

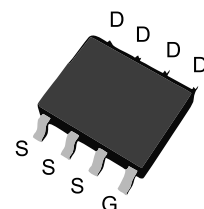
■ Features

- 150V/5A
 $R_{DS(ON)} = 65m\Omega$ (max.) @ $V_{GS} = 10V$
 $R_{DS(ON)} = 80m\Omega$ (max.) @ $V_{GS} = 5V$
- Reliable and Rugged.
- Lead free and green device available (RoHS compliant).

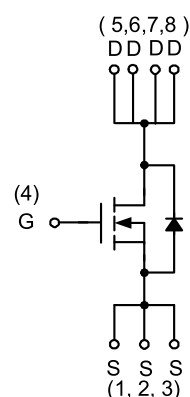
■ Application

- DC-DC converters switching for networking
- General purpose switching

■ Pin Description



Top View of SOP-8



N-Channel MOSFET

■ Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise specified)

PARAMETER	CONDITIONS	Symbol	MSL650N15G	UNIT
Drain-Source Voltage		V_{DSS}	150	V
300 μ s Pulsed Drain Current(Note:1)	$V_{GS} = 10V$	I_{DM}	20	A
Gate-Source Voltage		V_{GSS}	± 25	V
Diode Continuous Forward Current(Note:1)		I_S	5	A
Maximum junction and Storage Temperature Range		T_J, T_{STG}	-55 ~ +150	$^\circ\text{C}$
Continuous Drain Current(Note:1)	$V_{GS} = 10V, T_A = 25^\circ\text{C}$	I_D	5	A
	$V_{GS} = 10V, T_A = 70^\circ\text{C}$		4	
Thermal Resistance-Junction to Lead	Steady State	$R_{\theta JL}$	20	$^\circ\text{C/W}$
Thermal Resistance-Junction to Ambient(Note:1,2)	$t \leq 10s$	$R_{\theta JA}$	35	$^\circ\text{C/W}$
	Steady State		65	
Maximum Power Dissipation(Note:1)	$T_A = 25^\circ\text{C}$	P_D	3.5	W
	$T_A = 70^\circ\text{C}$		2.3	

NOTE : 1. Surface mounted on 1in² pad area, $t \leq 10\text{sec}$.
 2. Maximum under steady state condition is 75 $^\circ\text{C/W}$.

■ Electrical characteristics($T_A = 25^\circ\text{C}$ unless otherwise specified)

■ Static Characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_{DS} = 250\mu A$	BV_{DSS}	150			V
Gate Threshold Voltage	$V_{DS} = V_{GS}, I_{DS} = 250\mu A$	$V_{GS(th)}$	2	3	4	
Zero Gate Voltage Drain Current	$V_{DS} = 120V, V_{GS} = 0V$	I_{DSS}			1	μA
	$V_{DS} = 120V, V_{GS} = 0V, T_J = 85^\circ\text{C}$				30	
Gate Leakage Current	$V_{GS} = \pm 25V, V_{DS} = 0V$	I_{GSS}			± 100	nA
Drain-Source On-state Resistance(note:4)	$V_{GS} = 10V, I_{DS} = 5A$	$R_{DS(on)}$		52	65	m Ω
	$V_{GS} = 5V, I_{DS} = 3A$			60	80	

■ Diode Characteristics

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Diode Forward Voltage(note:3)	$I_{SD} = 5A, V_{GS} = 0V$	V_{SD}		0.8	1.3	V
Reverse Recovery Time(note:4)	$I_{SD} = 5A, dI_{SD}/dt = 100A/\mu s$	t_{RR}		55		ns
Reverse Recovery Charge(note:4)		Q_{RR}		130		nC

■ Dynamic Characteristics(note:4)

PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Input Capacitance	$V_{DS} = 30V, V_{GS} = 0V, F = 1.0MHz$	C_{iss}		1350		pF
Output Capacitance		C_{oss}		135		
Reverse Transfer Capacitance		C_{rss}		60		
Turn on Delay Time	$V_{DD} = 30V, R_L = 30\Omega, I_{DS} = 1A$ $V_{GEN} = 10V, R_G = 6\Omega$	$t_{d(on)}$		14	26	ns
Turn on Rise Time		t_r		9	17	
Turn off Delay Time		$t_{d(off)}$		33	60	
Turn off Fall Time		t_f		12	22	

