MSL049P03G

P-Channel Enhancement Mode MOSFET

■ Features

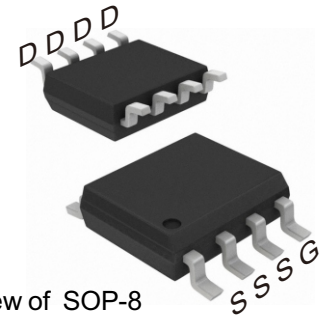
- -30V/-23.8A
  $R_{DS(ON)}$ = 4.9mΩ (max.) @ V_{GS}= -10V
  $R_{DS(ON)}$ = 8.2mΩ (max.) @ V_{GS}= -4.5V
- Super high dense cell design
- Reliable and Rugged.
- Lead free and green device available (RoHS compliant).
- HBM ESD protection level pass 8KV.

Note: The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

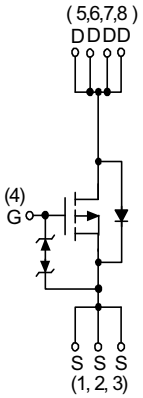
■ Application

- Power management in notebook computer portable equipment and battery powered system.

■ Pin Description



Top View of SOP-8



P- Channel MOSFET

■ Absolute Maximum Ratings (T_A = 25°C unless otherwise specified)

PARAMETER	CONDITIONS	Symbol	MSL049P03G	UNIT
Drain-Source Voltage		V_{DSS}	-30	V
Pulsed Drain Current(Note:1)	V_{GS} =-10V	I_{DM}	-95	A
Gate-Source Voltage		V_{GSS}	±25	V
Diode Continuous Forward Current(Note:1)		I_S	-5	A
Avalanche Current, single pulse (Note:2)	L=0.5mH	I_{AS}	-36	A
	L=1mH		-28	
Avalanche Energy, single pulse (Note:2)	L=0.5mH	E_{AS}	324	mJ
	L=1mH		392	
Thermal Resistance-Junction to Ambient(Note:1,3)	t ≤ 10s	$R_{\theta JA}$	30	°C/W
	Steady State		75	
Operating and Storage Temperature Range		T_J, T_{STG}	-55 ~ +150	°C
Maximum Power Dissipation(Note:1)	T_A = 25°C	P_D	4.2	W
	T_A = 70°C		2.7	
Continuous Drain Current(Note:1)	V_{GS} =-10V, T_A = 25°C	I_D	-23.8	A
	V_{GS} =-10V, T_A = 70°C		-19	
Thermal Resistance-Junction to Lead	Steady State	$R_{\theta JL}$	24	°C/W

NOTE : 1. Surface mounted on 1in² pad area, t ≤ 10sec.
2. UIS tested and pulse width limited by maximum junction temperature 150°C (initial temperature T_J =25°C).
3.Maximum under steady state condition is 75 °C/W.

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■ Electrical characteristics(T_A = 25°C unless otherwise specified)

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_{DS} = -250μA	BV_{DSS}	-30			V
Gate Threshold Voltage	V_{DS} = V_{GS}, I_{DS} = -250μA	$V_{GS(th)}$	-1.3	-1.8	-2.3	
Zero Gate Voltage Drain Current	V_{DS} = -24V, V_{GS} = 0V	I_{DSS}			-1	μA
	V_{DS} = -24V, V_{GS} = 0V, T_J = 85°C				-30	
Gate Leakage Current	V_{GS} = ±20V, V_{DS} = 0V	I_{GSS}			±10	
Drain-Source On-state Resistance(note:4)	V_{GS} = -10V, I_{DS} = -23.8A	$R_{DS(on)}$		3.9	4.9	mΩ
	V_{GS} = -4.5V, I_{DS} =-10A			6	8.2	

■ Diode Characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Diode Forward Voltage(note:4)	I_{SD} = -1A, V_{GS} = 0V	V_{SD}		-0.7	-1	V
Reverse Recovery Time(note:5)	I_{SD} = -23.8A, dI_{SD}/dt = 100A/μs	t_{RR}		33		ns
Reverse Recovery Charge(note:5)		Q_{RR}		26		nC

■ Dynamic Characteristics(note:5)

