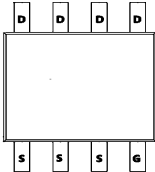
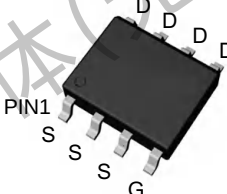
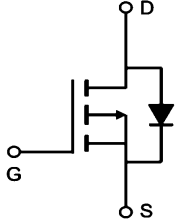


TM20P03S

P-Channel Enhancement Mosfet

General Description • Low $R_{DS(ON)}$ • RoHS and Halogen-Free Compliant Applications • Load switch • PWM	General Features $V_{DS} = -30V$ $I_D = -20A$ $R_{DS(ON)} = 6.8m\Omega$ (typ.) @ $V_{GS} = -10V$ 100% UIS Tested 100% R_g Tested 																																																							
 Marking: 4409  																																																								
Absolute Maximum Ratings ($T_A = 25^{\circ}C$ 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>-30</td><td>V</td></tr><tr><td>V_{GS}</td><td>Gate-Source Voltage</td><td>± 20</td><td>V</td></tr><tr><td>$I_D@T_A=25^{\circ}C$</td><td>Continuous Drain Current, V_{GS} @ - 10V</td><td>-20</td><td>A</td></tr><tr><td>$I_D@T_A=70^{\circ}C$</td><td>Continuous Drain Current, V_{GS} @ - 10V</td><td>-13</td><td>A</td></tr><tr><td>I_{DM}</td><td>Pulsed Drain Current</td><td>-74</td><td>A</td></tr><tr><td>EAS</td><td>Single Pulse Avalanche Energy</td><td>80</td><td>mJ</td></tr><tr><td>$P_D@T_A=25^{\circ}C$</td><td>Total Power Dissipation</td><td>3</td><td>W</td></tr><tr><td>T_{STG}</td><td>Storage Temperature Range</td><td>-55 to 175</td><td>$^{\circ}C$</td></tr><tr><td>T_J</td><td>Operating Junction Temperature Range</td><td>-55 to 175</td><td>$^{\circ}C$</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</td><td>---</td><td>80</td><td>$^{\circ}C/W$</td></tr><tr><td>$R_{\theta JC}$</td><td>Thermal Resistance Junction-Case</td><td>---</td><td>25</td><td>$^{\circ}C/W$</td></tr></table>		Symbol	Parameter	Rating	Units	V_{DS}	Drain-Source Voltage	-30	V	V_{GS}	Gate-Source Voltage	± 20	V	$I_D@T_A=25^{\circ}C$	Continuous Drain Current, V_{GS} @ - 10V	-20	A	$I_D@T_A=70^{\circ}C$	Continuous Drain Current, V_{GS} @ - 10V	-13	A	I_{DM}	Pulsed Drain Current	-74	A	EAS	Single Pulse Avalanche Energy	80	mJ	$P_D@T_A=25^{\circ}C$	Total Power Dissipation	3	W	T_{STG}	Storage Temperature Range	-55 to 175	$^{\circ}C$	T_J	Operating Junction Temperature Range	-55 to 175	$^{\circ}C$	Symbol	Parameter	Typ.	Max.	Unit	$R_{\theta JA}$	Thermal Resistance Junction-ambient	---	80	$^{\circ}C/W$	$R_{\theta JC}$	Thermal Resistance Junction-Case	---	25	$^{\circ}C/W$
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Electrical Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise noted)