■ Gate-Charge Characteristics(note:4)

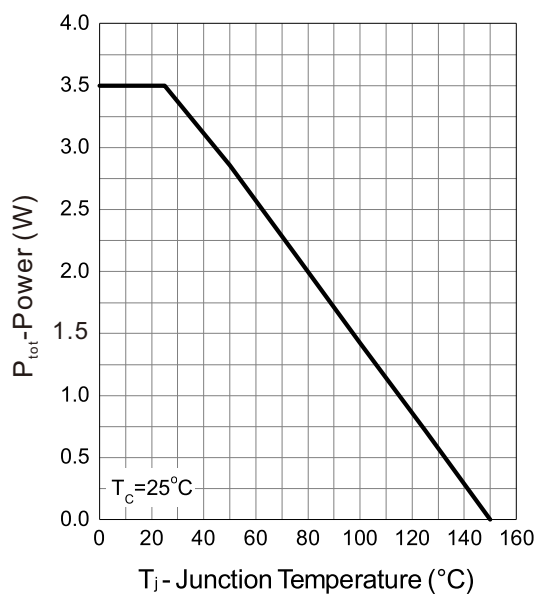
PARAMETER	CONDITIONS	Symbol	MIN.	TYP.	MAX.	UNIT
Total Gate Charge	$V_{DS} = 30V, V_{GS} = 10V, I_{DS} = 5A$	Q_g		30	42	nC
Gate-Source Charge		Q_{gs}		7		
Gate-Drain Charge		Q_{gd}		9		

NOTE : 3. Pulse test; pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$.

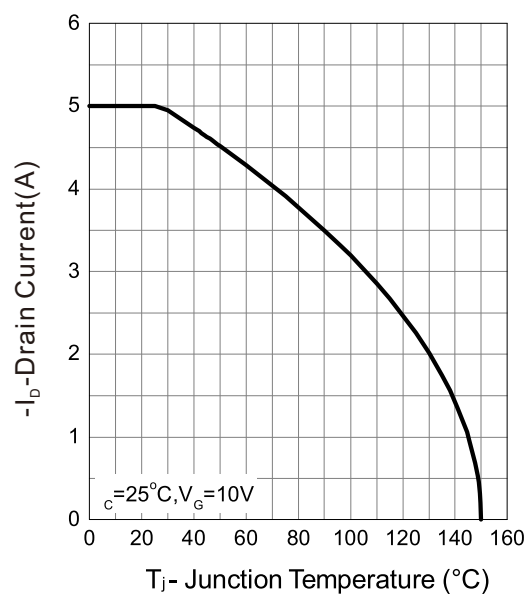
4. Guaranteed by design, not subject to production testing.

