



LMV721

10MHz Rail-to-Rail I/O CMOS Operational Amplifier

Description

The LMV721 is a family of single operational amplifiers, which are optimized for low voltage, low noise and rail-to-rail input and output, as well as excellent speed/power consumption ratio, providing an excellent bandwidth(10MHz) and slew rate (8.5V/us). The operational amplifiers are unity gain stable and feature an ultra-low input bias current.

The LMV721 has lower offset voltage, which is guaranteed not upper than 0.5mV at 25°C with $V_s = 5V$, $V_{CM} = V_s/2$.

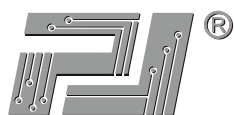
The LMV721 families of operational amplifiers under single supplies of 2.1V to 5.5V or dual power supplies of $\pm 1.05V$ to $\pm 2.75V$. The devices are ideal for sensor interfaces, active filters and portable applications.

Features

- High Gain Bandwidth: 10MHz
- Excellent Slew Rate: 8.5V/us
- Rail-to-Rail Input and Output
- Lower Offset Voltage: $\pm 0.5mV$ Max
- Input Voltage Range: -0.2V to +5.7V with $V_s = 5.5V$
- Supply Range: +2.1V to +5.5V
- Operating Range: -40°C ~ 125°C

Applications

- Sensors
- Active Filters
- A/D Converters
- Communications
- Cellular and Cordless Phones
- Laptops and PDAs
- Photodiode Amplification
- Battery-Powered Instrumentation



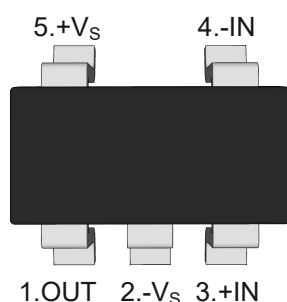
LMV721

10MHz Rail-to-Rail I/O

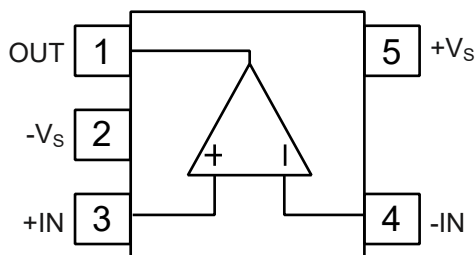
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Pin Distribution

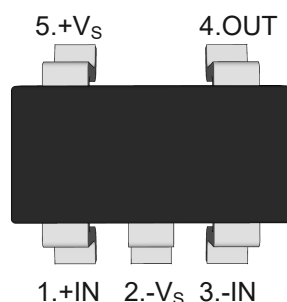
SOT-23-5



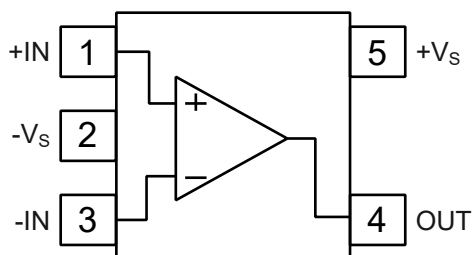
LMV721SE



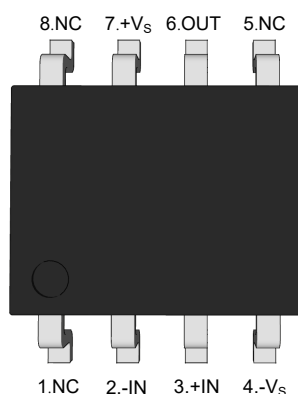
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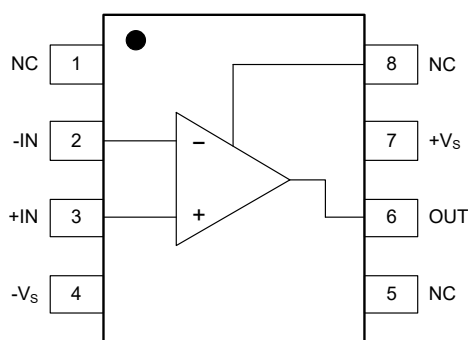
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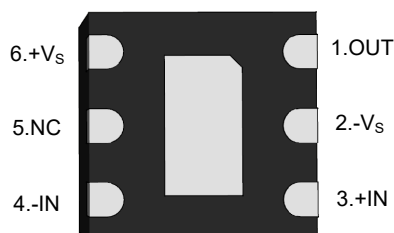
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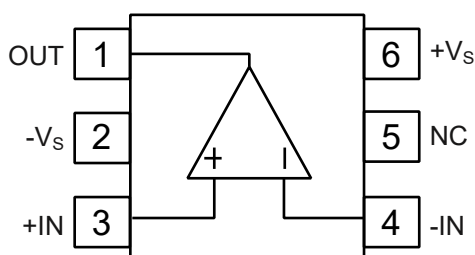
LMV721PA



DFN2x2C-6L



LMV721DFC



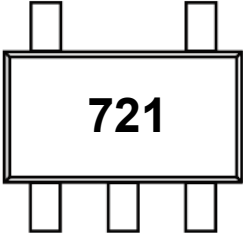
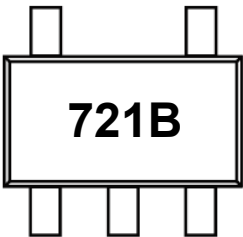
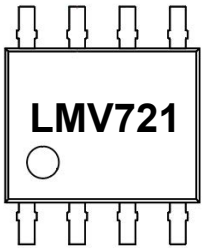
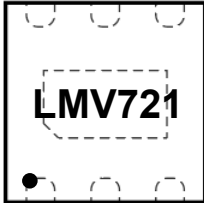


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10MHz Rail-to-Rail I/O

CMOS Operational Amplifier

Ordering Information

Orderable Device	Package	Reel (inch)	Package Qty (PCS)	Eco Plan ^{Note}	MSL Level	Marking Code
LMV721SE	SOT-23-5	7	3000	RoHS & Green	MSL3	
LMV721BSE	SOT-23-5	7	3000	RoHS & Green	MSL3	
LMV721PA	SOP-8	13	4000	RoHS & Green	MSL3	
LMV721DFC	DFN2x2C-6L	7	3000	RoHS & Green	MSL1	

Note:

RoHS: PJ defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials.

