

Features

- Operating with Single 5V or 12V Input
- Drives N-Channel MOSFETs
- Simple Single-Loop Control Design
 - Voltage-Mode PWM Control
 - Full 0% to 100% Duty Ratio
 - Fast Transient Response
- $\pm 2\%$ Output Voltage Accuracy Over Temperature
- Under-Voltage Protection for Output
- 200kHz Constant Frequency Operation (400kHz for APW7037A)
- Small size, 8-PIN Package (SOIC or TSSOP)

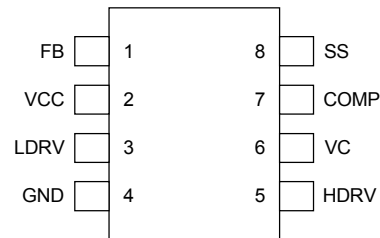
General Description

The APW7037/A controller IC is designed to provide a low cost synchronous Buck regulator for on-board DC to DC converter applications. The APW7037 together with dual N-channel MOSFETs such as APM7313, provide a low cost solution for such applications. This device features an internal 200KHz oscillator (400KHz for “A” version), Power-On-Reset (POR) for both VCC and VC supplies, an external programmable soft-start function as well as output under-voltage detection that latches off the device when an output short is detected.

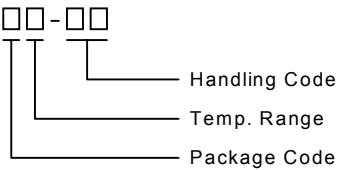
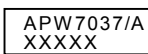
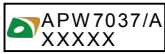
Applications

- Graphics Cards
- DDR Memory Power Supply
- DDR Memory Termination Voltage
- Low-Voltage Distributed Power Supplies

Pin Description

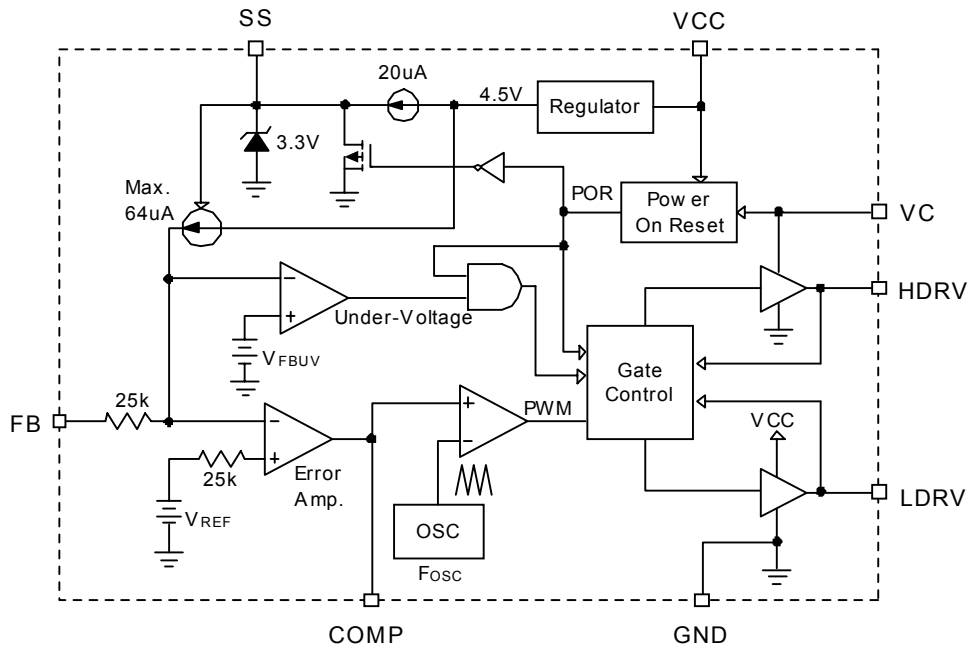


Ordering and Marking Information

APW7037/A □□-□□ 	Package Code K : SO-8 R : TSSOP-8 Operating Junction Temp. Range C : 0 to 70°C Handling Code TU : Tube TR : Tape & Reel
APW7037/A K : 	XXXXX - Date Code
APW7037/A R : 	XXXXX - Date Code

ANPEC reserves the right to make changes to improve reliability or manufacturability without notice, and advise customers to obtain the latest version of relevant information to verify before placing orders.

