

TM05P04MI

P-Channel Enhancement Mosfet

<p>General Description</p> <ul style="list-style-type: none"> • Low $R_{DS(ON)}$ • RoHS and Halogen-Free Compliant <p>Applications</p> <ul style="list-style-type: none"> • Load switch • PWM 	<p>General Features</p> <p>$V_{DS} = -40V$ $I_D = -5.4A$</p> <p>$R_{DS(ON)} = 45m\Omega (typ.) @ V_{GS} = -10V$</p> <p>100% UIS Tested 100% R_g Tested</p>
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MI:SOT-23-3L

Marking: 5P04

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

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-40	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current	-5.4	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current	-3.5	A
I_{DM}	Pulsed Drain Current ²	-20	A
$P_D @ T_A = 25^\circ C$	Total Power Dissipation ³	2.0	W
$P_D @ T_A = 70^\circ C$	Total Power Dissipation ³	1.5	W
T_{STG}	Storage Temperature Range	-55 to 175	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 175	$^\circ C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹	---	65	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Ambient ¹ ($t \leq 10s$)	---	48	$^\circ C/W$

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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	$V_{GS}=0V, I_D=-250\mu A$	-40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=-40V, V_{GS}=0V$	-	-	-1	μA
I_{GSS}	Gate to Body Leakage Current	$V_{DS}=0V, V_{GS}=\pm 20V$	-	-	± 100	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=-250\mu A$	-1.4	-1.75	-2.0	V
$R_{DS(on)}$	Static Drain-Source on-Resistance Note2	$V_{GS}=-10V, I_D=-5A$	-	45	54	m Ω
		$V_{GS}=-4.5V, I_D=-4A$	-	55	68	
Dynamic Characteristics						
C_{iss}	Input Capacitance	$V_{DS}=-20V, V_{GS}=0V,$ $f=1.0MHz$	-	899	-	pF
C_{oss}	Output Capacitance		-	94	-	pF
C_{riss}	Reverse Transfer Capacitance		-	69	-	pF
Q_g	Total Gate Charge	$V_{DS}=-20V, I_D=-4A,$ $V_{GS}=-10V$	-	17.3	-	nC
Q_{gs}	Gate-Source Charge		-	3.2	-	nC
Q_{gd}	Gate-Drain("Miller") Charge		-	4.3	-	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	$V_{DS}=-20V, I_D=-4A,$ $V_{GS}=-10V, R_{GEN}=3\Omega$	-	10.3	-	ns
t_r	Turn-on Rise Time		-	4.3	-	ns
$t_{d(off)}$	Turn-off Delay Time		-	39	-	ns
t_f	Turn-off Fall Time		-	46.5	-	ns
Drain-Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain to Source Diode Forward Current		-	-	-5.4	A
I_{SM}	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-22	A
V_{SD}	Drain to Source Diode Forward Voltage	$V_{GS}=0V, I_S=-5.5A$	-	-0.8	-1.2	V
t_{rr}	Reverse Recovery Time	$V_{GS}=0V, I_S=-5.5A,$ $di/dt=100A/\mu s$	-	17	-	ns
Q_{rr}	Reverse Recovery Charge		-	11.5	-	nC

