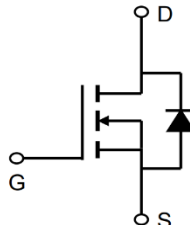
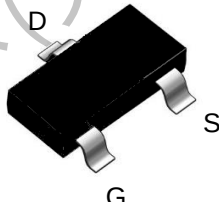
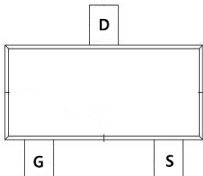


TM04N02I

N-Channel Enhancement Mosfet

General Description • Low $R_{DS(ON)}$ • RoHS and Halogen-Free Compliant Applications • Load switch • PWM	General Features $V_{DS} = 20V$ $I_D = 3.8A$ $R_{DS(ON)} = 35\text{ m}\Omega(\text{Typ.}) @ V_{GS} = 4.5V$ 100% UIS Tested 100% R_g Tested 																																																			
I: SOT-23  Marking: A2SHB																																																				
Absolute Maximum Ratings ($T_c = 25^{\circ}\text{C}$ unless otherwise noted) <table><tr><th>Symbol</th><th>Parameter</th><th>Rating</th><th>Units</th></tr><tr><td>V_{DS}</td><td>Drain-Source Voltage</td><td>20</td><td>V</td></tr><tr><td>V_{GS}</td><td>Gate-Source Voltage</td><td>± 10</td><td>V</td></tr><tr><td>$I_D @ T_A = 25^{\circ}\text{C}$</td><td>Continuous Drain Current, $V_{GS} @ 10V^1$</td><td>3.8</td><td>A</td></tr><tr><td>$I_D @ T_A = 70^{\circ}\text{C}$</td><td>Continuous Drain Current, $V_{GS} @ 10V^1$</td><td>2.47</td><td>A</td></tr><tr><td>I_{DM}</td><td>Pulsed Drain Current²</td><td>14</td><td>A</td></tr><tr><td>$P_D @ T_A = 25^{\circ}\text{C}$</td><td>Total Power Dissipation³</td><td>1.05</td><td>W</td></tr><tr><td>T_{STG}</td><td>Storage Temperature Range</td><td>-55 to 150</td><td>$^{\circ}\text{C}$</td></tr><tr><td>T_J</td><td>Operating Junction Temperature Range</td><td>-55 to 150</td><td>$^{\circ}\text{C}$</td></tr></table> Thermal Data <table><tr><th>Symbol</th><th>Parameter</th><th>Typ.</th><th>Max.</th><th>Unit</th></tr><tr><td>$R_{\theta JA}$</td><td>Thermal Resistance Junction-ambient ¹</td><td>---</td><td>162</td><td>$^{\circ}\text{C/W}$</td></tr><tr><td>R</td><td>Thermal Resistance Junction Case¹</td><td></td><td></td><td>$^{\circ}\text{C/W}$</td></tr></table>		Symbol	Parameter	Rating	Units	V_{DS}	Drain-Source Voltage	20	V	V_{GS}	Gate-Source Voltage	± 10	V	$I_D @ T_A = 25^{\circ}\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	3.8	A	$I_D @ T_A = 70^{\circ}\text{C}$	Continuous Drain Current, $V_{GS} @ 10V^1$	2.47	A	I_{DM}	Pulsed Drain Current ²	14	A	$P_D @ T_A = 25^{\circ}\text{C}$	Total Power Dissipation ³	1.05	W	T_{STG}	Storage Temperature Range	-55 to 150	$^{\circ}\text{C}$	T_J	Operating Junction Temperature Range	-55 to 150	$^{\circ}\text{C}$	Symbol	Parameter	Typ.	Max.	Unit	$R_{\theta JA}$	Thermal Resistance Junction-ambient ¹	---	162	$^{\circ}\text{C/W}$	R	Thermal Resistance Junction Case ¹			$^{\circ}\text{C/W}$
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TM04N02I
N-Channel Enhancement Mosfet
Electrical Characteristics
 $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	20	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 20\text{ V}, V_{GS} = 0\text{ V}$	--	--	1	μA
		$V_{DS} = 16\text{ V}, T_C = 125^\circ\text{C}$	--	--	10	μA
I_{GSSF}	Gate-Body Leakage Current, Forward	$V_{GS} = 10\text{ V}, V_{DS} = 0\text{ V}$	--	--	100	nA
I_{GSSR}	Gate-Body Leakage Current, Reverse	$V_{GS} = -10\text{ V}, V_{DS} = 0\text{ V}$	--	--	-100	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	0.45	0.7	1.1	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 4.5\text{ V}, I_D = 3.5\text{ A}$	--	35	55	m Ω
		$V_{GS} = 2.5\text{ V}, I_D = 2.0\text{ A}$	-	55	70	

