ESD5451R

1-Line, Bi-directional, Transient Voltage Suppressors

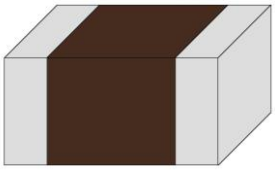
http//:www.sh-willsemi.com

Descriptions

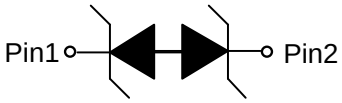
The ESD5451R is a bi-directional TVS (Transient Voltage Suppressor). It is specifically designed to protect sensitive electronic components which are connected to low speed data lines and control lines from over-stress caused by ESD (Electrostatic Discharge), EFT (Electrical Fast Transients) and Lightning.

The ESD5451R may be used to provide ESD protection up to ±30kV (contact and air discharge) according to IEC61000-4-2, and withstand peak pulse current up to 8A (8/20μs) according to IEC61000-4-5.

The ESD5451R is available in DFP1006-2L package. Standard products are Pb-free and Halogen-free.



DFP1006-2L



Circuit diagram

Features

- Reverse stand-off voltage: ±5V Max
- Transient protection for each line according to
  IEC61000-4-2 (ESD): ±30kV (contact and air discharge)
  IEC61000-4-4 (EFT): 40A (5/50ns)
  IEC61000-4-5 (surge): 8A (8/20μs)
- Capacitance: C_J = 17.5pF typ.
- Low leakage current: I_R < 1nA typ.
- Low clamping voltage: V_{CL} = 11V typ. @ I_{PP} = 16A (TLP)
- Solid-state silicon technology

Top View

Applications

- Cellular handsets
- Tablets
- Laptops
- Other portable devices
- Network communication devices

