

N-Channel Enhancement Mode Field Effect Transistor with Schottky Diode

General Description

The VB3222A uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. A Schottky diode is provided to facilitate the implementation of a bidirectional blocking switch, or for DC-DC conversion applications.

Features

V_{DS} (V) = 20V

I_D = 6.0A (V_{GS} = 4.5V)

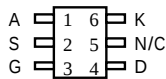
$R_{DS(ON)}$ < 26m Ω (V_{GS} = 4.5V)

$R_{DS(ON)}$ < 35m Ω (V_{GS} = 2.5V)

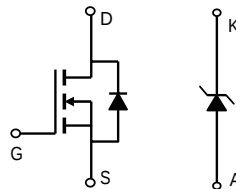
$R_{DS(ON)}$ < 45m Ω (V_{GS} = 1.8V)

SCHOTTKY

V_{DS} (V) = 20V, I_F = 1A, V_F < 0.5V@0.5A



TSOP6



Absolute Maximum Ratings $T_A=25^\circ\text{C}$ unless otherwise noted

Parameter	Symbol	MOSFET	Schottky	Units
Drain-Source Voltage	V_{DS}	20		V
Gate-Source Voltage	V_{GS}	± 8		V
Continuous Drain Current ^A	$T_A=25^\circ\text{C}$	I_D	6.0	A
	$T_A=70^\circ\text{C}$		4.5	
Pulsed Drain Current ^B	I_{DM}	18		
Schottky reverse voltage	V_{KA}		20	V
Continuous Forward Current ^A	$T_A=25^\circ\text{C}$	I_F	2	A
	$T_A=70^\circ\text{C}$		1	
Pulsed Forward Current ^B	I_{FM}		10	
Power Dissipation	$T_A=25^\circ\text{C}$	P_D	1.50	W
	$T_A=70^\circ\text{C}$		0.9	
Junction and Storage Temperature Range	T_J, T_{STG}	-55 to 150	-55 to 150	$^\circ\text{C}$

Parameter: Thermal Characteristics MOSFET		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	80.3	110	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		117	150	
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	43	80	
Thermal Characteristics Schottky					
Maximum Junction-to-Ambient ^A	t ≤ 10s	R _{θJA}	109.4	135	°C/W
Maximum Junction-to-Ambient ^A	Steady-State		136.5	175	
Maximum Junction-to-Lead ^C	Steady-State	R _{θJL}	58.5	80	

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units
STATIC PARAMETERS						
BV _{DSS}	Drain-Source Breakdown Voltage	I _D =250μA, V _{GS} =0V	20			V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =16V, V _{GS} =0V T _J =55°C			1 5	μA
I _{GSS}	Gate-Body leakage current	V _{DS} =0V, V _{GS} =±8V			100	nA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	0.4		1.5	V
I _{D(ON)}	On state drain current	V _{GS} =4.5V, V _{DS} =5V	10			A
R _{DS(ON)}	Static Drain-Source On-Resistance	V _{GS} =4.5V, I _D =3.8A T _J =125°C		23 42		mΩ
		V _{GS} =2.5V, I _D =3.3A		27		mΩ
		V _{GS} =1.8V, I _D =2.8A		40		mΩ
g _{FS}	Forward Transconductance	V _{DS} =5V, I _D =3.8A		10.5		S
V _{SD}	Diode Forward Voltage	I _S =1A, V _{GS} =0V		0.8	1	V
I _S	Maximum Body-Diode Continuous Current				1.8	A
DYNAMIC PARAMETERS						
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =10V, f=1MHz		449		pF
C _{oss}	Output Capacitance			74		pF
C _{rss}	Reverse Transfer Capacitance			51.6		pF
R _g	Gate resistance	V _{GS} =0V, V _{DS} =0V, f=1MHz		4.9		Ω
SWITCHING PARAMETERS						
Q _g	Total Gate Charge	V _{GS} =4.5V, V _{DS} =10V, I _D =3.8A		5.9		nC
Q _{gs}	Gate Source Charge			0.36		nC
Q _{gd}	Gate Drain Charge			1.3		nC
t _{D(on)}	Turn-On DelayTime	V _{GS} =5V, V _{DS} =10V, R _L =2.6Ω, R _{GEN} =0Ω		4.5		ns
t _r	Turn-On Rise Time			6		ns
t _{D(off)}	Turn-Off DelayTime			32.7		ns
t _f	Turn-Off Fall Time			7.1		ns
t _{rr}	Body Diode Reverse Recovery Time	I _F =3.8A, dI/dt=100A/μs		13		ns
Q _{rr}	Body Diode Reverse Recovery Charge	I _F =3.8A, dI/dt=100A/μs		3.3		nC
SCHOTTKY PARAMETERS						
V _F	Forward Voltage Drop	I _F =0.5A		0.39	0.5	V
I _{rm}	Maximum reverse leakage current	V _R =16V			0.02	mA
		V _R =16V, T _J =125°C			20	
C _T	Junction Capacitance	V _R =10V		34		pF
t _{rr}	SchottkyReverse Recovery Time	I _F =1A, dI/dt=100A/μs		5.2	10	ns
Q _{rr}	Schottky Reverse Recovery Charge	I _F =1A, dI/dt=100A/μs		0.8		nC

