UMW TP321/358

General Purpose, 1MHz, Micro-Power CMOS Op-Amps

1.Description

UMW TP321/358 are general purpose single, dual and quad CMOS op-amps with low offset, high frequency response, low power, low supply voltage, and rail-to-rail inputs and outputs.

The UMW TP321/358 are unity gain stable with a constant 1MHz gain-bandwidth product, 1V/μs slew rate while consuming only 45μA of supply current per amplifier. The rail-to-rail input and output characteristics allow the full power-supply voltage to be used for signal range.

This combination of features makes the UMW TP321/358 superior and cost-effective among RRIO CMOS opamps. The TP321/358 are ideal choices for battery-powered applications because they minimize errors due to power supply voltage variations over the lifetime of the battery and maintain high CMRR even for a rail-to-rail input op-amp.

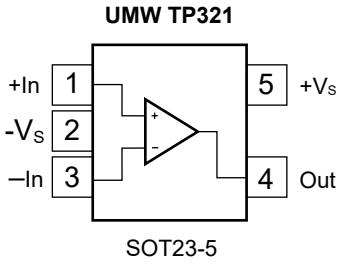
2.Features

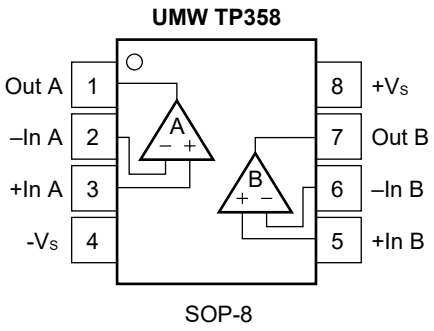
- General Purpose, Low Cost
- Gain Bandwidth Product: 1MHz
- Low Quiescent Current: 45μA/Amplifier
- Offset Voltage: 5.0mV Maximum
- Offset Voltage Temperature Drift: 2uV/°C
- Input Bias Current: 10pA
- CMRR/PSRR: 90dB
- Unity Gain Stable
- Rail-to-Rail Input and Output
- No Phase Reversal for Overdriven Inputs
- Supply Voltage Ran ge: 2.1V to 6.0V
- Operati on Range: -40° C to 125° C
- ESD Rating :
- 8kV - HBM, 2kV - CDM and 500V - MM
- Popular Type Package

3.Applications

- Audio Output
- Battery and Power Supply Control
- Smoke/Gas/Environment Sensors
- Medical Equipment
- Portable Instruments and Mobile Device
- Active Filters
- Piezo Electrical Transducer Amplifier
- Sensor Interface
- ASIC Input or Output Amplifier

4.Pinning information





5.Absolute Maximum Ratings (1)

Parameter	Value
Supply Voltage, V+ to V-	6.6V
Input Voltage	V^- – 0.1 to V^+ + 0.1
Input Current: +IN, –IN, SHDN (2)	±10mA
Output Current: OUT	±40mA
Output Short-Circuit Duration (3)	Indefinite
Operating Temperature Range	-40°C to 125°C
Maximum Junction Temperature	150°C
Storage Temperature Range	-65°C to 150°C
Lead Temperature (Soldering, 10 sec)	260°C

Note:

(1): Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.

(2): The inputs are protected by ESD protection diodes to each power supply. If the input extends more than 300mV beyond the power supply, the input current should be limited to less than 10mA.

(3): A heat sink may be required to keep the junction temperature below the absolute maximum. This depends on the power supply voltage and how many amplifiers are shorted. Thermal resistance varies with the amount of PC board metal connected to the package. The specified values are for short traces connected to the leads.