Green: PJ defines "Green" to mean Halogen-Free and Antimony-Free.



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Absolute Maximum Ratings ($T_A=25^{\circ}\text{C}$) ^{Note1}

Parameter	Symbol	Value	Units
Supply Voltage	V_{CC}	7	V
Signal Input Voltage ^{Note2}	V_I	$(-V_S)-0.5\sim(+V_S)+0.5$	V
Signal Output Voltage ^{Note3}	V_O	$(-V_S)-0.5\sim(+V_S)+0.5$	V
Signal Input Current	I_I	$-10\sim+10$	mA
Signal Output Current	I_O	$-150\sim+150$	mA
Junction Temperature	T_J	150	$^{\circ}\text{C}$
Operating Temperature Range	T_{OPR}	$-40\sim+125$	$^{\circ}\text{C}$
Lead Temperature (Soldering, 10 sec)	T_L	260	$^{\circ}\text{C}$
Storage Temperature Range	T_{STG}	$-65\sim150$	$^{\circ}\text{C}$

Note1: Exceeding the above limits may damage to the chip. The reliability of the device will also be affected if the device works under the limit conditions. Electrostatic discharge can also cause damage to chips, so it is suggested to take some preventive measures for integrated circuits. Failure to follow proper handling and installation can also cause damage. Precision LMV721 and other devices are more vulnerable to damage than ordinary devices in the case of tiny electrostatic, and small parameter changes may make the whole circuit performance substandard.

Note2: Input terminals are diode-clamped to the power-supply rails. Input signals that can swing more than 0.5V beyond the supply rails should be current-limited to 10mA or less.

Note3: Output terminals are diode-clamped to the power-supply rails. Output signals that can swing more than 0.5V beyond the supply rails should be current-limited to $\pm 150\text{mA}$ or less.

ESD Ratings

Parameter		Value	Unit
Electrostatic discharge	HBM	± 4000	V

Recommended Operating Conditions

Parameter		Value	Unit
Supply Voltage $V_S=(V_+)-(V_-)$	Signal-supply	2.1~5.5	V
	Dual-supply	1.05~2.75	V
Operating Ambient Temperature		$-40 \sim +125$	$^{\circ}\text{C}$



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Electrical Characteristics

At $V_S=5V$, $R_L = 10k\Omega$ connected to $V_S/2$, and $V_{OUT} = V_S/2$, $T_A=25^\circ C$, unless otherwise noted.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Units
Operating voltage range	V_S		2.1	--	5.5	V
Quiescent Current	I_Q		--	0.4	--	mA
Power Supply Rejection	PSRR	$V_{CM} = (-V_S)+0.5 V$, $V_S=2.5V\sim 5.5V$	75	--	--	dB
Turn-on Time	t_{ON}		--	12	--	μs
Input Offset Voltage	V_{OS}	$V_{CM} = V_S/2$	-0.5	± 0.2	+0.5	mV
Input Offset Voltage Average Drift	TC V_{OS}	$T_A=-40^\circ C\sim 125^\circ C$	--	± 2.6	--	$\mu V/^\circ C$
Input bias current	I_B		-10	± 1	10	pA
Input offset current	I_{OS}		-10	± 1	10	pA
Common-mode input voltage range	V_{CM}	$V_S=5.5V$	-0.2	--	2.7	V
Open-loop Gain	AOL	$V_O=0.15V\sim 4.85 V$, $R_L=2 k\Omega$	86	--	--	dB
		$V_O=0.05V\sim 4.95V$, $R_L=10 k\Omega$	96	--	--	
Common Mode Rejection	CMRR	$V_{CM}=-0.2V\sim 4 V$, $V_S=5.5V$	70	--	--	dB
		$V_{CM}=-0.2V\sim 5.7 V$, $V_S=5.5V$	65	--	--	
Output voltage swing	V_O	$R_L=10K\Omega$	--	10	--	mV
		$R_L=2K\Omega$	--	50	--	mV
Output Current	I_O		--	140	--	mA
Slew Rate	SR		--	8.5	--	V/ μs
Gain Bandwidth Product	GBP		--	10	--	MHz
Phase Margin	PM		--	62	--	$^\circ$
Setting Time,0.1%	t_s		--	0.5	--	μs
Overload Recovery Time		$V_{IN}\cdot Gain \geq V_S$	--	3.2	--	μs
Equivalent Input Noise Voltage	eN	$f=1KHz$	--	9.5	--	$nV/\sqrt{Hz}$
		$f=10KHz$	--	6.5	--	



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Typical Electrical Curves

($T_A = +25^{\circ}\text{C}$, $V_S = +5\text{V}$, and $R_L = 10\text{k}\Omega$ connected to $V_S/2$, $V_{OUT}=V_S/2$, unless otherwise noted.)