A: The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The value in any given application depends on the user's specific board design. The current rating is based on the t ≤ 10s thermal resistance rating.

B: Repetitive rating, pulse width limited by junction temperature.

C: The R_{θJA} is the sum of the thermal impedance from junction to lead R_{θJL} and lead to ambient.

D: The static characteristics in Figures 1 to 6 are obtained using 80μs pulses, duty cycle 0.5% max.

E: These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The SOA curve provides a single pulse rating.

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

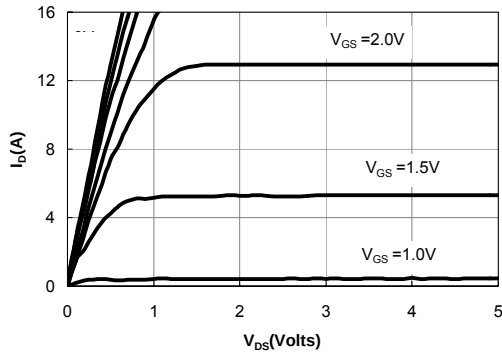


Figure 1: On-Regions Characteristics

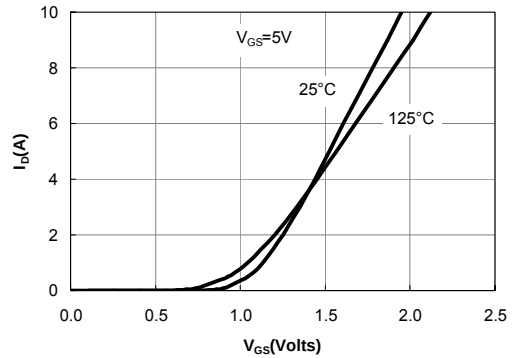


Figure 2: Transfer Characteristics

