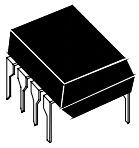
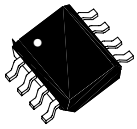
AX34063AP / AX34063AS

DC-to-DC Converter Integrate Circuit Devices



8-Lead Plastic **DIP-8**
Package Code: P



8-Lead Plastic **SO-8**
Package Code: S

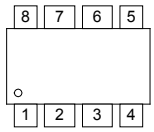
Description

The AX34063A Series is a monolithic control circuit containing the primary functions required for DC-to-DC converters. These devices consist of an internal temperature compensated reference, comparator, controlled duty cycle oscillator with an active current limit circuit, driver and high current output switch. This series was specifically by Avantics Microelectronics Corp.

Features

- 3V to 40V Input Voltage Operation
- Internal 1.6A Peak Current Switch
- Internal ±1.8% Reference
- Low Quiescent Current at 1.6mA
- Frequency Operation from 100Hz~100KHz
- Output Voltage Adjustable
- Active Current Limiting
- Step-Up, Step-Down or Inverting Switching Regulators

Pin Connections



Pin1: Switch Collector (SWC)	Pin5: Comparator Inverting Input (FB)
Pin2: Switch Emitter (SWE)	Pin6: Voltage Supply (Vcc)
Pin3: Timing Capacitor (TC)	Pin7: Ipk Sense (Ipk)
Pin4: Ground (GND)	Pin8: Voltage Driver Collector (DRC)