■ Rating and characteristic curves

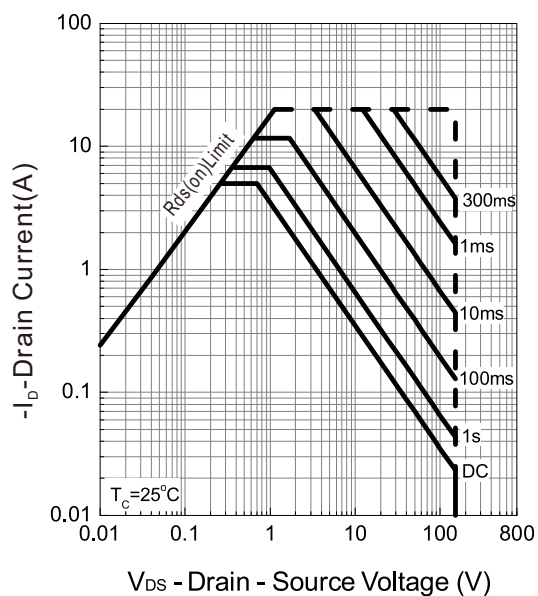
Power Dissipation



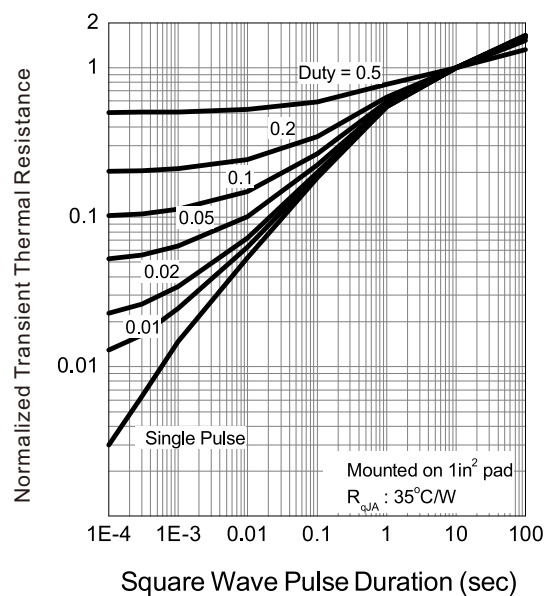
Drain Current



