

TM2302EI

N-Channel Enhancement Mosfet

General Description

- Low $R_{DS(ON)}$
- RoHS and Halogen-Free Compliant

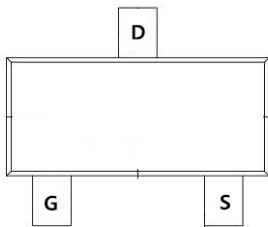
Applications

- Load switch
- PWM

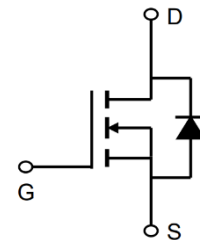
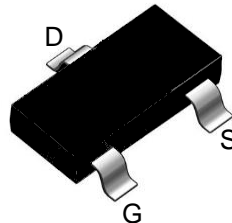
Product Summary

$V_{DS} = 20V$ $I_D = 2.3A$
 $R_{DS(ON)} = 50\ m\Omega$ (typ.) @ $V_{GS} = 4.5V$

100% UIS Tested
 100% R_g Tested



I: SOT-23



Marking: A2SHB OR 02N02

Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	20	V
V_{GS}	Gate-Source Voltage	± 12	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	2.3	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	0.95	A
I_{DM}	Pulsed Drain Current ²	8	A
$P_D @ T_A = 25^\circ C$	Total Power Dissipation ³	0.85	W
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 150	$^\circ C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-ambient ¹	---	162	$^\circ C/W$
R	Thermal Resistance Junction Case ¹			$^\circ C/W$



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Electrical Characteristics ($T_J=25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
Off Characteristic						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	20	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=20V, V_{GS}=0V,$	-	-	1.0	μA
I_{GSS}	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 12V$	-	-	± 100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	0.4	0.7	1.0	V
$R_{DS(on)}$	Static Drain-Source on-Resistance note2	$V_{GS}=4.5V, I_D=3A$	-	50	70	m Ω
		$V_{GS}=2.5V, I_D=2A$	-	70	95	
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS}=10V, V_{GS}=0V,$ $f=1.0MHz$	-	124	-	pF
C_{oss}	Output Capacitance		-	28	-	pF
C_{rss}	Reverse Transfer Capacitance		-	25	-	pF
Q_g	Total Gate Charge	$V_{DS}=10V, I_D=3A,$ $V_{GS}=4.5V$	-	2.7	-	nC
Q_{gs}	Gate-Source Charge		-	0.4	-	nC
Q_{gd}	Gate-Drain("Miller") Charge		-	0.5	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	$V_{DS}=10V, I_D=3A,$ $R_{GEN}=3\Omega, V_{GS}=4.5V$	-	4	-	ns
t_r	Turn-on Rise Time		-	30	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	10	-	ns
t_f	Turn-off Fall Time		-	3.5	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	2.3	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	10	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS}=0V, I_S=3A$	-	-	1.2	V