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Gate Resistance	V_{GS} = 0V, V_{DS} = 0V F = 1.0MHz	R_G		2.2		Ω
Input Capacitance	V_{DS} = -15V, V_{GS} = 0V, F = 1.0MHz	C_{iss}		5750		pF
Output Capacitance		C_{oss}		1120		
Reverse Transfer Capacitance		C_{rss}		1050		
Turn on Delay Time	V_{DD} = -15V, R_L = 15Ω, I_{DS} = -1A V_{GEN}=-10V R_G = 6Ω	$t_{d(on)}$		23		ns
Turn on Rise Time		t_r		32		
Turn off Delay Time		$t_{d(off)}$		157		
Turn off Fall Time		t_f		108		

■ Gate-Charge Characteristics(note:5)

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Total Gate Charge	V_{DS} = -15V, V_{GS}=-10V, I_{DS} =-23.8A	Q_g		135		nC
Gate-Source Charge		Q_{gs}		15		
Gate-Drain Charge		Q_{gd}		39		

NOTE : 4.Pulse test; pulse width ≤ 300μs, duty cycle ≤ 2%.
5.Guranteed by design, not subject to production testing.

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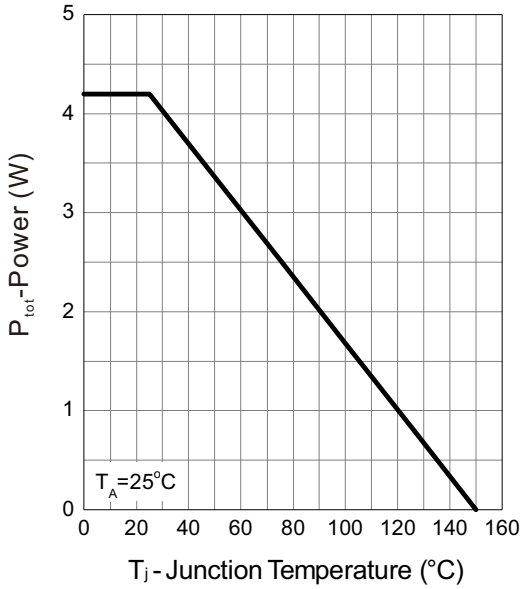
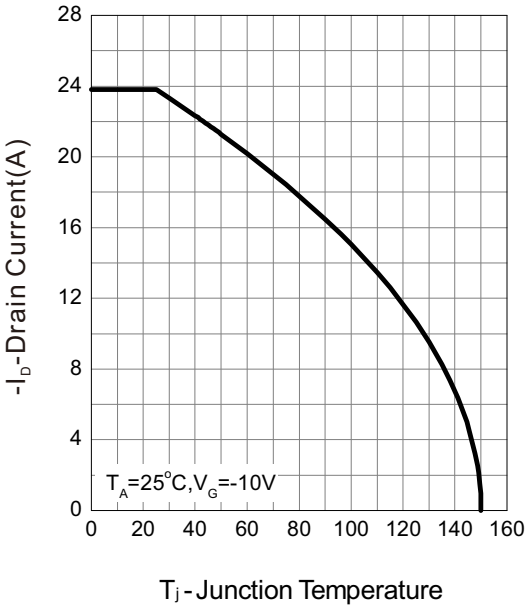
■ Rating and characteristic curves