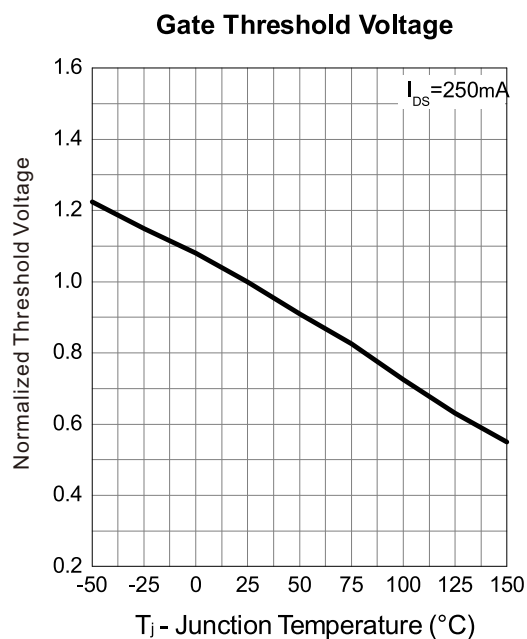
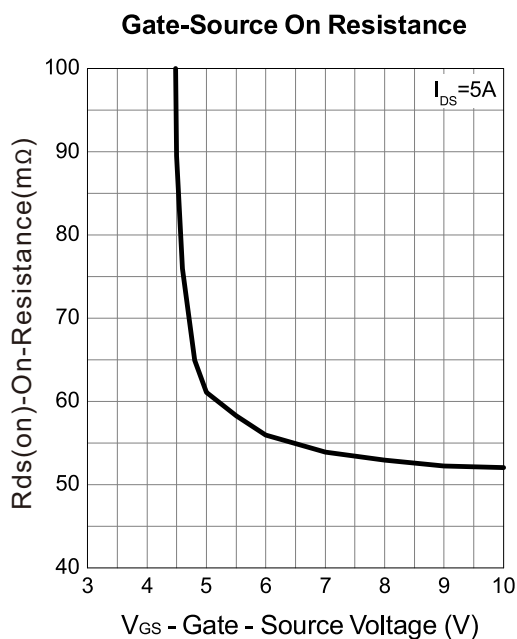
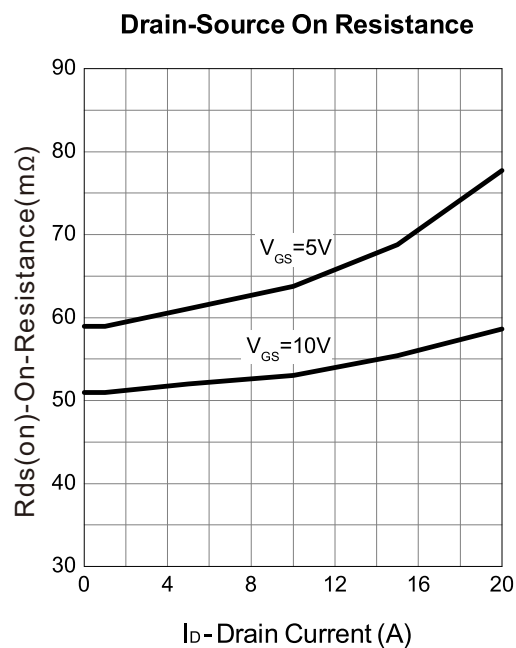
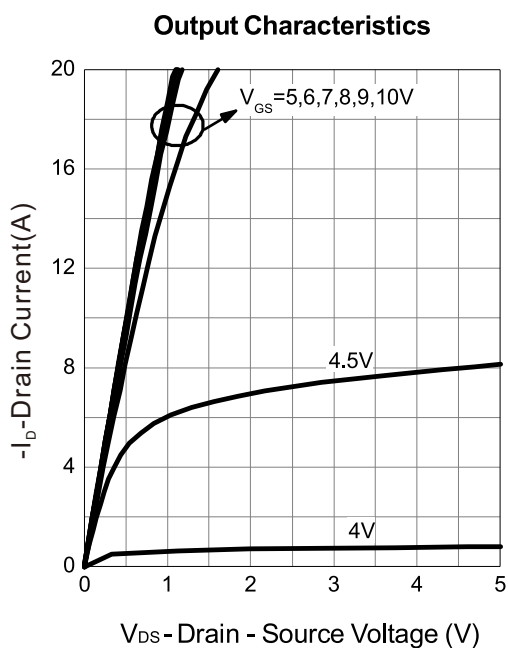
Safe Operation Area