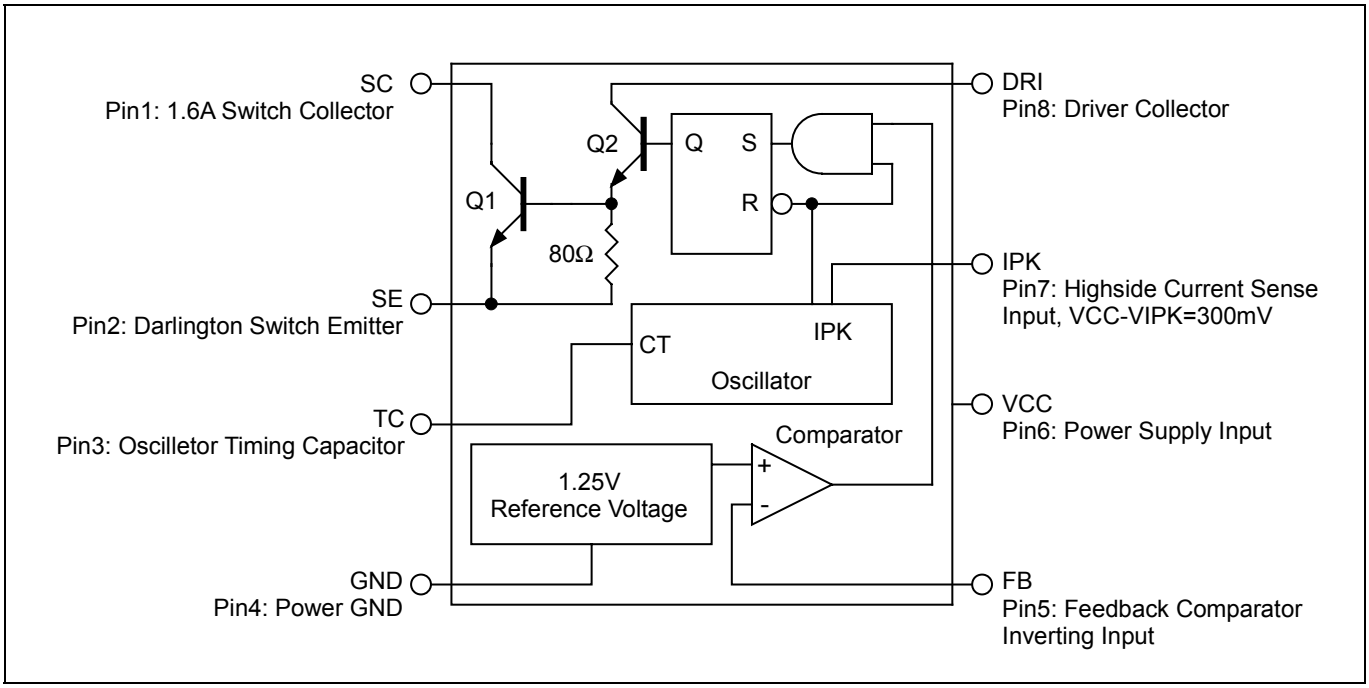
Absolute Maxium Rating

Parameter	Symbol	Value		Unit
Power Supply Voltage	V_{CC}	40		V
Comparator Input Voltage Range	V_{ir}	-0.3~+40		V
Switch Collector Voltage	$V_{C(SW)}$	40		V
Switch Emitter Voltage	V_{SWE}	40		V
Switch Emitter to Collector Voltage	V_{CE}	40		V
Driver Collector Voltage	$V_{C(DR)}$	40		V
Switch Current	I_{SW}	1.5		A
Power Dissipation at T_J=20°C	P_D	DIP-8	1.25	W
		SO-8	0.625	
Operating Ambient Temperature Range	T_{opr}	0~+70		°C
Storage Temperature Range	T_{stg}	-65~+150		°C
Operating Junction Temperature	T_{opj}	120		°C
Thermal Resistance Junction-ambient	θJA	125		°C/W

Electrical Characteristics (V_{CC}=5V,T_A=0~70°C, unless otherwise specified)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Oscillator						
Charging Current	I_{chg}	V_{CC}=5~40V, Ta=25°C	10	25	40	uA
Discharge Current	I_{dischg}	V_{CC}=5~40V, Ta=25°C	140	190	240	uA
Frequency	f_{OSC}	V_{PIN5}=0, C_T=1nF, Ta=25°C	28	33	40	KHz
Discharge to Charge Current Ratio	I_{dischg}/I_{chg}	V_{PIN7}=V_{CC}, Ta=25°C	5.2	6	7.5	
Current Limit Sense Voltage	V_{IPK}	I_{dischg}=I_{chg}, Ta=25°C	250	300	350	mV
Output Switch						
Saturation Voltage, Darlington Connection	$V_{CE(sat)}$1	I_{SW}=1A, $V_{C(SW)}$=$V_{C(DR)}$	-	1	1.3	V
Saturation Voltage	$V_{CE(sat)}$2	I_{SW}=1A, $I_{C(DR)}$=50mA	-	0.4	0.7	V
DC Current Gain	h_{FE}	I_{SW}=1A, V_{CE}=5V	35	120	-	
Collector Off-State Current	$I_{CC(off)}$	V_{CE}=40V, Ta=25°C	-	10	100	uA
Comparator						
Threshold Voltage	V_{FB}		1.23	1.25	1.27	V
Threshold Voltage Line Regulation	ΔV_{FB}	V_{CC}=5~40V	-	1.5	6	mV
Input Bias Current	I_{IB}	V_{IN}=0V	-	40	400	nA
Total Device						
Supply Current	I_{CC}	V_{CC}=5~40V, V_{PIN7}=V_{CC}, V_{Pin5}>V_{FB}, C_T=0.001uF, Pin7=GND, Remaining pins open	-	1.6	3	mA

Block Diagram



Application Information

Design Formula Table

Calculation	Step-Down	Step-Up	Voltage-Inverting
t_{on}/t_{off}	$(V_{out}+V_F)/(V_{in(min)}-V_{sat}-V_{out})$	$(V_{out}+V_F-V_{in(min)})/(V_{in(min)}-V_{sat})$	$(\|V_{out}\|+V_F)/(V_{in(max)}-V_{sat})$
$(t_{on}+t_{off})$ max	$1/F_{min}$	$1/F_{min}$	$1/F_{min}$
C_T	$4*10^{-5}t_{on}$	$4*10^{-5}t_{on}$	$4*10^{-5}t_{on}$
$I_{C(sw)}$	$2*I_{out(max)}$	$2*I_{out(max)}(t_{on}+t_{off}/t_{off})$	$2*I_{out(max)}(t_{on}+t_{off}/t_{off})$
R_S	$0.3/I_{C(sw)}$	$0.3/I_{C(sw)}$	$0.3/I_{C(sw)}$
$L_{(min)}$	$(V_{in(min)}-V_{sat}/I_{pk(sw)})*t_{on(max)}$	$(V_{in(min)}-V_{sat}/I_{pk(sw)})*t_{on(max)}$	$(V_{in(min)}-V_{sat}/I_{pk(sw)})*t_{on(max)}$
C_O	$(I_{pk(sw)}*(t_{on}+t_{off}))/(8*V_{ripple(P-P)})$	$I_{out}*t_{on}/V_{ripple(P-P)}$	$I_{out}*t_{on}/V_{ripple(P-P)}$

V_{sat}: Saturation voltage of the output switch.