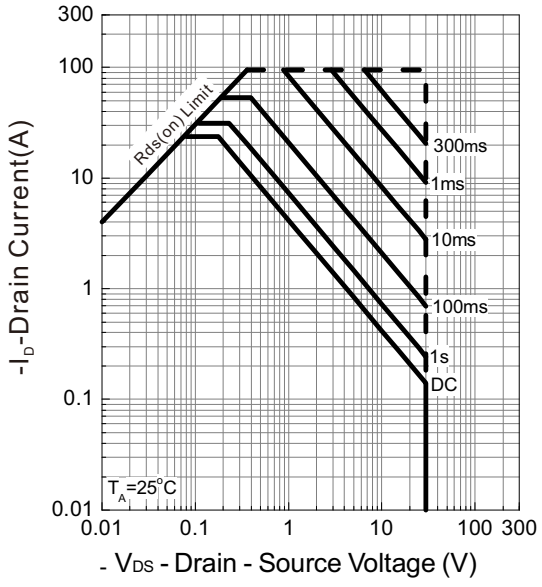
Power Dissipation



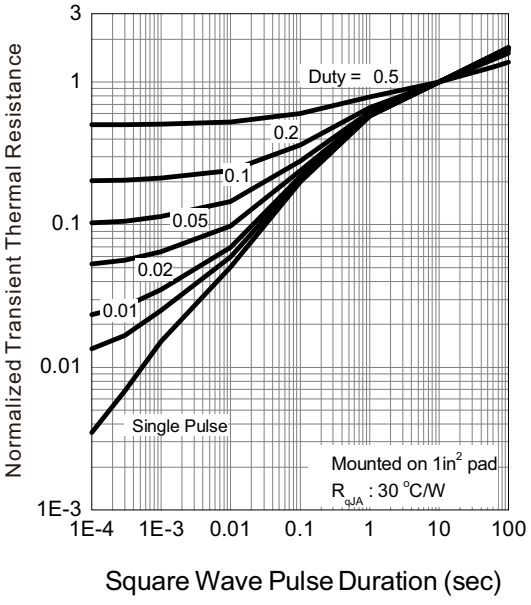
Drain Current



Safe Operation Area



Thermal Transient Impedance



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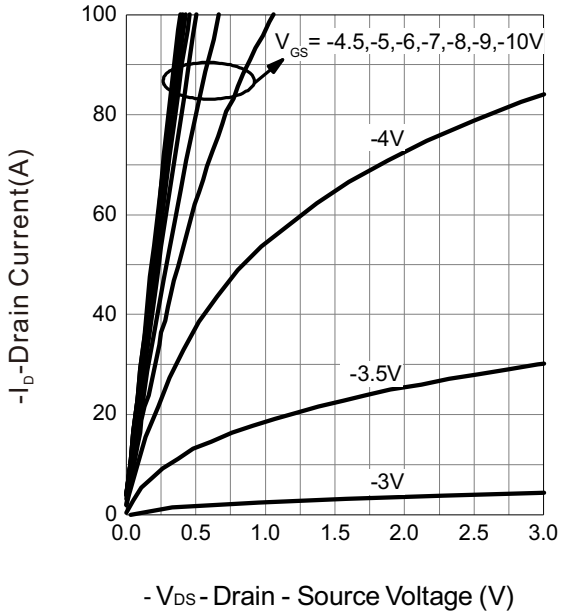
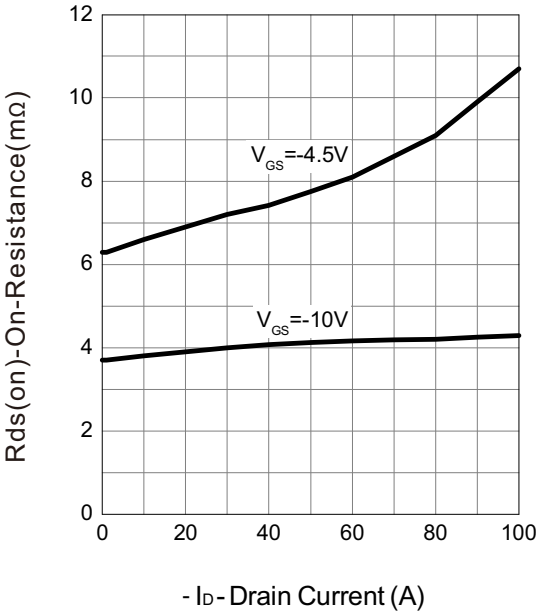
■ Rating and characteristic curves