Parameter		Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics							
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = -250\mu A$	-30	-	-	V
Gate-body Leakage current		I_{GSS}	$V_{DS} = 0V, V_{GS} = \pm 20V$	-	-	± 100	nA
Zero Gate Voltage Drain Current	$T_J = 25^{\circ}C$	I_{DSS}	$V_{DS} = -30V, V_{GS} = 0V$	-	-	-1	μA
	$T_J = 100^{\circ}C$			-	-	-100	
Gate-Threshold Voltage		$V_{GS(th)}$	$V_{DS} = V_{GS}, I_D = -250\mu A$	-1.0	-1.5	-2.0	V
Drain-Source On-Resistance ⁴		$R_{DS(on)}$	$V_{GS} = -10V, I_D = -12A$	-	6.8	10	m Ω
			$V_{GS} = -4.5V, I_D = -10A$	-	11	13	
Forward Transconductance ⁴		g_{fs}	$V_{DS} = -10V, I_D = -10A$	-	50	-	S
Dynamic Characteristics ⁵							
Input Capacitance		C_{iss}	$V_{DS} = -15V, V_{GS} = 0V, f = 1MHz$	-	2200	-	pF
Output Capacitance		C_{oss}		-	430	-	
Reverse Transfer Capacitance		C_{rss}		-	358	-	
Gate Resistance		R_g	$f = 1MHz$	-	9.5	-	Ω
Switching Characteristics ⁵							
Total Gate Charge		Q_g	$V_{GS} = -10V, V_{DS} = -15V, I_D = -12A$	-	35	-	nC
Gate-Source Charge		Q_{gs}		-	9.9	-	
Gate-Drain Charge		Q_{gd}		-	10.5	-	
Turn-On Delay Time		$t_{d(on)}$	$V_{GS} = -10V, V_{DD} = -15V, R_G = 3\Omega, I_D = -12A$	-	10.8	-	ns
Rise Time		t_r		-	13.2	-	
Turn-Off Delay Time		$t_{d(off)}$		-	73	-	
Fall Time		t_f		-	35	-	
Reverse Recovery Time		t_{rr}	$I_F = -12A, dI_F/dt = 100A/\mu s$	-	25	-	ns
Reverse Recovery Charge		Q_{rr}		-	10	-	nC
Drain-source body diode Characteristics							
Diode Forward Voltage ⁴		V_{SD}	$I_S = -1A, V_{GS} = 0V$	-	-	-1.2	V
Continuous Source Current	$T_A = 25^{\circ}C$	I_S	-	-	-	-20	A

