

## Crystal Oscillator

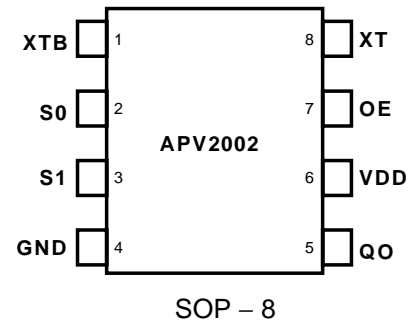
### Features

- Single Chip XO
- Up to 60MHz Square Wave
- Load Capacitors Build-in
- Feedback Resistor Build-in
- 3-State Output
- High Reliability
- CMOS/TTL Input Level
- CMOS/TTL Output Duty Level
- Fundamental Oscillator
- Frequency Divider Build-in
- 2.7V to 5.5V Supply Voltage
- High Stability Against Noise on VDD
- Chip Form and SOP-8 Package Available

### General Description

The APV2002 is a CMOS IC that integrates all circuit components required for an oscillator. It is a low cost, low jitter, high performance oscillator, which consists of low-current oscillator circuit and output buffer. The IC also incorporates a high-precision, thin-film feedback resistor and load capacitors with excellent frequency characteristics. It also offers frequency divider for application flexibility choice.

### Pin Assignment



### Ordering Information

<p>APV2002 <span style="font-family: monospace;">□□-□□</span></p> <div style="margin-left: 20px;"> <p>└─── Handling Code</p> <p>└─── Temp. Range</p> <p>└─── Package Code</p> </div>	<p>Package Code                  K : SOP-8                  Y : CHIP FORM</p> <p>Temp. Range                  I : -40 to 85°C</p> <p>Handling Code                  TU : Tube            TY : Tray                  TR : Tape &amp; Reel    W : Wafer</p>
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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.

## Pin Description

Pin	Symbol	Function
1	XTB	Crystal drive
2	S0 (Note1)	Frequency select pin1
3	S1	Frequency select pin2
4	GND	Ground
5	QO	Frequency output
6	VDD	Power
7	OE (Note2)	Output enable
8	XT	Crystal feedback

Note1 : Please refer frequency selector

Note2 : High or no connection : enable , Low : disable

## Electrical Characteristics

The following specifications apply for  $V_{DD} = 5V$  unless otherwise noted.

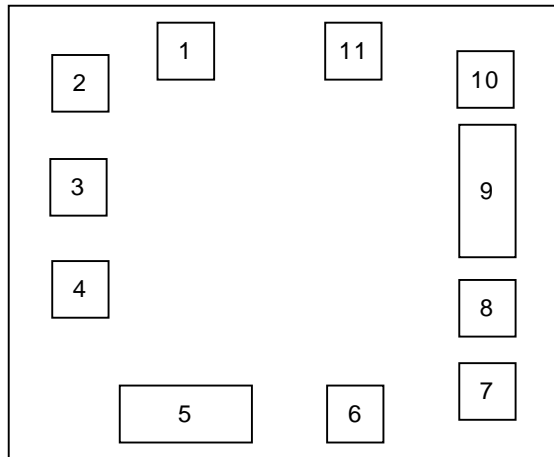
Symbol	Parameter	Test Condition	APV2002			Unit
			Min.	Typ.	Max.	
<b>Operating condition</b>						
VDD	Supply Voltage		4.5	5	5.5	V
	Ambient Temperature		-40		85	°C
<b>DC characteristics</b>						
Freq	Crystal Frequency		0.5		60	MHz
IDD	Operating Current	Crystal 50MHz , $C_L = 50pF$			20	mA
$V_{IN}$	Input Voltage		-0.5		$V_{DD}+0.5V$	
$V_{OUT}$	Output Voltage		-0.5		$V_{DD}+0.5V$	
<b>AC characteristics</b>						
Duty	Waveform Symmetry		40	50	60	%
Tr	Rise Time	0.5V to 4.5V , $C_L = 50pF$		3		ns
Tf	Fall Time	4.5V to 0.5V , $C_L = 50pF$		3		ns

## Electrical Characteristics (Cont.)

The following specifications apply for  $V_{DD} = 3.3V$  unless otherwise noted.

Symbol	Parameter	Test Condition	APV2002			Unit
			Min.	Typ.	Max.	
<b>Operating condition</b>						
VDD	Supply Voltage		3.0	3.3	3.6	V
	Ambient Temperature		-40		85	°C
<b>DC characteristics</b>						
Freq	Crystal Frequency		0.5		60	MHz
IDD	Operating Current	Crystal 55MHz , $C_L = 50pF$			20	mA
$V_{IN}$	Input Voltage		-0.5		$V_{DD}+0.5V$	
$V_{OUT}$	Output Voltage		-0.5		$V_{DD}+0.5V$	
<b>AC characteristics</b>						
Duty	Waveform Symmetry		40	50	60	%
Tr	Rise Time	0.3V to 3.0V , $C_L = 50pF$		3		ns
Tf	Fall Time	3.0V to 0.3V , $C_L = 50pF$		3		ns

## Pad Layout



## Pad Description

Pad #	Symbol	Description
1	XTB	Crystal drive
2	OE	Output enable
3	S0	Frequency select pad1
4	S1	Frequency select pad2
5	GND	Ground
6	C/T (Note3)	Duty cycle modulation
7	QO	Frequency output
8	NC (Note4)	Reserve
9	VDD	Power
10	OE	Output enable
11	XT	Crystal feedback

Note3 : C/T-no connection or connect to VDD for above 30Meg XO; connect to GND for below 30Meg XO.