Thermal Transient Impedance

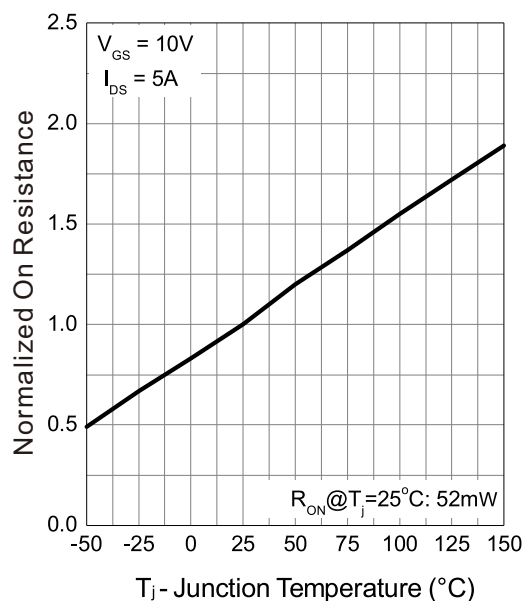


■ Rating and characteristic curves

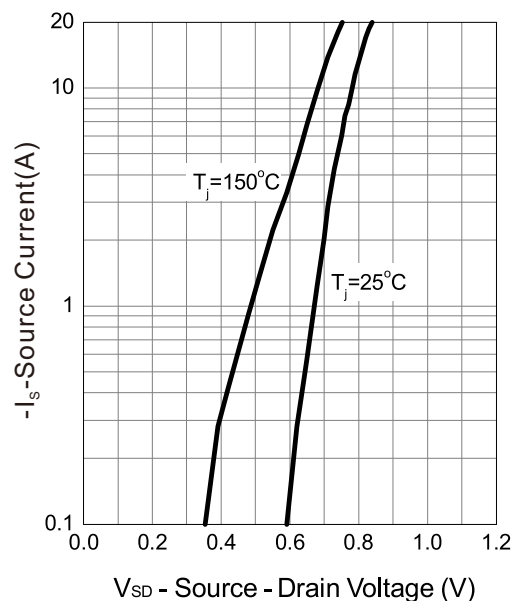


■ Rating and characteristic curves

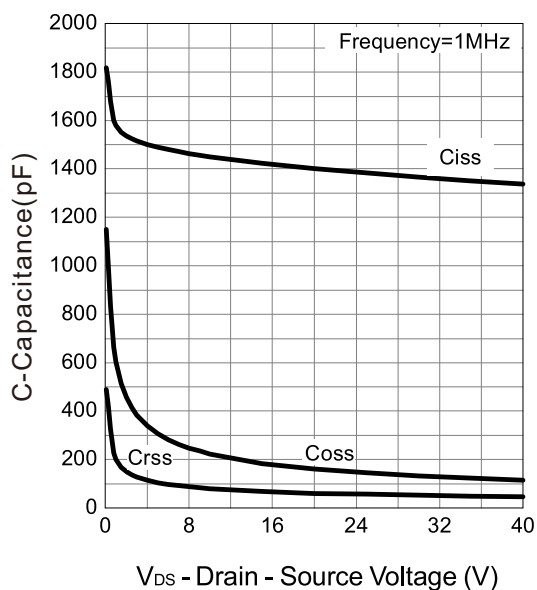
Drain-Source On Resistance



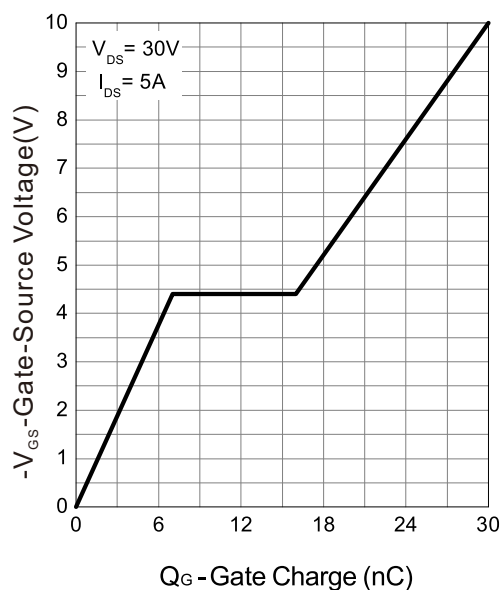
Source-Drain Diode Forward



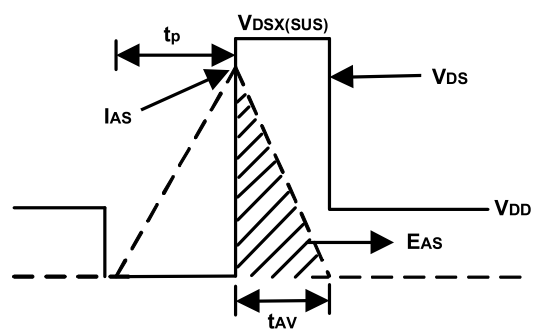
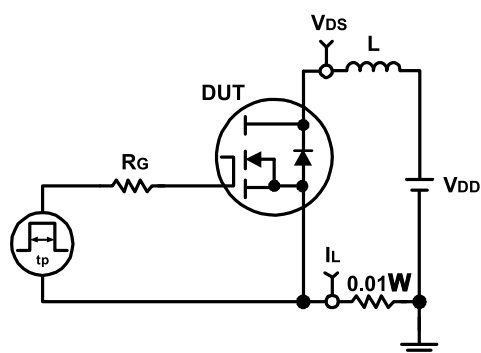
Capacitance



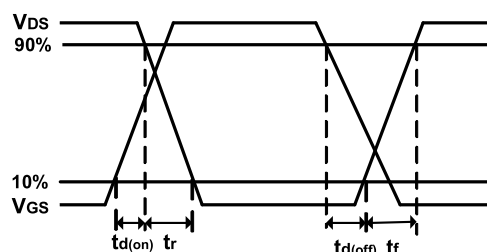
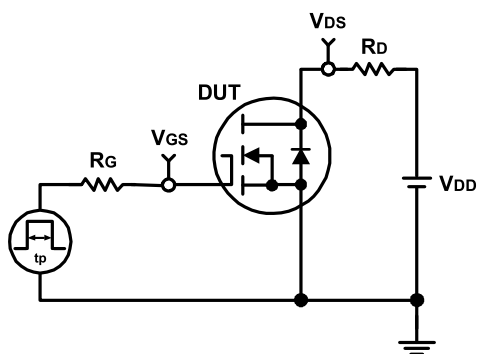
Gate Charge



