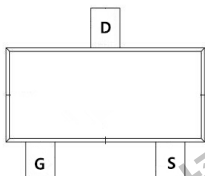
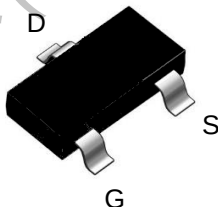
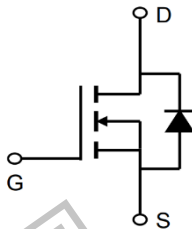


TM09N02I

N-Channel Enhancement Mosfet

General Description • Low $R_{DS(ON)}$ • RoHS and Halogen-Free Compliant Applications • Load switch • PWM	General Features $V_{DS} = 20V$ $I_D = 8.8A$ $R_{DS(ON)} = 11 m\Omega (Typ.) @ V_{GS} = 4.5V$ 100% UIS Tested 100% R_g Tested 
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 Marking: 2312	I: SOT-23 	
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Absolute Maximum Ratings (T _C =25°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°C	Continuous Drain Current, V _{GS} @ 10V ¹	8.8	A	
I _D @T _A =70°C	Continuous Drain Current, V _{GS} @ 10V ¹	4.9	A	
I _{DM}	Pulsed Drain Current ²	30	A	
P _D @T _A =25°C	Total Power Dissipation ³	2	W	
P _D @T _A =70°C	Total Power Dissipation ³	0.66	W	
T _{STG}	Storage Temperature Range	-55 to 150	°C	
T _J	Operating Junction Temperature Range	-55 to 150	°C	
Thermal Data				
Symbol	Parameter	Typ.	Max.	Unit
R _{θJA}	Thermal Resistance Junction-ambient ¹	---	162	°C/W
R	Thermal Resistance Junction Case ¹			°C/W

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N-Channel Enhancement Mosfet
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 =250μA	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} =±12V	-	-	±100	nA
On Characteristics						
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _D =250μA	0.5	0.7	1.2	V
R _{DS(on)}	Static Drain-Source on-Resistance note2	V _{GS} =4.5V, I _D =8A	-	11	16	mΩ
		V _{GS} =2.5V, I _D =5A	-	15	22.5	
Dynamic Characteristics						
C _{iss}	Input Capacitance	V _{DS} =10V, V _{GS} =0V, f=1.0MHz	-	700	-	pF
C _{oss}	Output Capacitance		-	132	-	pF
C _{rss}	Reverse Transfer Capacitance		-	114	-	pF
Q _g	Total Gate Charge	V _{DS} =10V, I _D =4A, V _{GS} =4.5V	-	15	-	nC
Q _{gs}	Gate-Source Charge		-	2	-	nC
Q _{gd}	Gate-Drain(“Miller”) Charge		-	5.2	-	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DS} =10V, I _D =4A, R _{GEN} =3Ω, V _{GS} =4.5V	-	9	-	ns
t _r	Turn-on Rise Time		-	25	-	ns
t _{d(off)}	Turn-off Delay Time		-	37	-	ns
t _f	Turn-off Fall Time		-	14	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I _S	Maximum Continuous Drain to Source Diode Forward Current		-	-	8.8	A
I _{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	32	A
V _{SD}	Drain to Source Diode Forward Voltage	V _{GS} =0V, I _S =8A	-	-	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