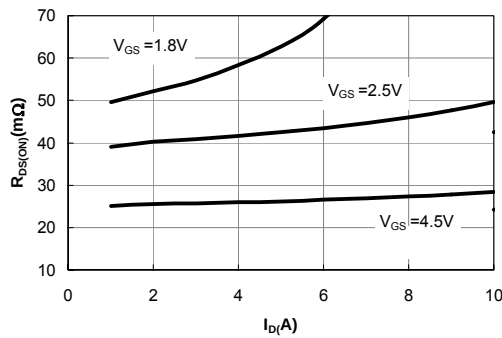


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

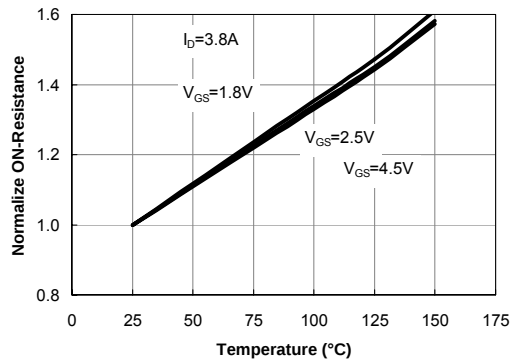


Figure 4: On-Resistance vs. Junction Temperature

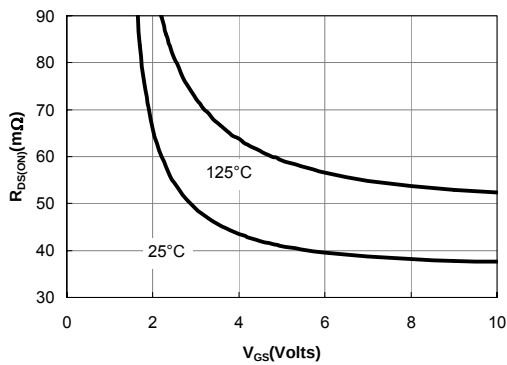


Figure 5: On-Resistance vs. Gate-Source Voltage

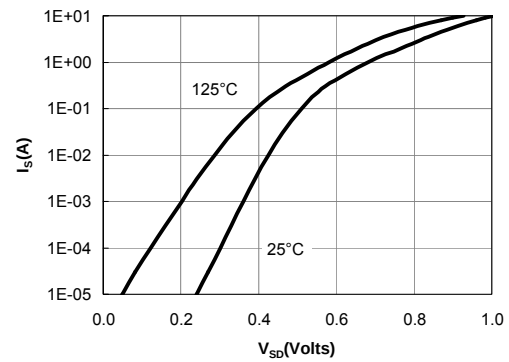


Figure 6: Body-Diode Characteristics

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS

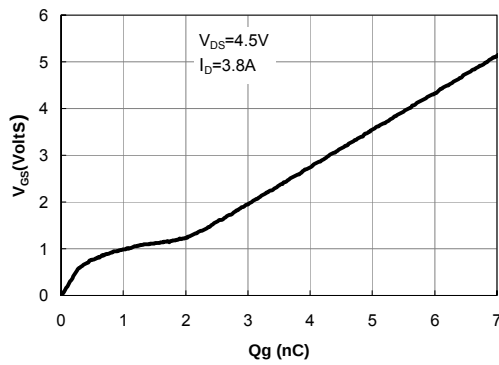


Figure 7: Gate-Charge Characteristics

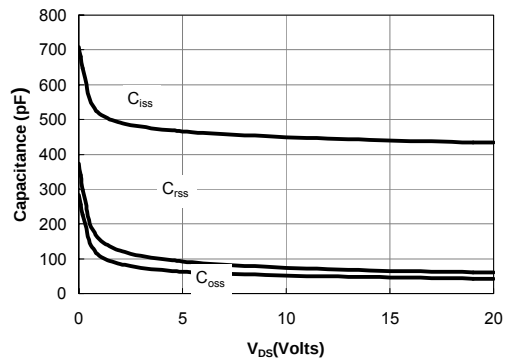


Figure 8: Capacitance Characteristics

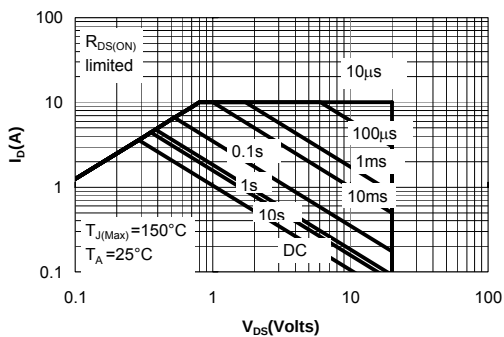


Figure 9: Maximum Forward Biased Safe Operating Area (Note E)

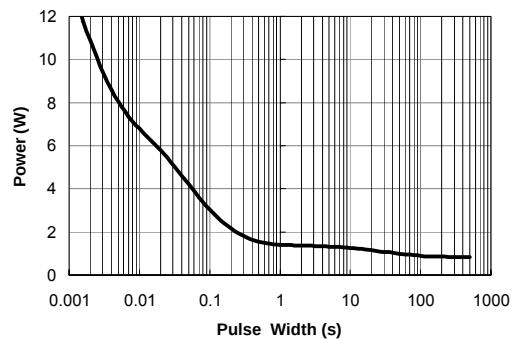


Figure 10: Single Pulse Power Rating Junction-to-Ambient (Note E)