6.Electrical Characteristics

The denotes the specifications which apply over the full operating temperature range, otherwise specifications are at T_A=27°C. V_{SUPPLY}=5V, V_{CM}=V_{OUT}=V_{SUPPLY}/2, R_L=100KΩ, C_L=100pF.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input Offset Voltage	V_{OS}	V_{CM}=V_{SUPPLY}/2	-5	±0.8	5	mV
Input Offset Voltage Drift	V_{OS}TC			2		μV/°C
Input Bias Current	I_B			10		pA
Input Offset Current	I_{OS}			1		pA
Input Voltage Noise Density	e_n	f=1kHz		45		nV/√Hz
		f=10kHz		29		nV/√Hz
Input Resistance	R_{IN}		>100			GΩ
Input Capacitance	C_{IN}	Differential		1.5		pF
		Common Mode		3		pF
Common Mode Rejection Ratio	CMRR	V_{CM}=0.1V 4.9V	80	90		dB
Common-mode input Voltage Range	V_{CM}		-0.1		5.1	V
Power Supply Rejection Ratio	PSRR		80	90		dB
Open-Loop Large Signal Gain	A_{VOL}	V_{OUT}=2.5V, R_{LOAD}=100kΩ	80	97		dB
		V_{OUT}=0.1V to 4.9V, R_{LOAD}=100kΩ	72	95		dB
Output Swing from Supply Rail	V_{OL}	R_{LOAD}=100kΩ		5		mV
Output Short-Circuit Current	I_{SC}	Sink or source current		40		mA
Quiescent Current per Amplifier	I_Q			45	87	μA
Phase Margin	PM	R_{LOAD}=100kΩ, C_{LOAD}=100pF		63		°
Gain Margin	GM	R_{LOAD}=100kΩ, C_{LOAD}=100pF		-15		dB
Gain-Bandwidth Product	GBWP	f=1kHz		1		MHz

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Settling Time, 1.5V to 3.5V	ts	0.1%		2.3		μs
Unity Gain		0.01%		2.8		μs
Settling Time, 2.45V to 2.55V		0.1%		0.33		μs
Unity Gain		0.01%		0.38		μs
Slew Rate	SR	A_V=1, V_{OUT}=1.5V to 3.5V C_{LOAD}=100pF, R_{LOAD}=100kΩ		1		V/μs
Total Harmonic Distortion and	THD+N	f=1kHz,A_V=1,R_L=100kΩ,V_{OUT}=2V_{PP}		-105		dB
Noise		f=10kHz,A_V=1,R_L=100kΩ,V_{OUT}=2V_{PP}		-90		dB

7.1 Typical characteristic

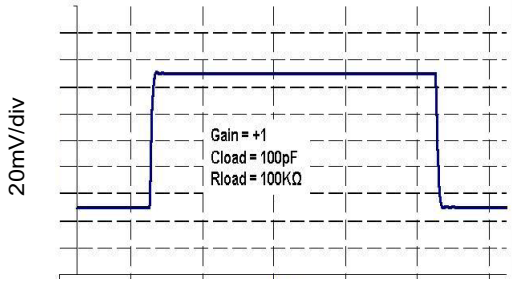


Figure 1: Small-Signal Step Response, 100mV Step

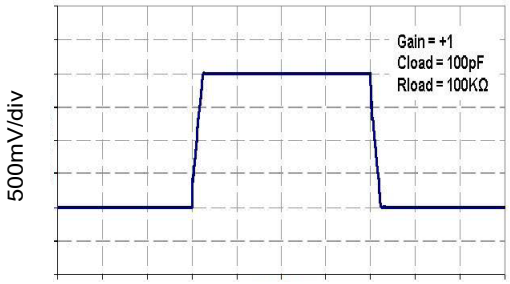


Figure 2: Large-Signal Step Response, 2V Step

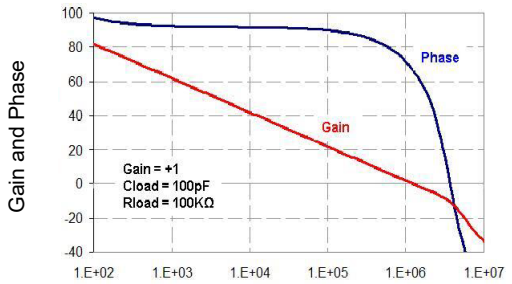


Figure 3: Open-Loop Gain and Phase

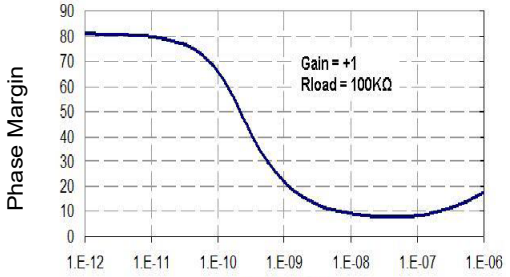


Figure 4: Phase Margin vs. C_{LOAD} (Stable for Any C_{LOAD})