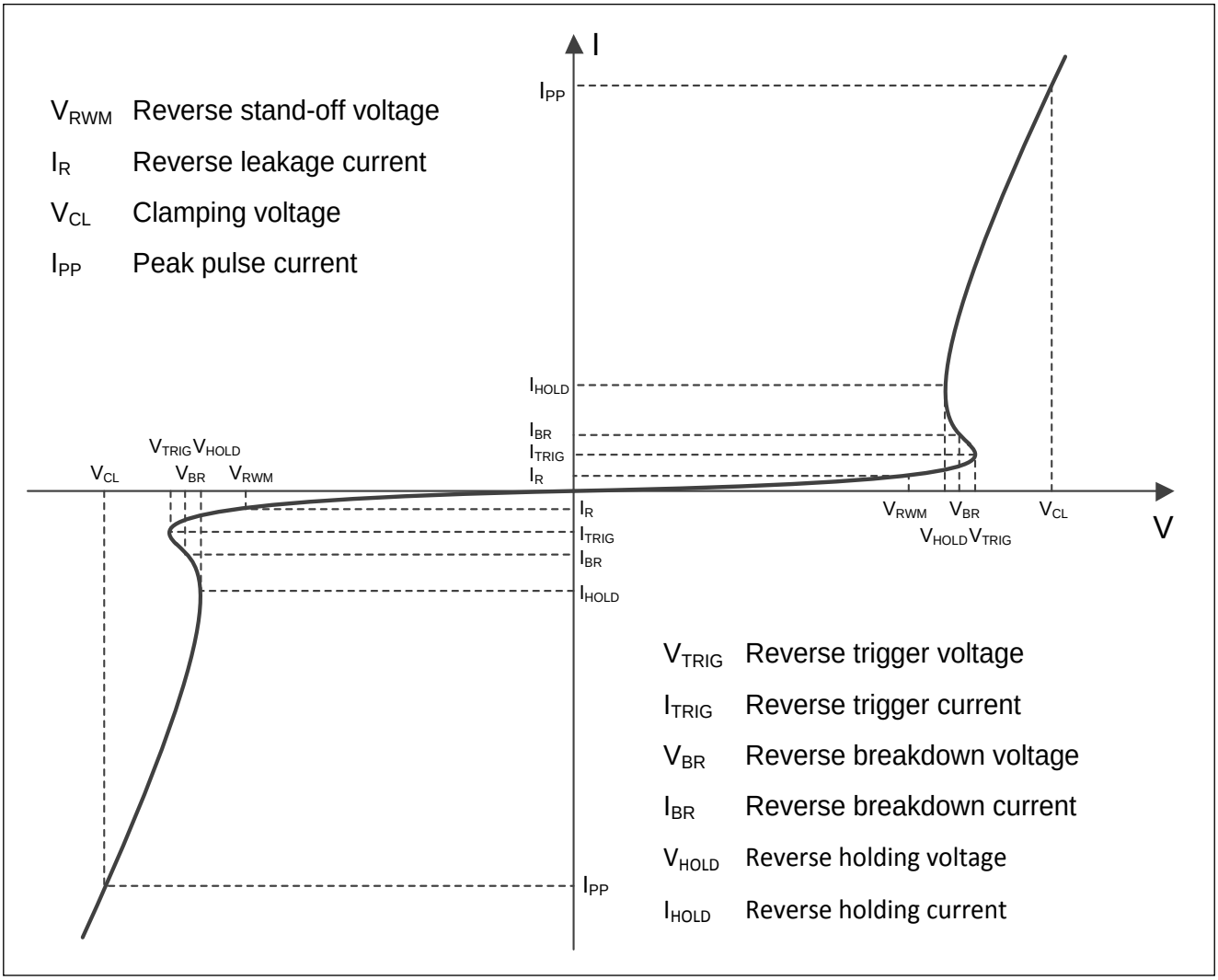
Order information

Device	Package	Shipping
ESD5451R-2/TR	DFP1006-2L	10000/Tape&Reel

Absolute maximum ratings

Parameter	Symbol	Rating	Unit
Peak pulse power (t_p = 8/20μs)	P_{pk}	80	W
Peak pulse current (t_p = 8/20μs)	I_{PP}	8	A
ESD according to IEC61000-4-2 air discharge	V_{ESD}	±30	kV
ESD according to IEC61000-4-2 contact discharge		±30	
Junction temperature	T_J	125	°C
Operation temperature	T_{OP}	-40~85	°C
Lead soldering temperature - SMT	T_L - SMT	260	°C
Lead soldering temperature - manual	T_L – manual	<300	°C
Storage temperature	T_{STG}	-55~150	°C

Electrical characteristics (T_A=25 °C, unless otherwise noted)



Definitions of electrical characteristics

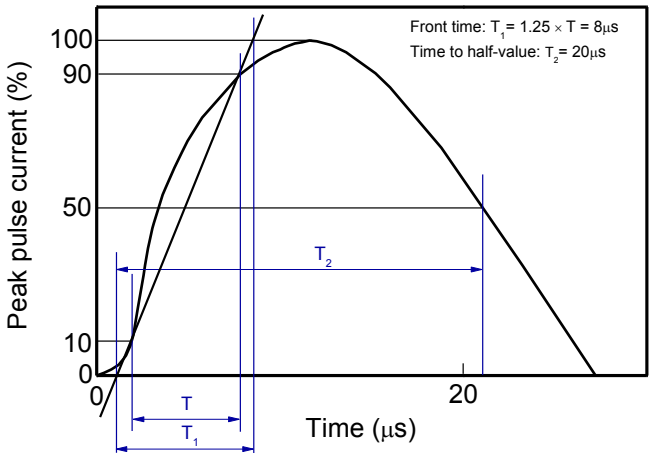
Electrical characteristics (T_A=25 °C, unless otherwise noted)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse stand-off voltage	V_{RWM}				±5	V
Reverse leakage current	I_R	V_{RWM} = 5V		<1	100	nA
Reverse breakdown voltage	V_{BR}	I_{BR} = 1mA	5.1			V
Reverse holding voltage	V_{HOLD}	I_{HOLD} = 50mA	5.1			V
Clamping voltage 1)	V_{CL}	I_{PP} = 16A, t_p = 100ns		11		V
Clamping voltage 2)	V_{CL}	V_{ESD} = 8kV		12		V
Clamping voltage 3)	V_{CL}	I_{PP} = 1A, t_p = 8/20μs			6.5	V
		I_{PP} = 5A, t_p = 8/20μs			8.5	V
		I_{PP} = 8A, t_p = 8/20μs			10	V
Dynamic resistance 1)	R_{DYN}			0.24		Ω
Junction capacitance	C_J	V_R = 0V, f = 1MHz		17.5	22	pF
		V_R = 5V, f = 1MHz		11.5	16	pF

