Quadruple Operational Comparator

LM324QD

Description

The LM324QD consists of four independent high gain, internally frequency compensated operational amplifiers which are designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage.

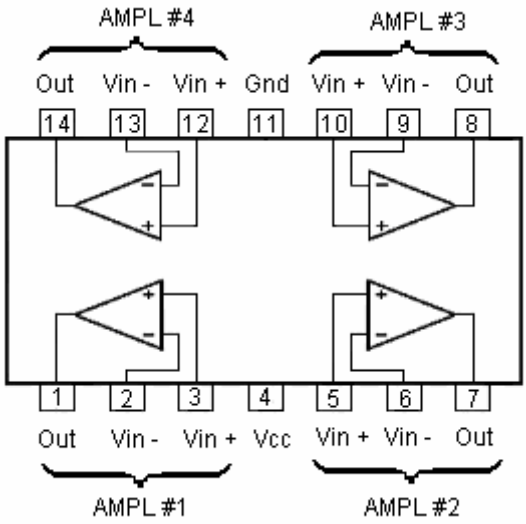
Features

- Wide range of supply voltages
- Low supply current drain independent of supply voltage
- Low input biasing current
- Low input offset voltage and offset current
- Differential input voltage range equal to the power supply voltage
- Input common-mode voltage range includes ground
- DC voltage gain 100V/mV typ
- Internally frequency compensation

Applications

- General purpose amplifier
- Transducer amplifier
- DC gain block

Pin Configurations



Absolute Maximum Rating(Ta=25℃)

Parameter	Symbol	Value	Unit
Power Supply Voltages Single Supply Split Supplies	 V_{CC} V_{CC}, V_{EE}	 32 ±16	V
Input Differential Voltage Range	V_{IDR}	±32	V
Input Common Mode Voltage Range	V_{ICR}	-0.3 ~ +32	V
Operating Temperature	Topr	0 ~ +70	℃
Storage Temperature	Tstg	-65 ~ +150	℃

Electrical Characteristics (V_{CC}=5V,Ta=25°C, V_{EE}=GND, unless otherwise specified.)

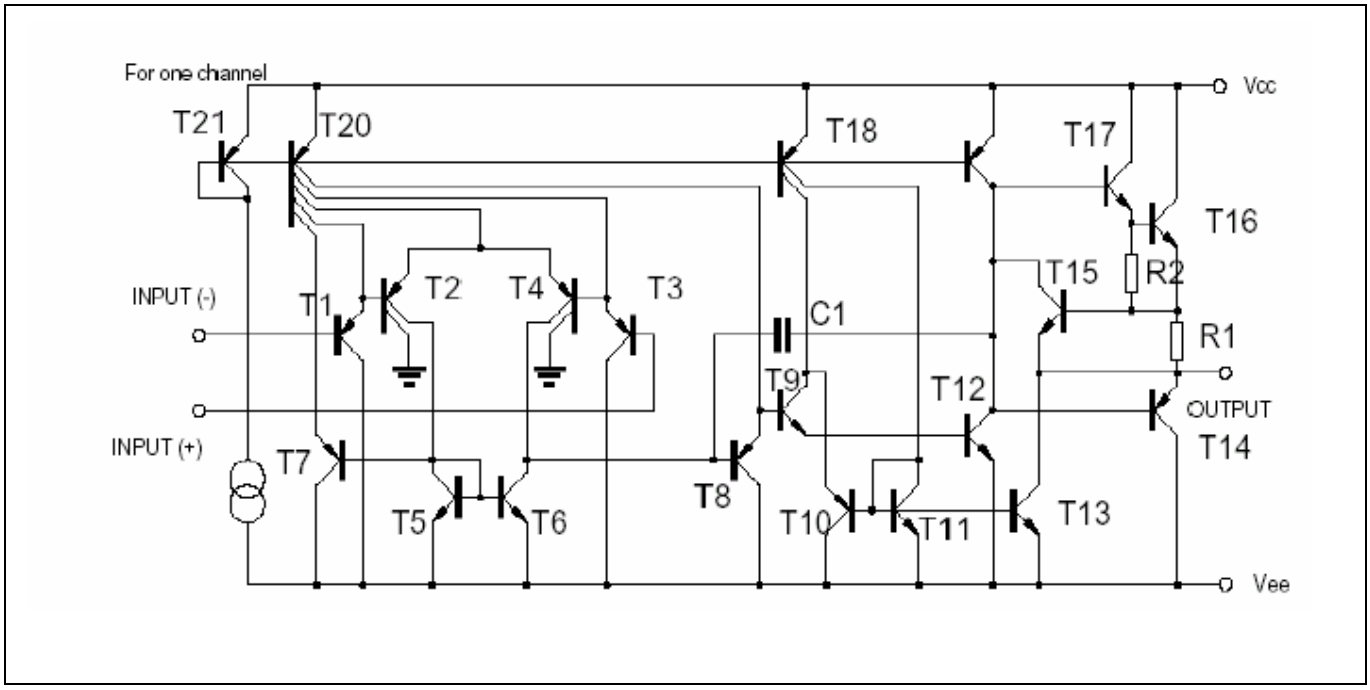
Parameter	Test Condition		Symbol	Min.	Typ.	Max.	Unit
Input Offset Voltage	V_{CC}=5 to 30V V_{IC}=V_{ICR} min, V_O=1.4V	25˚C 0~70˚C	V_{IO}	-	3 -	7 9	mV
Average temperature coefficient of input offset voltage		0~70˚C	αV_{IO}	-	7	-	μV/˚C
Input Offset Current	V_O=1.4V	25˚C 0~70˚C	I_{IO}	-	2 -	50 150	nA
Average temperature coefficient of input offset current		0~70˚C	αI_{IO}	-	10	-	pA/˚C
Input Bias Current	V_O=1.4V	25˚C 0~70˚C	I_{IB}	-	-20 -	-250 -500	nA
Input Common-Mode Voltage	V_{CC}=5V to 30V	25˚C 0~70˚C	V_{ICR}	0 to V_{CC}-1.5 0 to V_{CC}-2	- -		V