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Typical Characteristics

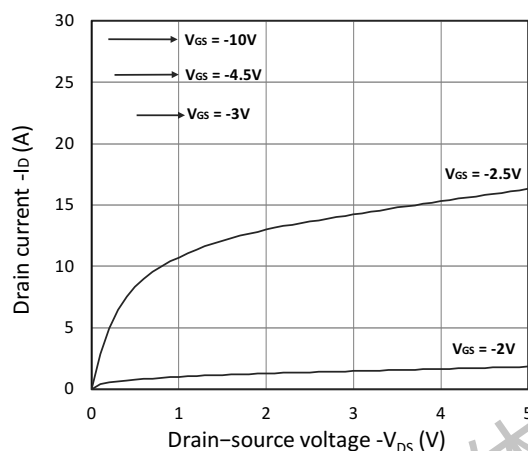


Figure 1. Output Characteristics

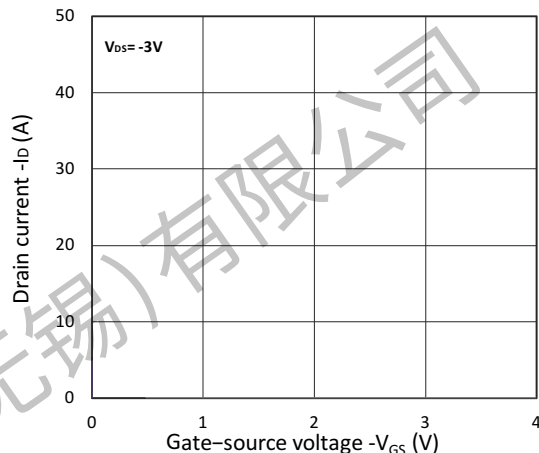


Figure 2. Transfer Characteristics

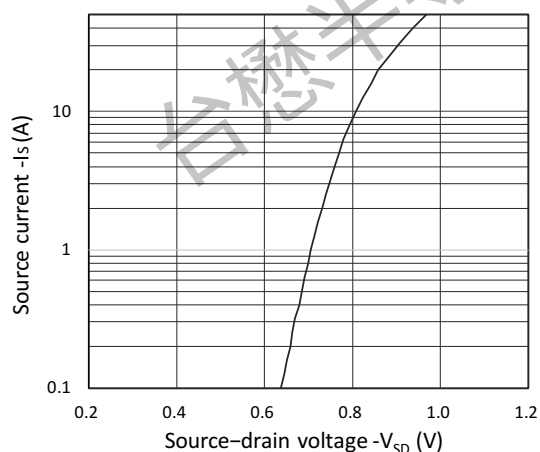


Figure 3. Forward Characteristics of Reverse

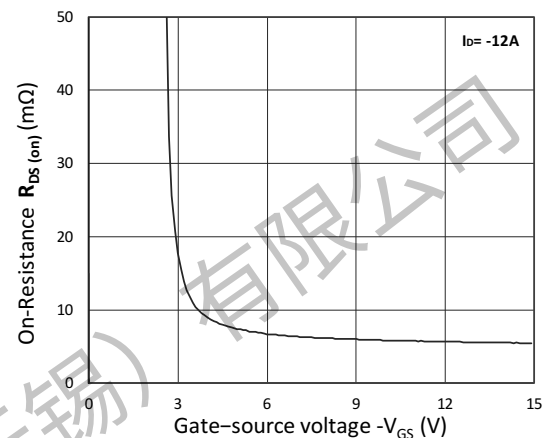


Figure 4. $R_{DS(ON)}$ vs. V_{GS}

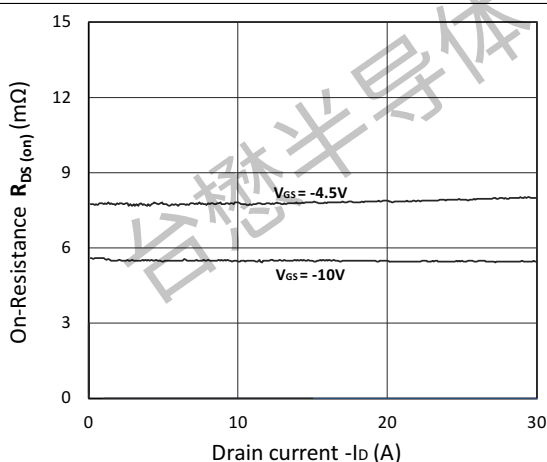


Figure 5. $R_{DS(ON)}$ vs. I_D

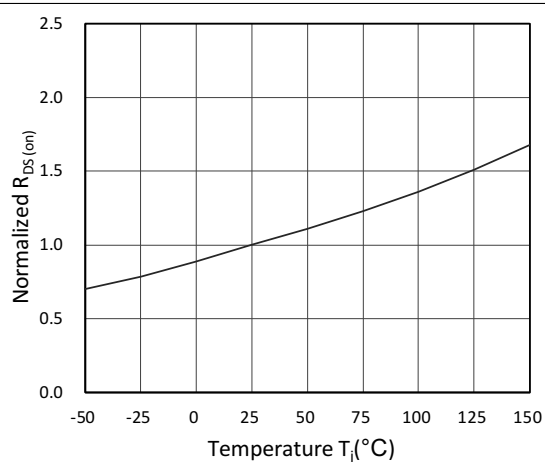


Figure 6. Normalized $R_{DS(ON)}$ vs. Temperature

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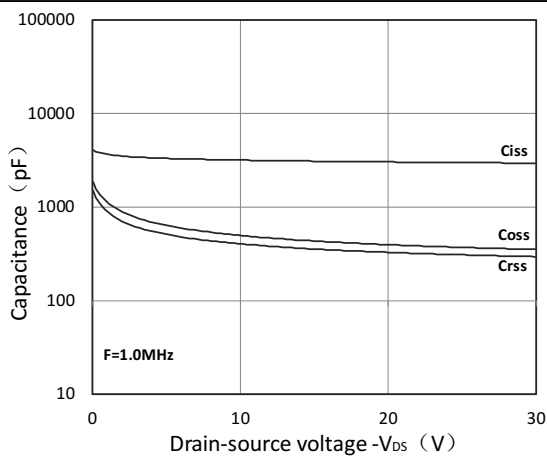