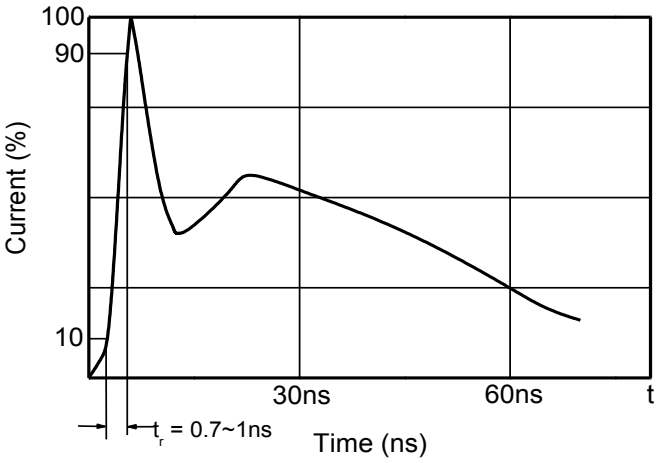
Notes:

1) *TLP parameter: Z_0 = 50Ω, t_p = 100ns, t_r = 2ns, averaging window from 60ns to 80ns. R_{DYN} is calculated from 4A to 16A.*
2) *Contact discharge mode, according to IEC61000-4-2.*
3) *Non-repetitive current pulse, according to IEC61000-4-5.*

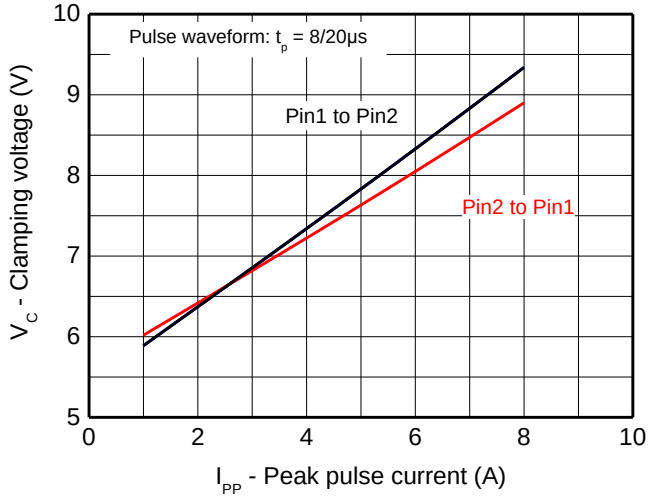
Typical characteristics (T_A=25°C, unless otherwise noted)