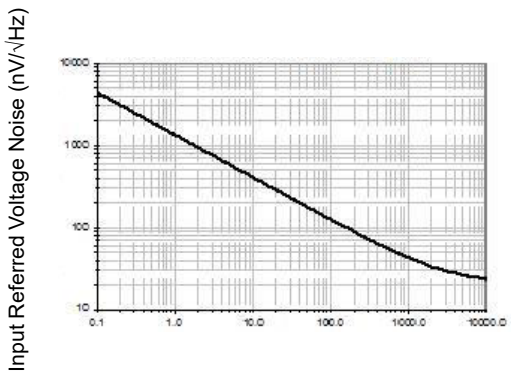


Figure 5: Input Voltage Noise Spectral Density

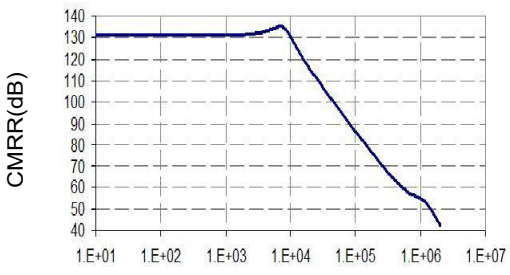
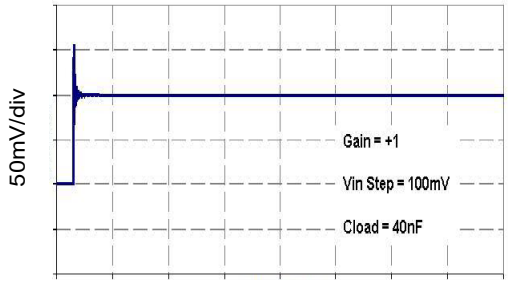


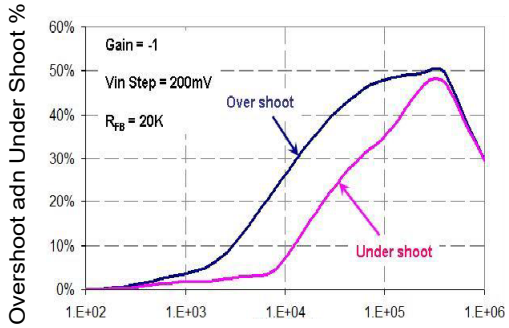
Figure 6: Common-Mode Rejection Ratio

7.2 Typical characteristic



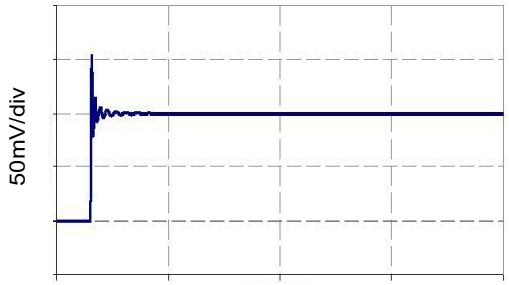
0.1mSec/div

Figure 7: Over-Shoot Voltage, C_{LOAD}=40nF, Gain=+1



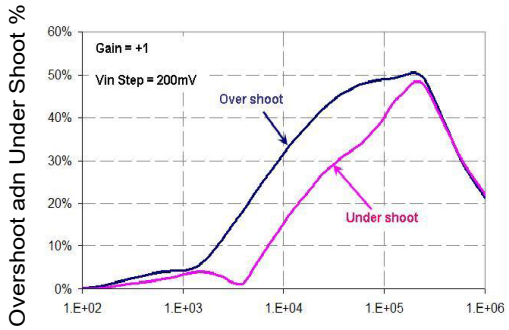
C_{load} (pF)

Figure 8: Over-Shoot % vs. C_{LOAD}, Gain -1, RFB=20kΩ



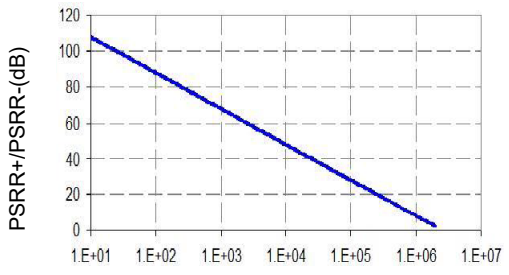
Frequency (Hz)