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

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

Typical Performance Characteristics

Figure 1: Output Characteristics

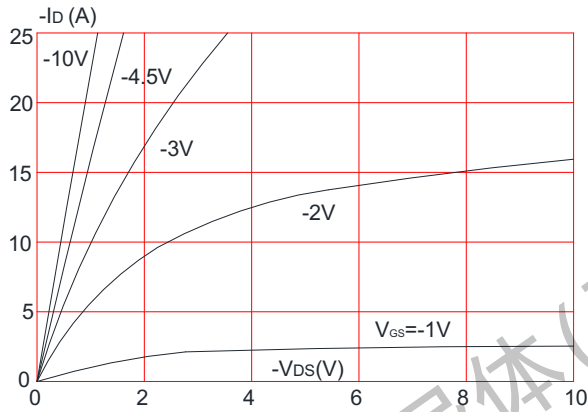


Figure 2: Typical Transfer Characteristics

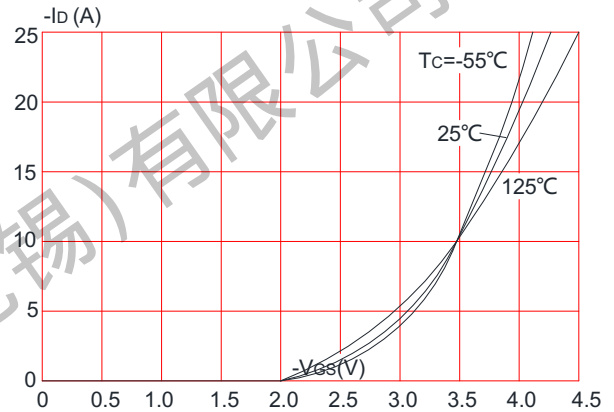


Figure 3: On-resistance vs. Drain Current

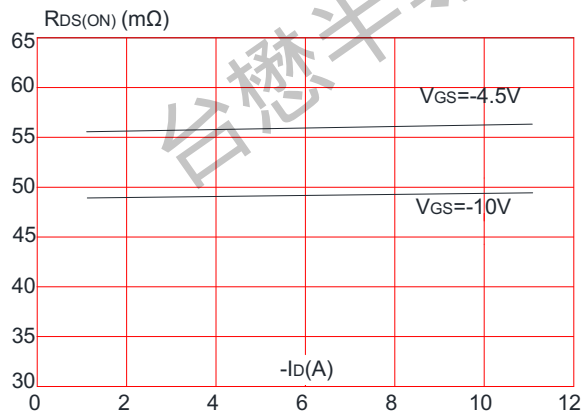


Figure 4: Body Diode Characteristics

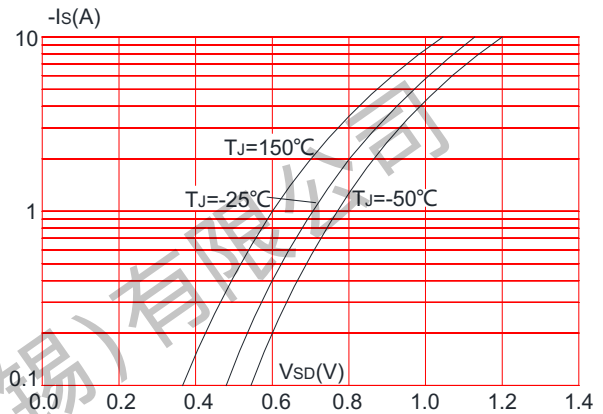


Figure 5: Gate Charge Characteristics

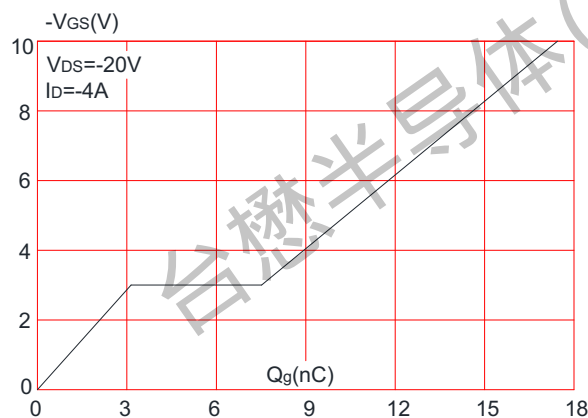
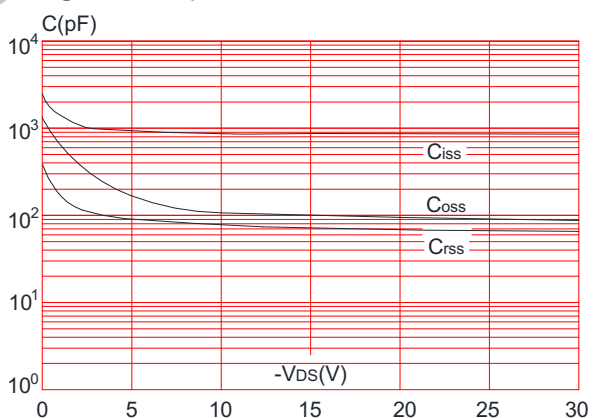