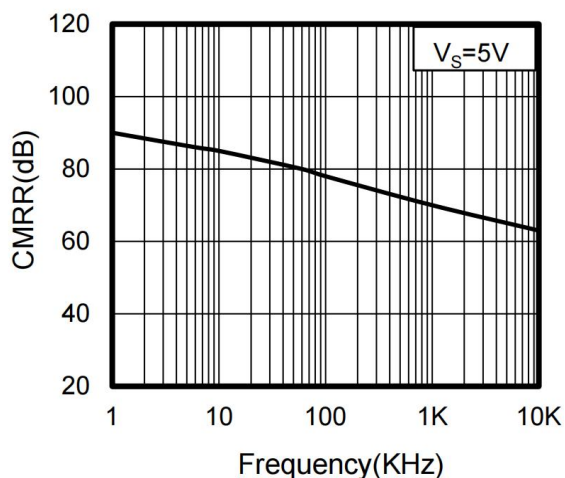


Figure 1. Common-Mode Rejection Ratio vs Frequency

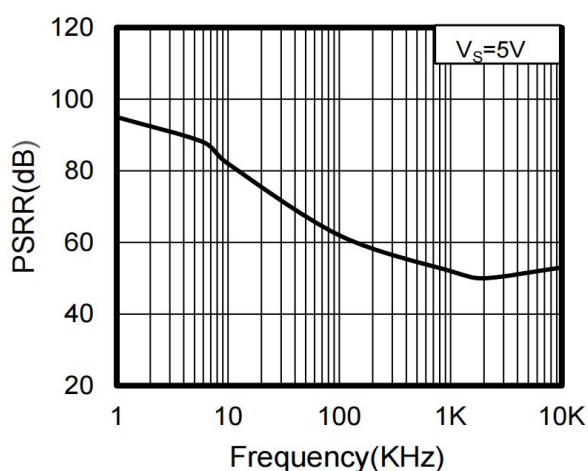


Figure 2. Power-Supply Rejection Ratio vs Frequency

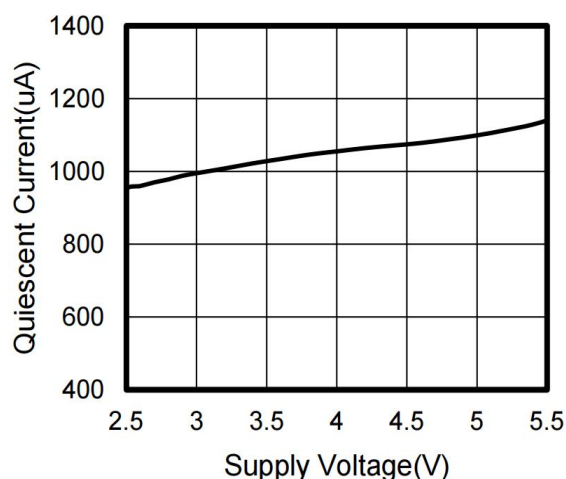


Figure 3. Quiescent Current vs Supply Voltage

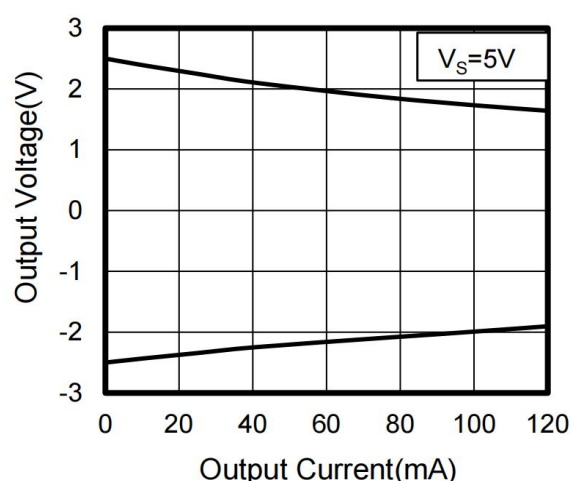


Figure 4. Output Voltage vs Output Current

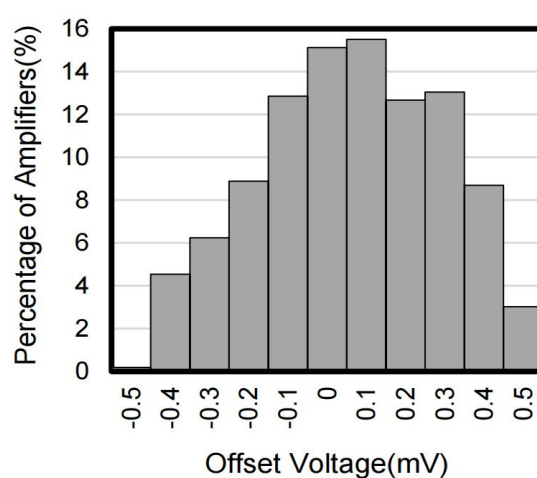
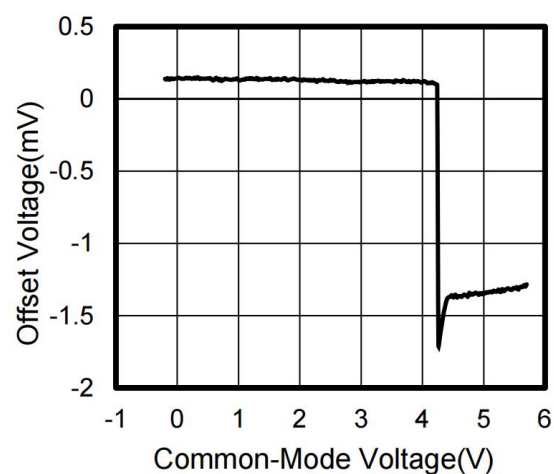
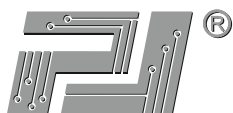


Figure 5. Offset Voltage vs Common-Mode Voltage Figure 6. Offset Voltage Production Distribution



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Layout

Layout Guideline

Attention to good layout practices is always recommended. Keep traces short. When possible, use a PCB ground plane with surface-mount components placed as close to the device pins as possible. Place a 0.1uF capacitor closely across the supply pins.

These guidelines should be applied throughout the analog circuit to improve performance and provide benefits such as reducing the EMI susceptibility.