Figure 7. Capacitance Characteristics

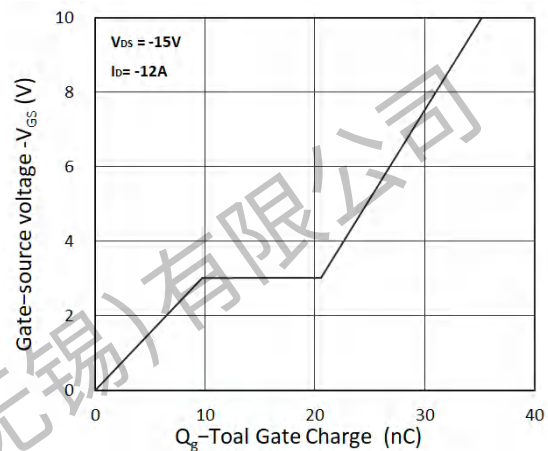


Figure 8. Gate Charge Characteristics

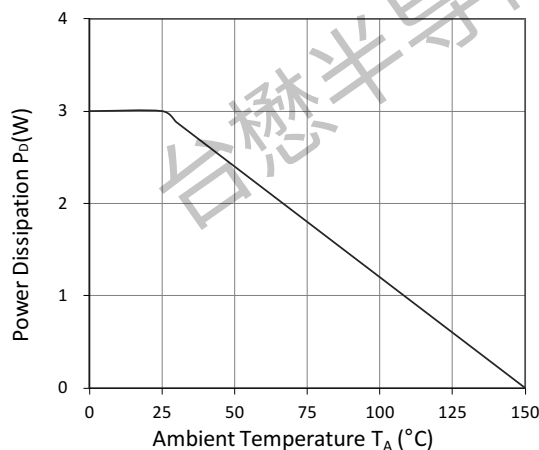


Figure 9. Power Dissipation

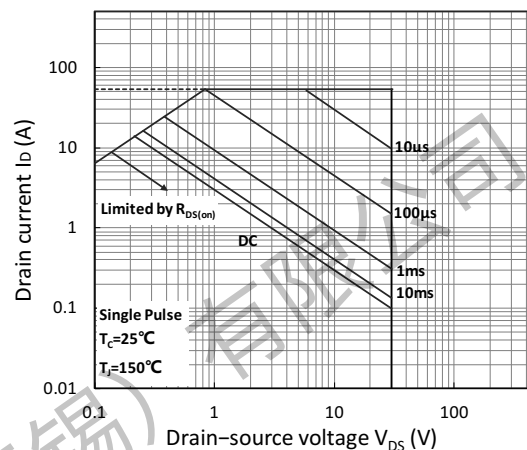


Figure 10. Safe Operating Area

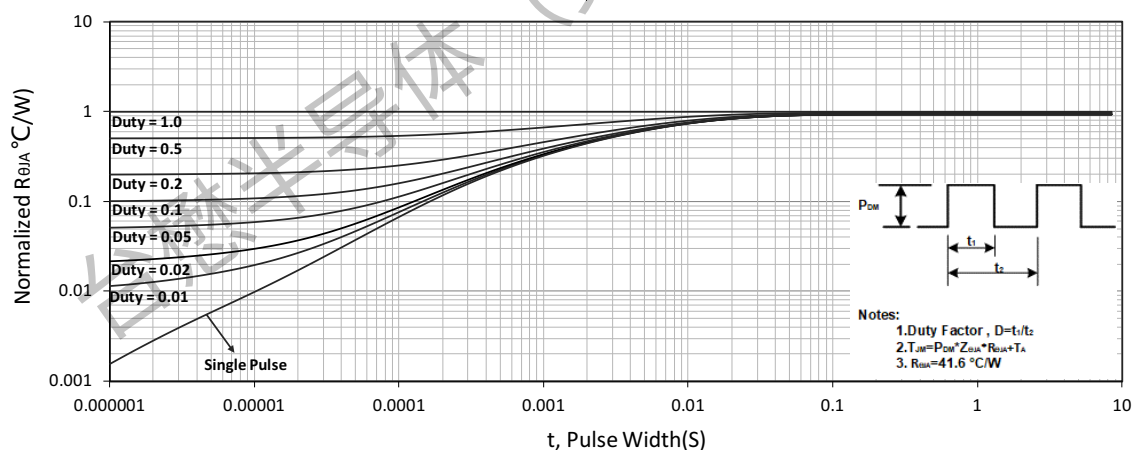
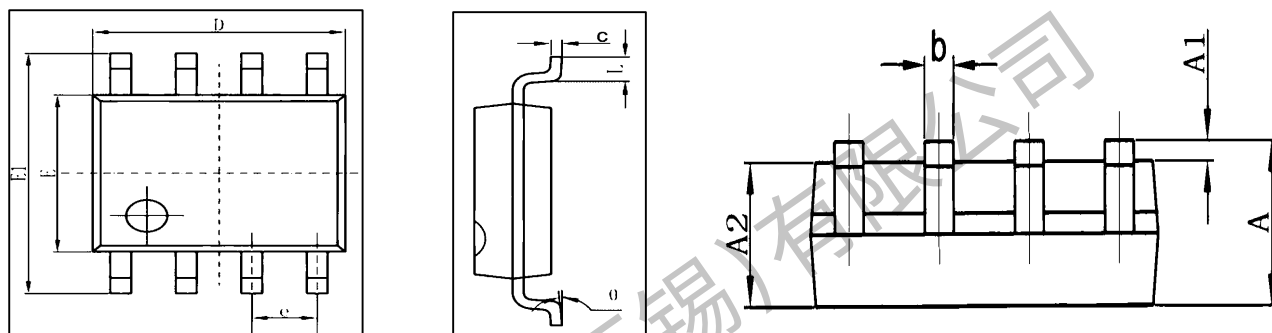