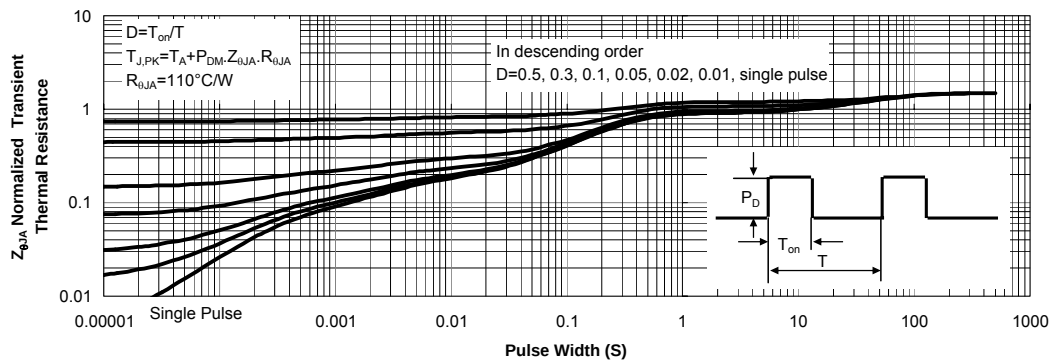


Figure 11: Normalized Maximum Transient Thermal Impedance

TYPICAL ELECTRICAL AND THERMAL CHARACTERISTICS: SCHOTTKY

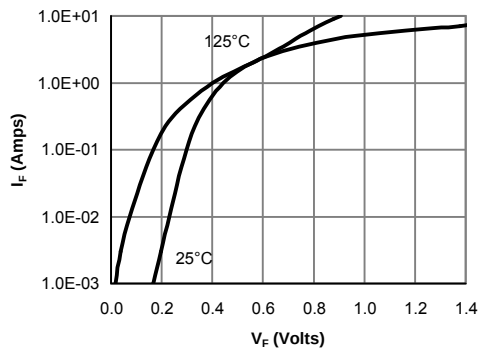


Figure 12: Schottky Forward Characteristics

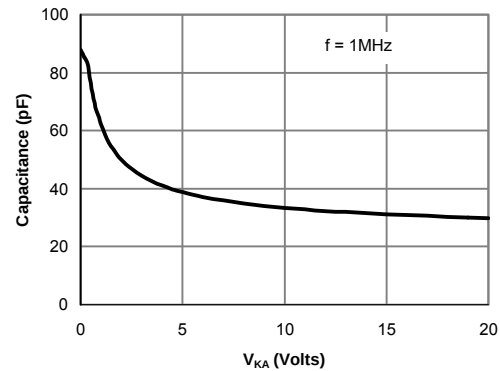


Figure 13: Schottky Capacitance Characteristics

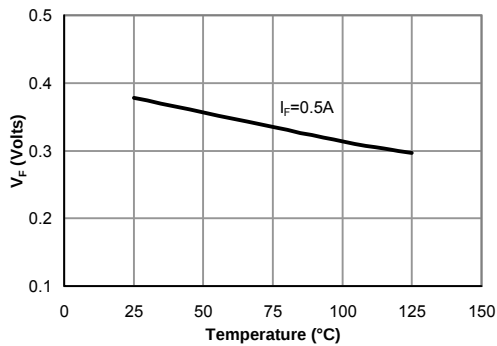


Figure 14: Schottky Forward Drop vs. Junction Temperature

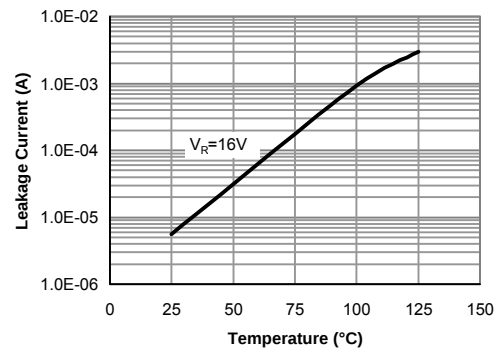


Figure 15: Schottky Leakage current vs. Junction Temperature

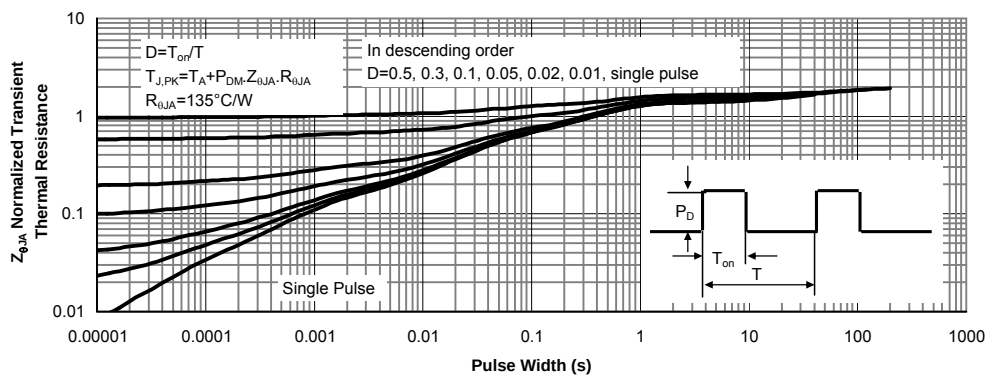
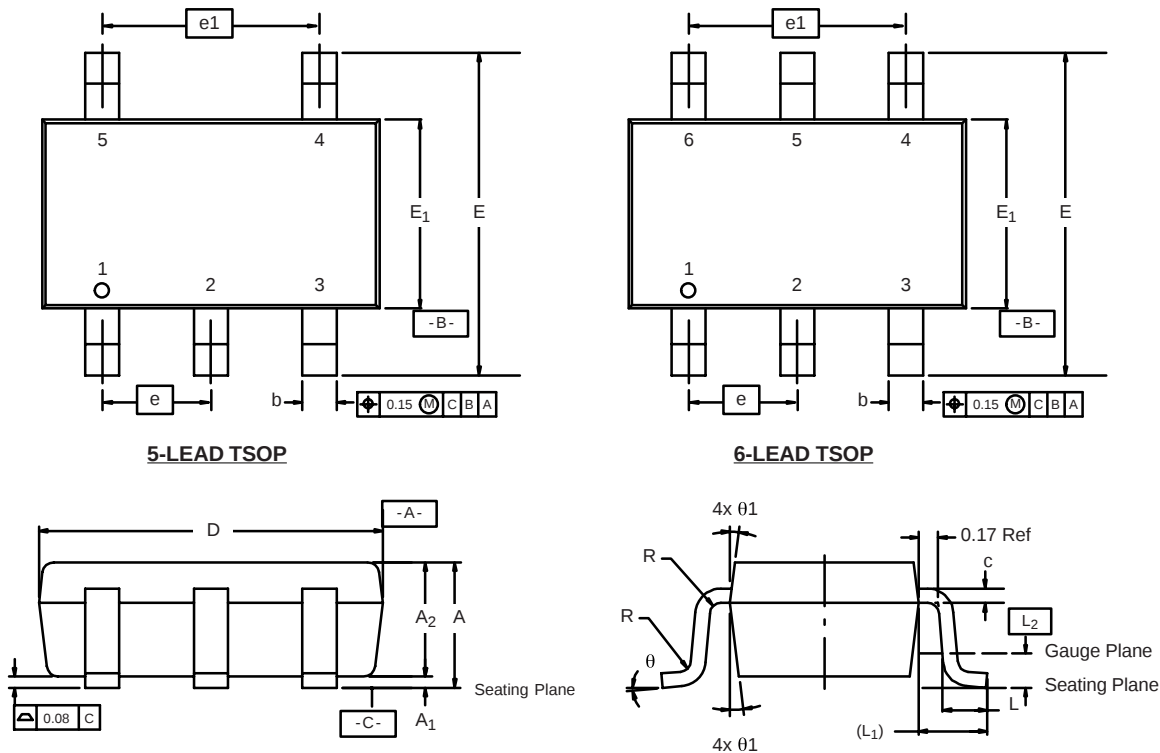


Figure 15: Schottky Normalized Maximum Transient Thermal Impedance

TSOP: 5/6-LEAD
JEDEC Part Number: MO-193C



Dim	MILLIMETERS			INCHES		
	Min	Nom	Max	Min	Nom	Max
A	0.91	-	1.10	0.036	-	0.043
A ₁	0.01	-	0.10	0.0004	-	0.004
A ₂	0.90	-	1.00	0.035	0.038	0.039
b	0.30	0.32	0.45	0.012	0.013	0.018
c	0.10	0.15	0.20	0.004	0.006	0.008
D	2.95	3.05	3.10	0.116	0.120	0.122
E	2.70	2.85	2.98	0.106	0.112	0.117
E ₁	1.55	1.65	1.70	0.061	0.065	0.067
e	0.95 BSC			0.0374 BSC		
e ₁	1.80	1.90	2.00	0.071	0.075	0.079
L	0.32	-	0.50	0.012	-	0.020
L ₁	0.60 Ref			0.024 Ref		
L ₂	0.25 BSC			0.010 BSC		
R	0.10	-	-	0.004	-	-
θ	0°	4°	8°	0°	4°	8°
θ ₁	7° Nom			7° Nom		
ECN: C-06593-Rev. I, 18-Dec-06						
DWG: 5540						

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