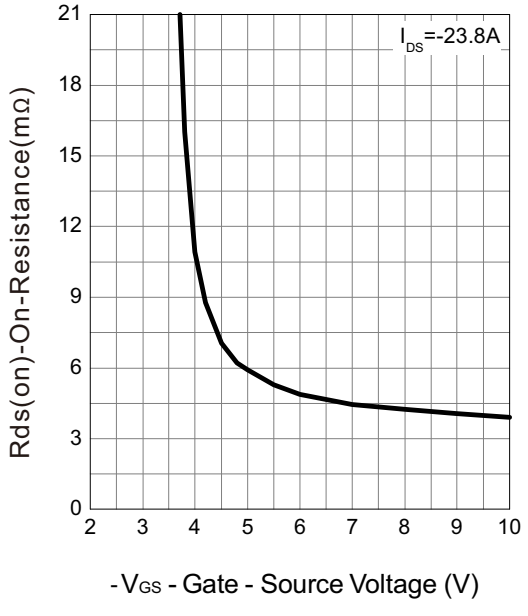
Output Characteristics



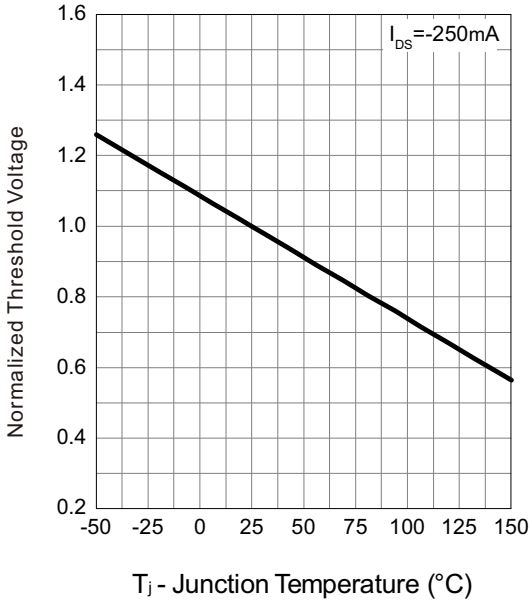
Drain-Source On Resistance



Gate-Source On Resistance



Gate Threshold Voltage



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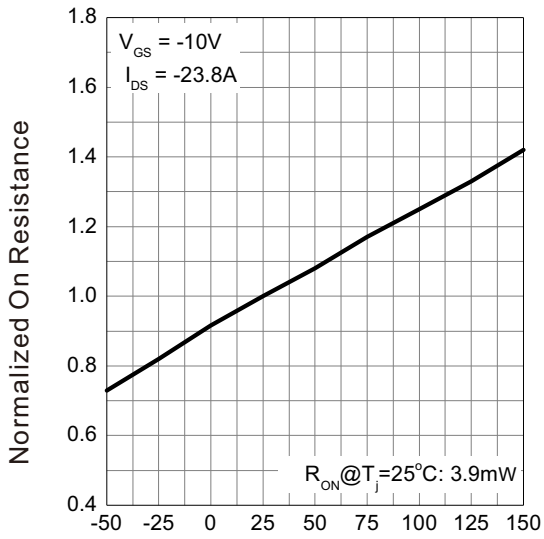
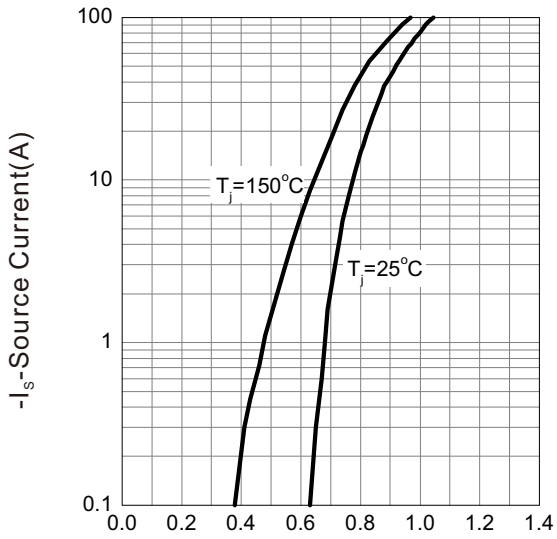
■ Rating and characteristic curves

Drain-Source On Resistance



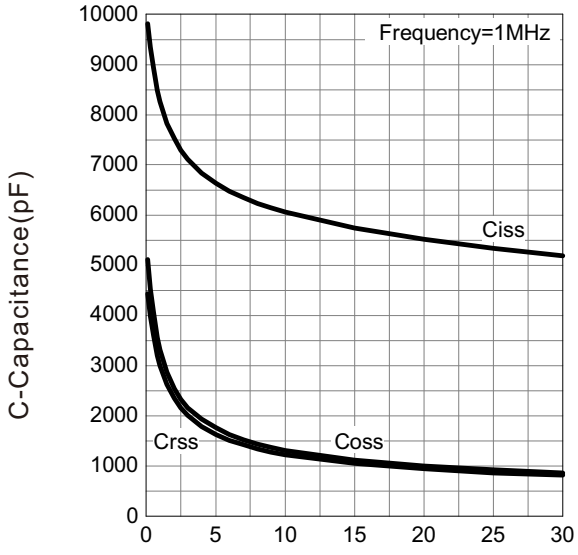
T_j - Junction Temperature (°C)