Figure 6: Capacitance Characteristics



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Figure 7: Normalized Breakdown Voltage vs. Junction Temperature

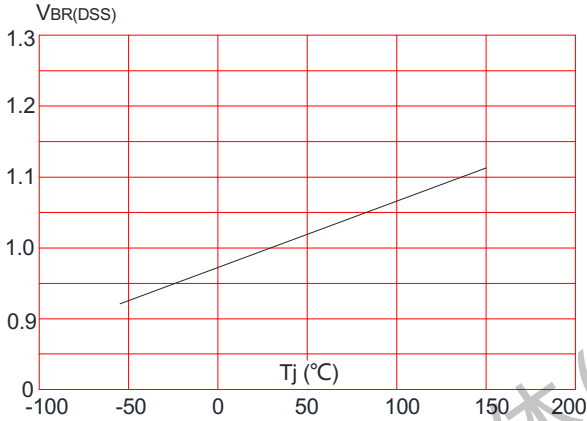


Figure 8: Normalized on Resistance vs. Junction Temperature

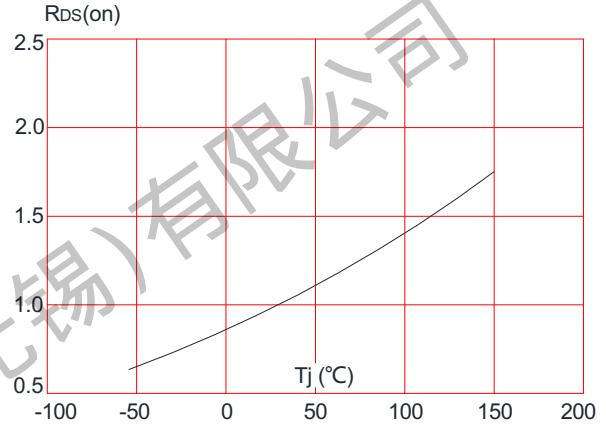


Figure 9: Maximum Safe Operating Area

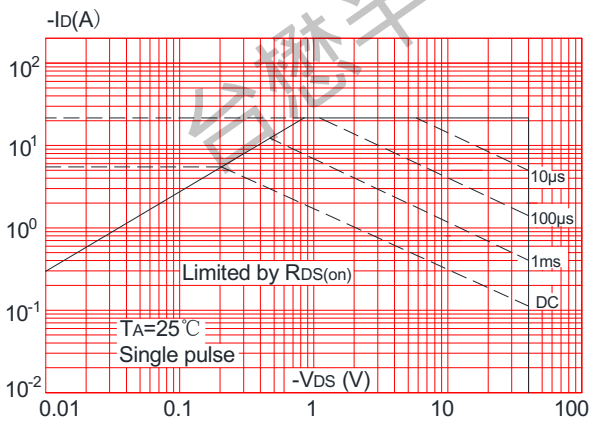


Figure 10: Maximum Continuous Drain Current vs. Ambient Temperature

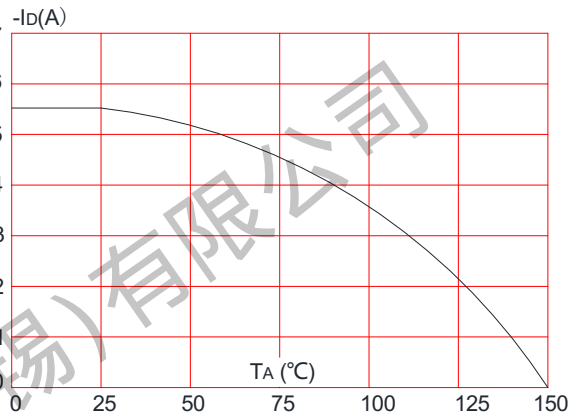
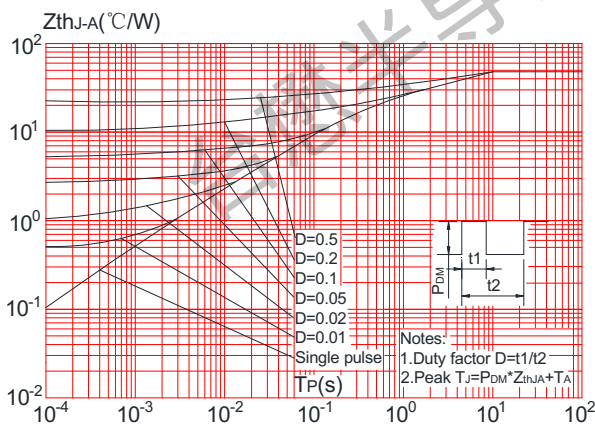


