


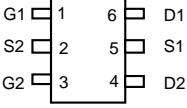


# TM04G02MI6

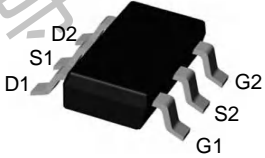
## N+P-Channel Enhancement Mode Mosfet

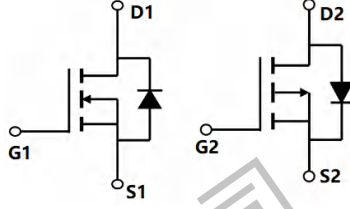
<p><b>General Description</b></p> <ul style="list-style-type: none"> <li>• Low <math>R_{DS(ON)}</math></li> <li>• RoHS and Halogen-Free Compliant</li> </ul> <p><b>Applications</b></p> <ul style="list-style-type: none"> <li>• Load switch</li> <li>• PWM</li> </ul>	<p><b>General Features</b></p> <p><b>N Channel</b>  <math>V_{DS} = 20V, I_D = 4.0A</math>  <math>R_{DS(ON)} = 22m\Omega (typ.) @ V_{GS} = 4.5V</math></p> <p><b>P Channel</b>  <math>V_{DS} = -20V, I_D = -3.6A</math>  <math>R_{DS(ON)} = 55m\Omega (typ.) @ V_{GS} = -4.5V</math></p> <p>100% UIS Tested          100% <math>R_g</math> Tested</p> 
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MI6:SOT-23-6L



Marking: 20G04





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

Symbol	Parameter	Rating		Units
		N-Channel	P-Channel	
$V_{DS}$	Drain-Source Voltage	20	-20	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	$\pm 12$	V
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 4.5V^1$	4.0	-3.6	A
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ 4.5V^1$	2.6	-2.3	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	16	-14	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	72	59	mJ
$I_{AS}$	Avalanche Current	21	-19	A
$P_D @ T_A = 25^\circ C$	Total Power Dissipation <sup>4</sup>	2.5	2.08	W
$T_{STG}$	Storage Temperature Range	-55 to 175	-55 to 175	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 175	-55 to 175	$^\circ C$

**Thermal Data**

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup>	---	85	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	62.5	$^\circ C/W$

**TM04G02MI6**

**N+P-Channel Enhancement Mode Mosfet**

**N-Electrical Characteristics (T<sub>J</sub>=25 °C unless otherwise specified)**

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	20	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V,	-	-	1.0	μA
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> =±12V	-	-	±100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	0.4	0.75	1	V
R <sub>DS(on)</sub>	Static Drain-Source on-Resistance <small>note2</small>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A	-	22	27	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =3A	-	29	44	
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =10V, V <sub>GS</sub> =0V, f=1.0MHz	-	358	-	pF
C <sub>oss</sub>	Output Capacitance		-	69.3	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	58.5	-	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =10V, I <sub>D</sub> =2A, V <sub>GS</sub> =4.5V	-	5.6	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	0.8	-	nC
Q <sub>gd</sub>	Gate-Drain("Miller") Charge		-	1	-	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DS</sub> =10V, I <sub>D</sub> =4A, R <sub>GEN</sub> =3Ω, V <sub>GS</sub> =4.5V	-	5	-	ns
t <sub>r</sub>	Turn-on Rise Time		-	30	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time		-	48	-	ns
t <sub>f</sub>	Turn-off Fall Time		-	36	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	4.0	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	16	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> =4A	-	-	1.2	V