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1.0\text{ MHz}$	--	180	-	pF
C_{oss}	Output Capacitance		--	37	--	pF
C_{rss}	Reverse Transfer Capacitance		--	34	--	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{GS} = 5\text{ V}, V_{DS} = 10\text{ V}, I_D = 3\text{ A},$ $R_G = 6\text{ }\Omega, R_L = 2.7\text{ }\Omega$	--	4.5	--	ns
t_r	Turn-On Rise Time		--	31	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	12	--	ns
t_f	Turn-Off Fall Time		--	4.0	--	ns
Q_g	Total Gate Charge	$V_{DS} = 10\text{ V}, I_D = 3\text{ A},$ $V_{GS} = 5\text{ V}$	--	6.23	--	nC
Q_{gs}	Gate-Source Charge		--	6	--	nC
Q_{gd}	Gate-Drain Charge		--	0.5	--	nC

Drain-Source Diode Characteristics and Maximum Ratings

I_S	Maximum Continuous Drain-Source Diode Forward Current	--	--	3.8	A
I_{SM}	Maximum Pulsed Drain-Source Diode Forward Current	--	--	14	A
V_{SD}	Drain to Source Diode Forward Voltage, $V_{GS} = 0\text{ V}, I_{SD} = 3.5\text{ A}, T_J = 25^\circ\text{C}$	--	--	1.2	V

Notes:

1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
2. Device mounted on FR-4 PCB, 1inch x 0.85inch x 0.062 inch
3. Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 0.5\%$