V_F: Forward voltage drop of the ringback rectifier.

The following power supply characteristics must be chosen:

V_{in}: Nominal input voltage.

V_{out}: Desired output voltage. $|V_{out}|=1.25*(1+R_B/R_A)$

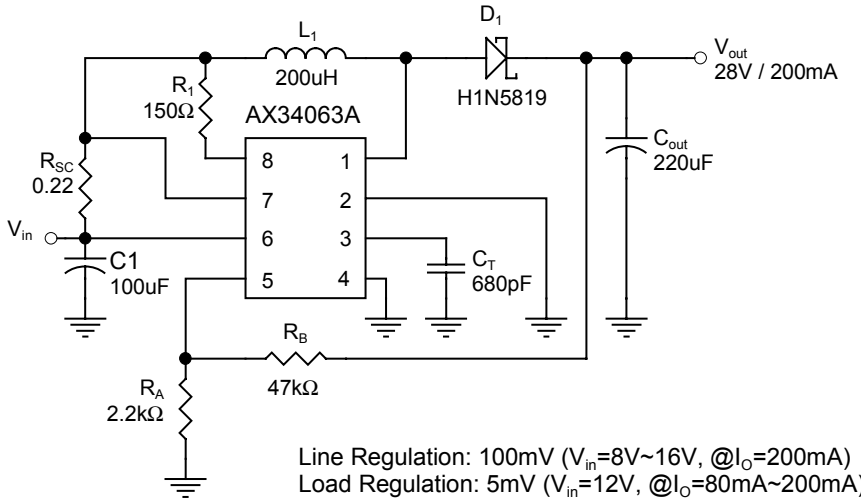
I_{out}: Desired output current

F_{min}: Minimum desired output switching frequency at the selected values for Vin and Iout.

$V_{ripple(P-P)}$: Desired peak to peak output ripple voltage in practice, the calculated value will need to be increased due to the capacitor equivalent series resistance and board layout. The ripple voltage should be kept to a low value since it will directly effect the line and load regulation.

Application Information (Continuos)

Fig.2 Step-Up Converter



Line Regulation: 100mV (V_{in}=8V~16V, @I_O=200mA)
Load Regulation: 5mV (V_{in}=12V, @I_O=80mA~200mA)

Fig.3 Step-Up Converter With External NPN Switch

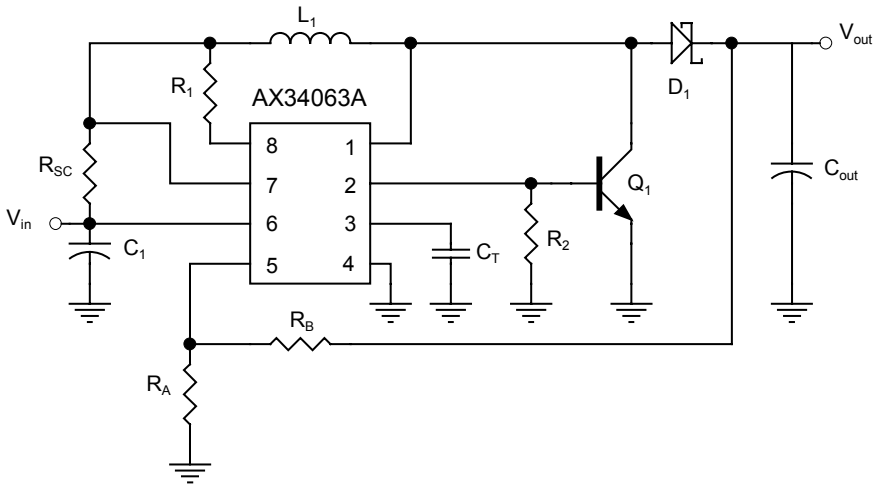
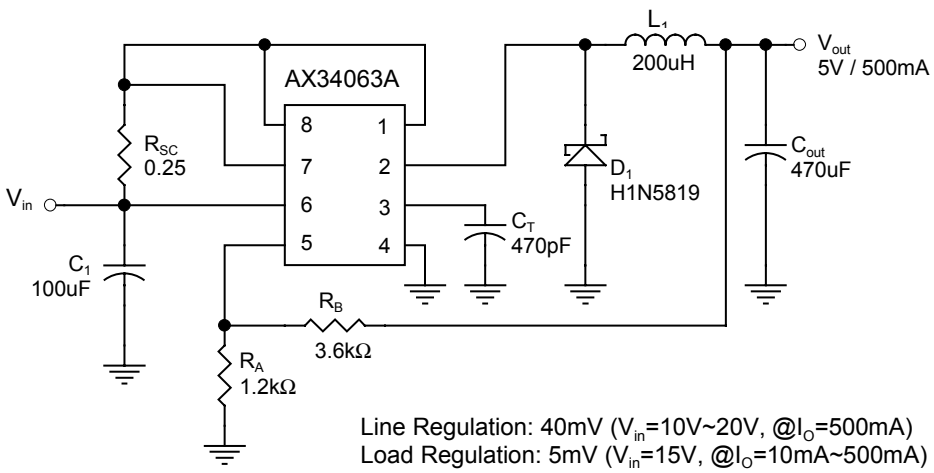