Source-Drain Diode Forward



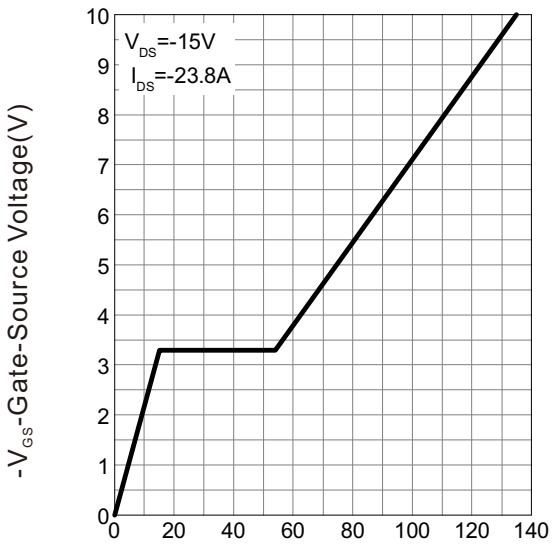
$-V_{SD}$- Source - Drain Voltage (V)

Capacitance



$-V_{DS}$ - Drain-Source Voltage (V)

Gate Charge



Q_G - Gate Charge (nC)

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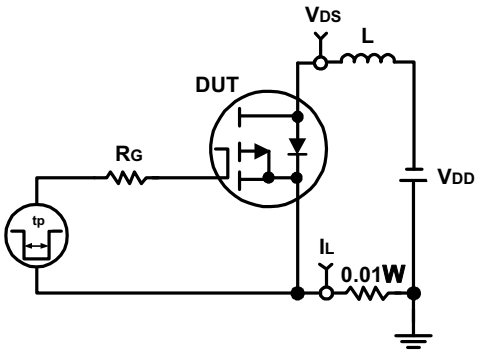
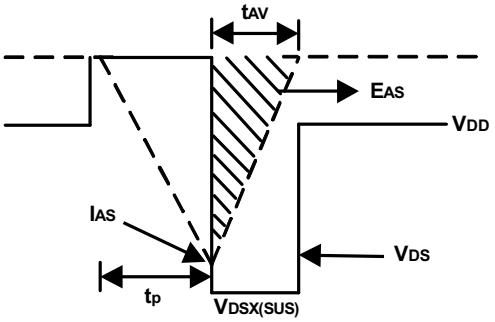
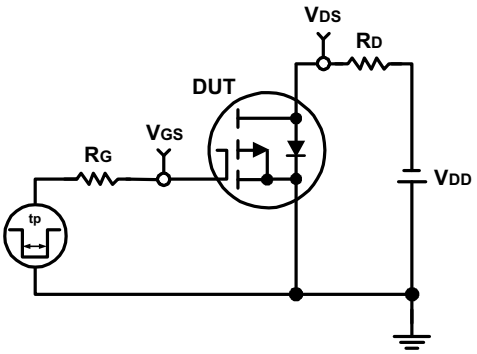
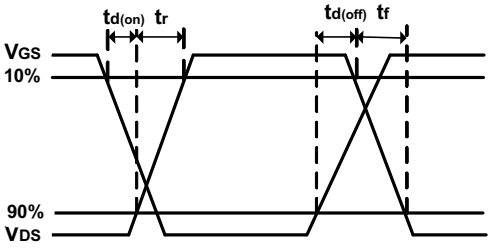
■ Test circuit and waveform