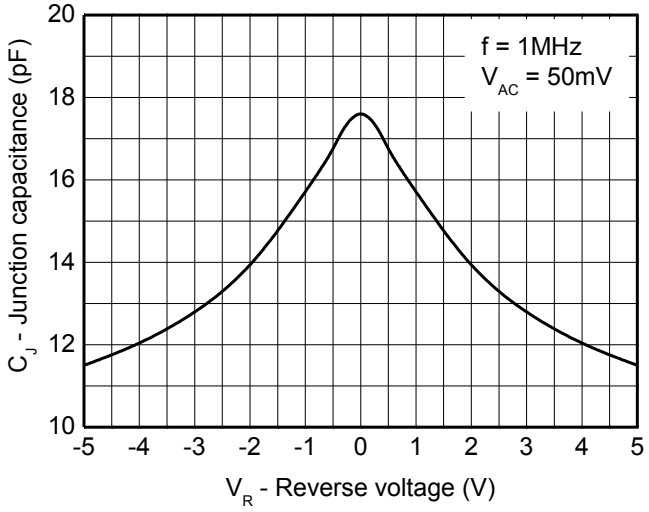
8/20μs waveform per IEC61000-4-5



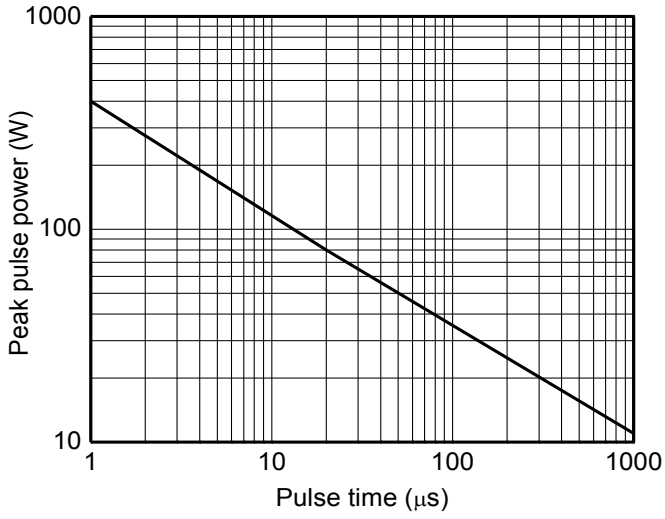
Contact discharge current waveform per IEC61000-4-2