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

2. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%

**TM04G02MI6**

**N+P-Channel Enhancement Mode Mosfet**

**P-Electrical Characteristics (T<sub>J</sub>=25 °C unless otherwise specified)**

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> = -250μA	-20	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = -20V, V <sub>GS</sub> =0V,	-	-	-1	μA
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> = ±12V	-	-	±100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = -250μA	-0.3	-0.65	-1.0	V
R <sub>DS(on)</sub>	Static Drain-Source on-Resistance <small>note2</small>	V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -3A	-	55	70	mΩ
		V <sub>GS</sub> = -2.5V, I <sub>D</sub> = -2A	-	70	100	
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = -10V, V <sub>GS</sub> =0V, f=1.0MHz	-	503	-	pF
C <sub>oss</sub>	Output Capacitance		-	67	-	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		-	58	-	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = -10V, I <sub>D</sub> = -2A, V <sub>GS</sub> = -4.5V	-	4.1	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	0.8	-	nC
Q <sub>gd</sub>	Gate-Drain("Miller") Charge		-	1.1	-	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> = -10V, I <sub>D</sub> = -3A, R <sub>G</sub> =1Ω, V <sub>GEN</sub> = -4.5V, R <sub>L</sub> =1.2Ω	-	11	-	ns
t <sub>r</sub>	Turn-on Rise Time		-	52	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time		-	16	-	ns
t <sub>f</sub>	Turn-off Fall Time		-	10	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward Current		-	-	-3.6	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-14	A
V <sub>SD</sub>	Drain to Source Diode Forward Voltage	V <sub>GS</sub> =0V, I <sub>S</sub> = -3A	-	-	-1.2	V

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature  
2. Pulse Test: Pulse Width≤300μs, Duty Cycle≤2%