Layout Example

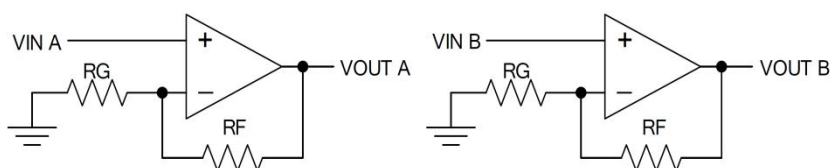


Figure 7. Schematic Representation

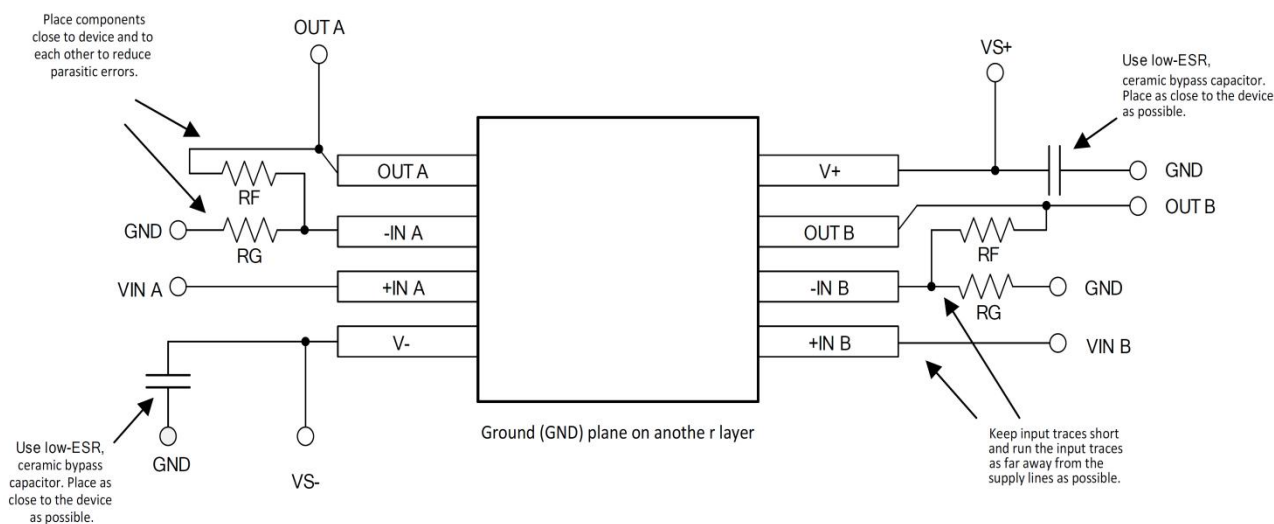
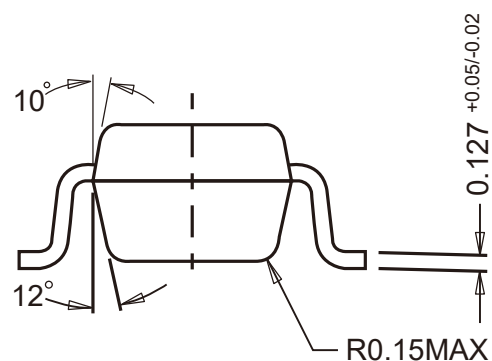
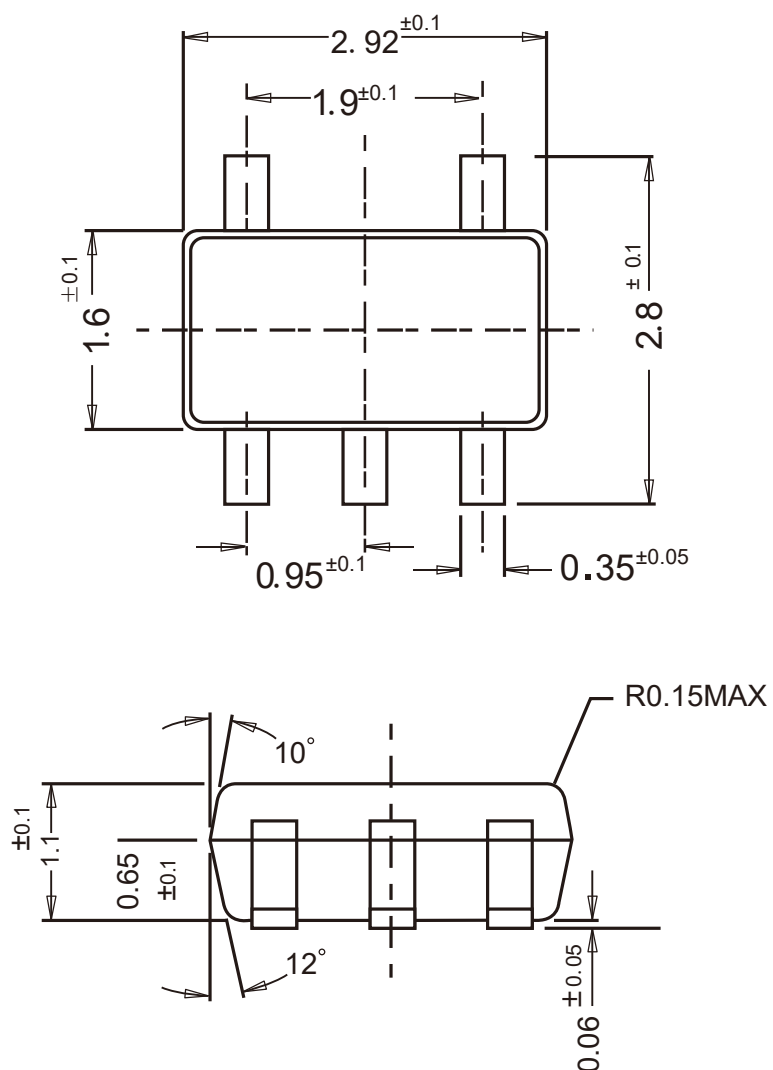