Figure1: Output Characteristics

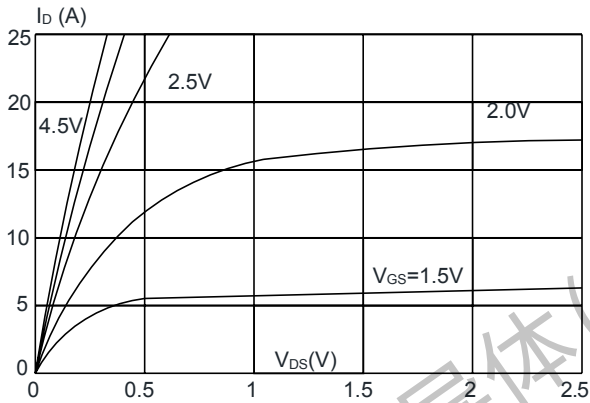


Figure 2: Typical Transfer Characteristics

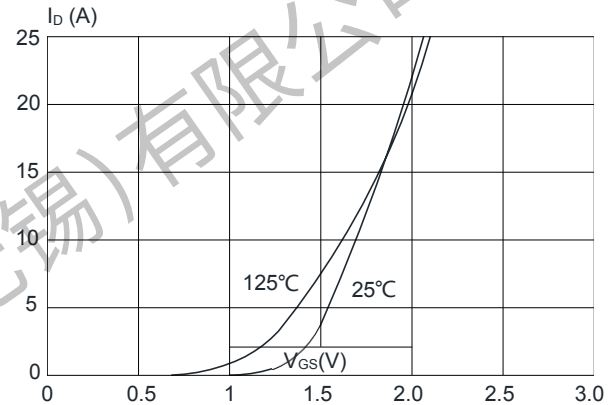


Figure 3: On-resistance vs. Drain Current

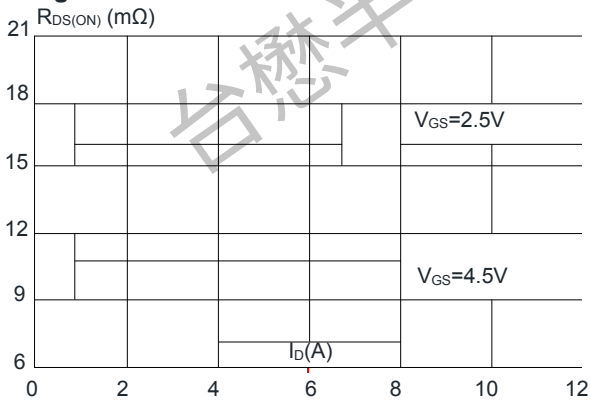


Figure 4: Body Diode Characteristics

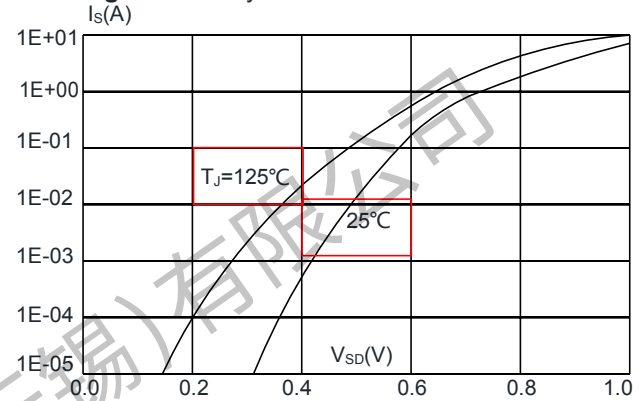


Figure 5: Gate Charge Characteristics

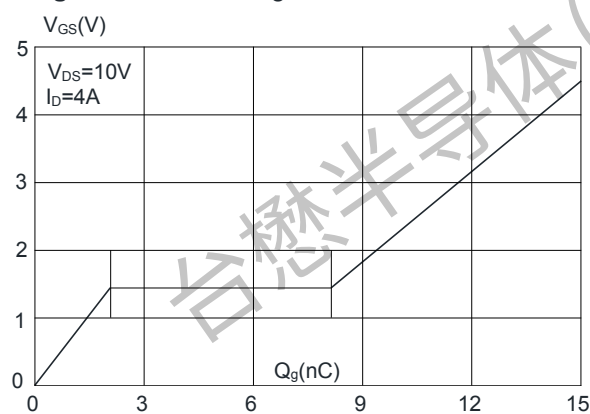
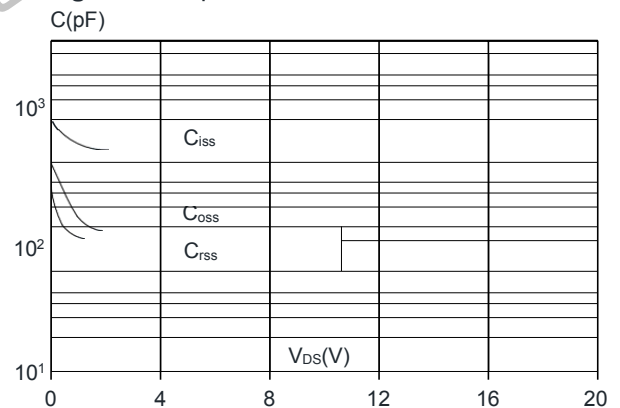