Power Supply Current (four amplifiers)	R_O=2.5V, no load	0~70°C	I_{CC}	-	1.5	2.4	mA
	V_{CC}=30V, V_O=0.5V_{CC}, no load	0~70°C		-	1.1	3	mA
Large Signal Differential Voltage Amplification	V_{CC}=15V, V_O(p)=1V to 11V, R_L≥2kΩ	25°C	A_{VD}	25	100	-	V/mV
		0~70°C		15	-	-	
High Level Output Voltage	R_L=2kΩ	25°C	V_{OH}	V_{CC}-1.5	-	-	V
	V_{CC}=30V, R_L=2kΩ	0~70°C		26	-	-	
	V_{CC}=30V, R_L=10kΩ	0~70°C		27	28	-	
Low Level Output Voltage	R_L=10kΩ	0~70°C	V_{OL}	-	5	20	mV
Common Mode Rejection Ratio	V_{CC}=5V to 30V V_{IC}=V_{ICR} min	25°C	CMRR	65	80	-	dB
Power Supply Rejection Ratio	V_{CC}=5V to 30V	25°C	PSRR	65	100	-	dB
Channel Crosstalk Attenuation	f=1kHz to 20kHz	25°C	CS	-	120	-	dB
Short Circuit Output Current	V_{CC} at 5V, GND at -5V, V_O=0V	25°C	I_{SC}	-	±40	±60	mA
Output Current	V_{CC}=15V, V_{ID}=1V, V_O=0V	25°C	I_O	-20	-30	-	mA
		0~70°C		-10	-	-	
	V_{CC}=15V, V_{ID}=-1V, V_O=15V	25°C		10	20	-	mA
		0~70°C		5	-	-	
	V_{ID}=-1V, V_O=0.2V	25°C		12	30	-	μA