Block Diagram



Absolute Maximum Ratings

Description	Rating	Unit
VCC to GND	-0.2~30	V
VC to GND	-0.2~30	V
Operating Junction Temperature	0~125	°C
Storage Temperature	-65~150	°C
Soldering Temperature (10 Seconds)	300	°C
Minimum ESD Rating	±2	kV

Thermal Characteristics

Symbol	Parameter	Value	Unit
θ_{JA}	Thermal Resistance in Free Air 8-pin SOIC 8-pin TSSOP	160 124	°C/W

Electrical Characteristics

Unless otherwise specified, these specifications apply over VCC=5V, VC=12V and TA=0 to 70°C. Typical values refer to TA=25°C.

Symbol	Parameter	Test Conditions	APW7037/A			Unit
			Min.	Typ.	Max.	
SUPPLY CURRENT						
I _{CC}	VCC Dynamic Supply Current	F _{OSC} =200KHz, C _L =1500pF	2	3	5	mA
I _C	VC Dynamic Supply Current	F _{OSC} =200KHz, C _L =1500pF	2	5.5	8	mA
I _{CCQ}	VCC Static Supply Current	SS=GND	0.5	1.5	3	mA
I _{CQ}	VC Static Supply Current	SS=GND	0.2	0.4	1	mA
POWER-ON RESET						
	Rising VCC Threshold		4.0	4.2	4.4	V
	VCC POR Hysteresis			0.25		V
	Rising VC Threshold		3.1	3.3	3.5	V
	VC POR Hysteresis			0.2		V
OSCILLATOR						
F _{OSC}	Free Running Frequency	APW7037 APW7037A	180 360	200 400	220 440	KHz
ΔV _{OSC}	Ramp Amplitude			1.10		V
ERROR AMPLIFIER						
I _{FB1}	FB Pin Input Bias Current	SS=3V, V _{FB} =1V		1		nA
I _{FB2}	FB Pin Input Bias Current	SS=0V, V _{FB} =1V		-64		μA
GM	Transconductance		450	600	750	μmho
REFERENCE VOLTAGE						
V _{FB}	FB Pin Regulation Voltage	APW7037 APW7037A	1.225 0.784	1.250 0.800	1.275 0.816	V
LREG	V _{FB} Line Regulation	VCC = 5~12V		0.2	0.35	%
GATE DRIVERS						
	HDRV Rising Time	C _L = 1500pF		20	50	nS
	HDRV Falling Time	C _L = 1500pF		15	50	nS
	LDRV Rising Time	C _L = 1500pF		25	50	nS
	LDRV Falling Time	C _L = 1500pF		25	50	nS
	Dead Band Time		50	150	250	nS
PROTECTION						
V _{FBUV}	FB Under-Voltage Threshold	V _{FB} Falling APW7037 APW7037A	0.4 0.3	0.6 0.4	0.8 0.5	V
V _{SD}	Shutdown Threshold Voltage	Pull the voltage of SS pin		0.5		V
I _{SS}	Soft-Start Current	SS=0	10	20	30	μA

Functional Pin Description

FB (Pin 1)

Connect this pin to the output (V_{OUT}) of the PWM converter via an external resistor divider to provide a voltage feedback path for the converter. The output voltage set by the resistor divider is determined using the following formula :

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R_{OUT}}{R_{GND}}\right)$$

where R_{OUT} is the resistor connected from V_{OUT} to FB, and R_{GND} is the resistor connected from FB to ground. The voltage at this pin is also monitored for Under-Voltage protection.

VCC (Pin 2)

Connect this pin to input voltage from 5V to 20V. This pin provides the bias for the control circuitry and the low-side power MOSFET driver (LDRV). The voltage at this pin is monitored for Power-On Reset (POR) purpose.

LDRV (Pin 3)

Connect this pin to the gate of the low-side power MOSFET. This pin provides the gate drive for the MOSFET.

GND (Pin 4)

Signal and power ground for the IC. All voltage levels are measured with respect to this pin.

HDRV (Pin 5)

Connect this pin to the gate of the high-side power MOSFET. This pin provides the gate drive for the MOSFET.

VC (Pin 6)

This pin provides bias voltage to the high-side MOSFET driver. A bootstrap circuit may be used to pump a boot voltage for enforcing the driving capability of the gate driver and improving the performance of the MOSFET.

