UMW TP1561/1562/1564

6MHz, 600μA, RRIO, Op Amps

1.Description

The UMW TP156X series are CMOS dual, and quad RRIO opamps with low offset, low power and stable high frequency response. to achieve very good AC performance with 6MHz bandwidth, 4.5V/μs slew rate and low distortion while drawing only 600μA of quiescent current per amplifier. The input common-mode voltage range extends 300mV beyond V– and V+, and the outputs swing rail-to-rail. The TP156X family can be used as plug-in replacements for many commercially available op-amps to reduce power and improve input/output range and performance.

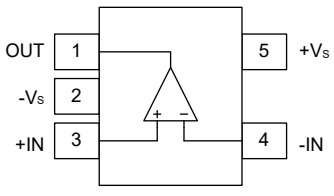
2.Features

- Supply Voltage: 2.5V to 6.0V
- Low Supply Current: 600μA per channel
- Rail to Rail Input and Output
- Bandwidth: 6 MHz
- Slew Rate: 4.5V/μs
- Excellent EMI Suppress Performance
- Offset Voltage: ±3mV Maximum
- Offset Voltage Temperature Drift: 1μV/°C
- Low Noise: 19 nV/√Hz at 1kHz
- High Output Capability: 100mA
- -40°C to 125°C Operation Temperature Range

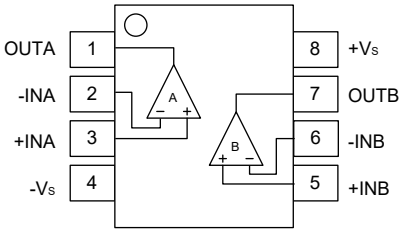
3.Applications

- White Goods
- Motor Contro

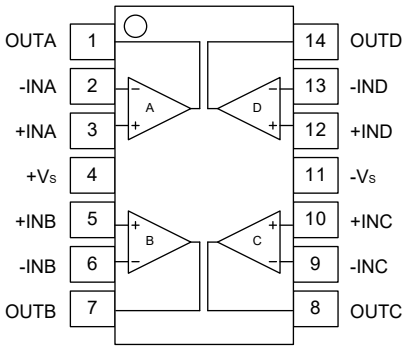
4.Pinning Information



TP1561A
SOT-23-5



TP1562AL1
SOP-8



TP1564AL1
SOP-14

5.Absolute Maximum Ratings

Parameter	Rating
Supply Voltage, $(+V_S)$-$(-V_S)$	7V
Input Voltage	$(-V_S)$ - 0.3 to $(+V_S)$ + 0.3
Differential input Voltage	±7V
Input Current: +IN, -IN Note 2	±10mA
Output Short-Circuit Duration Note 3	Infinite
Maximum Junction Temperature	150°C
Operating Temperature Range	-40 to 125°C
Storage Temperature Range	-65 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.
Note 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.
Note 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.ESD Ratings

Parameter	Condition	Symbol	Value	Units
Human Body Model ESD	MIL-STD-883H Method 3015.8	HBM	4	kV
Charged Device Model ESD	JEDEC-EIA/JESD22-C101E	CDM	1.5	kV

7.Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Units
Supply Voltage, (+VS)- (-VS)	V_S	2.5		6	V
Operating Temperature Range	T_A	-40		125	°C

8.Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
SOT23-5	250	81	°C/W
SOP-8	158	43	°C/W
SOP-14	120	36	°C/W