■ Avalanche Test circuit and waveform

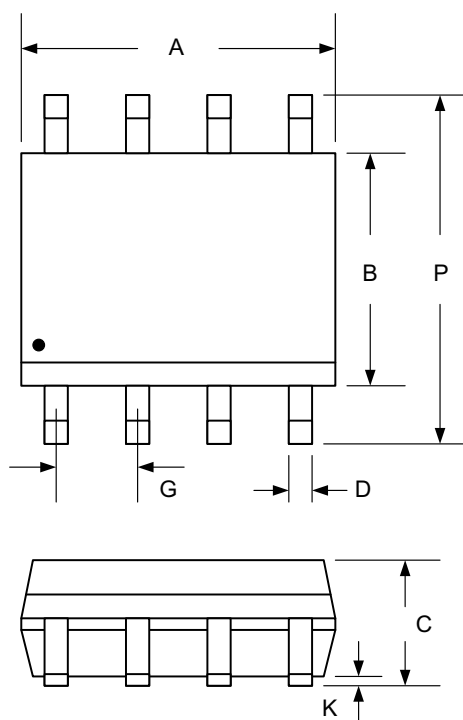


■ Switching time test circuit and waveform

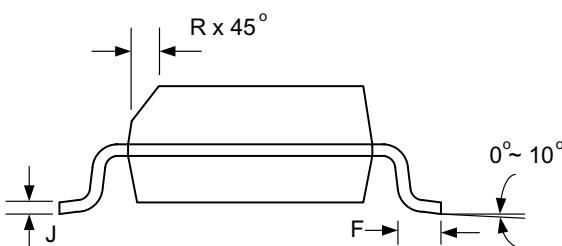


■ Package Information

SOP-8 packag

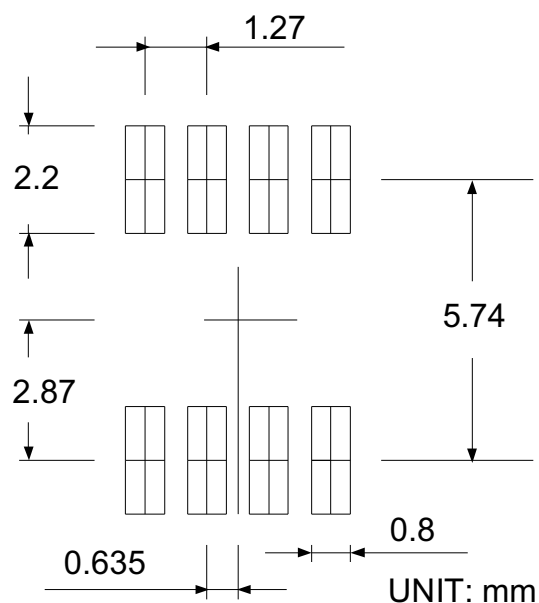


Symbol	Dimensions (mm)		Dimensions (inches)	
	Minimum	Maximum	Minimum	Maximum
A	4.800	5.000	0.189	0.196
B	3.800	4.000	0.150	0.157
C	1.350	1.750	0.054	0.068
D	0.310	0.510	0.012	0.020
F	0.400	1.270	0.016	0.050
G	1.27 BSC		0.05 BSC	
J	0.170	0.250	0.007	0.009
K	0.100	0.250	0.004	0.008
P	5.800	6.200	0.229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