## Typical Performance Characteristics

### N-Channel Typical Characteristics

Figure 1: Output Characteristics

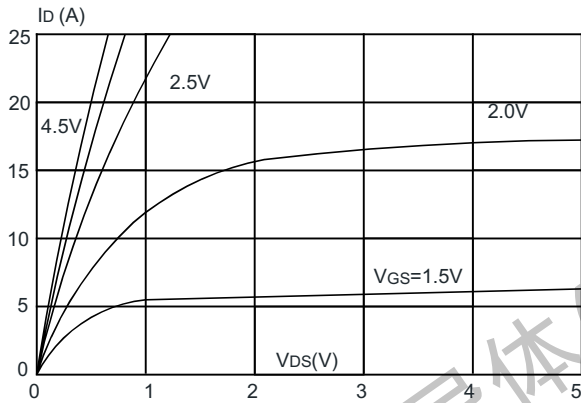


Figure 2: Typical Transfer Characteristics

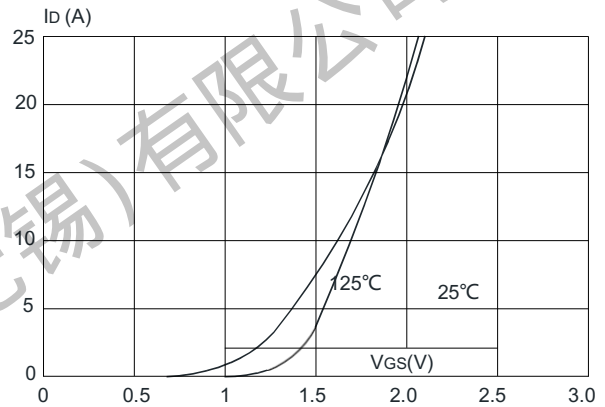


Figure 3: On-resistance vs. Drain Current

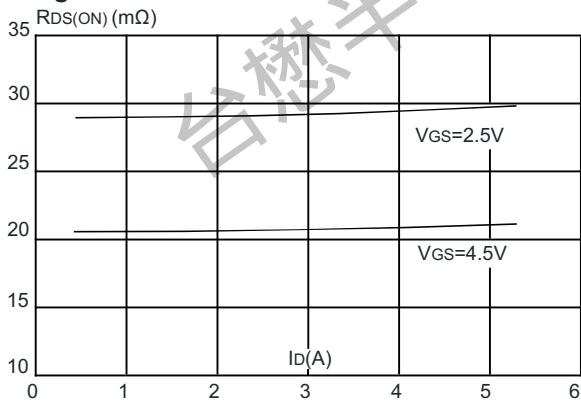


Figure 4: Body Diode Characteristics

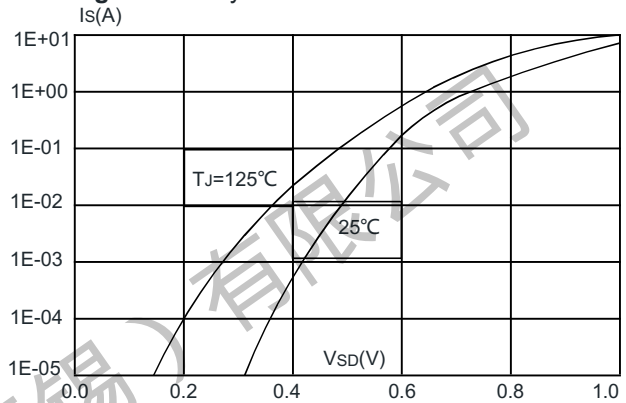


Figure 5: Gate Charge Characteristics

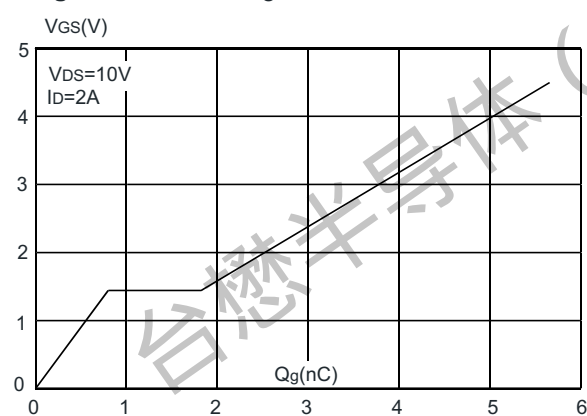
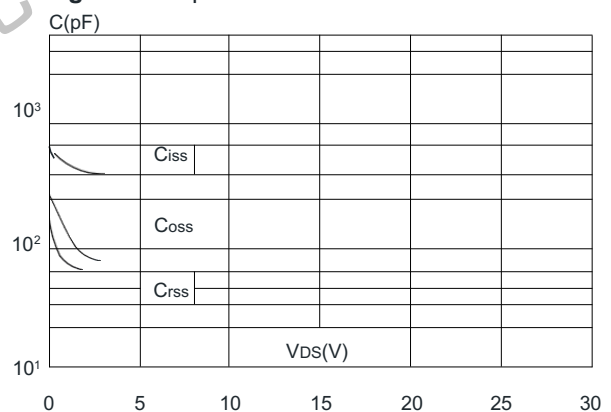


Figure 6: Capacitance Characteristics



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P-Channel Typical Characteristics