COMP (Pin 7)

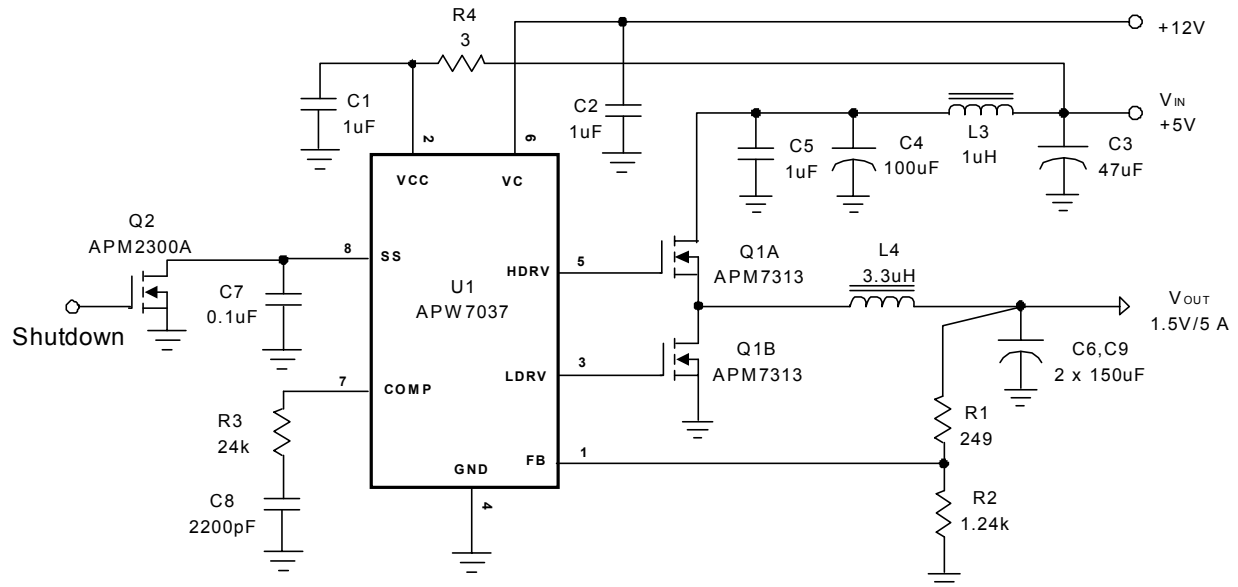
This pin is the output of the error amplifier. Add an external resistor-capacitor network to provide a loop compensation for the PWM converter.

SS (Pin 8)

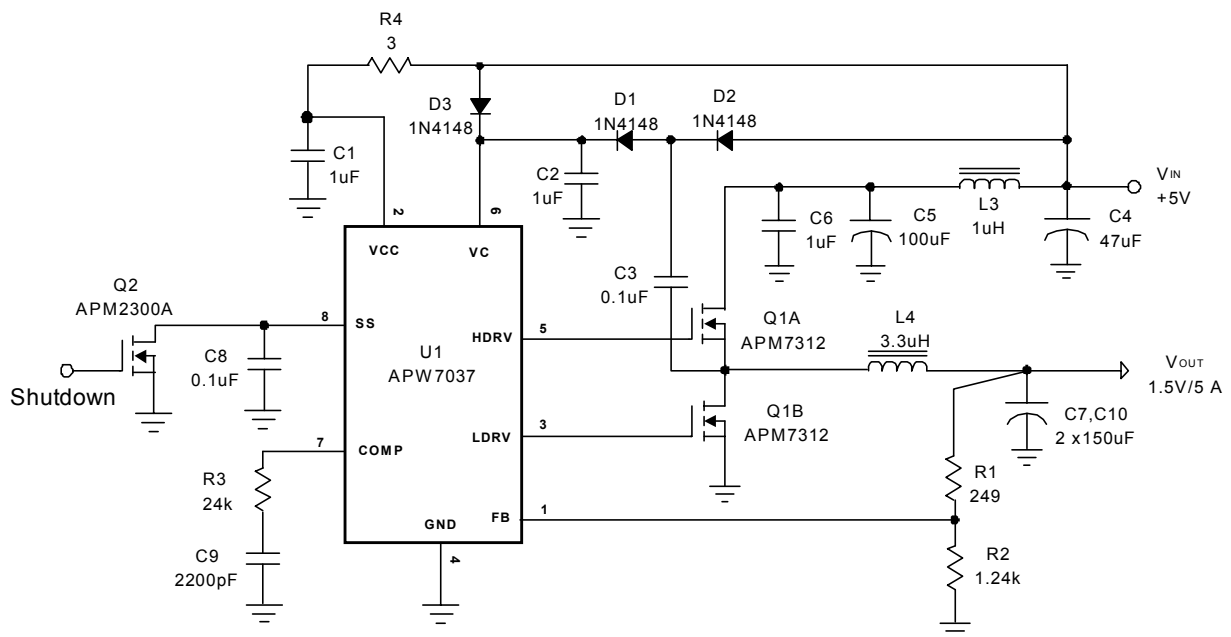
Connect a capacitor from this pin to ground. This capacitor, along with an internal 20uA current source, sets the soft-start interval of the PWM converter and prevents the outputs from overshoot as well as limits the input current. Pull this pin below 0.5V can shut-down the converter.