Figure 8. Layout Example

SOT-23-5

Dimensions in mm





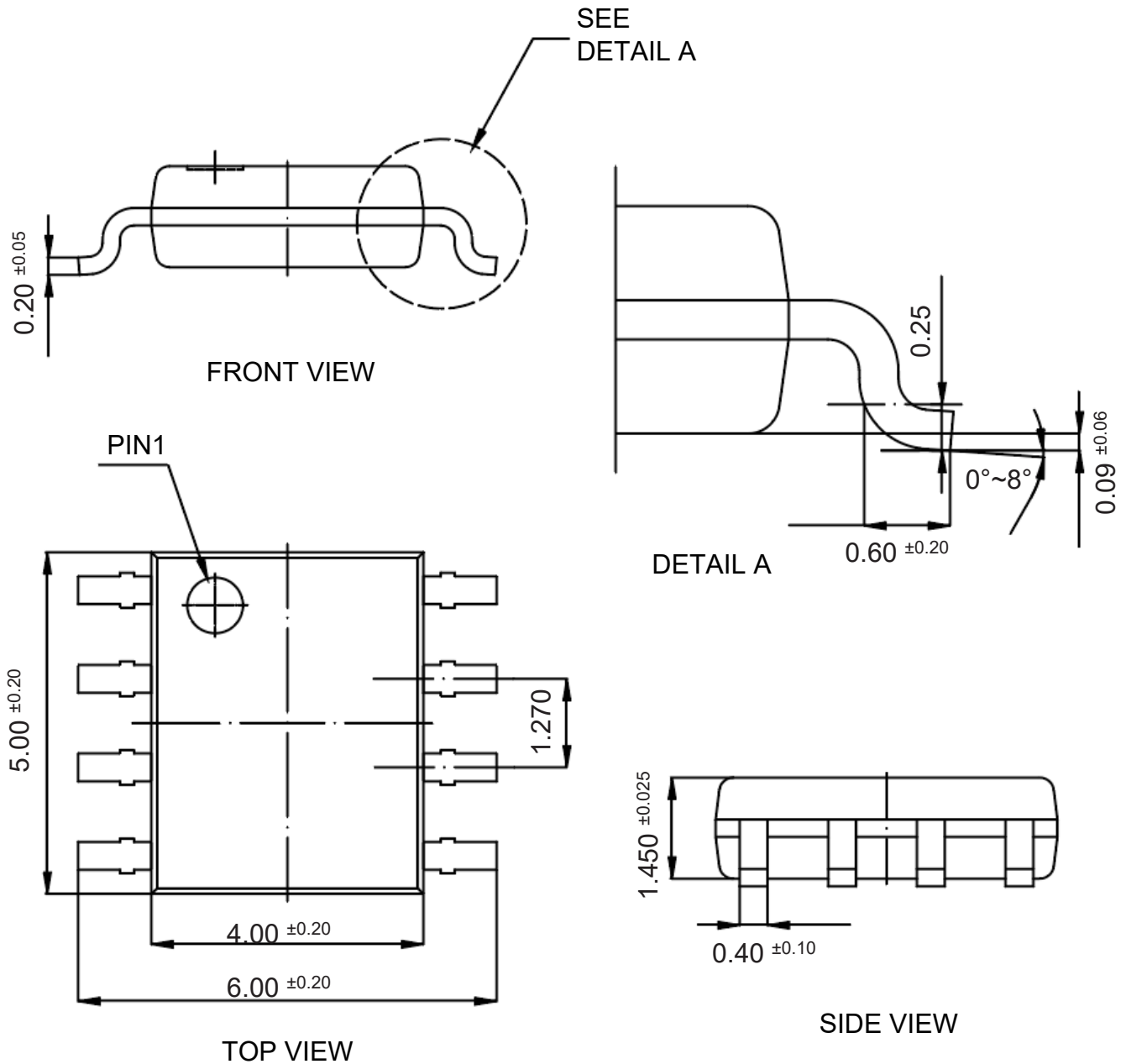
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Package Outline

SOP-8

Dimensions in mm





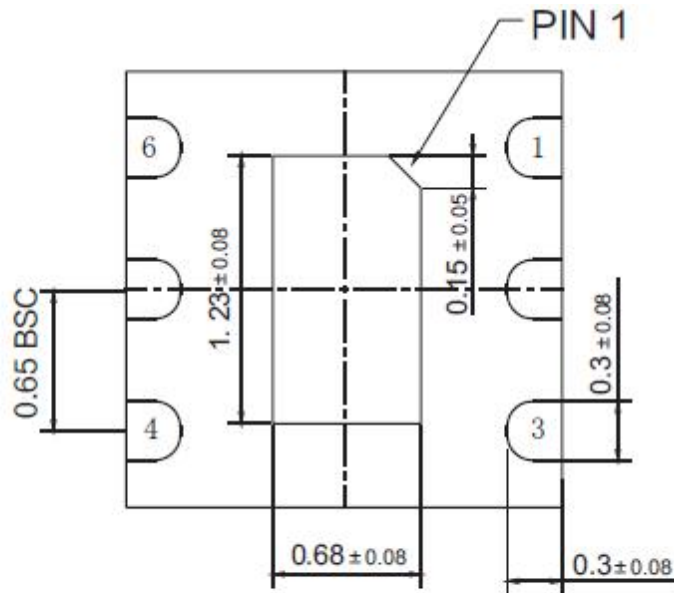
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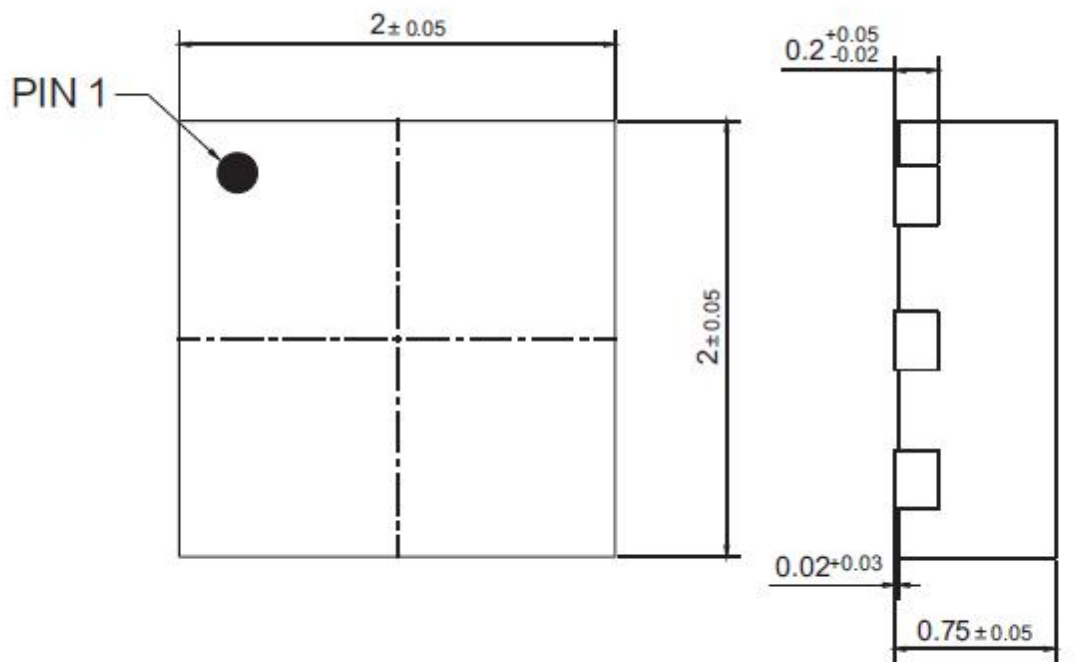
Package Outline