TM04N02I

N-Channel Enhancement Mosfet

Typical Performance Characteristics

N- Channel Typical Characteristics

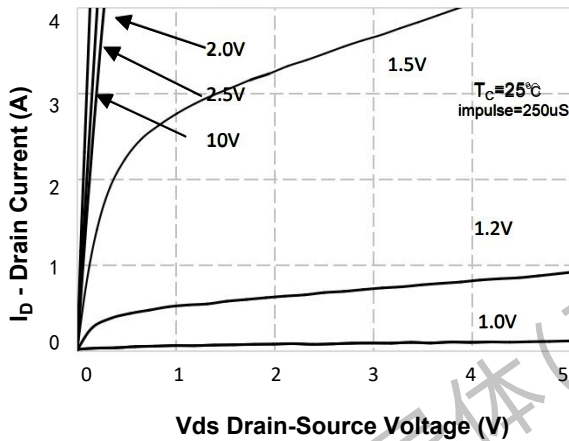


Figure 1. On-Region Characteristics

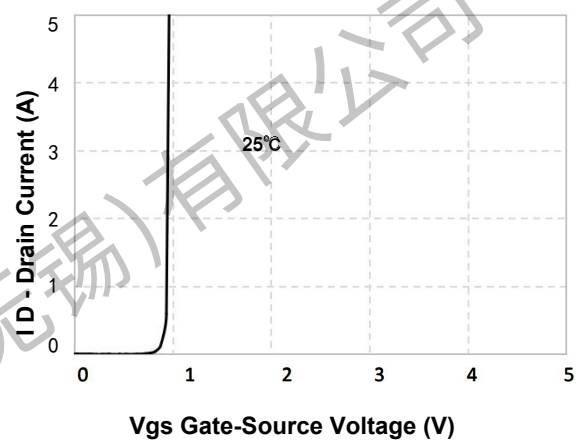


Figure 2. Transfer Characteristics

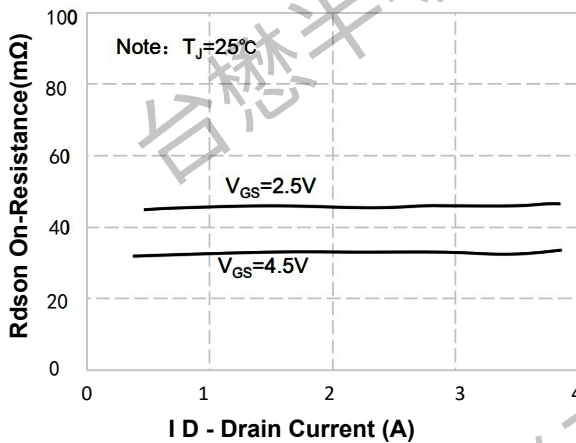


Figure 3. On-Resistance Variation vs Drain Current and Gate Voltage

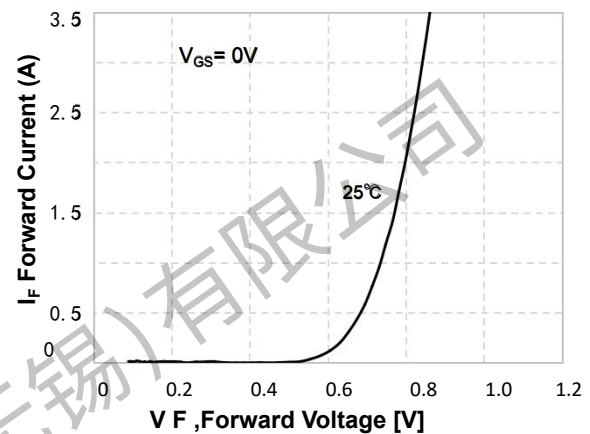


Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature

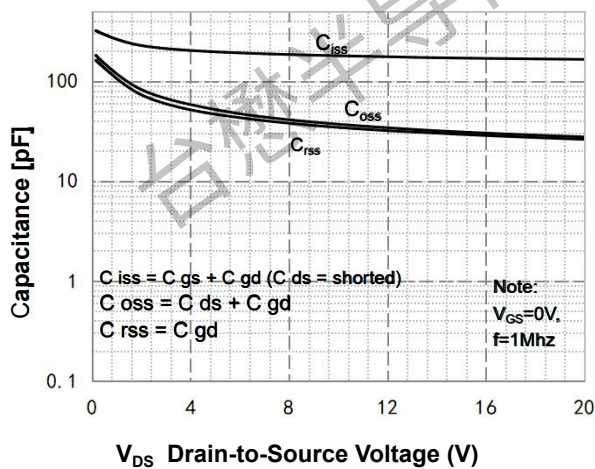


Figure 5. Capacitance Characteristics

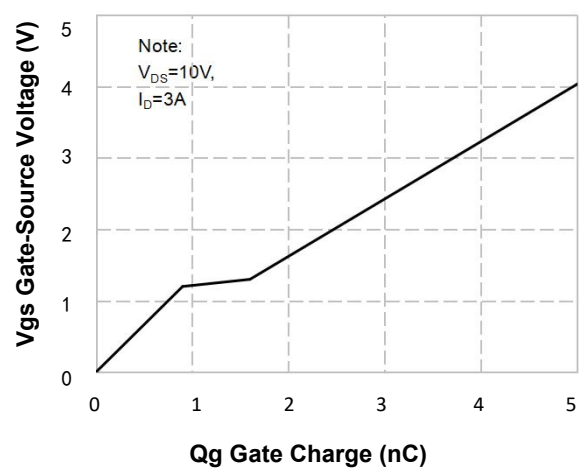


Figure 6. Gate Charge Characteristics

TM04N02I

N-Channel Enhancement Mosfet

N- Channel Typical Characteristics (Continued)