Typical Applications

1. Dual supply voltage(5V and 12V) application

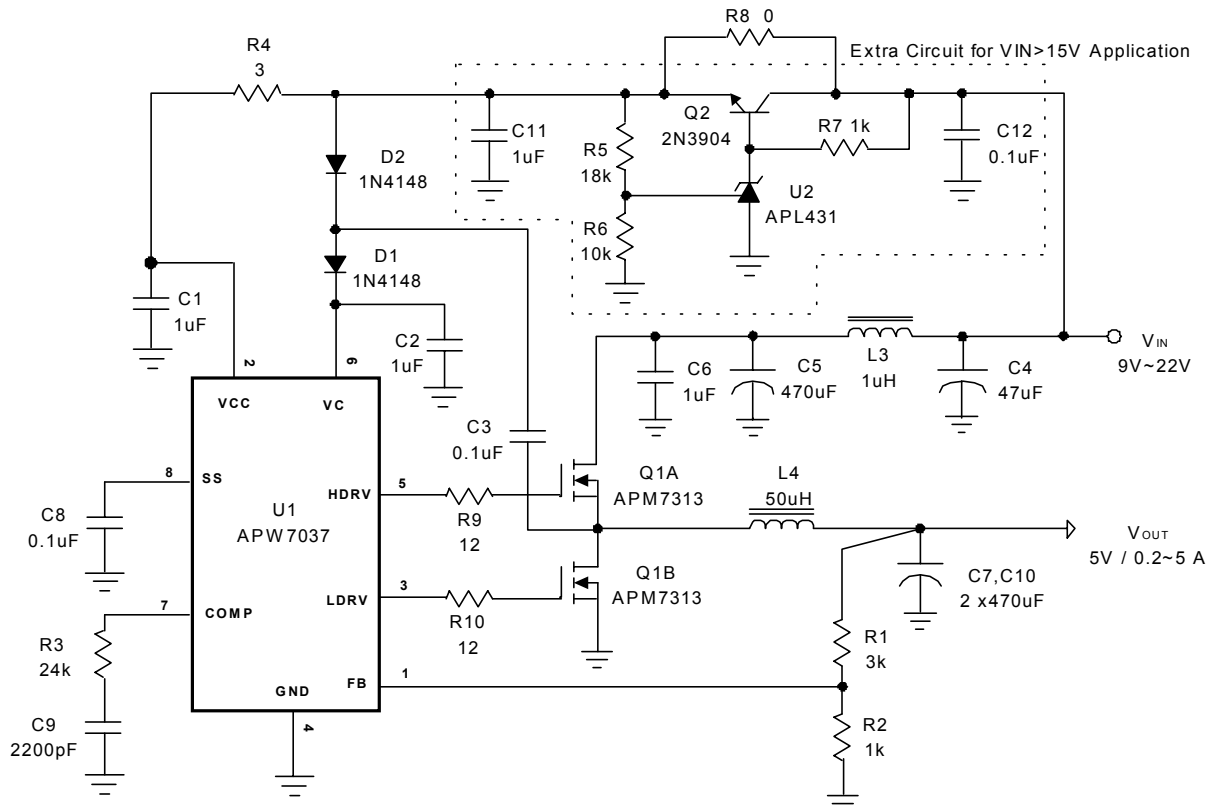


2. Single supply voltage(5V) application



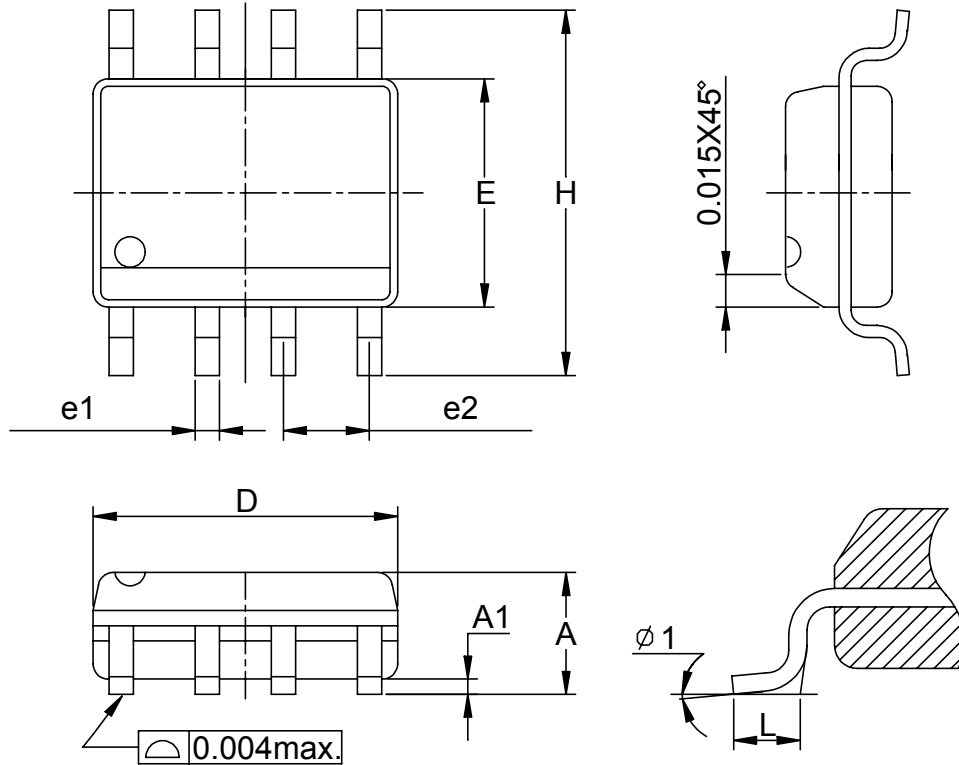