Figure 6: Capacitance Characteristics



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Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

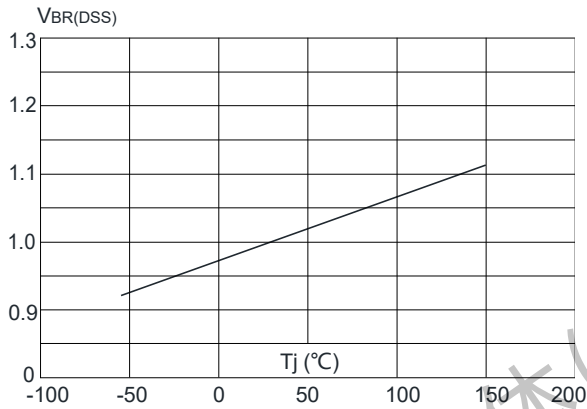


Figure 8: Normalized on Resistance vs. Junction Temperature

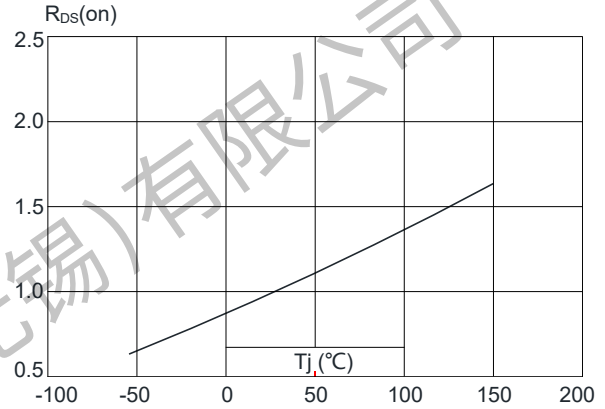


Figure 9: Maximum Safe Operating Area