Figure 9: Over-Shoot Voltage, C_{LOAD}=40nF, Gain=-1
RFB=100kΩ



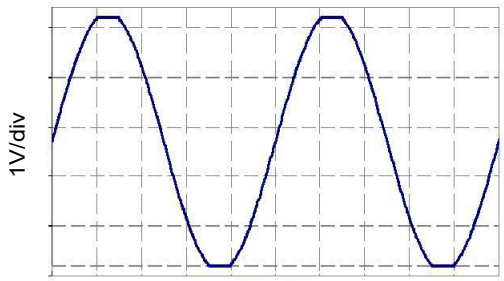
Load Capacitance (pF)

Figure 10: Small-Signal Over-Shoot % vs. C_{LOAD}
Gain = +1



Frequency (Hz)

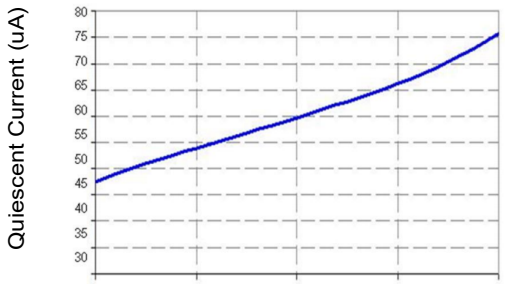
Figure 11: Power-Supply Rejection Ratio



0.2msec/div

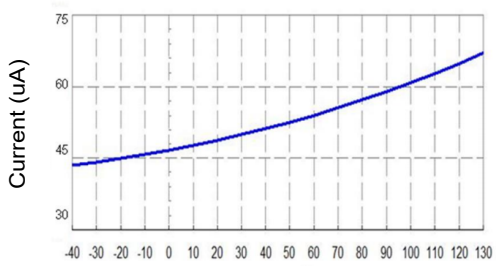
Figure 12: V_{IN}=-0.2V to 5.7V, No Phase Reversal

7.3 Typical characteristic



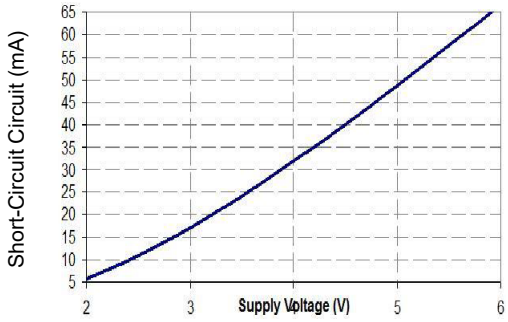
Supply Voltage (V)

Figure 13: Quiescent Supply Current vs. Supply Voltage



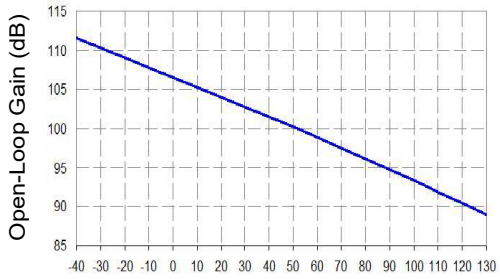
Temperature (°C)

Figure 14: Quiescent Supply Current vs. Temperature



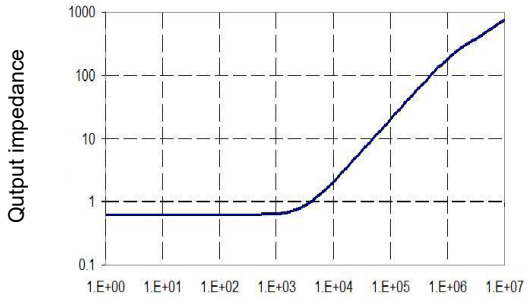
Supply Voltage (V)

Figure 15: Short-Circuit Current vs. Supply Voltage



Temperature (°C)

Figure 16: Open-Loop Gain vs. Temperature



Frequency (Hz)