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 0.5\%$

Typical Performance Characteristics

Figure 1: Output Characteristics

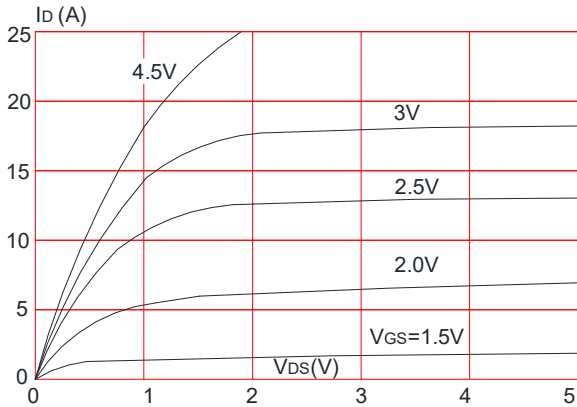


Figure 2: Typical Transfer Characteristics

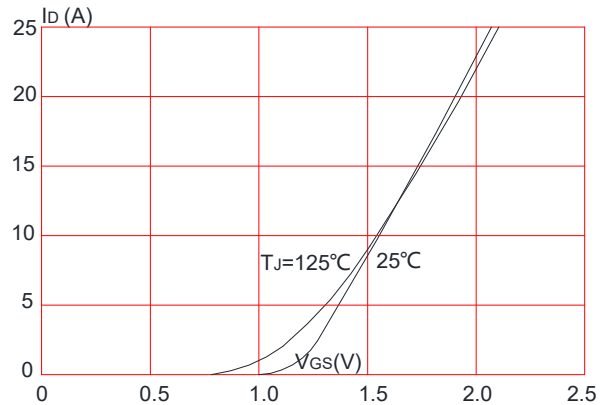


Figure 3: On-resistance vs. Drain Current

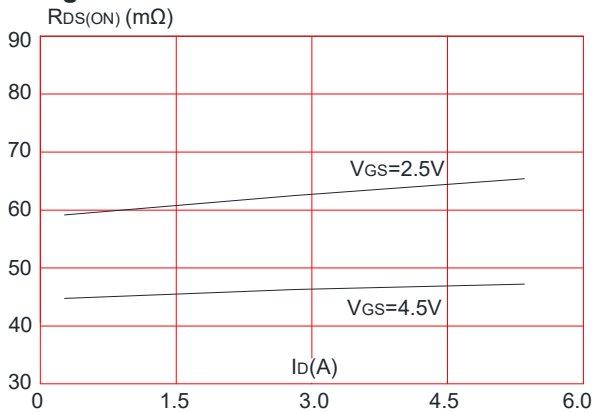


Figure 4: Body Diode Characteristics

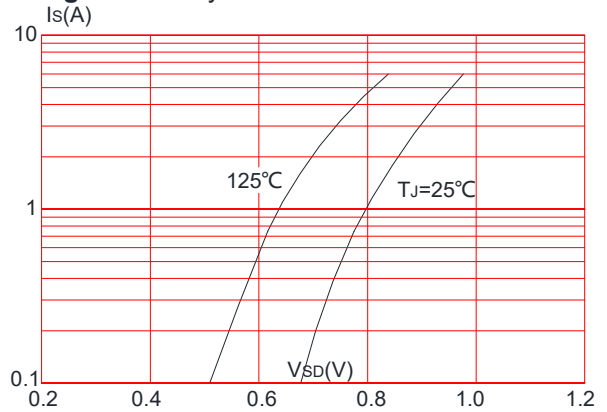


Figure 5: Gate Charge Characteristics

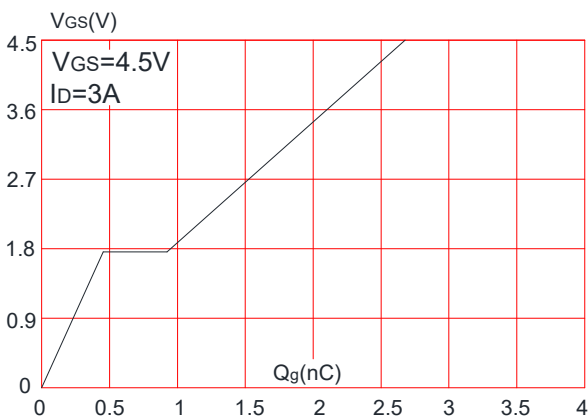
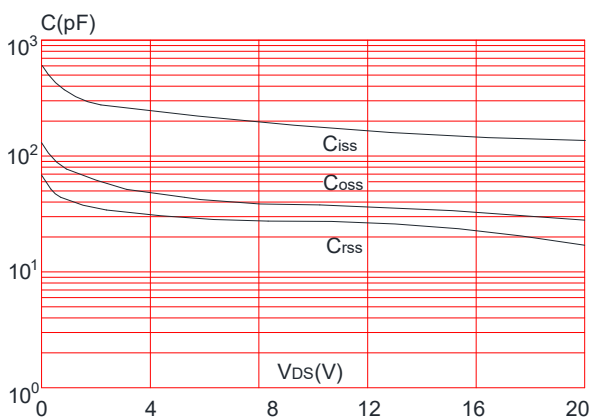


Figure 6: Capacitance Characteristics



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Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