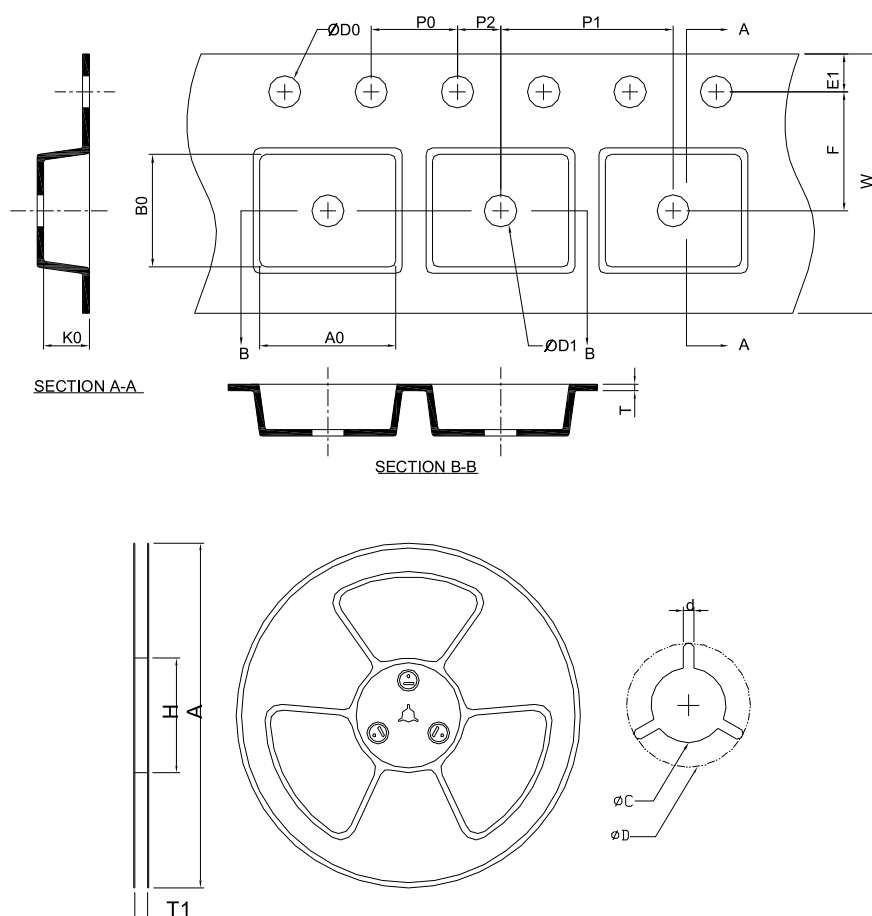


Package Dimensions (Controlling dimensions are in millimeters)