Note4 : NC-no connection

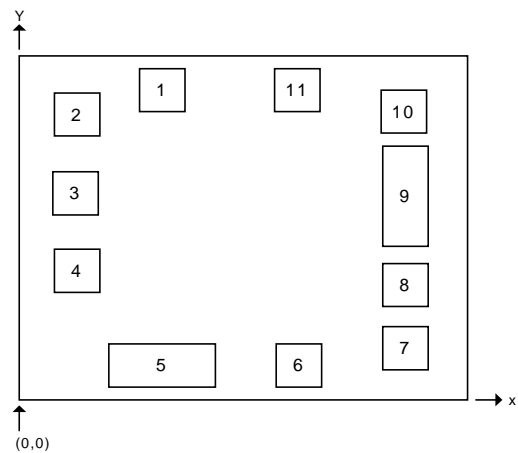
## Frequency Selector

S1	S0	QO
X	X	Default
X	O	÷ 2
O	X	÷ 4
O	O	÷ 8

Note5 : X-no connection , O-connect to GND

Note6 : This function for die use only

## Pad Position



Die Size = 716.5um \* 821.5um

Pad Size = 86um \* 86um

Die Thickness = 250um

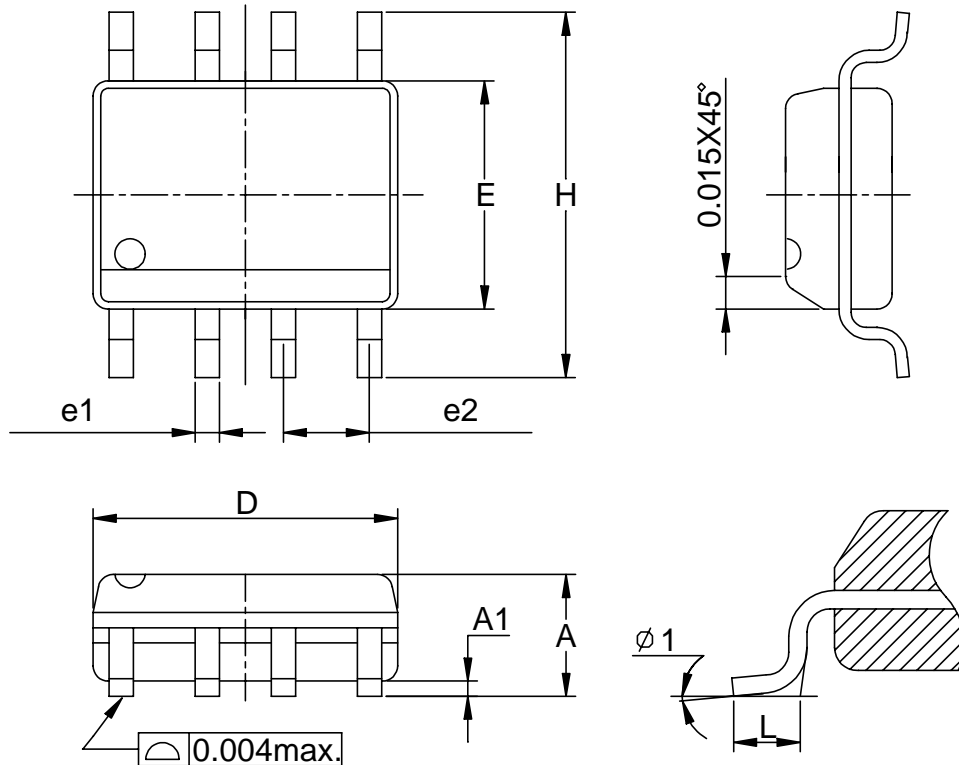
Pad #	Symbol	Pad Center	
		X(um)	Y(um)
1	XTB	260	743
2	OEPAD	78	700
3	S0PAD	78	531
4	S1PAD	78	359
5	GND	225,321	78,78
6	TCBPAD	468	78
7	QO	638	163
8	NC	638	356
9	VDD	638,638	457,553
10	OEPAD	638	700
11	XT	449	743

Note7 : Substrate should be connected to GND.

Note8 : VDD and GND are double pads.