Figure 11. Normalized Maximum Transient Thermal Impedance

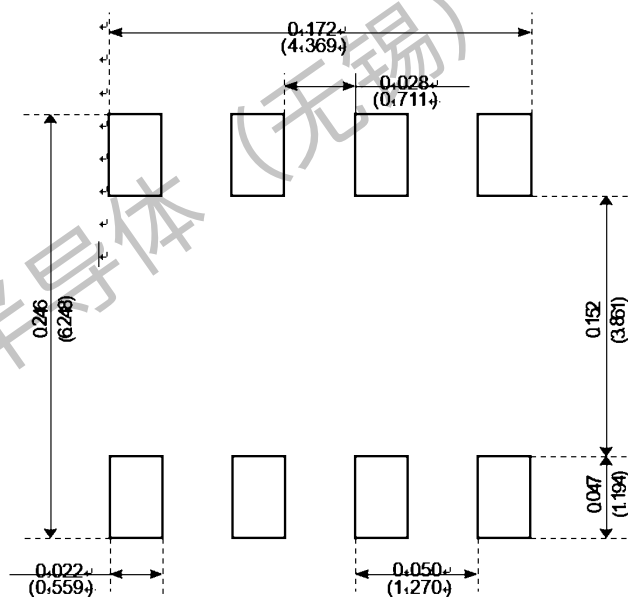
TM20P03S

P-Channel Enhancement Mosfet

Package Mechanical Data:SOP-8L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