Fig.4 Step-Down Converter



Line Regulation: 40mV (V_{in}=10V~20V, @I_O=500mA)
Load Regulation: 5mV (V_{in}=15V, @I_O=10mA~500mA)
Short Circuit Current: 1.3A (V_{in}=15V, @R_L=0.1Ω

Fig.5 Step-Down Converter With External PNP Saturation Switch

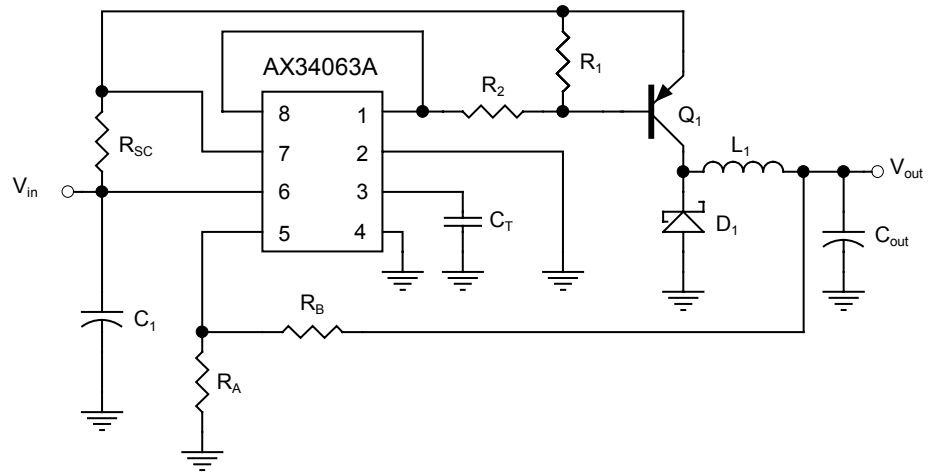
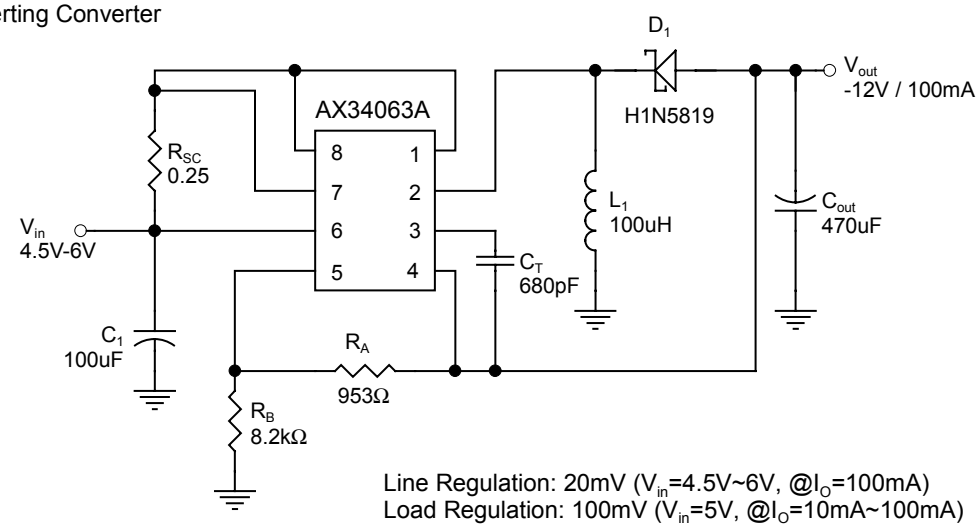
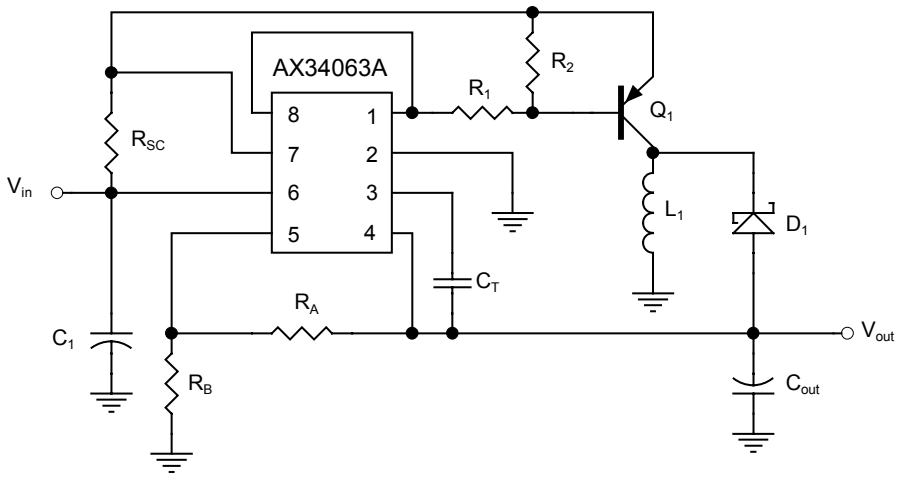