DFN2x2-6L-0006

Dimensions in mm

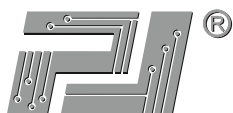


BOTTOM VIEW



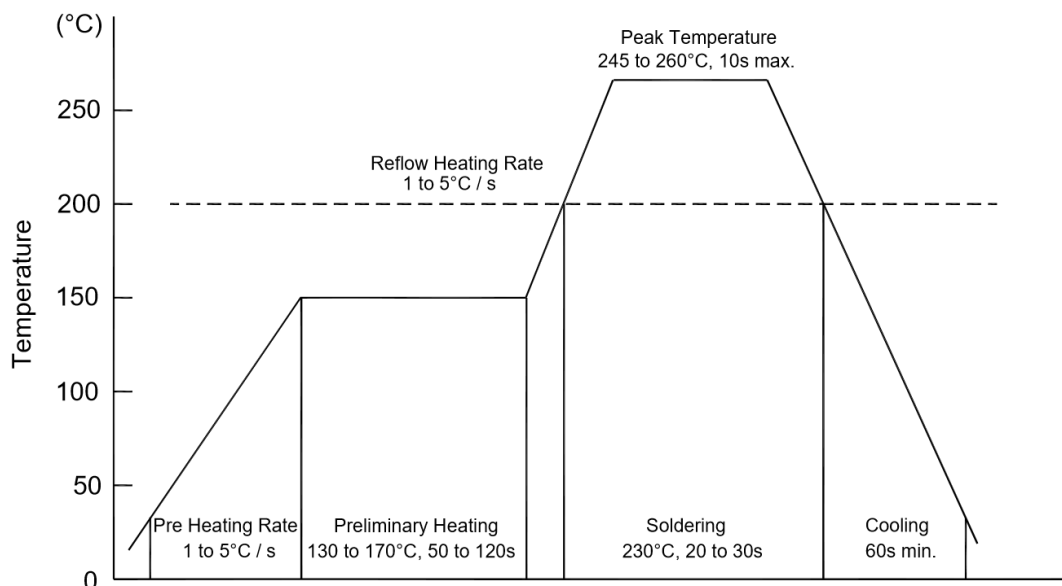
TOP VIEW

SIDE VIEW



Conditions of Soldering and Storage

◆ Recommended condition of reflow soldering



Recommended peak temperature is over 245°C. If peak temperature is below 245°C, you may adjust the following parameters:

- Time length of peak temperature (longer)
- Time length of soldering (longer)
- Thickness of solder paste (thicker)

◆ Conditions of hand soldering

- Temperature: 300°C
- Time: 3s max.
- Times: one time

◆ Storage conditions

- **Temperature**
5 to 40°C
- **Humidity**
30 to 80% RH
- **Recommended period**
One year after manufacturing