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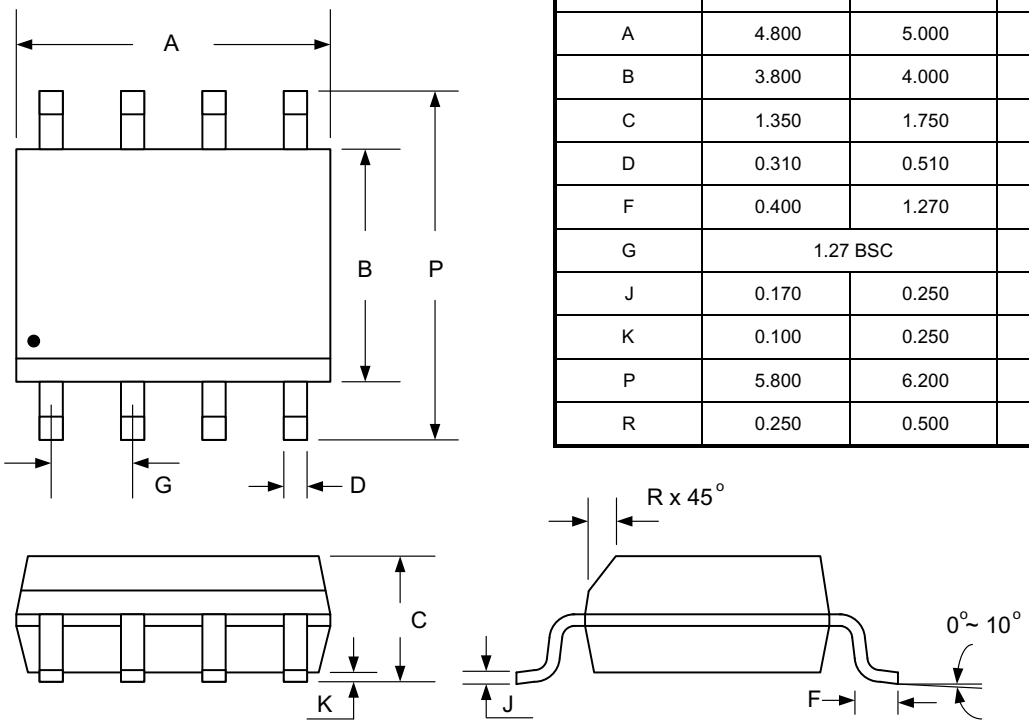
■ Package Information

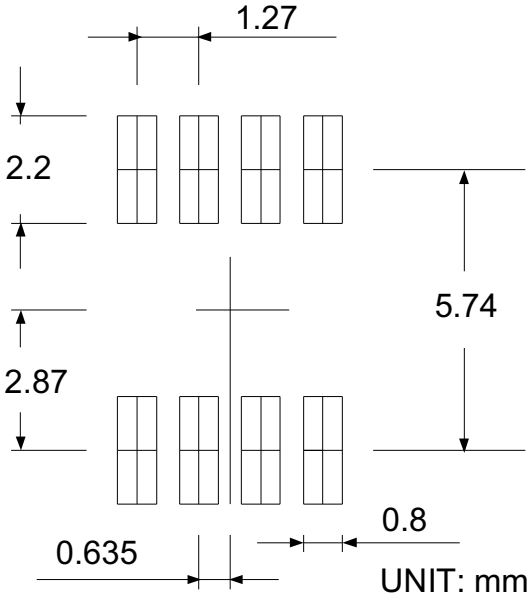
SOP-8 packag



Symbol	Dimensions (mm)		Dimensions (inches)	
	Minimum	Maximum	Minimum	Maximum
A	4.800	5.000	0.189	0.196
B	3.800	4.000	0.150	0.157
C	1.350	1.750	0.054	0.068
D	0.310	0.510	0.012	0.020
F	0.400	1.270	0.016	0.050
G	1.27 BSC		0.05 BSC	
J	0.170	0.250	0.007	0.009
K	0.100	0.250	0.004	0.008
P	5.800	6.200	0.229	0.244
R	0.250	0.500	0.010	0.019

Package Dimensions (Controlling dimensions are in millimeters)