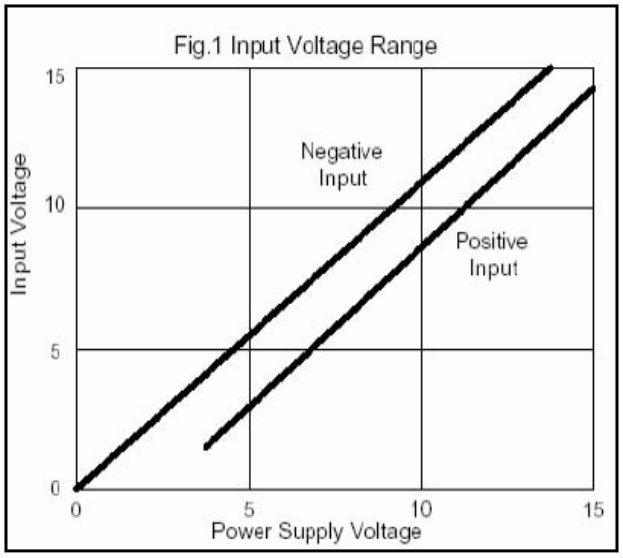
Ordering Information

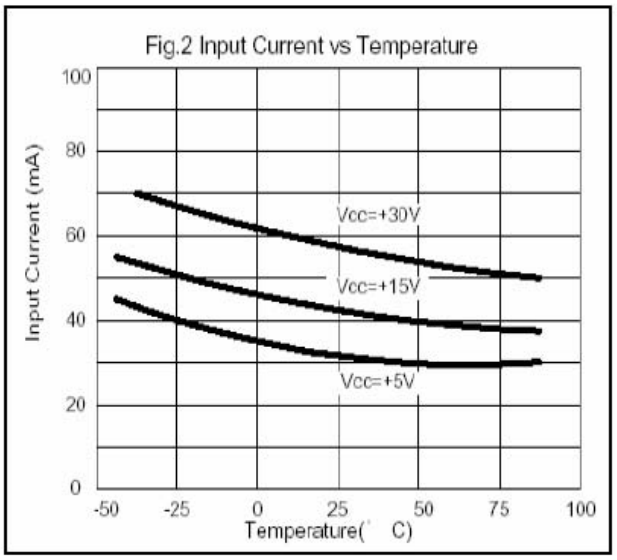
Device	Package	Shipping
LM324QD-0-T3-G	SOP-14 (Pb-free lead plating and halogen-free package)	2500 pcs/ Tape & Reel

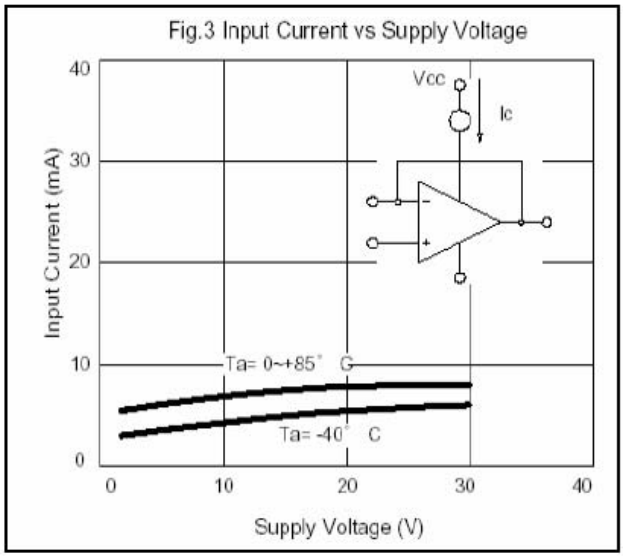
Block Diagram, each channel

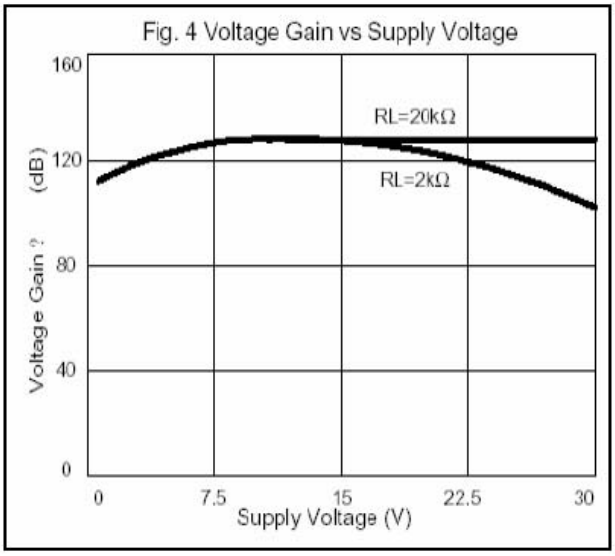


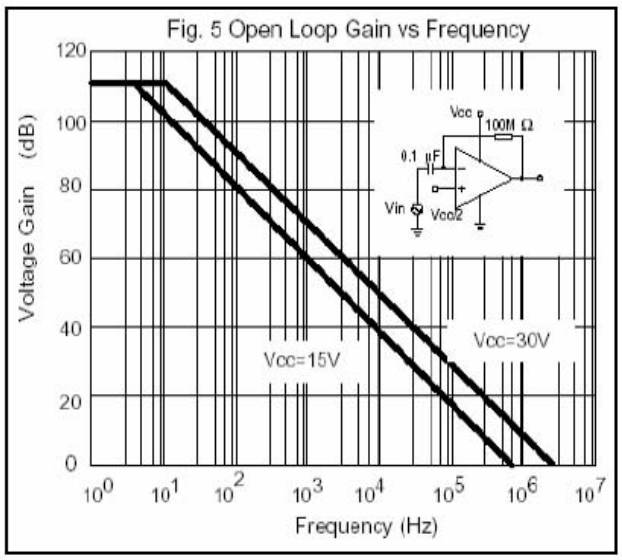
Characteristic Curves, each channel

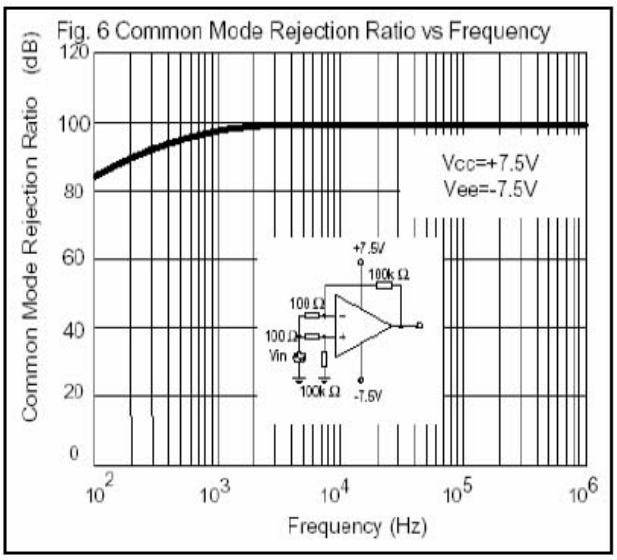












Characteristic Curves, each channel(Cont.)