Figure.11: Maximum Effective Transient Thermal Impedance, Junction-to-Ambient

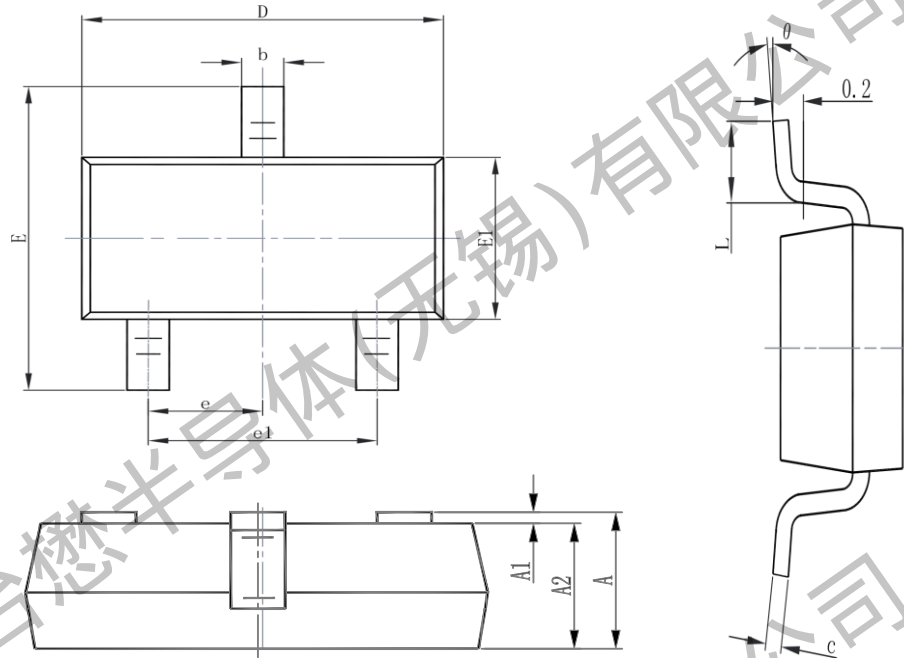




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Package Mechanical Data:SOT-23-3L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E1	1.500	1.700	0.059	0.067
E	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
theta	0°	8°	0°	8°