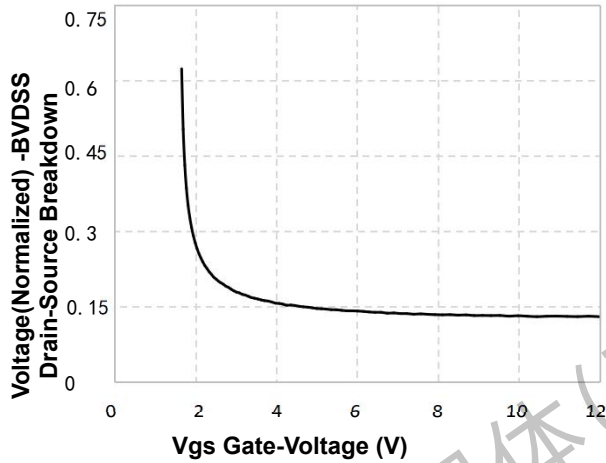


Figure 7. Breakdown Voltage Variation vs Gate-Voltage

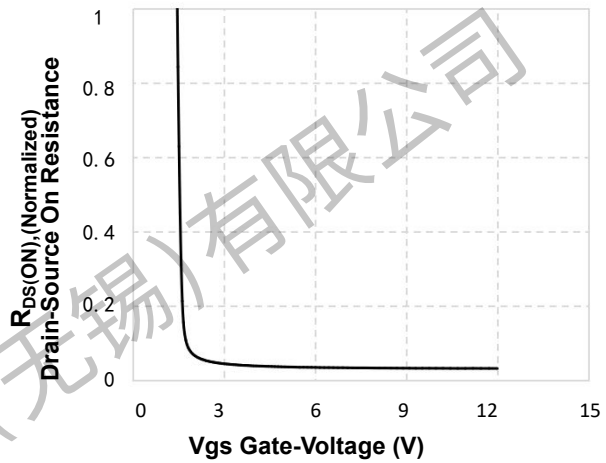


Figure 8. On-Resistance Variation vs Gate Voltage

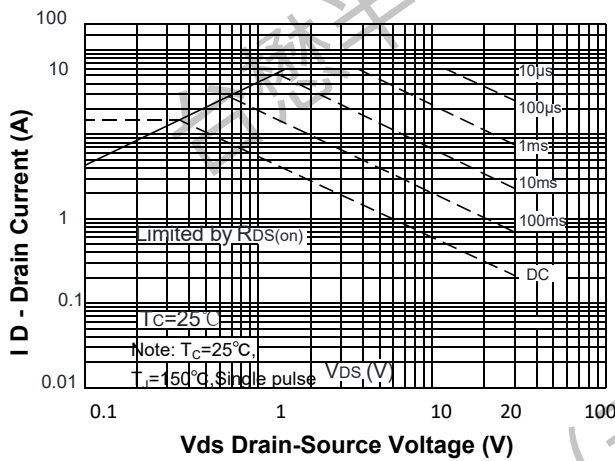


Figure 9. Maximum Safe Operating Area