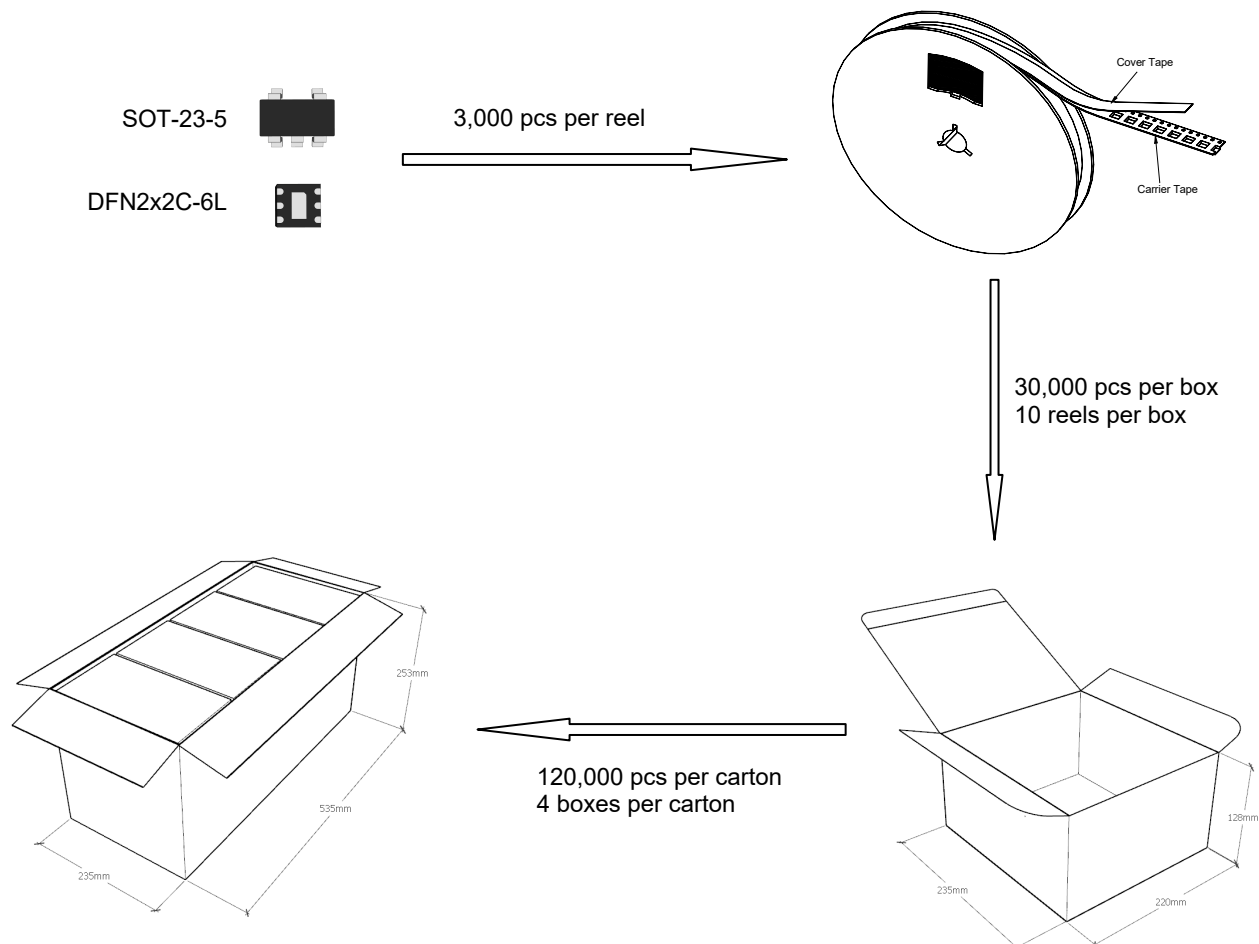
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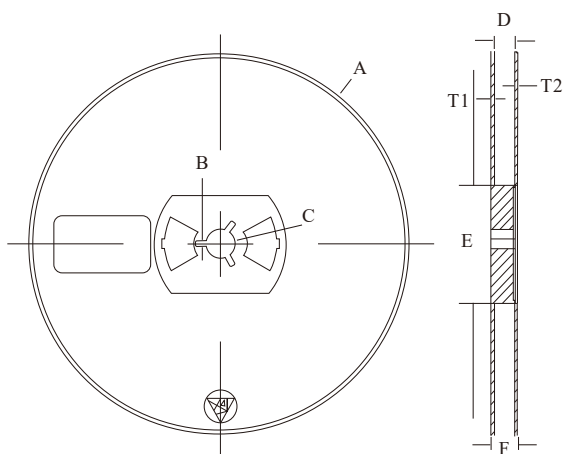
CMOS Operational Amplifier

Package Specifications

- The method of packaging



◆ Reel data



Reel (7")

Symbol	Value (unit: mm)
A	$\varnothing 177.8 \pm 1$
B	2.7 ± 0.2
C	$\varnothing 13.5 \pm 0.2$
E	$\varnothing 54.5 \pm 0.2$
F	12.3 ± 0.3
D	$9.6 +2/-0.3$
T1	1.0 ± 0.2
T2	1.2 ± 0.2