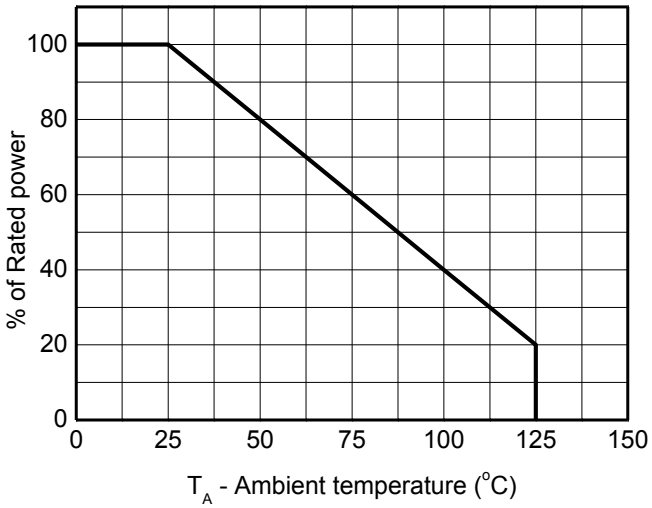
Clamping voltage vs. Peak pulse current



Capacitance vs. Reverse voltage

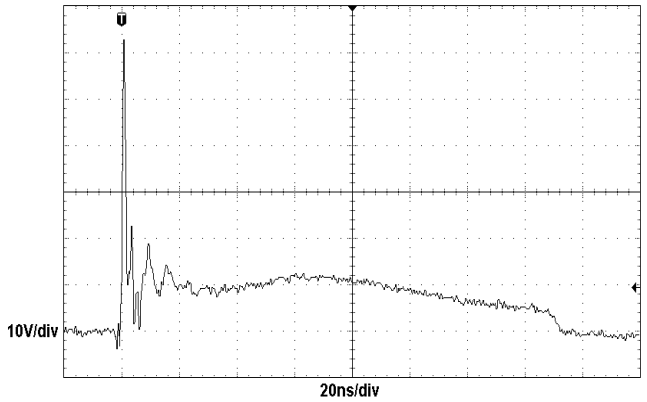


Non-repetitive peak pulse power vs. Pulse time

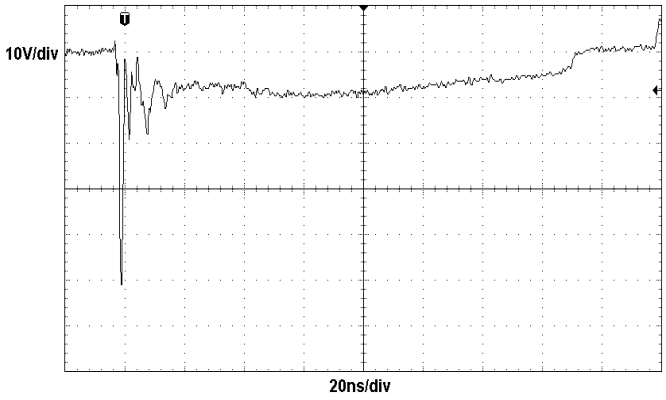


Power derating vs. Ambient temperature

Typical characteristics (T_A=25°C, unless otherwise noted)



ESD clamping
(+8kV contact discharge per IEC61000-4-2)



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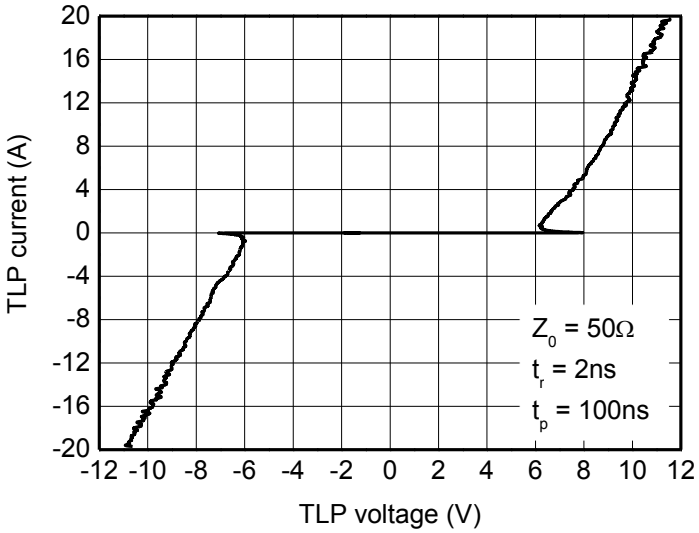
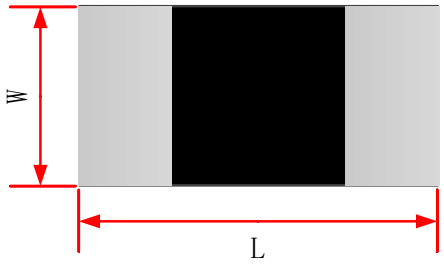