RECOMMENDED LAND PATTERN



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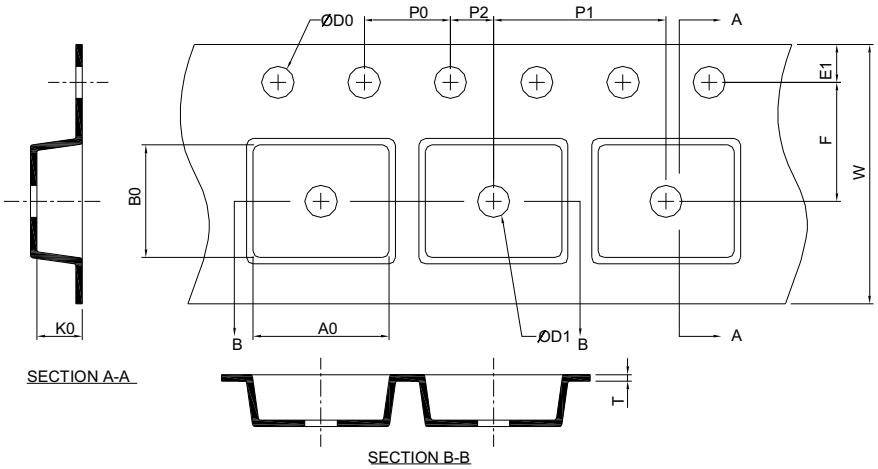
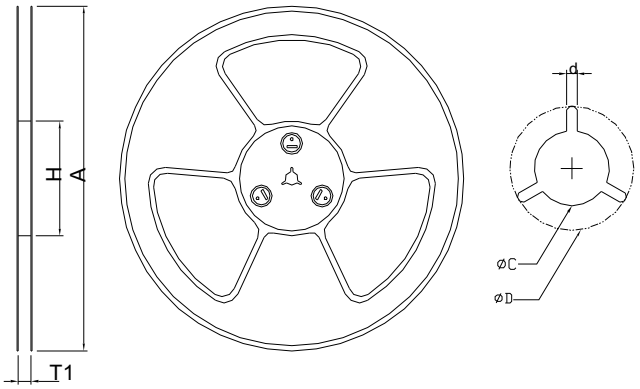
■ Carrier Tape and Reel Dimension





Application	A	H	T1	C	d	D	W	E1	F
SOP-8	330.0± 2.00	50 MIN.	12.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	12.0±0.30	1.75±0.10	5.5±0.05
	P0	**P1**	**P2**	**D0**	**D1**	**T**	**A0**	**B0**	**K0**
	4.0±0.10	8.0±0.10	2.0±0.05	1.5+0.10 -0.00	1.5 MIN.	0.6+0.00 -0.40	6.40±0.20	5.20±0.20	2.10±0.20

(mm)