Figure 1: Output Characteristics

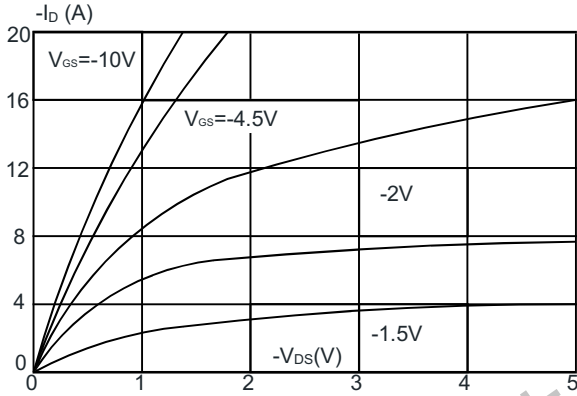


Figure 2: Typical Transfer Characteristics

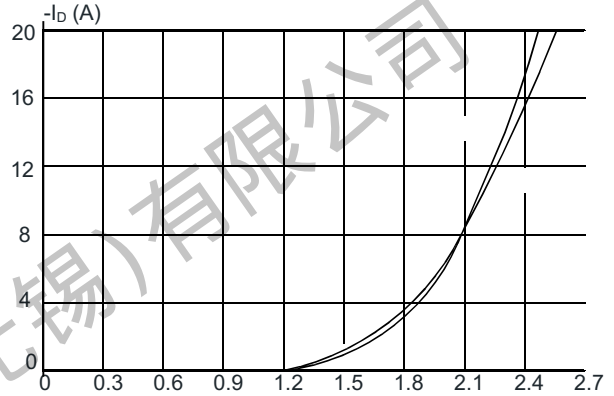


Figure 3: On-resistance vs. Drain Current

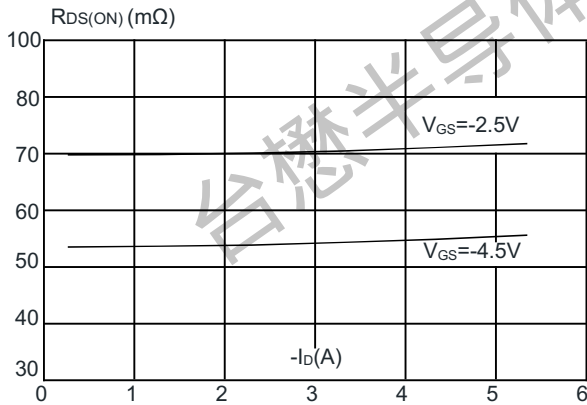


Figure 4: Body Diode Characteristics

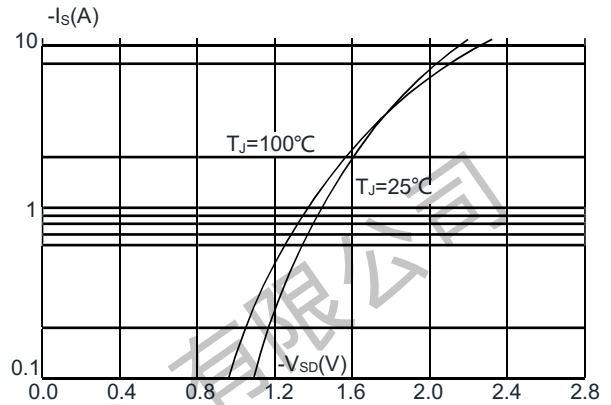


Figure 5: Gate Charge Characteristics

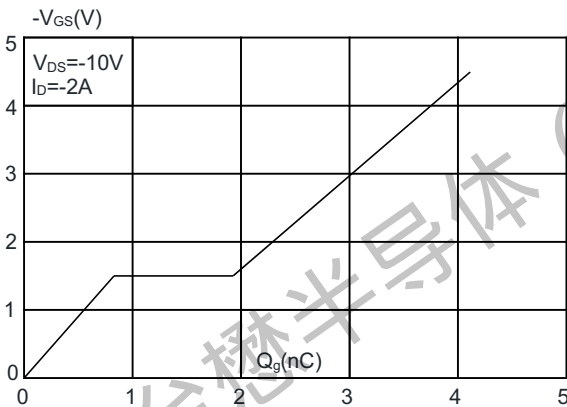
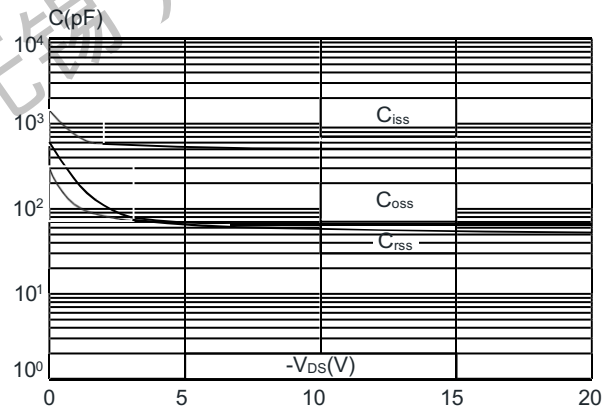