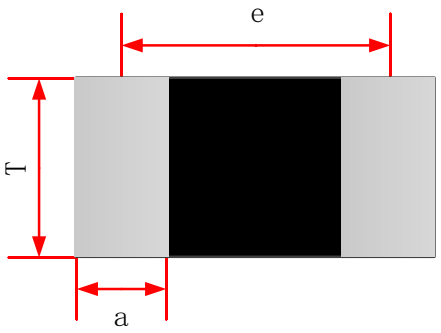
TLP Measurement

Package outline dimensions

DFP1006-2L



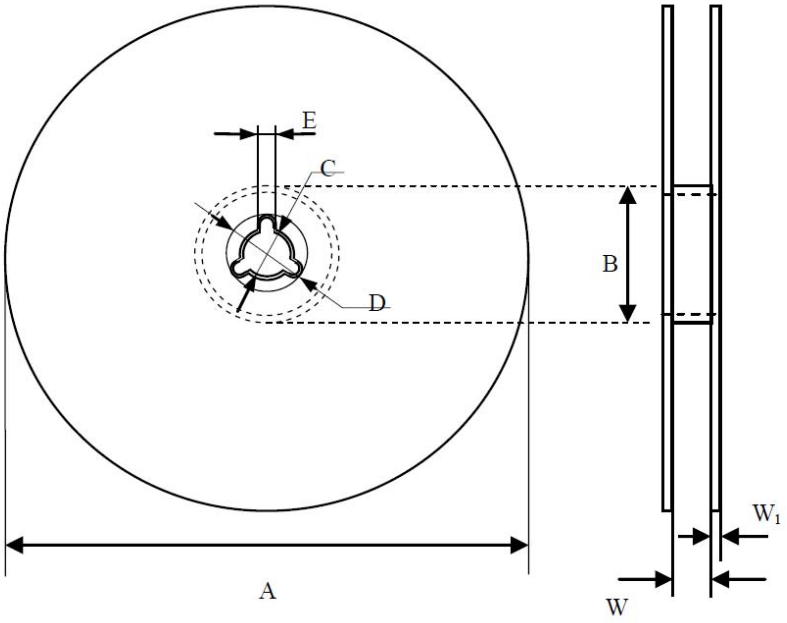
Top View（Bottom View）



Side View

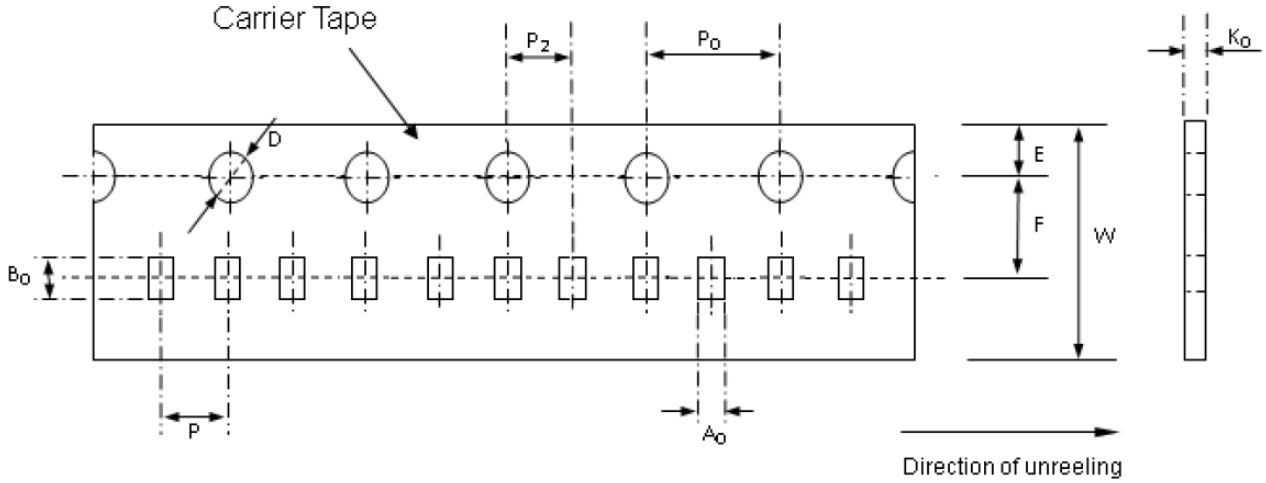
Symbol	Dimensions in millimeter		
	Min.	Typ.	Max.
W	0.40	0.50	0.53
L	0.90	1.00	1.10
T	0.40	0.50	0.53
a	0.15	0.25	0.35
e	0.75 Typ.		