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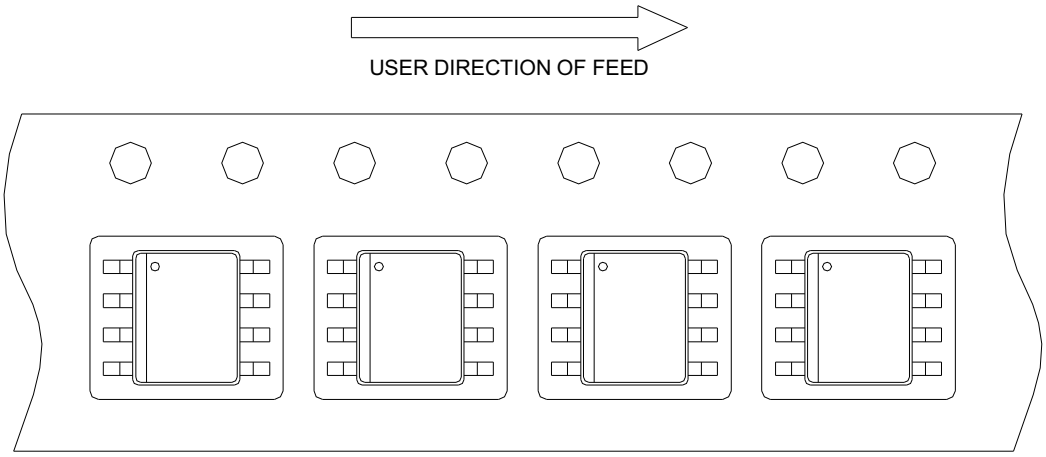
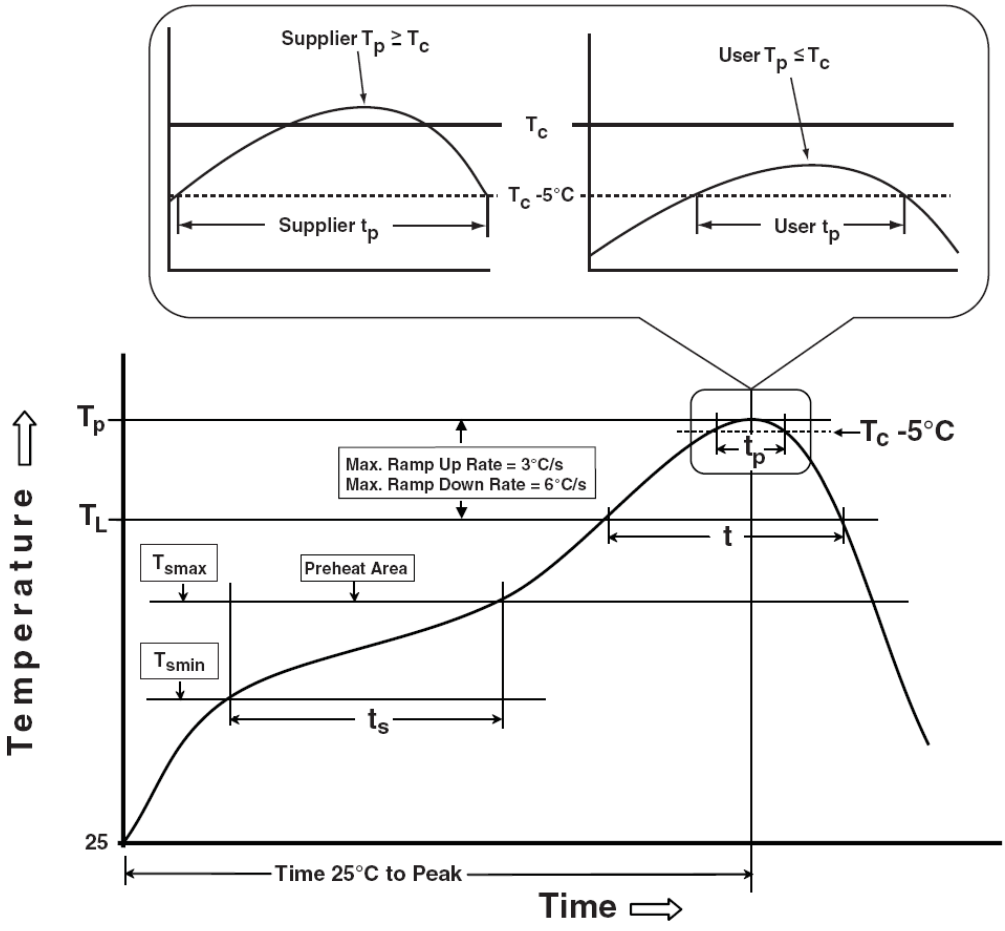
■ Tapping Direction Information

SOP-8



■ Classification Profile



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■ Classification Reflow Profile

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak Temperature min (T_{smin}) Temperature max (T_{smax}) Time (T_{smin} to T_{smax}) (t_s)	100 °C 150 °C 60-120 seconds	150 °C 200 °C 60-120 seconds
Average ramp-up rate (T_{smax} to T_P)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L) Time at liquidous (t_L)	183 °C 60-150 seconds	217 °C 60-150 seconds
Peak package body Temperature (T_p)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (t_P)** within 5°C of the specified classification temperature (T_c)	20** seconds	30** seconds
Average ramp-down rate (T_p to T_{smax})	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile Temperature (T_p) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (t_p) is defined as a supplier minimum and a user maximum.		

Table 1. SnPb Eutectic Process – Classification Temperatures (Tc)

Package Thickness	Volume mm^3 <350	Volume mm^3 ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2. Pb-free Process – Classification Temperatures (Tc)

Package Thickness	Volume mm^3 <350	Volume mm^3 350-2000	Volume mm^3 >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥2.5 mm	250 °C	245 °C	245 °C

■ Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245°C
HTRB	JESD-22, A108	1000 Hrs, 80% of VDS max @ Tjmax
HTGB	JESD-22, A108	1000 Hrs, 100% of VGS max @ Tjmax
PCT	JESD-22, A102	168 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	500 Cycles, -65°C~150°C

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