## Packaging Information

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



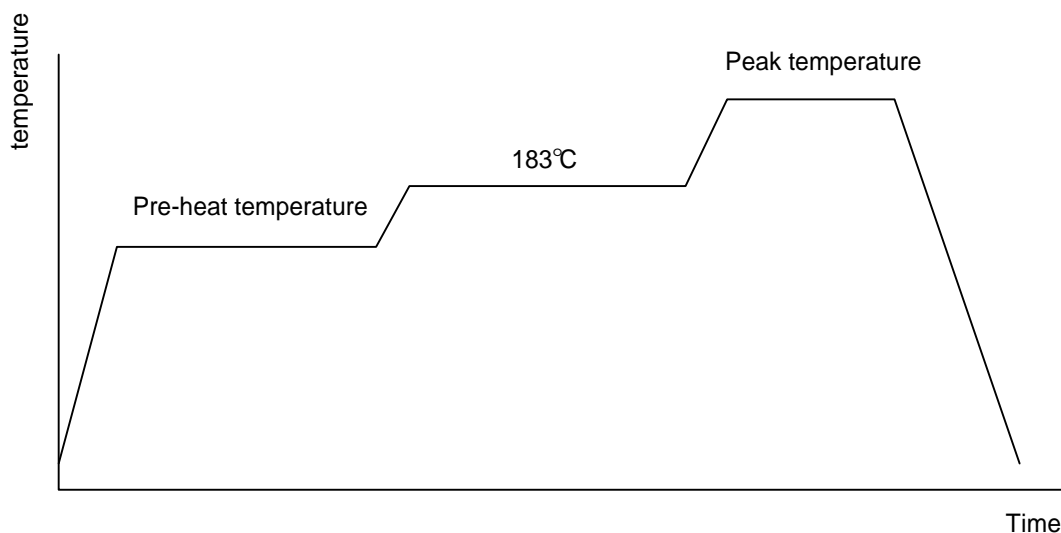
Dim	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	1.35	1.75	0.053	0.069
A1	0.10	0.25	0.004	0.010
D	4.80	5.00	0.189	0.197
E	3.80	4.00	0.150	0.157
H	5.80	6.20	0.228	0.244
L	0.40	1.27	0.016	0.050
e1	0.33	0.51	0.013	0.020
e2	1.27BSC		0.50BSC	
φ 1	8°		8°	

## 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)

Reference JEDEC Standard J-STD-020A APRIL 1999



## 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.	

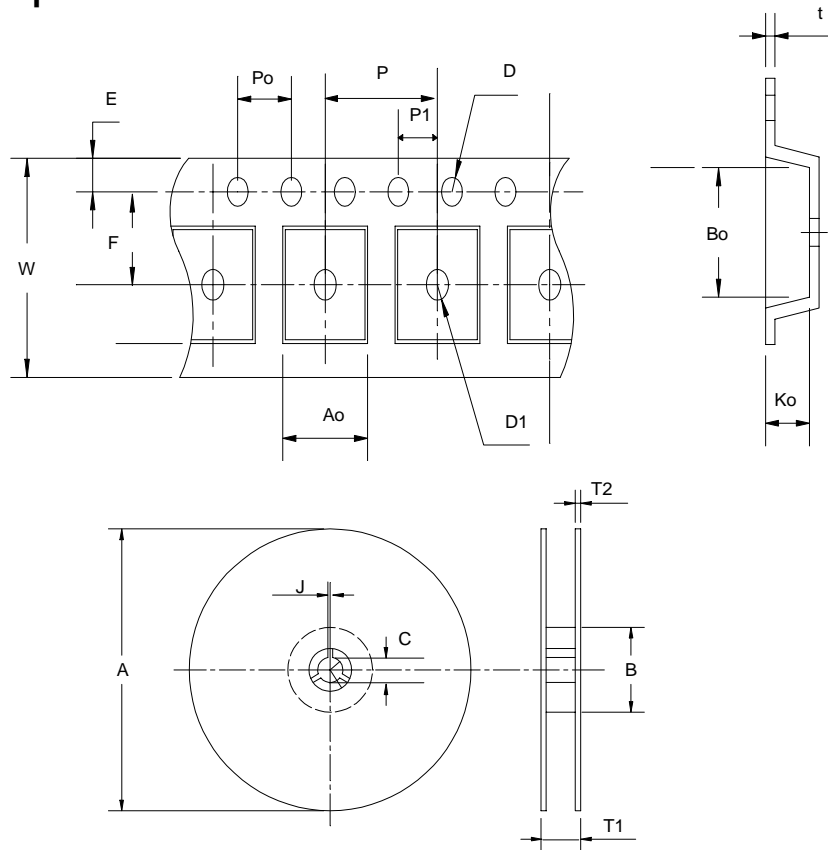
## Package Reflow Conditions

pkg. thickness ≥ 2.5mm and all bgas	pkg. thickness < 2.5mm and pkg. volume ≥ 350 mm <sup>3</sup>	pkg. thickness < 2.5mm and pkg. volume < 350mm <sup>3</sup>
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

## Carrier Tape



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



## Cover Tape Dimensions

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

## Customer Service

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