Fig. 7 Voltage Follower Pulse Response

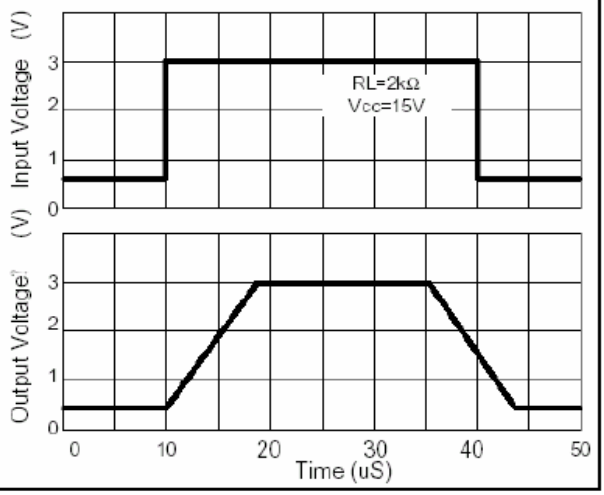


Fig. 8 Voltage Follower Response (Small Signal)

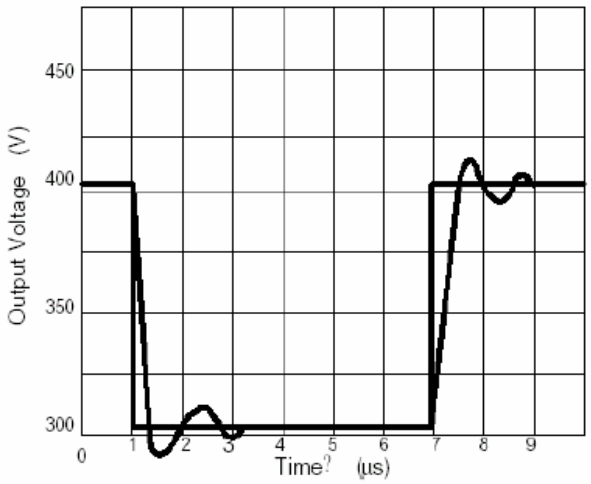


Fig. 9 Gain vs Large Signal Frequency

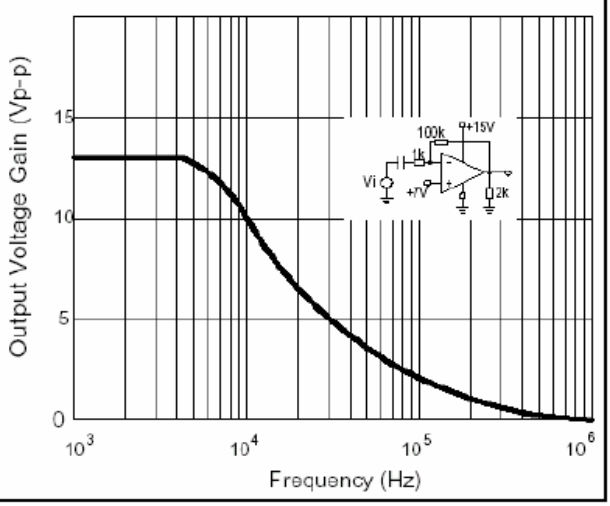