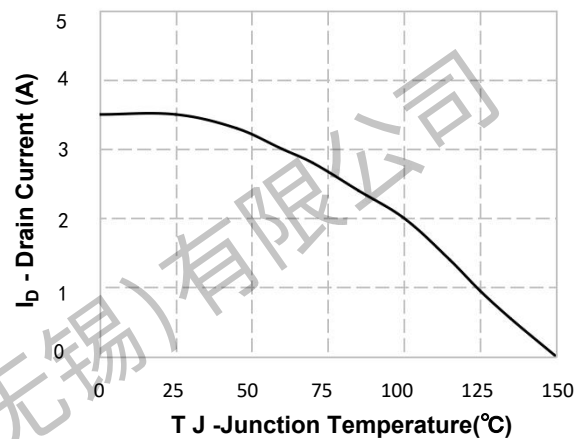


Figure 10. Maximum PContinuous Drain Current vs Case Temperature

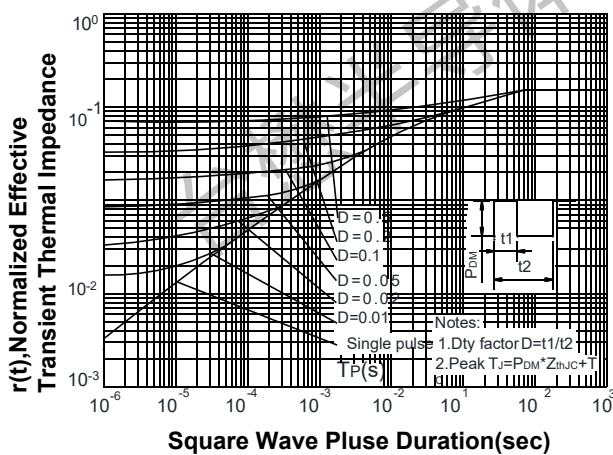


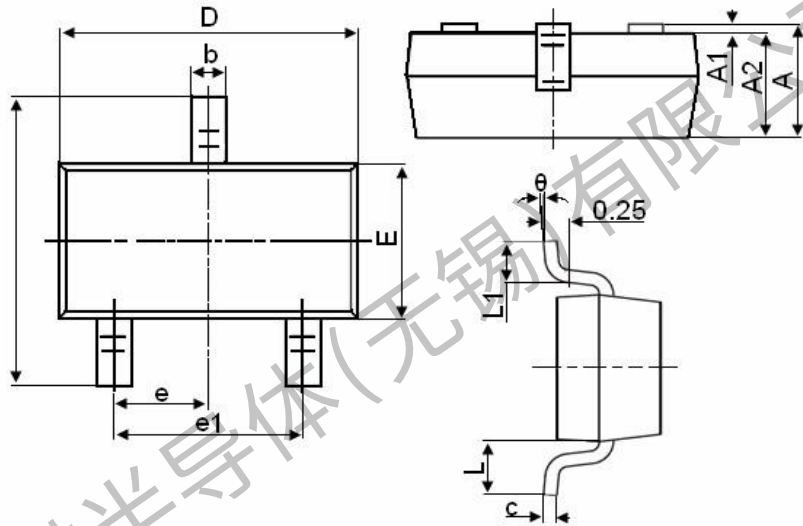
Figure 11. Transient Thermal Response Curve