RECOMMENDED LAND PATTERN



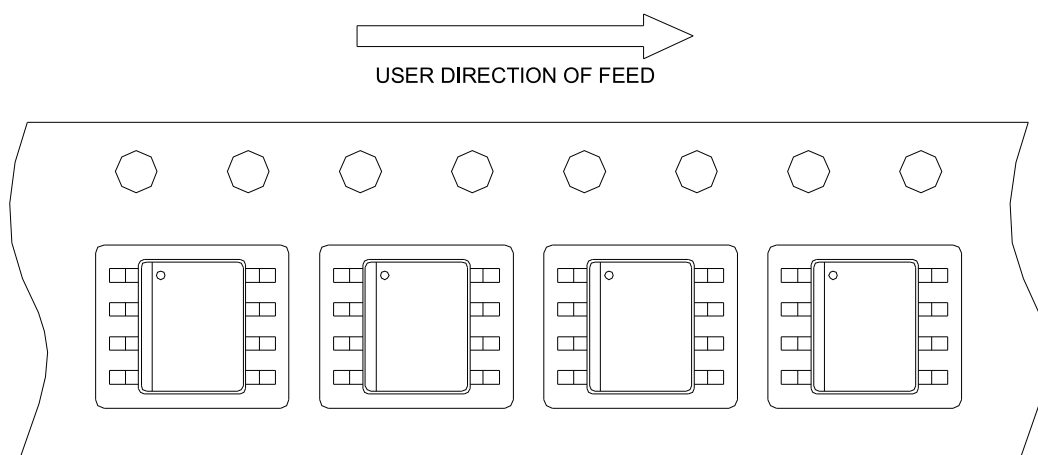
Carrier Tape and Reel Dimension



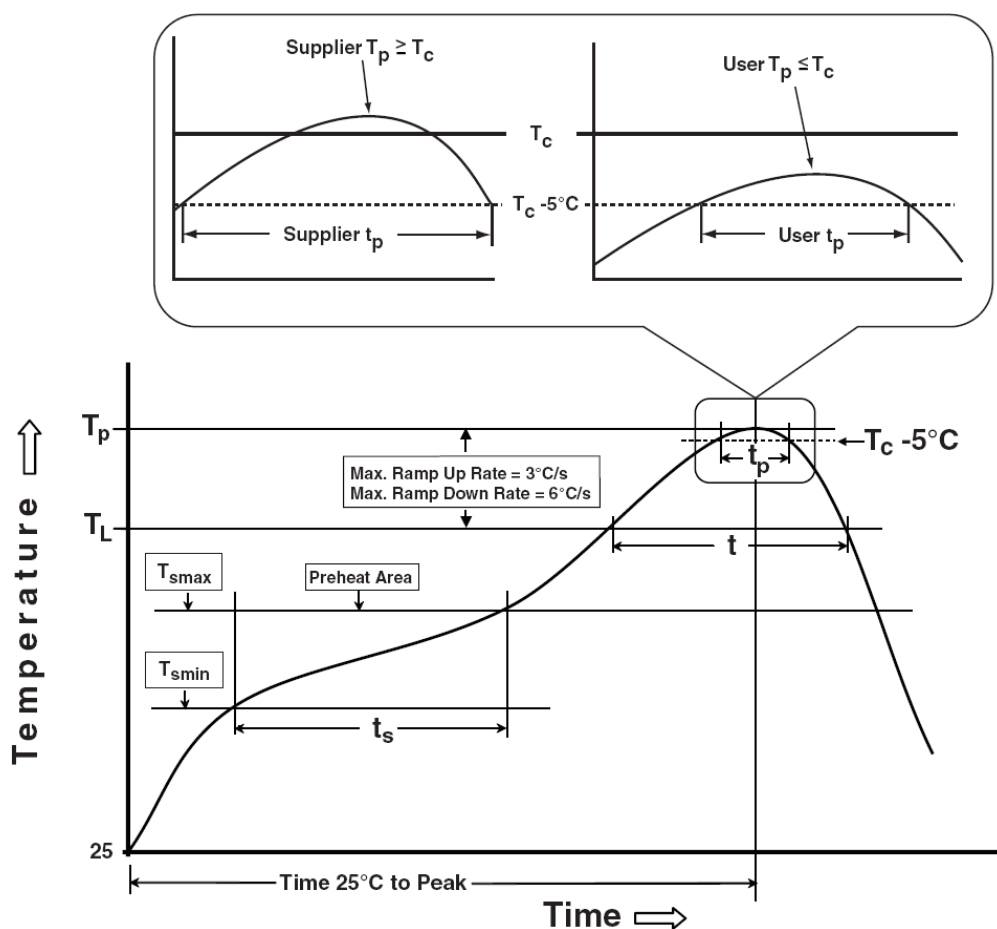
Application	A	H	T1	C	d	D	W	E1	F
SOP-8	330.0±2.00	50 MIN.	12.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	12.0±0.30	1.75±0.10	5.5±0.05
	P0	P1	P2	D0	D1	T	A0	B0	K0
	4.0±0.10	8.0±0.10	2.0±0.05	1.5+0.10 -0.00	1.5 MIN.	0.6+0.00 -0.40	6.40±0.20	5.20±0.20	2.10±0.20

(mm)

■ Tapping Direction Information SOP-8



■ Classification Profile



■ 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 (T_c)

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 (T_c)

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 @ T_{jmax}
HTGB	JESD-22, A108	1000 Hrs, 100% of VGS max @ T_{jmax}
PCT	JESD-22, A102	168 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	500 Cycles, -65°C~150°C

- CITC reserves the right to make changes to this document and its products and specifications at any time without notice.
- Customers should obtain and confirm the latest product information and specifications before final design, purchase or use.
- CITC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does CITC assume any liability for application assistance or customer product design.
- CITC does not warrant or accept any liability with products which are purchased or used for any unintended or unauthorized application.
- No license is granted by implication or otherwise under any intellectual property rights of CITC.
- CITC products are not authorized for use as critical components in life support devices or systems without express written approval of CITC.