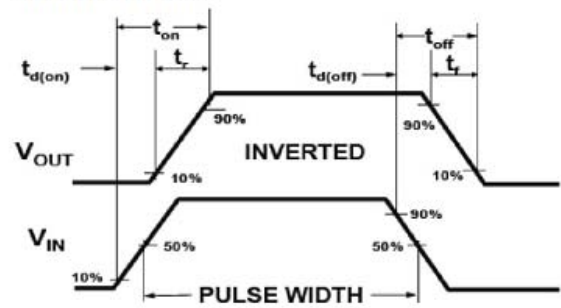
Gate charge test circuit:



Switch Time Test Circuit:



Switch Waveforms:



Typical Characteristics

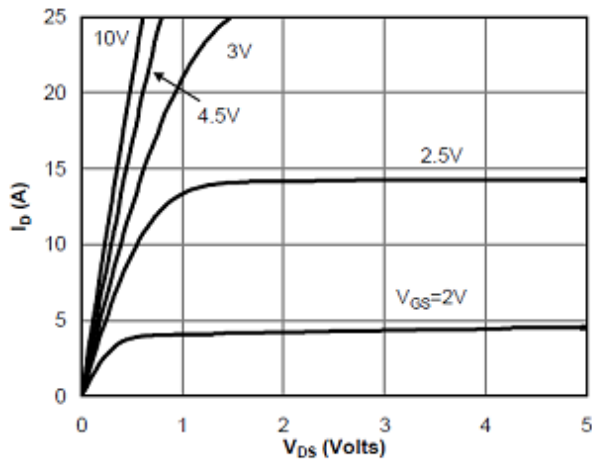


Fig 1: On-Region Characteristics

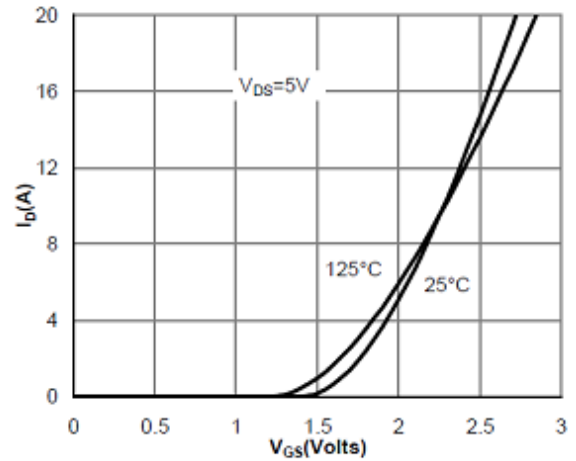


Figure 2: Transfer Characteristics

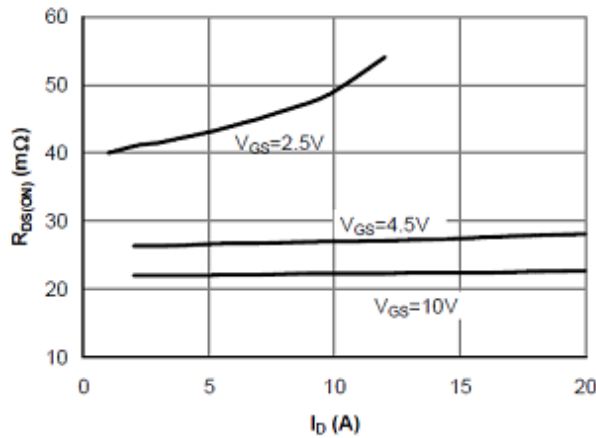


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

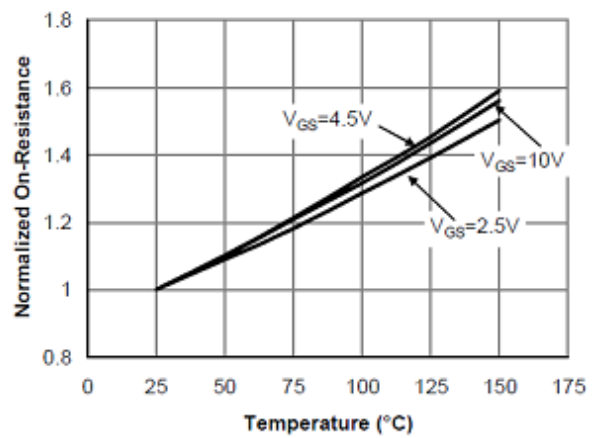


Figure 4: On-Resistance vs. Junction Temperature

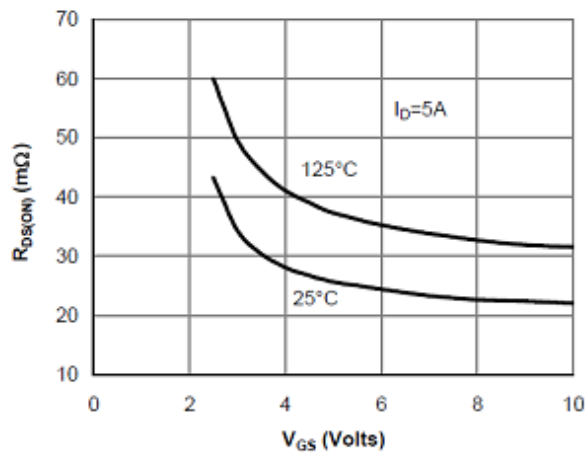


Figure 5: On-Resistance vs. Gate-Source Voltage