Fig. 10 Output Current Sinking vs Output Voltage

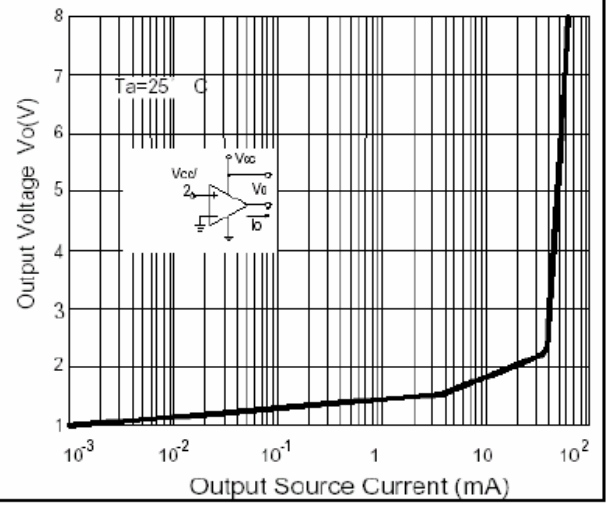


Fig. 11 Output Sink Current vs Output Voltage

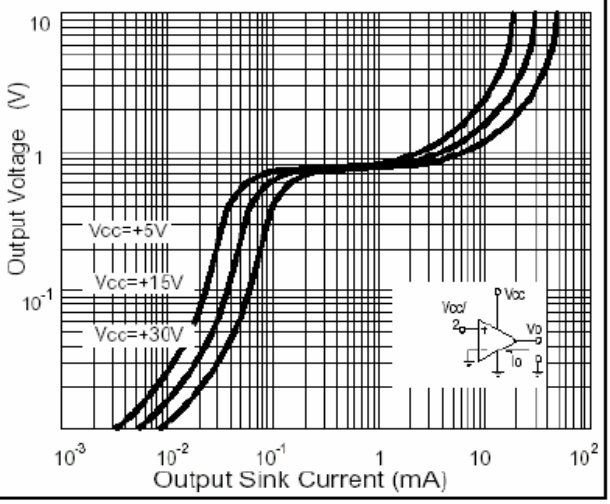
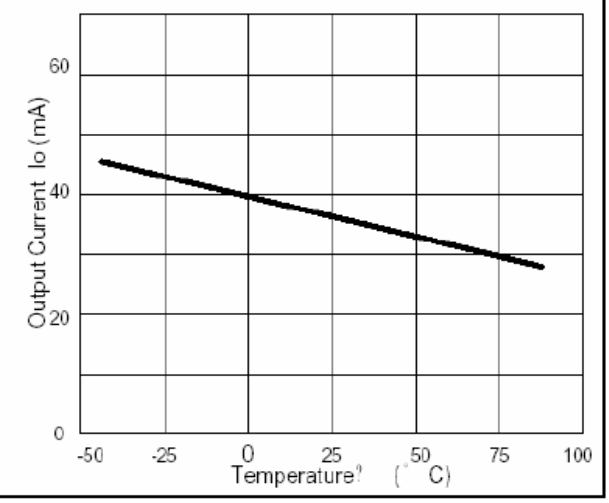
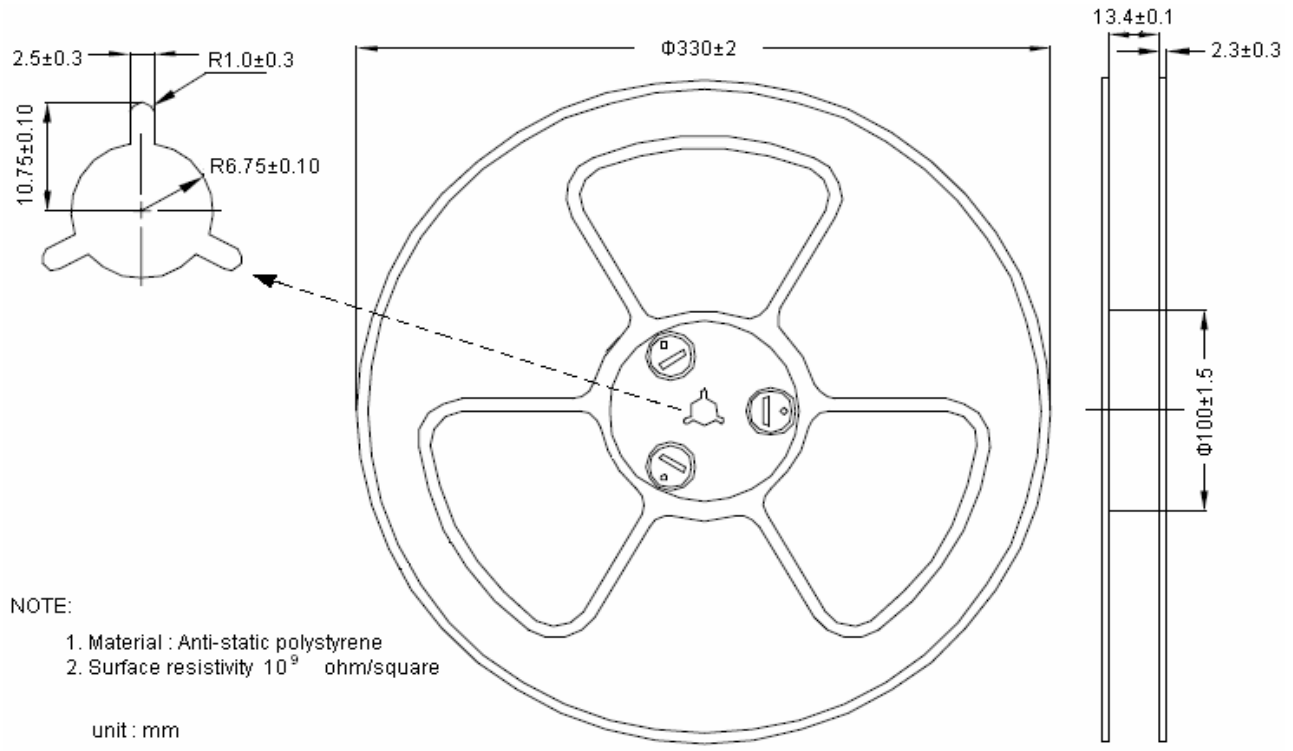