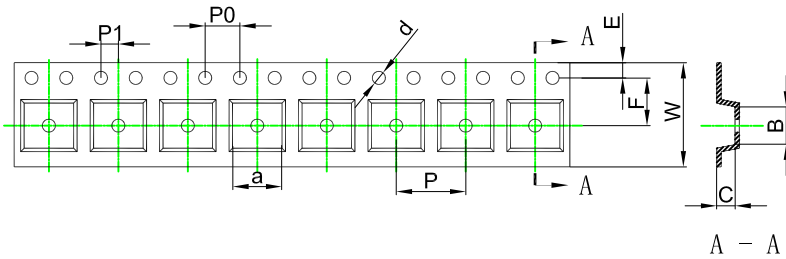


Recommended Minimum Pads

TM20P03S

P-Channel Enhancement Mosfet

SOP-8L Embossed Carrier Tape



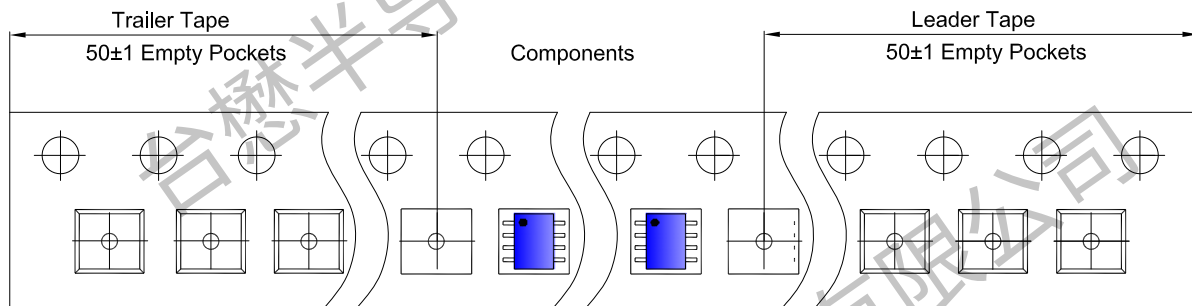
Packaging Description:

SOP-8L parts are shipped in tape. The carrier tape is made from a dissipative (carbon filled) polycarbonate resin. The cover tape is a multilayer film (Heat Activated Adhesive in nature) primarily composed of polyester film, adhesive layer, sealant, and anti-static sprayed agent. These reeled parts in standard option are shipped with 2,500 units per 13" or 33cm diameter reel. The reels are clear in color and is made of polystyrene plastic (anti-static coated).

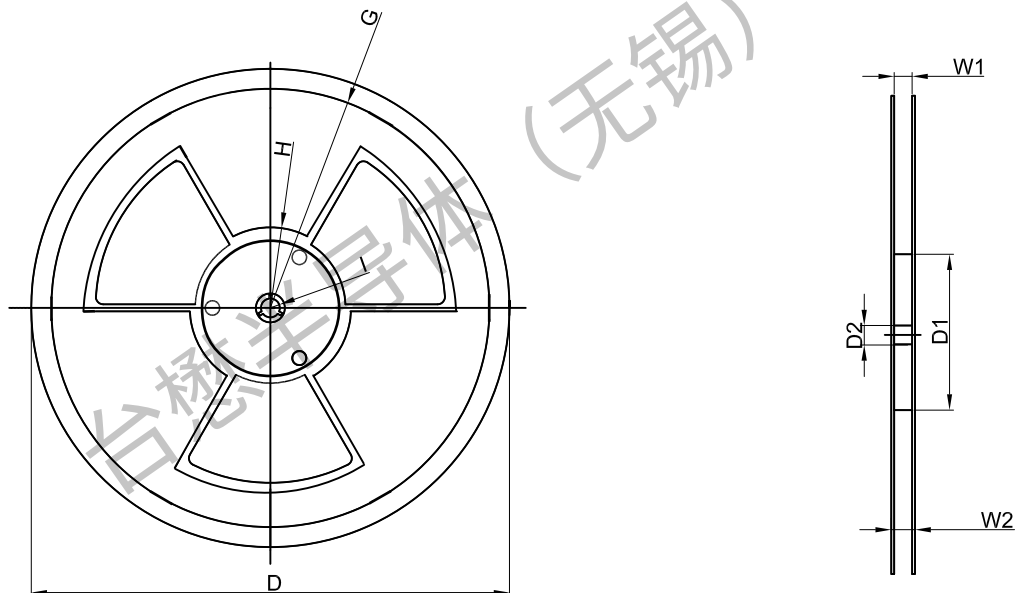
ALL DIM IN mm

Dimensions are in millimeter										
Pkg type	a	B	C	d	E	F	P0	P	P1	W
SOP-8L	6.40	5.40	2.10	Ø1.50	1.75	5.50	4.00	8.00	2.00	12.00

SOP-8L Tape Leader and Trailer



SOP-8L Reel



Dimensions are in millimeter								
Reel Option	D	D1	D2	G	H	I	W1	W2
13"Dia	Ø330.00	100.00	13.00	R135.00	R55.00	R6.50	12.00	14.00

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)	G.W.(kg)
3,000 pcs	13 inch	6,000 pcs	370×355×52	48,000 pcs	400×360×368	

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Revision history:

Date	Rev	Description	Page
2023.07.30	23.07	Original	