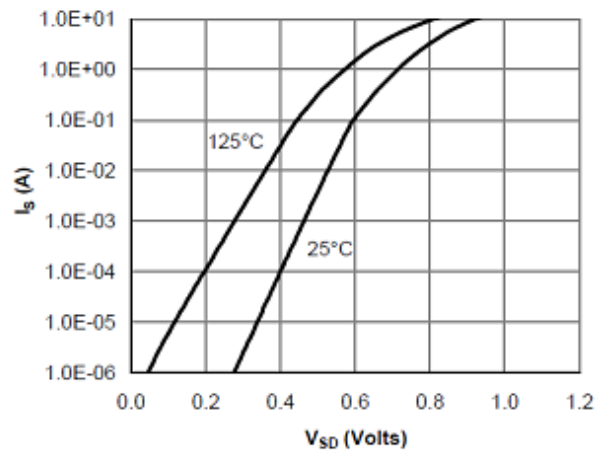


Figure 6: Body-Diode Characteristics

Typical Characteristics

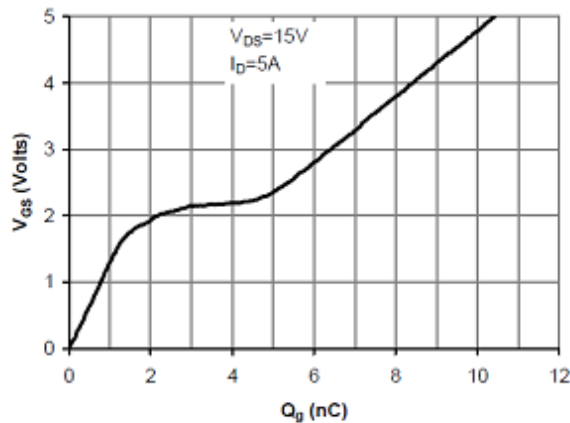


Figure 7: Gate-Charge Characteristics

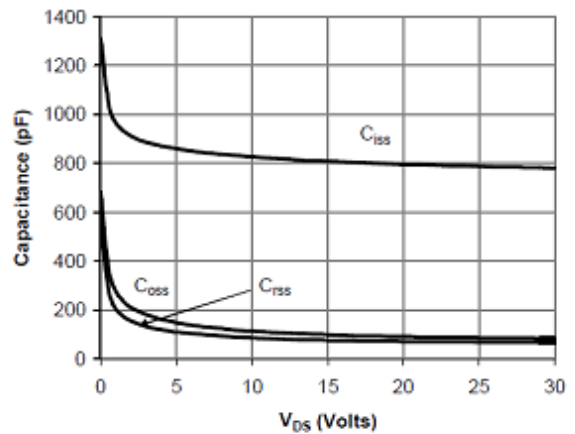


Figure 8: Capacitance Characteristics

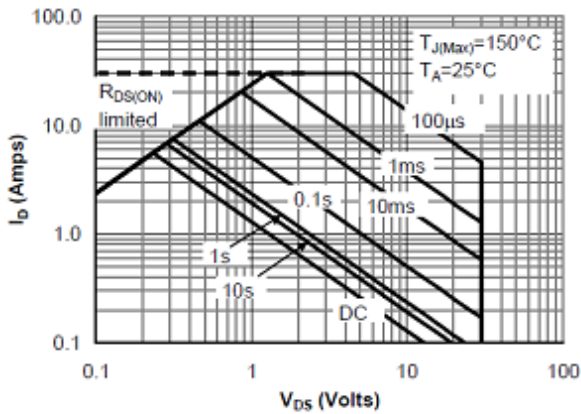


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

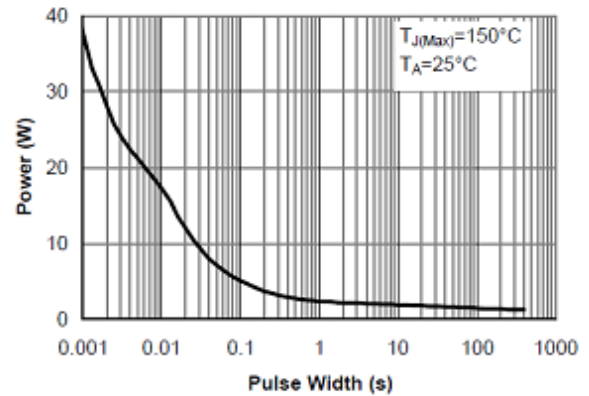


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

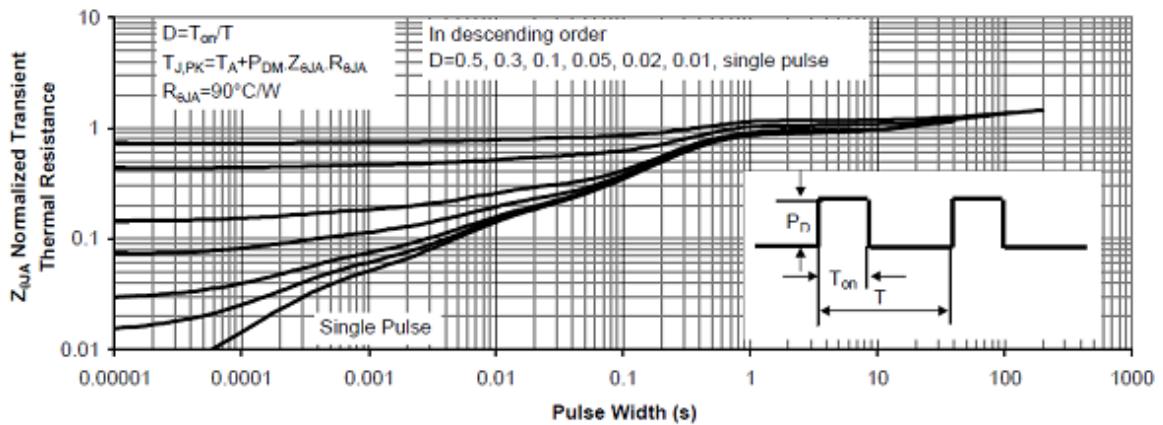
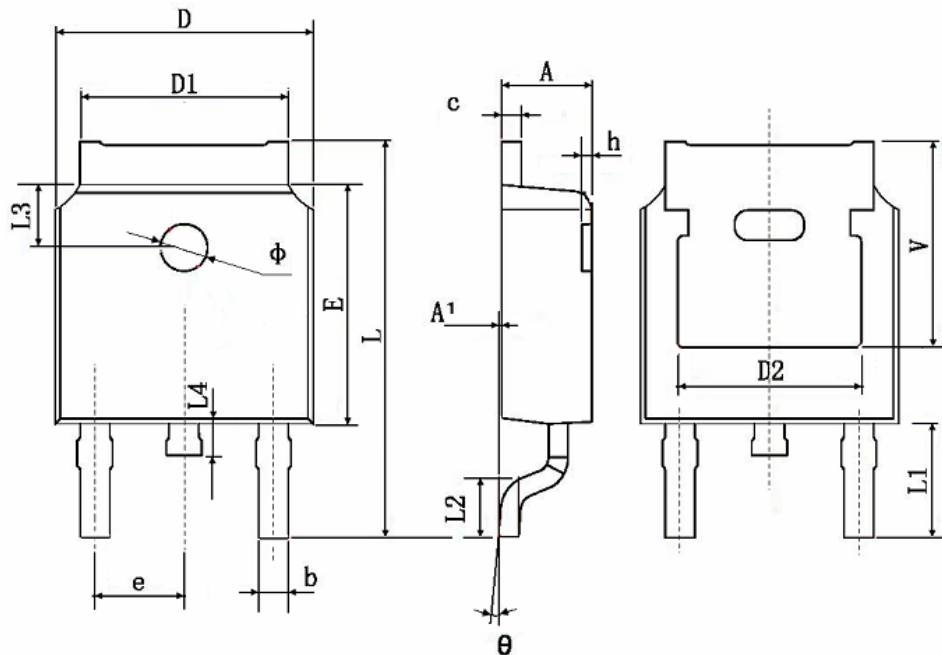


Figure 11: Normalized Maximum Transient Thermal Impedance

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Package Outline Dimension

TO-252



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.660	0.860	0.026	0.034
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	0.483 TYP.		0.190 TYP.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.800	10.400	0.386	0.409
L1	2.900 TYP.		0.114 TYP.	
L2	1.400	1.700	0.055	0.067
L3	1.600 TYP.		0.063 TYP.	
L4	0.600	1.000	0.024	0.039
φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.350 TYP.		0.211 TYP.	

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