Fig.12 Current Limiting vs Temperature



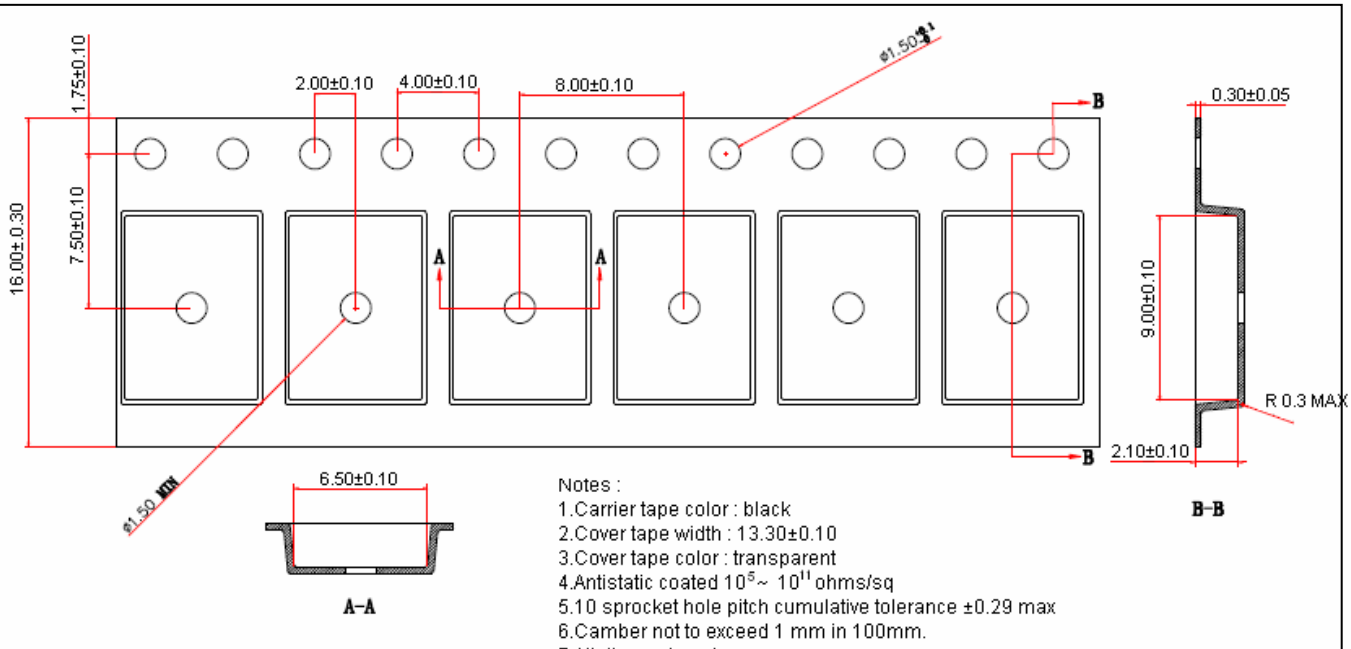
Reel Dimension



NOTE:
1. Material : Anti-static polystyrene
2. Surface resistivity 10^{9} ohm/square