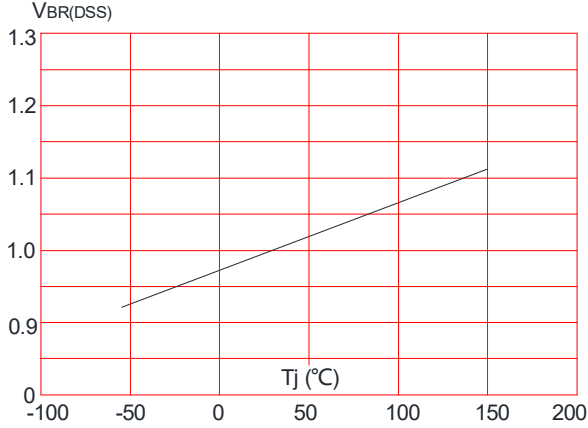


Figure 8: Normalized on Resistance vs. Junction Temperature

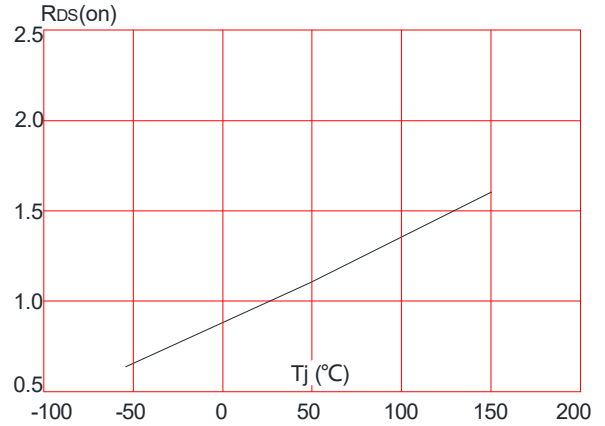


Figure 9: Maximum Safe Operating Area

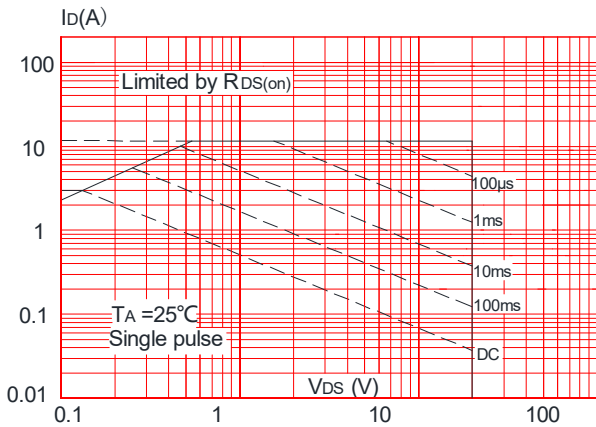


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

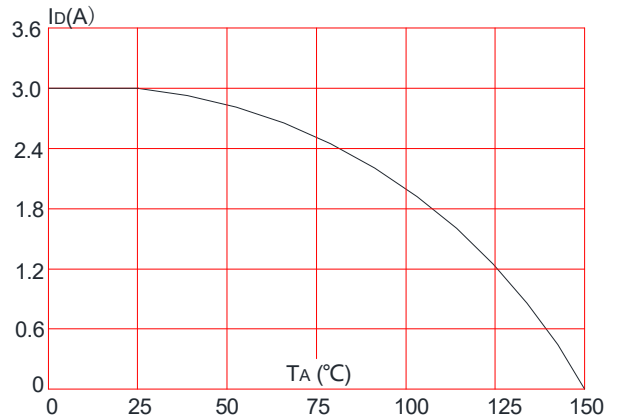
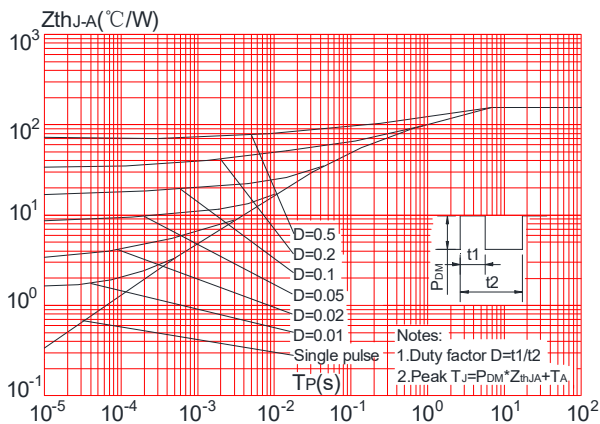
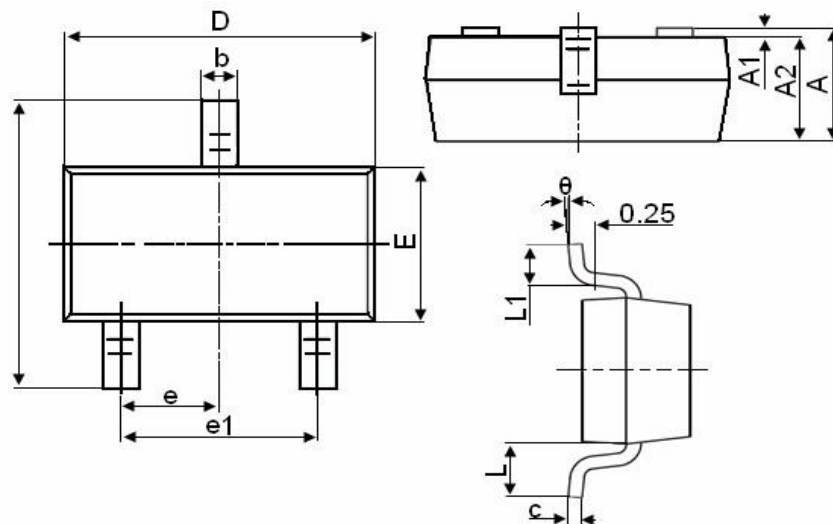


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



Package Mechanical Data: SOT-23



Symbol	Dimensions in Millimeters	
	MIN.	MAX.
A	0.900	1.150
A1	0.000	0.100
A2	0.900	1.050
b	0.300	0.500
c	0.080	0.150
D	2.800	3.000
E	1.200	1.400
E1	2.250	2.550
e	0.950TYP	
e1	1.800	2.000
L	0.550REF	
L1	0.300	0.500
θ	0°	8°