9.Electrical Characteristics

All test condition is V_S=5V, T_A=25°C, R_L=2kΩ, C_L=100pF, unless otherwise noted.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Supply Voltage Range	V_S		2.5		6	V
Quiescent Current per Amplifier	I_Q			600	900	μA
Power Supply Rejection Ratio	PSRR		75	90		dB
Input Offset Voltage	V_{OS}	V_{CM}=0V to 3V	-3		3	mV
Input Offset Voltage Drift	$V_{OS}TC$	T_A=-40°C to 125°C		1		μV/°C
Input Bias Current	I_B	T_A=25°C		1		pA
		T_A=85°C		25		pA
Input Offset Current	I_{OS}			1		pA
Input Capacitance	C_{IN}	Differential Mode		8		pF
		Common Mode		7		pF
Open-loop Voltage Gain	A_V	R_{LOAD}=10kΩ	80	100		dB
Common-mode input Voltage Range	V_{CMR}		(V-) - 0.1		(V+)+0.1	V
Common Mode Rejection Ratio	CMRR	V_{CM}=0V to 2.5V	70	100		dB
Channel Separation	Xtalk	f=1kHz, R_L=2kΩ		110		dB
Maximum Output Voltage Swing	V_{OH}, V_{OL}	R_{LOAD}=10kΩ		3	15	mV
Output Short-Circuit Current	I_{SC}		90	100		mA
Gain-Bandwidth Product	GBW			6		mA
Slew Rate	SR	A_V=1, V_{OUT}=1.5V to 3.5V C_{LOAD}=60pF, R_{LOAD}=1kΩ		4.5		V/μs
Settling Time, 0.1%	t_s	A_V=1,2V Step		0.8		μs
Settling Time, 0.01%		C_{LOAD}=60pF, R_{LOAD}=1kΩ		1		μs
Phase Margin	PM	R_{LOAD}=1kΩ, C_{LOAD}= 60pF		60		°
Gain Margin	GM	R_{LOAD}=1kΩ, C_{LOAD}= 60pF		15		dB
Input Voltage Noise	E_N	f=0.1Hz to 10Hz		8		$μV_{PP}$

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input Voltage Noise Density	e_N	f=1kHz		19		nV/√Hz
Input Current Noise	i_N	f=1kHz		2		fA/√Hz
TotalHarmonicDistortion and Noise	THD+N			0.003		%