Typical Applications (Cont.)

3. LCD Monitor Application Circuit



Package Information

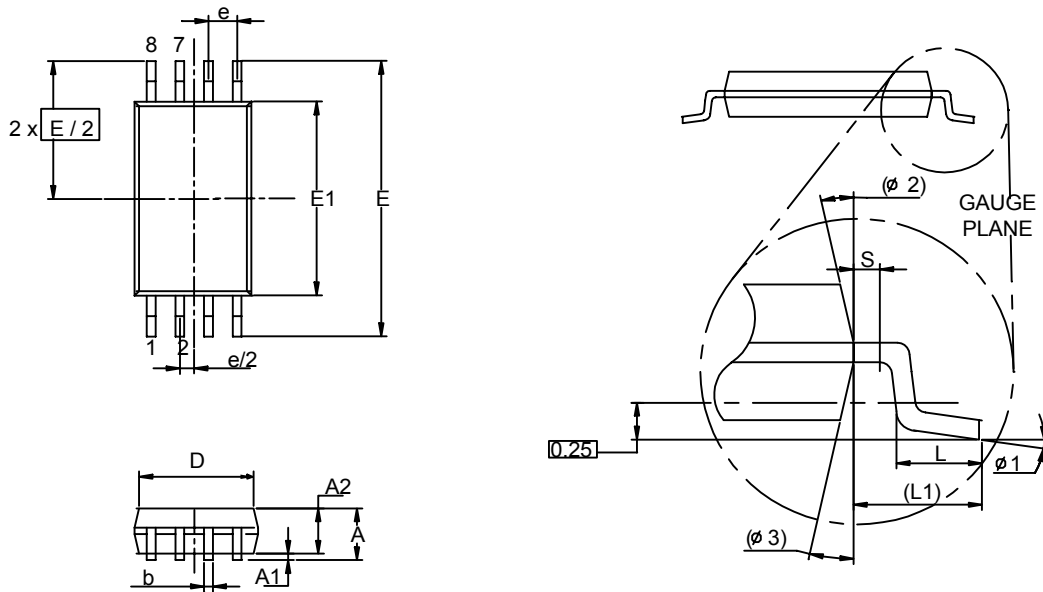
SOP-8 pin (Reference JEDEC Registration MS-012)



Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
D	4.80	5.00	0.189	0.197
E	3.80	4.00	0.150	0.157
H	5.80	6.20	0.228	0.244
L	0.40	1.27	0.016	0.050
e1	0.33	0.51	0.013	0.020
e2	1.27BSC		0.50BSC	
φ 1	8°		8°	

Package Information

TSSOP-8

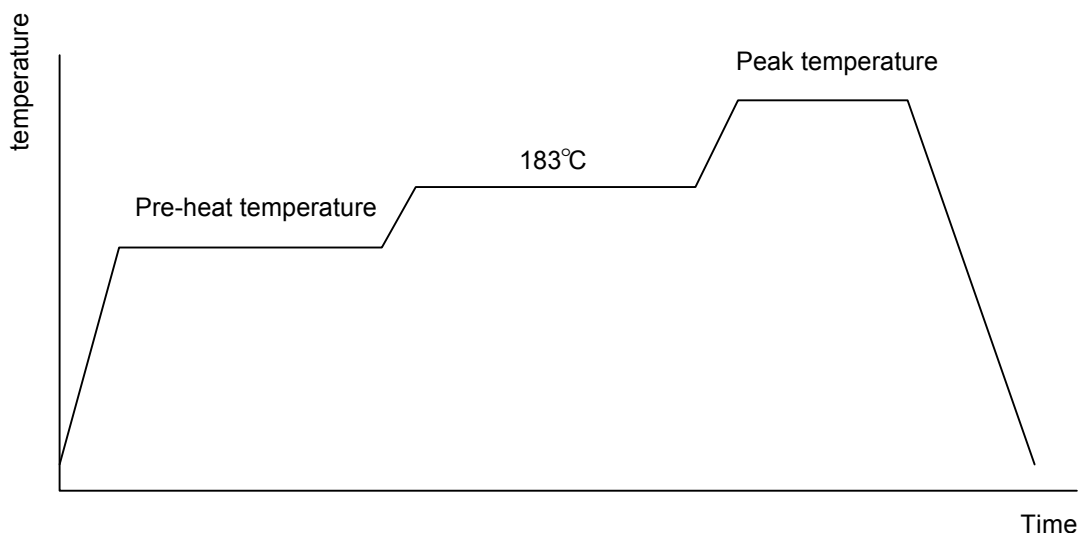


Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A		1.2		0.047
A1	0.00	0.15	0.000	0.006
A2	0.80	1.05	0.031	0.041
b	0.19	0.30	0.007	0.012
D	2.9	3.1	0.114	0.122
e	0.65 BSC		0.026 BSC	
E	6.40 BSC		0.252 BSC	
E1	4.30	4.50	0.169	0.177
L	0.45	0.75	0.018	0.030
L1	1.0 REF		0.039 REF	
R	0.09		0.004	
R1	0.09		0.004	
S	0.2		0.008	
φ1	0°	8°	0°	8°
φ2	12° REF		12° REF	
φ3	12° REF		12° REF	

Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material : 90/10 or 63/37 SnPb)
Lead Solderability	Meets EIA Specification RSI86-91, ANSI/J-STD-002 Category 3.

Reflow Condition (IR/Convection or VPR Reflow)



Classification Reflow Profiles

	Convection or IR/ Convection	VPR
Average ramp-up rate(183°C to Peak)	3°C/second max.	10 °C /second max.
Preheat temperature 125 ± 25°C)	120 seconds max	
Temperature maintained above 183°C	60 – 150 seconds	
Time within 5°C of actual peak temperature	10 –20 seconds	60 seconds
Peak temperature range	220 +5/-0°C or 235 +5/-0°C	215-219°C or 235 +5/-0°C
Ramp-down rate	6 °C /second max.	10 °C /second max.
Time 25°C to peak temperature	6 minutes max.	