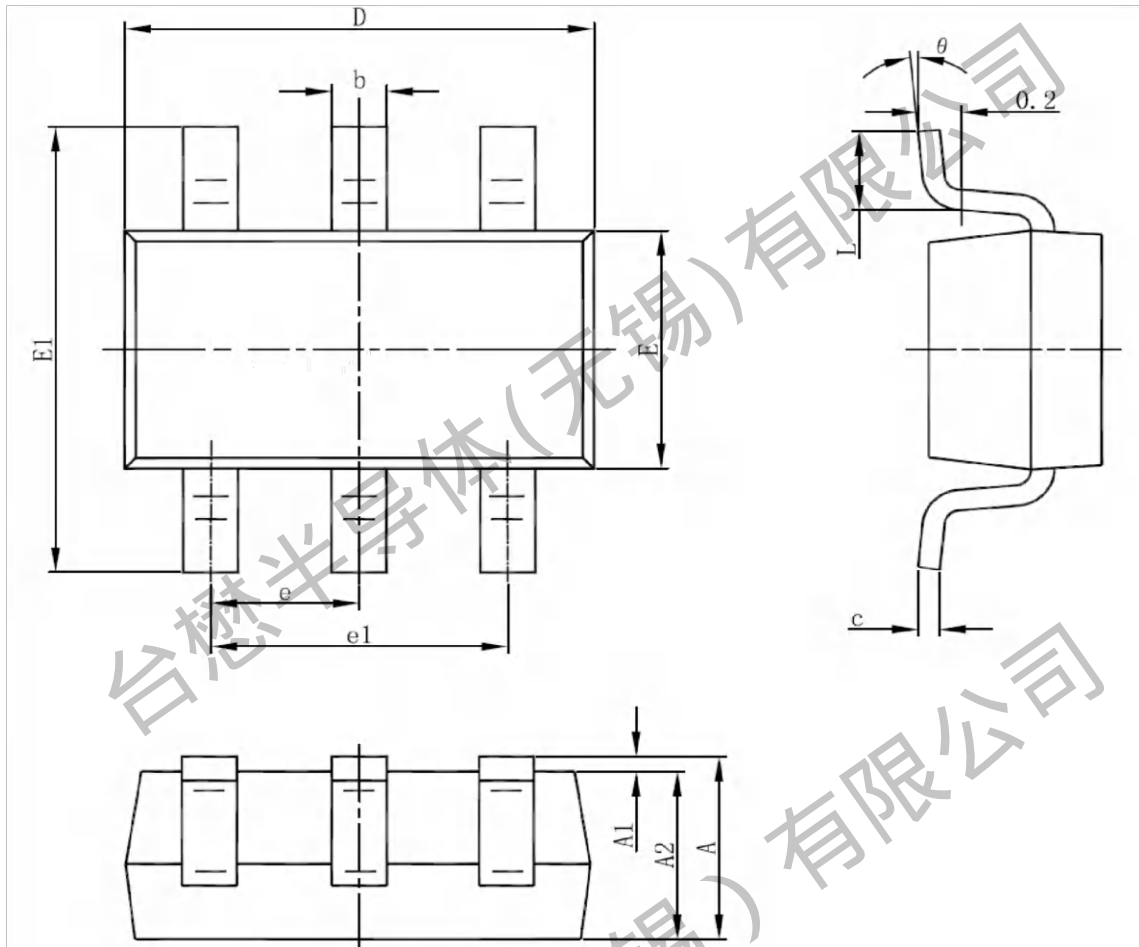
Figure 6: Capacitance Characteristics



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Package Mechanical Data:SOT-23-6L