TAPE AND REEL INFORMATION



Unit(mm)

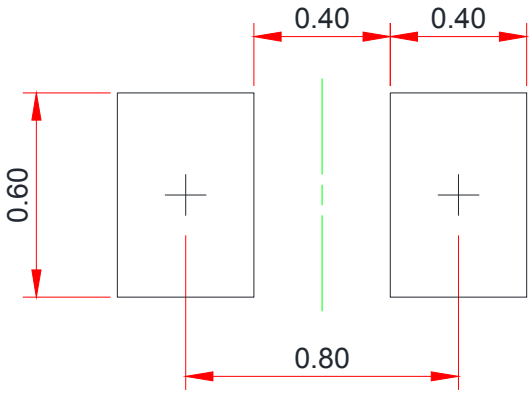
Symbol	A	B	C	D	E	W	W_1
0402	178.0±1.0	60.0±0.5	13.0±0.2	21.0±0.2	2.0±0.5	9.0±0.5	1.5±0.1



Unit(mm)

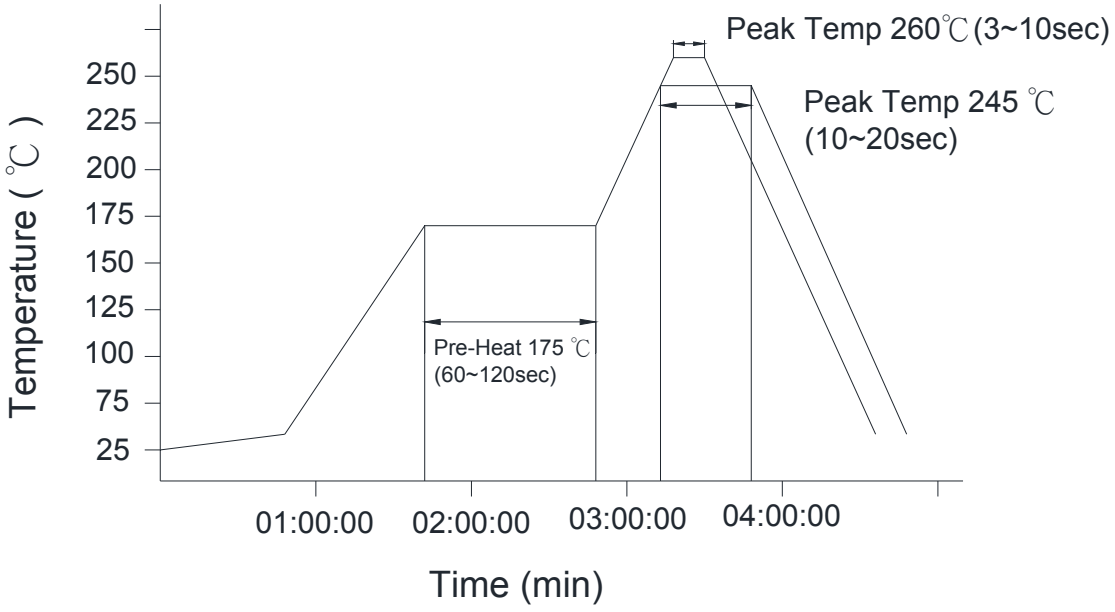
Symbol	A_0 ±0.05	B_0 ±0.05	K_0 ±0.05	D +0.10 -0.05	P ±0.10	P_2 ±0.10	P_0 ±0.10	W ±0.10	E ±0.10	F ±0.05
0402	0.60	1.12	0.60	1.50	2.00	2.00	4.00	8.00	1.75	3.50

Recommended land pattern (Unit: mm)



Notes:
This recommended land pattern is for reference purposes only. Please consult your manufacturing group to ensure your PCB design guidelines are met.

IR reflow and temperature of Soldering for Pb Free



IR reflow Pb Free Process suggestion profile

(1) The solder recommend is Sn96.5/Ag 3.5 of 120 to 150μm
(2) Ramp-up rate (217℃to Peak) + 3℃/second max
(3) Temp. maintain at 175 +/-25℃180 seconds max
(4) Temp. maintain above 217 ℃60-150 seconds
(5) Peak temperature range245℃+20℃/ -10 ℃time within 5 ℃of actually peak temperature (tp)
10~20 seconds
(6) Ramp down rate +6 ℃/second max
(7)Steel plate thickness 0.08mm