TM04N02I

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°

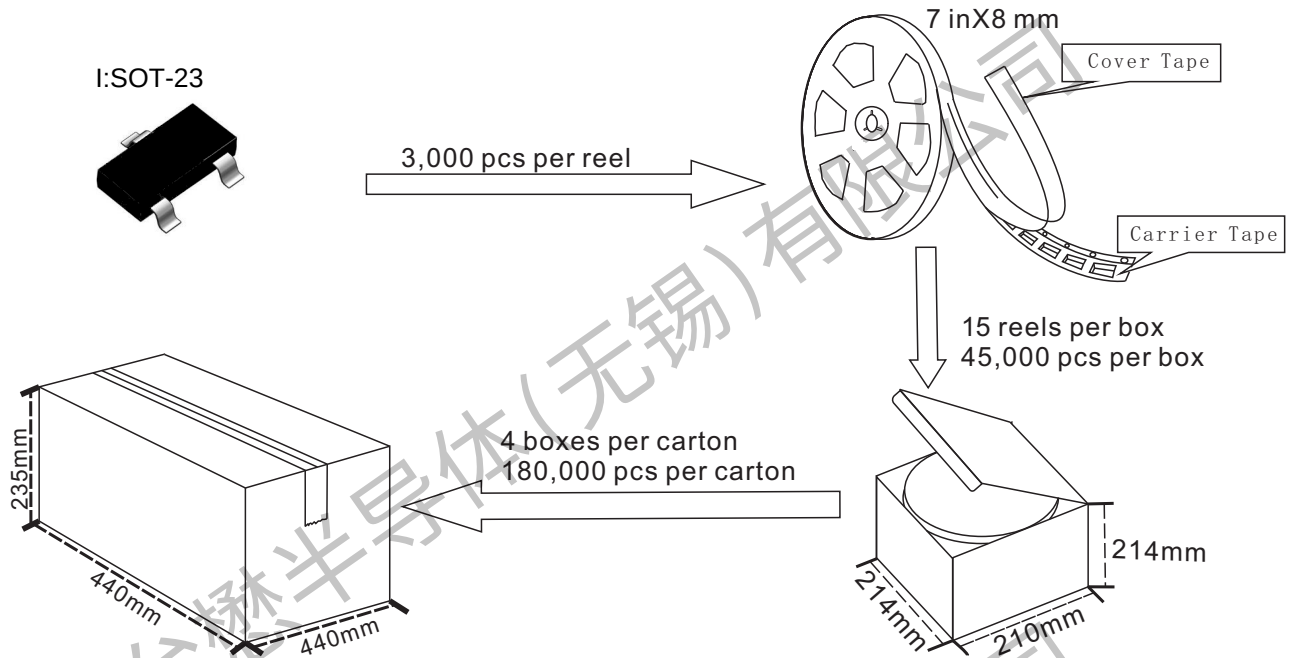


TM04N02I

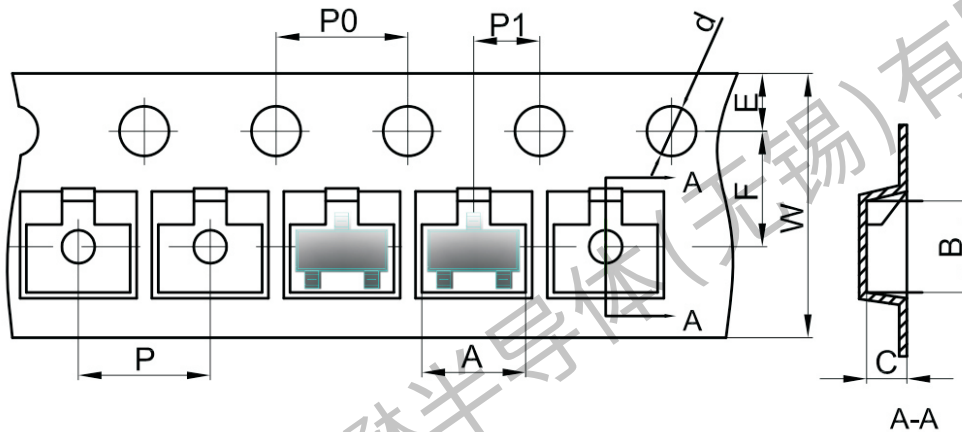
N-Channel Enhancement Mosfet

SOT-23 Packing

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



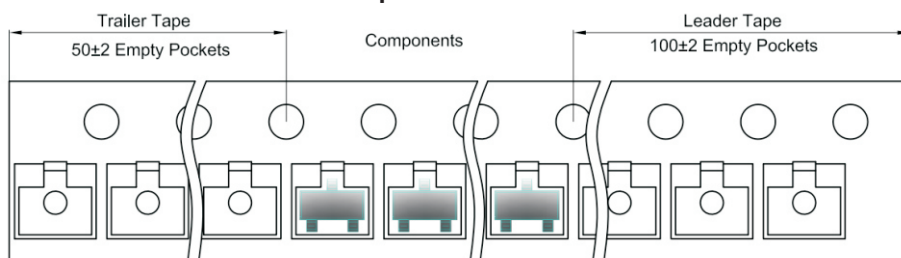
SOT-23 Embossed Carrier Tape



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
2024.05.09	24.05	Original	