unit : mm

Carrier Tape Dimension

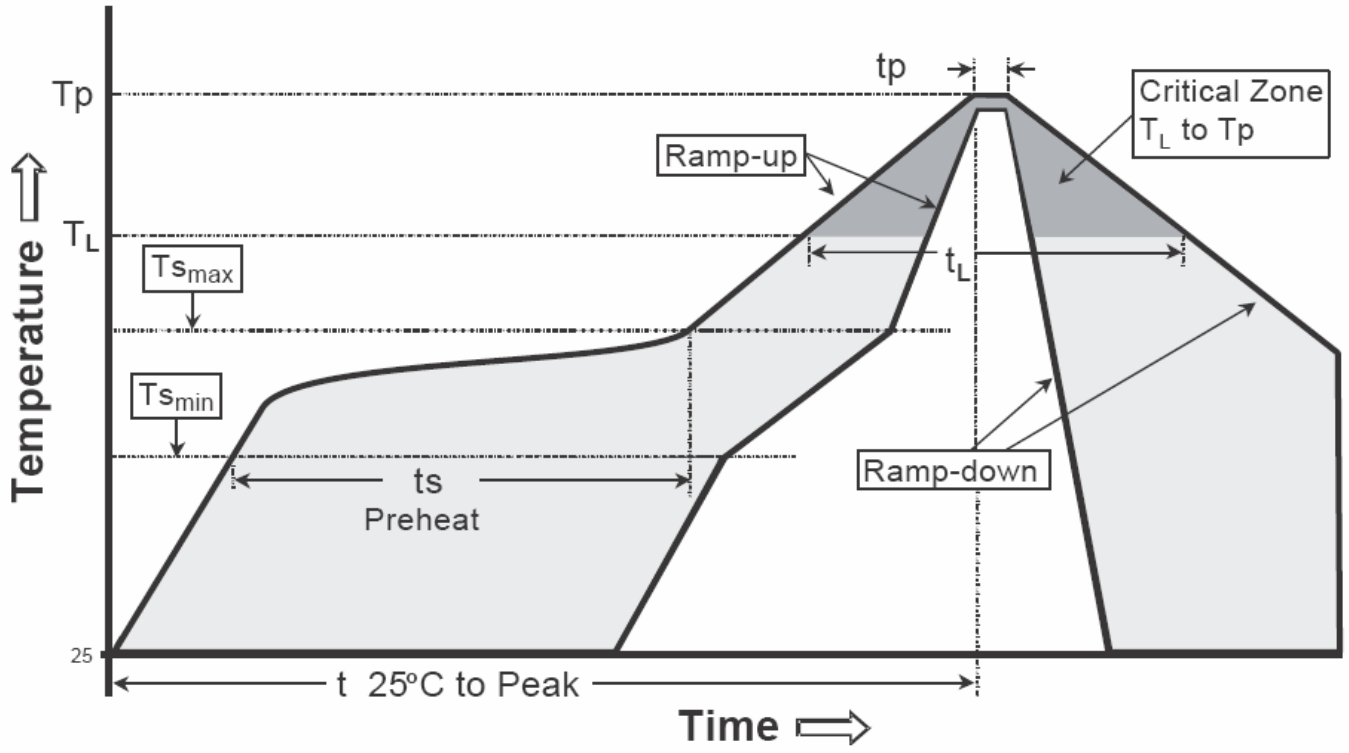


Notes :
1.Carrier tape color : black
2.Cover tape width : 13.30±0.10
3.Cover tape color : transparent
4.Antistatic coated 10^{5}~ 10^{11} ohms/sq
5.10 sprocket hole pitch cumulative tolerance ±0.29 max
6.Camber not to exceed 1 mm in 100mm.
7.All dimensions in mm.

Recommended wave soldering condition

Product	Peak Temperature	Soldering Time
Pb-free devices	260 +0/-5 °C	5 +1/-1 seconds

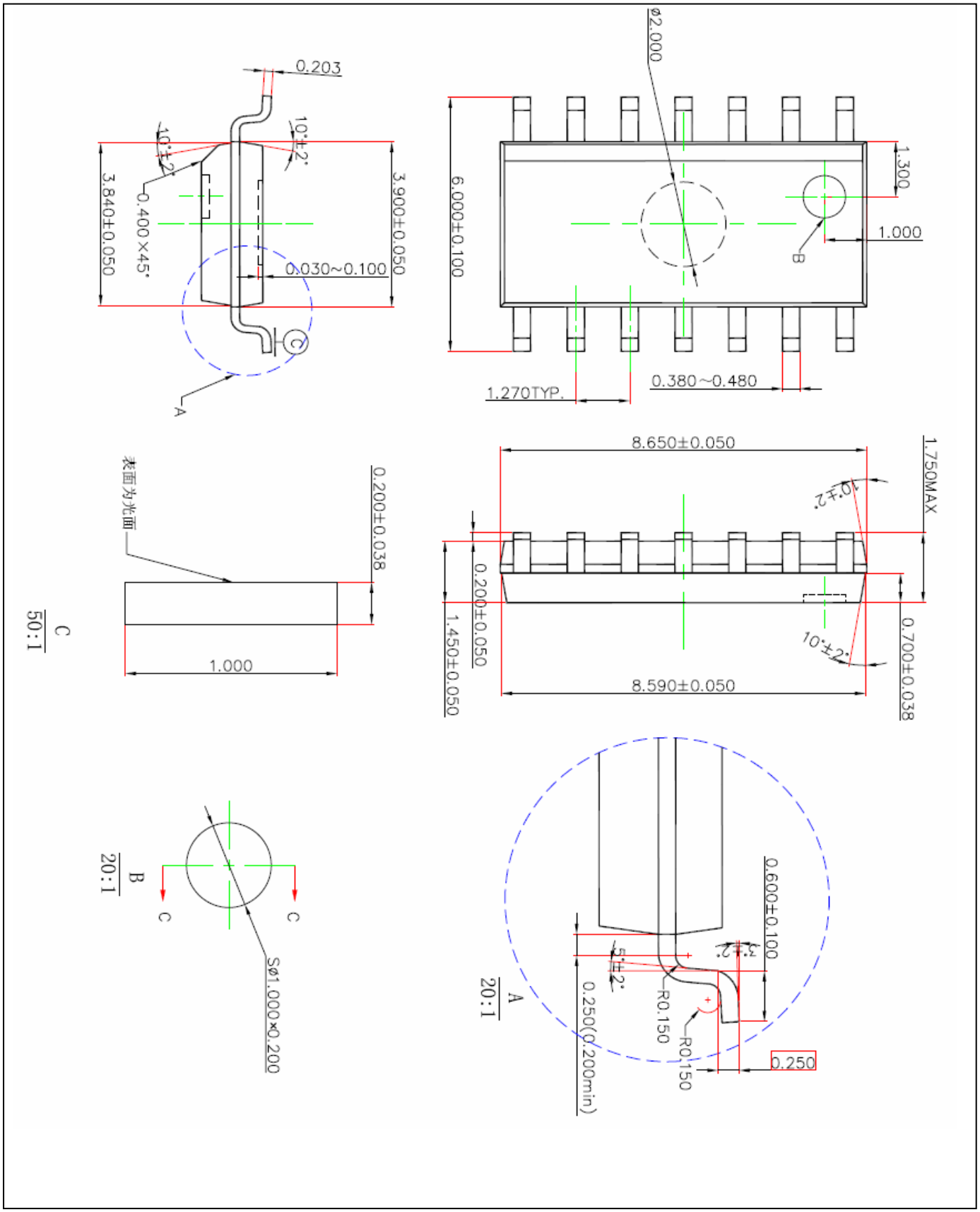
Recommended temperature profile for IR reflow