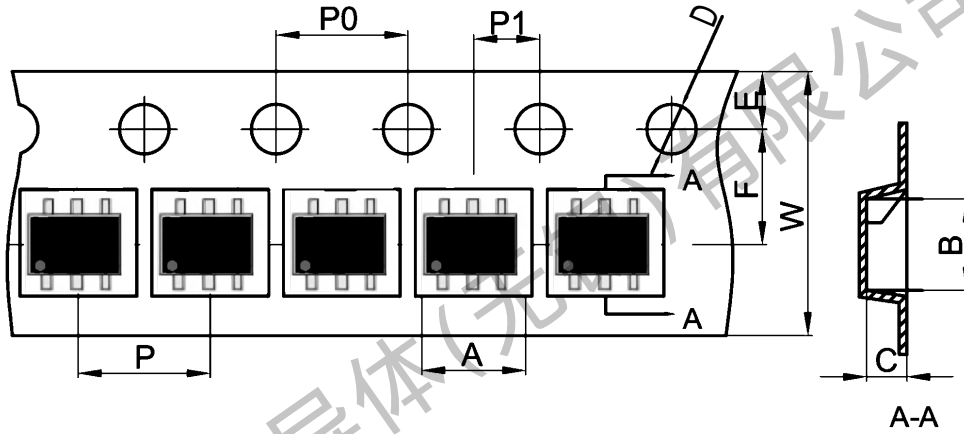
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)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



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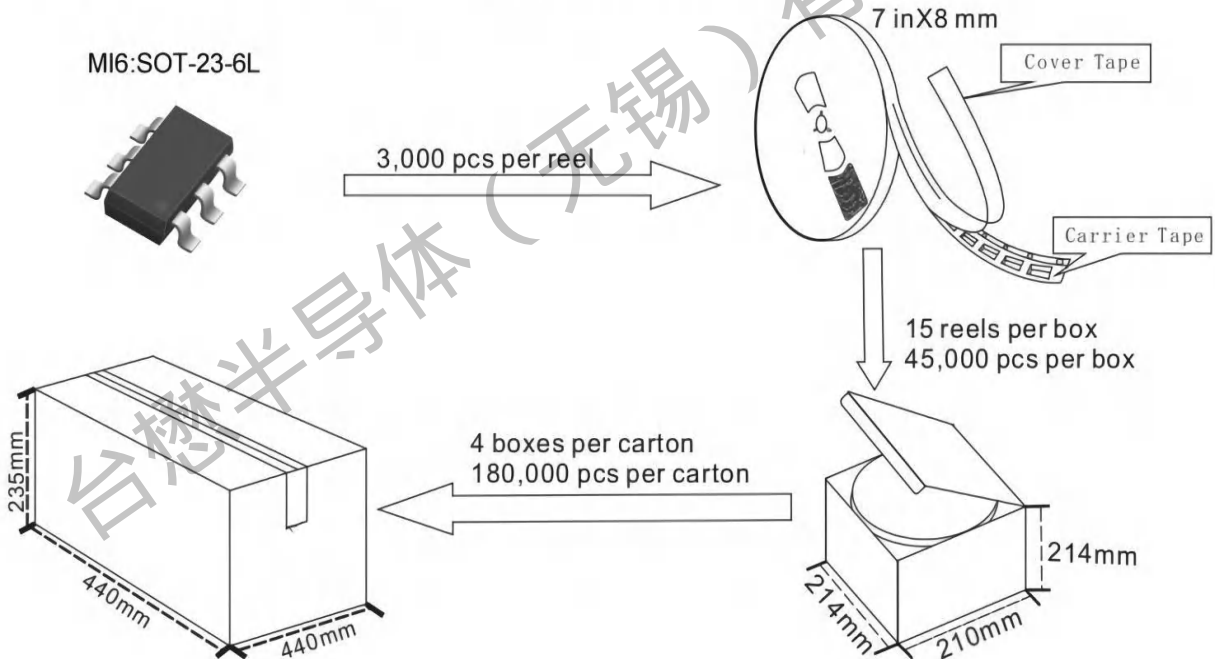
SOT-23-6L Embossed Carrier Tape



Dimensions are in millimeter										
Pkg type	A	B	C	D	E	F	P0	P	P1	W
SOT-23-6L	3.15	2.77	1.22	Ø1.50	1.75	3.50	4.00	4.00	2.00	8.00

SOT-23-6L Packing

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



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Revision history:

Date	Rev	Description	Page
2022.11.23	22.11	Original	