Fig.6 Voltage Inverting Converter

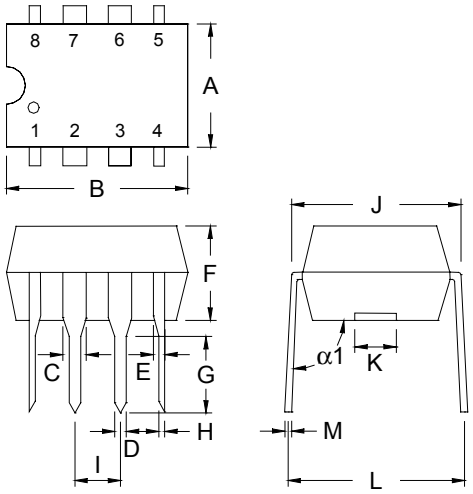


Line Regulation: 20mV (V_{in}=4.5V~6V, @I_O=100mA)
Load Regulation: 100mV (V_{in}=5V, @I_O=10mA~100mA)

Fig.7 Voltage Inverting Converter With External PNP Saturation Switch

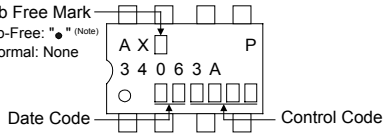


DIP-8 Dimension



8-Lead DIP-8
Plastic Package
AVANTICS Package Code: P

Marking:



Note: Green label is used for pb-free packing

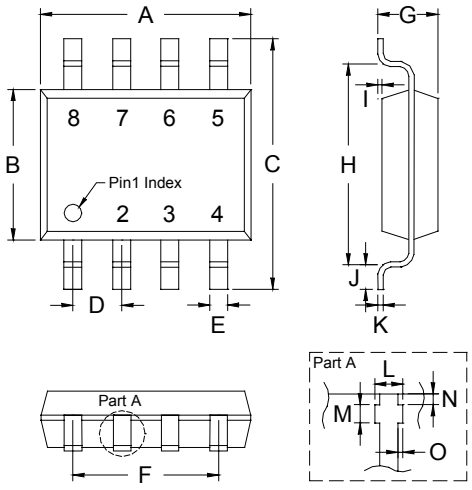
Pin Style: 1.SWC 2.SWE 3.TC 4.GND
5.FB 6.VCC 7.Ipk 8.DRC

Material:
- Lead solder plating: Sn60/Pb40 (Normal), Sn/3.0Ag/0.5Cu or Pure-Tin (Pb-free)
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

DIM	Min.	Max.
A	6.29	6.40
B	9.22	9.32
C	-	*1.52
D	-	*1.27
E	-	*0.99
F	3.25	3.35
G	3.17	3.55
H	0.38	0.53
I	2.28	2.79
J	7.49	7.74
K	-	*3.00
L	8.56	8.81
M	0.229	0.381
α1	94°	97°