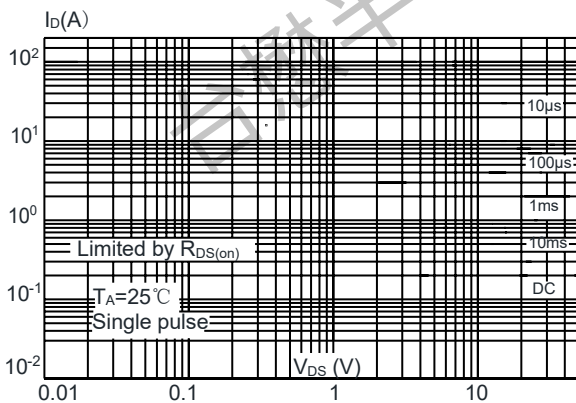


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

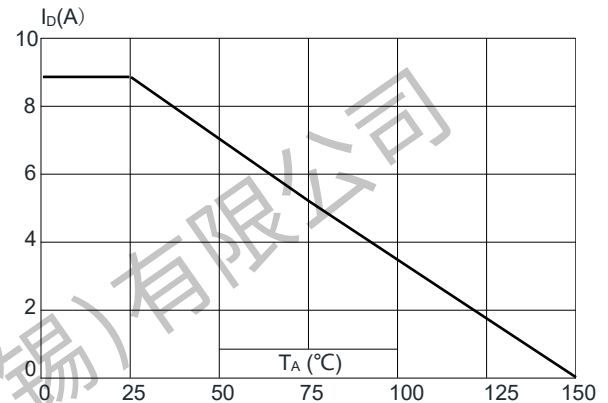
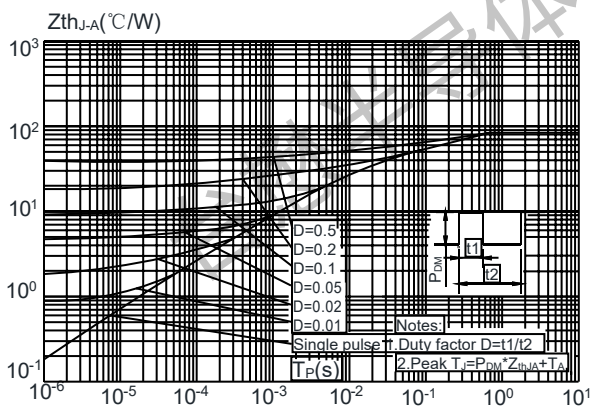


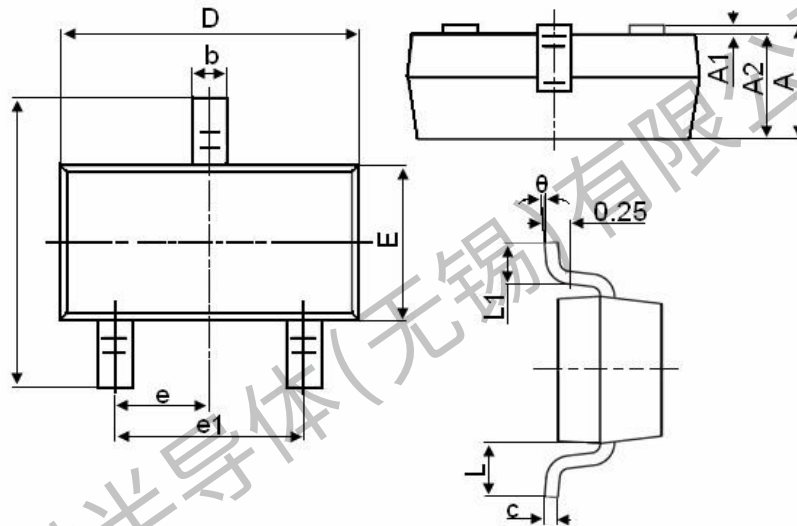
Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient



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N-Channel Enhancement Mosfet