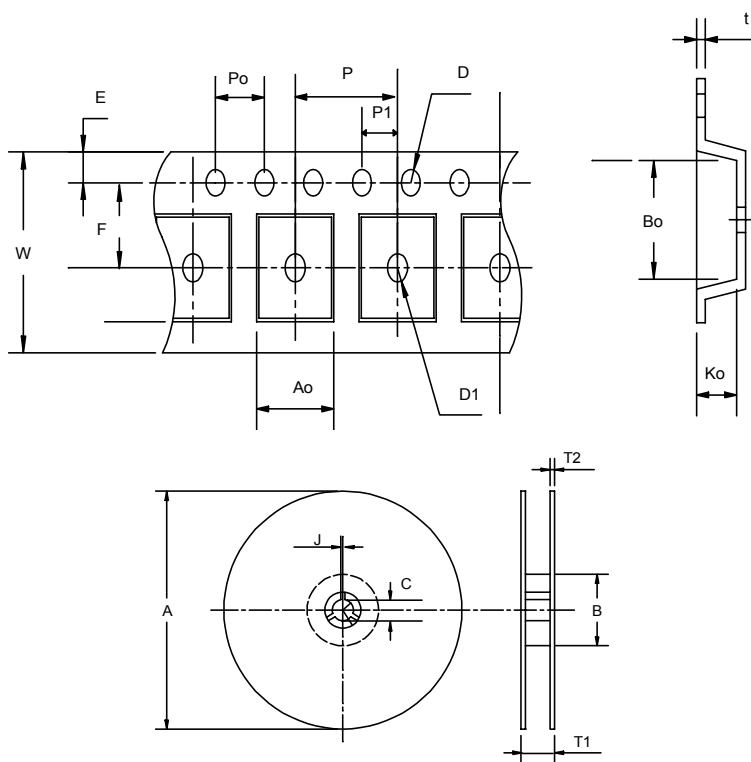
Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bgas	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm ³	pkg. thickness < 2.5mm and pkg. volume < 350mm ³
Convection 220 +5/-0 °C		Convection 235 +5/-0 °C
VPR 215-219 °C		VPR 235 +5/-0 °C
IR/Convection 220 +5/-0 °C		IR/Convection 235 +5/-0 °C

Reliability test program

Test item	Method	Description
SOLDERABILITY	MIL-STD-883D-2003	245°C , 5 SEC
HOLT	MIL-STD-883D-1005.7	1000 Hrs Bias @ 125 °C
PCT	JESD-22-B, A102	168 Hrs, 100 % RH , 121°C
TST	MIL-STD-883D-1011.9	-65°C ~ 150°C, 200 Cycles
ESD	MIL-STD-883D-3015.7	VHBM > 2KV, VMM > 200V
Latch-Up	JESD 78	10ms , I _{tr} > 100mA

Carrier Tape & Reel Dimensions



Application	A	B	C	J	T1	T2	W	P	E
SOP-8	330±1	62 ± 1.5	12.75 +0.15	2 + 0.5	12.4 +0.2	2± 0.2	12 + 0.3 - 0.1	8± 0.1	1.75± 0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	5.5 ± 0.1	1.55 ±0.1	1.55+0.25	4.0 ± 0.1	2.0 ± 0.1	6.4 ± 0.1	5.2± 0.1	2.1± 0.1	0.3±0.013
Application	A	B	C	J	T1	T2	W	P	E
TSSOP-8	330 ± 1	62 +1.5	12.75+ 0.15	2 + 0.5	12.4 ± 0.2	2 ± 0.2	12± 0.3	8± 0.1	1.75±0.1
	F	D	D1	Po	P1	Ao	Bo	Ko	t
	5.5 ± 0.1	1.5 + 0.1	1.5 + 0.1	4.0 ± 0.1	2.0 ± 0.1	7.0 ± 0.1	3.6 ± 0.3	1.6 ± 0.1	0.3±0.013

(mm)

Cover Tape Dimensions

Application	Carrier Width	Cover Tape Width	Devices Per Reel
SOP- 8	12	9.3	2500
TSSOP- 8	12	9.3	2500

Customer Service**Anpec Electronics Corp.**

Head Office :

5F, No. 2 Li-Hsin Road, SBIP,

Hsin-Chu, Taiwan, R.O.C.

Tel : 886-3-5642000

Fax : 886-3-5642050

Taipei Branch :

7F, No. 137, Lane 235, Pac Chiao Rd.,

Hsin Tien City, Taipei Hsien, Taiwan, R. O. C.

Tel : 886-2-89191368

Fax : 886-2-89191369