Figure 17: Closed-Loop Output Impedance vs. Frequency

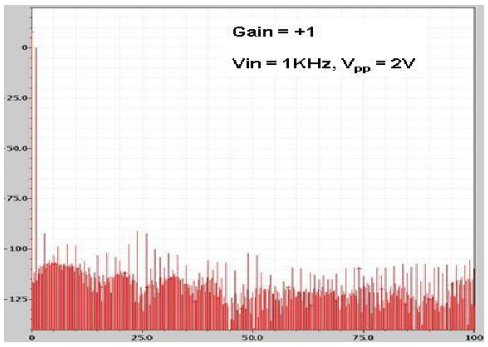


Figure 18: THD+Noise, Gain=+1, V_{IN}=1kHz, V_{PP}=2V

7.4 Typical characteristic

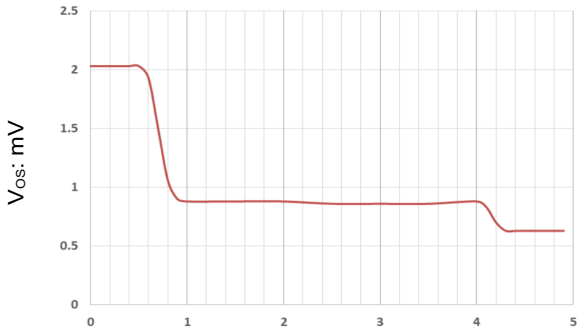
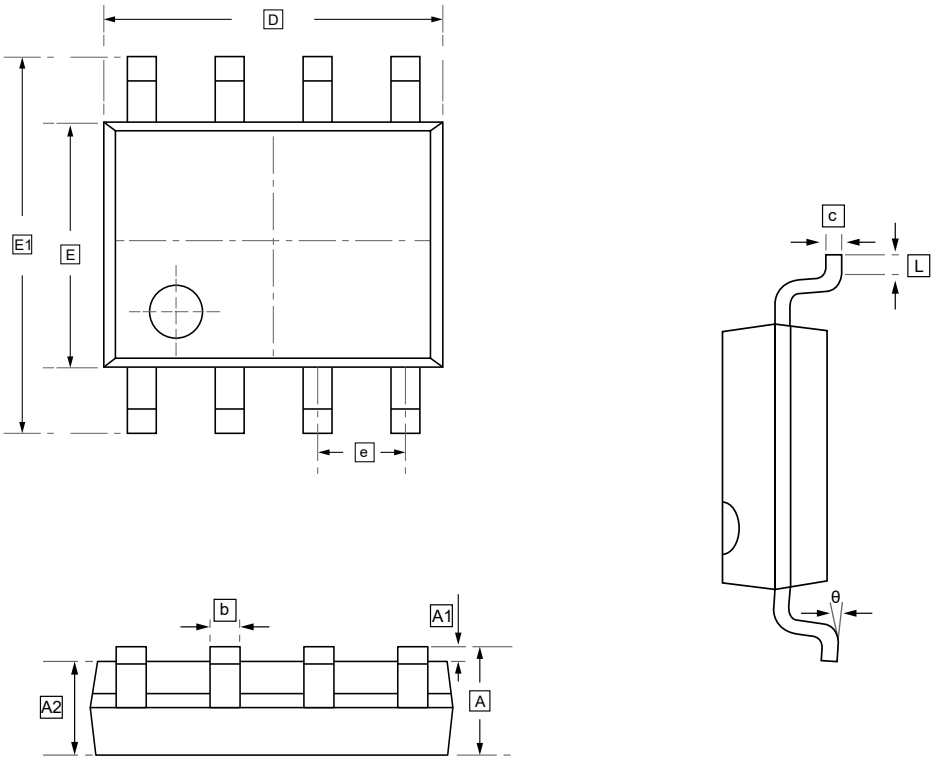