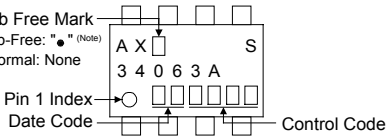
*: Typical, Unit: mm

SO-8 Dimension



8-Lead SO-8 Plastic
Surface Mounted Package
AVANTICS Package Code: S

Marking:



Note: Green label is used for pb-free packing

Pin Style: 1.SWC 2.SWE 3.TC 4.GND
5.FB 6.VCC 7.Ipk 8.DRC

Material:
- Lead solder plating: Sn60/Pb40 (Normal), Sn/3.0Ag/0.5Cu or Pure-Tin (Pb-free)
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0

DIM	Min.	Max.
A	4.85	5.10
B	3.85	3.95
C	5.80	6.20
D	1.22	1.32
E	0.37	0.47
F	3.74	3.88
G	1.45	1.65
H	4.80	5.10
I	0.05	0.20
J	0.30	0.70
K	0.19	0.25
L	0.37	0.52
M	0.23	0.28
N	0.08	0.13
O	0.00	0.15

*: Typical, Unit: mm

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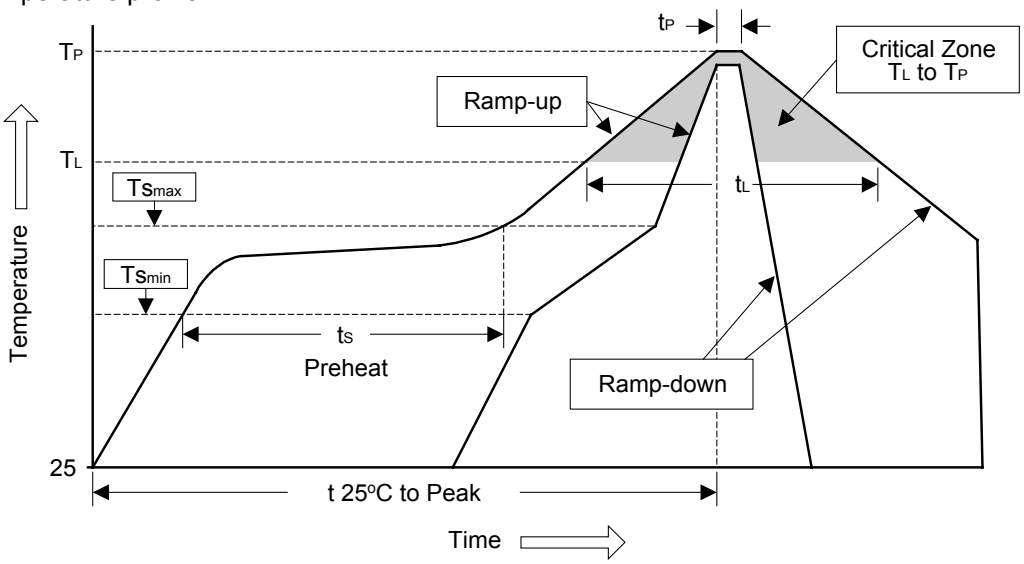
Soldering Methods for AVANTICS's Products

1. Storage environment: Temperature=10°C~35°C Humidity=65%±15%

2. Reflow soldering of surface-mount devices

Figure 1: Temperature profile



Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	<3°C/sec	<3°C/sec
Preheat - Temperature Min (Ts_{min}) - Temperature Max (Ts_{max}) - Time (min to max) (ts)	 100°C 150°C 60~120 sec	 150°C 200°C 60~180 sec
Tsmax to T_L - Ramp-up Rate	 <3°C/sec	 <3°C/sec
Time maintained above: - Temperature (T_L) - Time (t_L)	 183°C 60~150 sec	 217°C 60~150 sec
Peak Temperature (T_P)	240°C +0/-5°C	260°C +0/-5°C
Time within 5°C of actual Peak Temperature (t_P)	10~30 sec	20~40 sec
Ramp-down Rate	<6°C/sec	<6°C/sec
Time 25°C to Peak Temperature	<6 minutes	<8 minutes

3. Flow (wave) soldering (solder dipping)

Products	Peak temperature	Dipping time
Pb devices.	245°C ±5°C	5sec ±1sec
Pb-Free devices.	260°C +0/-5°C	5sec ±1sec