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°

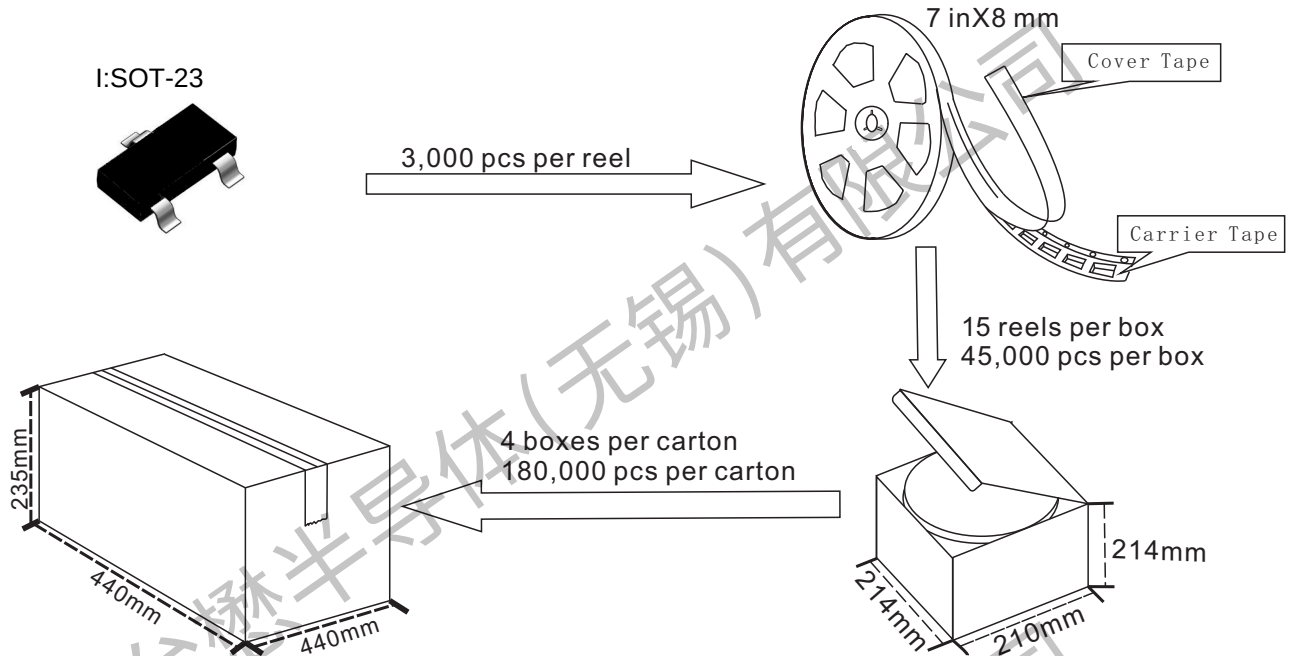


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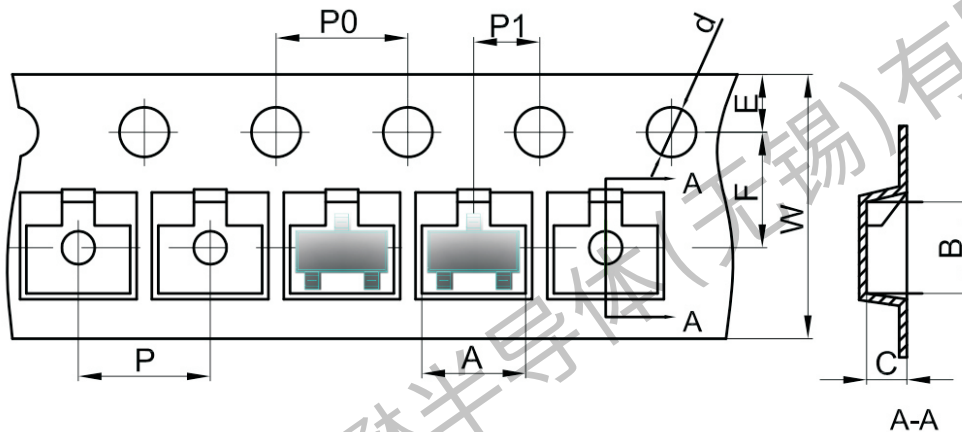
N-Channel Enhancement Mosfet

SOT-23 Packing

1. The method of packaging and dimension are shown as below figure. (Dimension in mm)

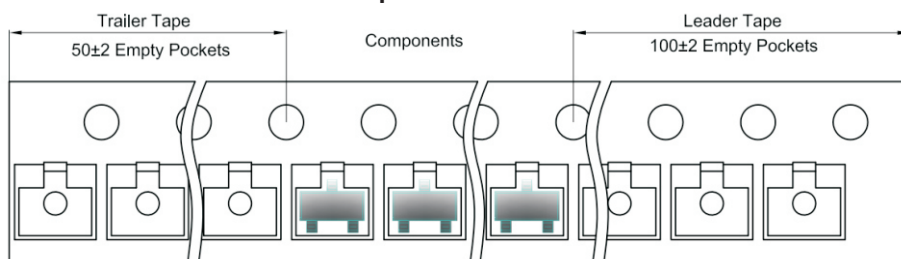


SOT-23 Embossed Carrier Tape



Dimensions are in millimeter										
Pkg type	A	B	C	d	E	F	P0	P	P1	W
SOT-23	3.15	2.77	1.22	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00

SOT-23 Tape Leader and Trailer



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Revision history:

Date	Rev	Description	Page
2023.07.04	23.07	Original	