Figure 19: V_{OS} vs. Common Mode Input Voltage

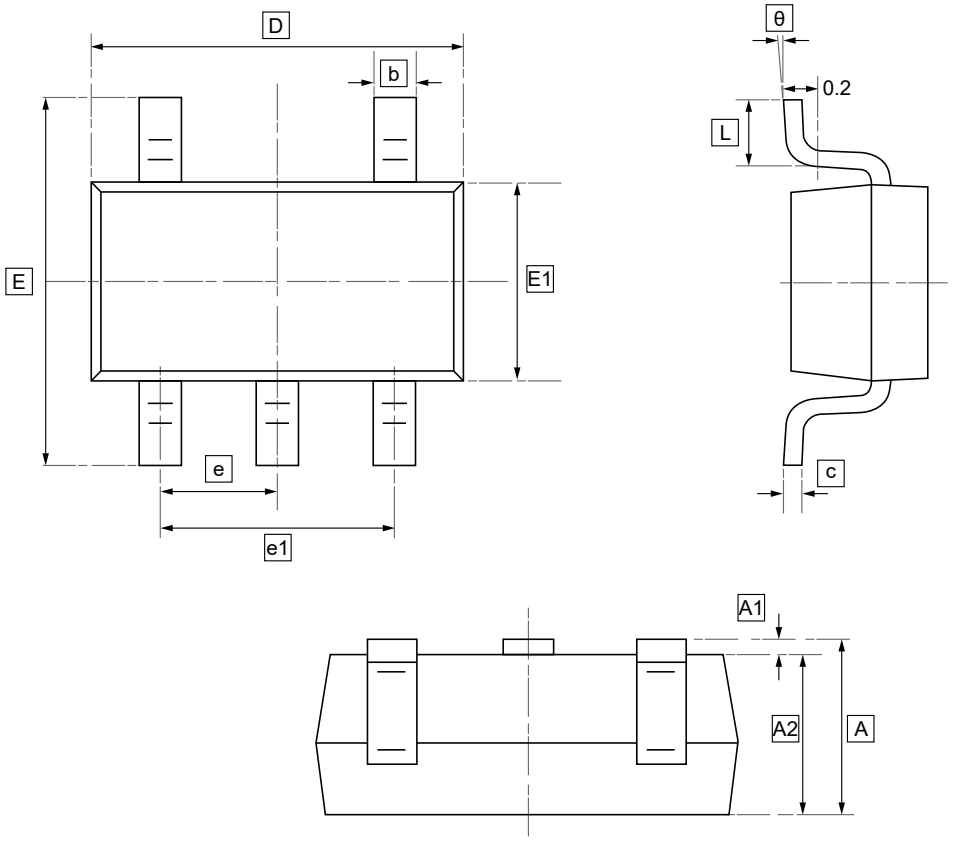
8.1 SOP-8 Package Outline Dimensions



DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	b	c	D	E	E1	e	L	θ
Min	1.350	0.000	1.350	0.330	0.170	4.700	3.800	5.800	1.270	0.400	0°
Max	1.750	0.100	1.550	0.510	0.250	5.100	4.000	6.200	BSC	1.270	8°

8.2 SOT23-5 Package Outline Dimensions

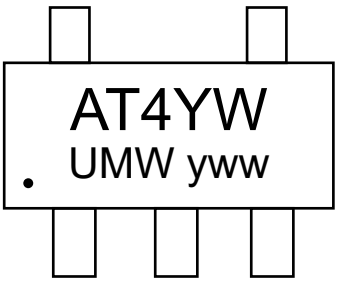


DIMENSIONS (mm are the original dimensions)

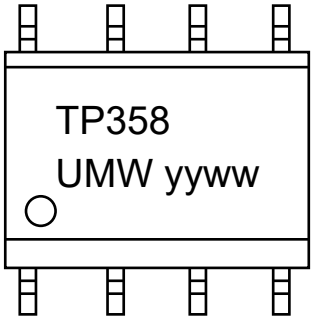
Symbol	A	A1	A2	b	c	D	E1	E	e	e1	L	θ
Min	1.050	0.000	1.050	0.300	0.100	2.820	1.500	2.650	0.950	1.800	0.300	0°
Max	1.250	0.100	1.150	0.500	0.200	3.020	1.700	2.950	BSC	2.000	0.600	8°

9.Ordering information

SOT23-5



SOP-8



y: Year Code
yy: Year Code
ww: Week Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW TP358-SR	TP358	SOP-8	2500	Tape and reel
UMW TP321-TR	AT4YW	SOT23-5	3000	Tape and reel

10.Disclaimer

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When applying our products, please do not exceed the maximum rated values, as this may affect the reliability of the entire system. Under certain conditions, any semiconductor product may experience faults or failures. Buyers are responsible for adhering to safety standards and implementing safety measures during system design, prototyping, and manufacturing when using our products to prevent potential failure risks that could lead to personal injury or property damage.

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