Profile feature	Sn-Pb eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Tsmax to Tp)	3°C/second max.	3°C/second max.
Preheat −Temperature Min(T_S min) −Temperature Max(T_S max) −Time($t_{s\ min}$ to $t_{s\ max}$)	 100°C 150°C 60-120 seconds	 150°C 200°C 60-180 seconds
Time maintained above: −Temperature (T_L) − Time (t_L)	 183°C 60-150 seconds	 217°C 60-150 seconds
Peak Temperature(T_P)	240 +0/-5 °C	260 +0/-5 °C
Time within 5°C of actual peak temperature(tp)	10-30 seconds	20-40 seconds
Ramp down rate	6°C/second max.	6°C/second max.
Time 25 °C to peak temperature	6 minutes max.	8 minutes max.

Note : All temperatures refer to topside of the package, measured on the package body surface.

SOP-14 Dimension

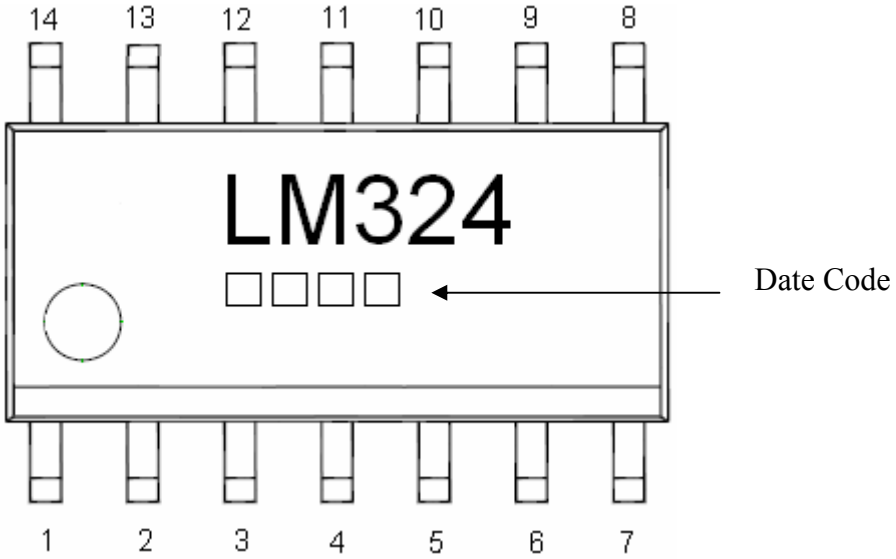


Notes: 1.Controlling dimension: millimeters.
2.Maximum lead thickness includes lead finish thickness, and minimum lead thickness is the minimum thickness of base material.
3.If there is any question with packing specification or packing method, please contact your local CYStek sales office.

Material:

- Lead: Pure tin plated.
- Mold Compound: Epoxy resin family, flammability solid burning class: UL94V-0.

Marking



14-Lead SOP-14 Plastic Package
CYStek Package Code: QD