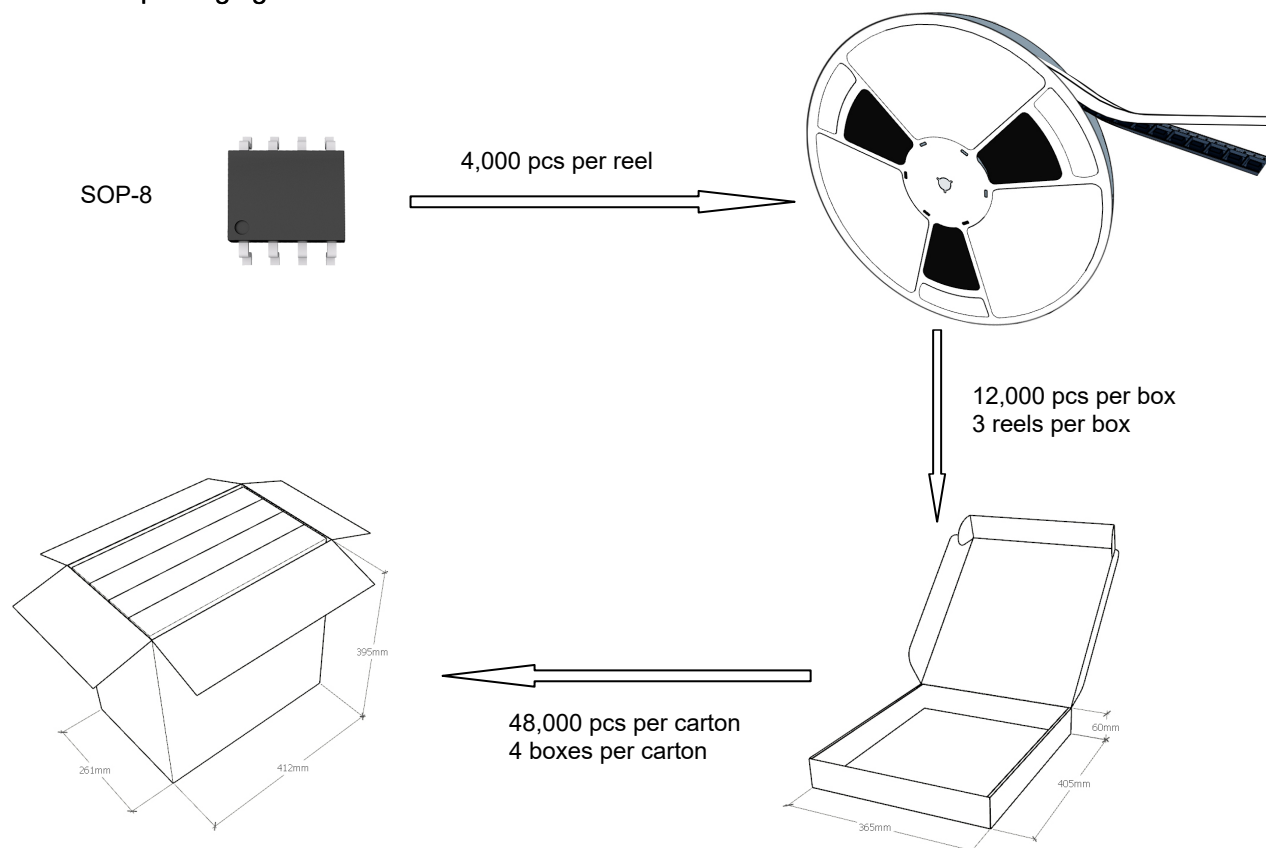


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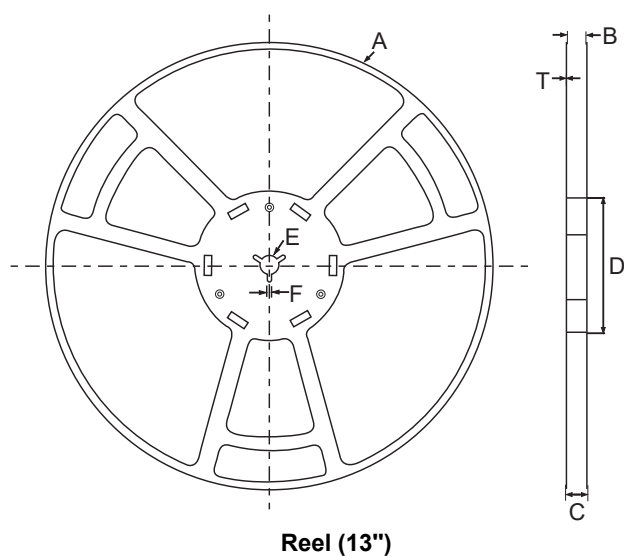
10MHz Rail-to-Rail I/O CMOS Operational Amplifier

Package Specifications

- The method of packaging



◆ Reel data



symbol	Value(unit:mm)
A	$\Phi 330 \pm 1$
B	12.7 ± 0.5
C	16.5 ± 0.3
D	$\Phi 99.5 \pm 0.5$
E	$\Phi 13.6 \pm 0.3$
F	2.8 ± 0.3
T1	1.9 ± 0.2

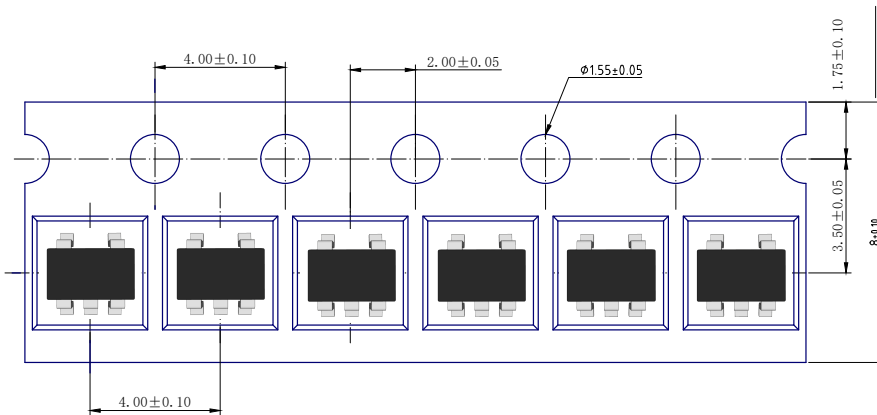


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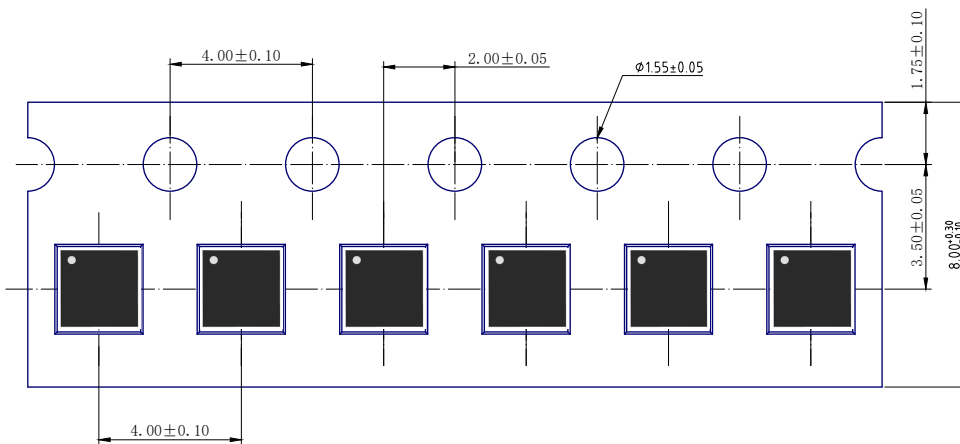
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◆ Embossed tape data

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DFN2x2C-6L



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