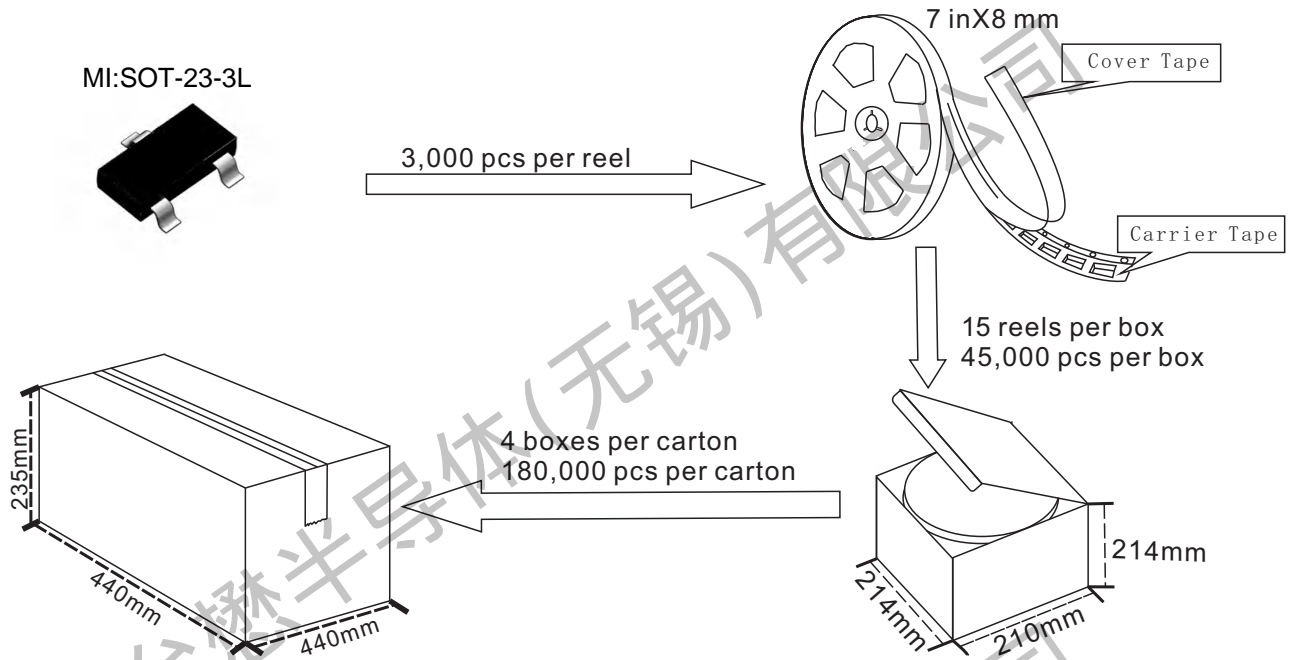


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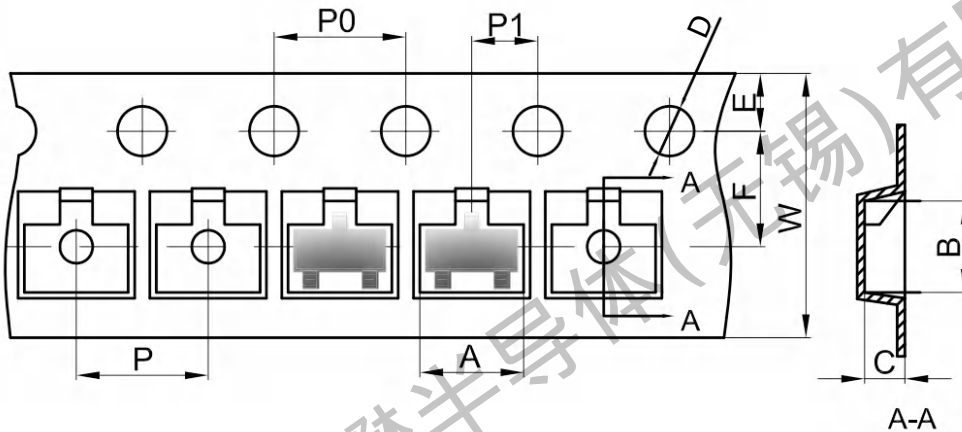
P-Channel Enhancement Mosfet

SOT-23-3L Packing

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



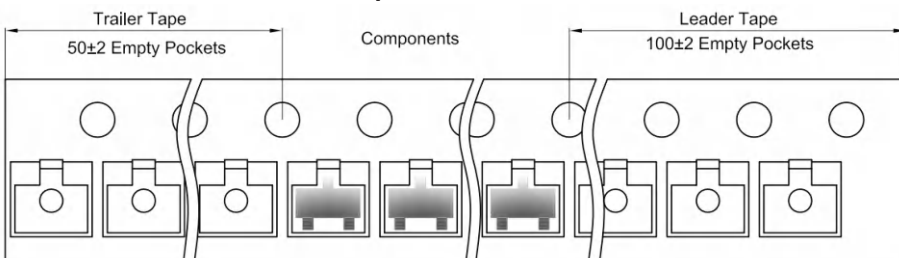
SOT-23-3L Embossed Carrier Tape



Dimensions are in millimeter

Pkg type	A	B	C	D	E	F	P0	P	P1	W
SOT-23-3L	3.15	2.77	1.22	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00

SOT-23-3L Tape Leader and Trailer





Important Notices and Disclaimers

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Revision history:

Date	Rev	Description	Page
2023.04.19	23.04	Original	