10.1 Typical characteristic

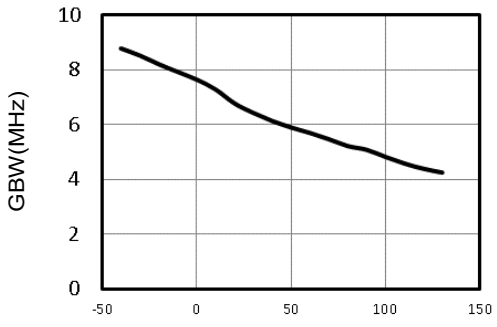


Figure 1: Unity Gain Bandwidth vs. Temperature

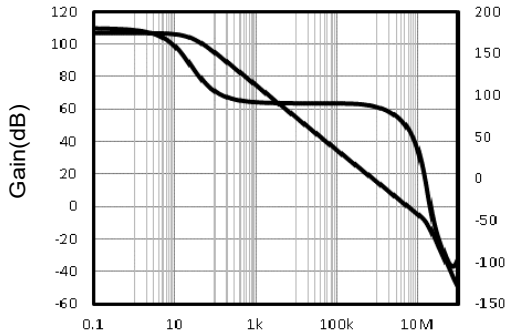


Figure 2: Open-Loop Gain and Phase

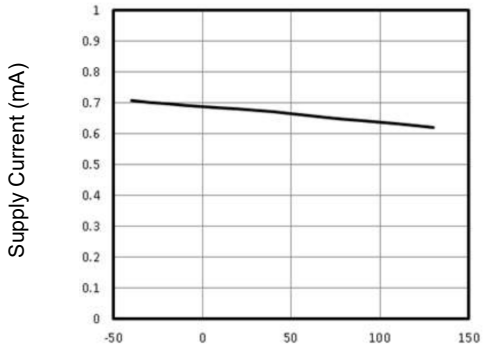


Figure 3: Supply Current vs. Temperature

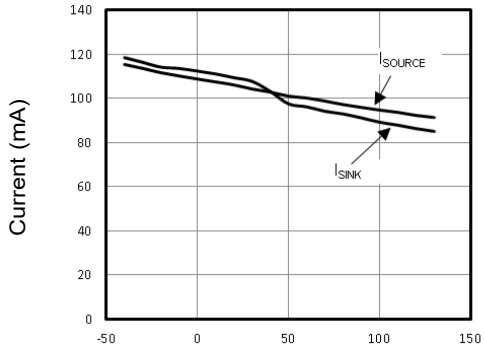


Figure 4: Short Circuit Current vs. Temperature

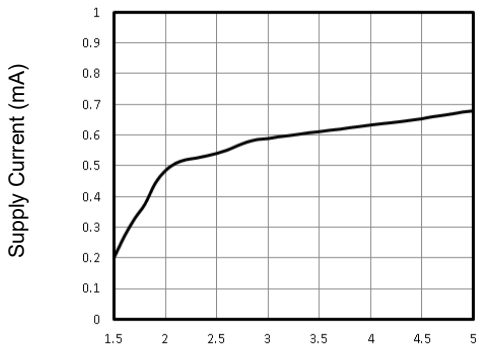


Figure 5: Quiescent Current vs. Supply Voltage

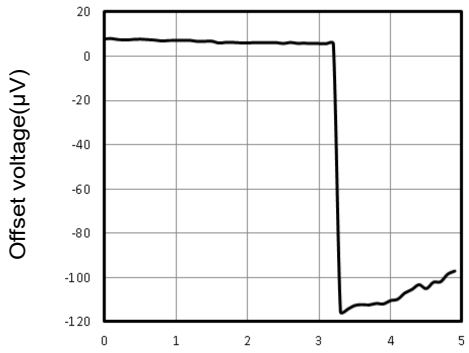


Figure 6: Offset Voltage vs. Common-Mode Voltage

10.2 Typical characteristic

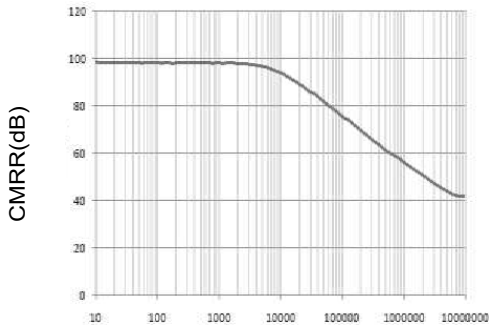


Figure 7: CMRR vs. Frequency

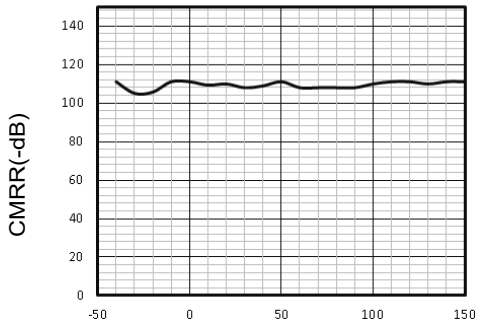


Figure 8: CMRR vs. Temperature

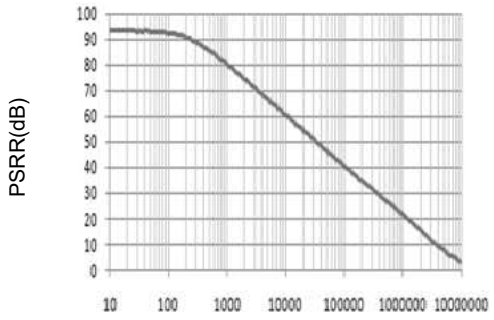


Figure 9: Power-Supply Rejection Ratio

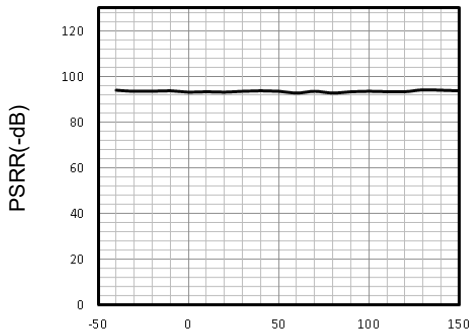


Figure 10: PSRR vs. Temperature

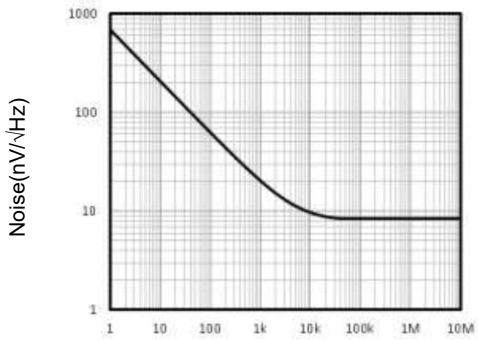


Figure 11: Input Voltage Noise Spectral Density

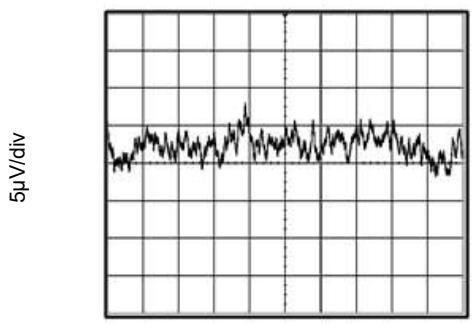


Figure 12: 0.1 Hz to 10 Hz Input Voltage Noise

10.3 Typical characteristic

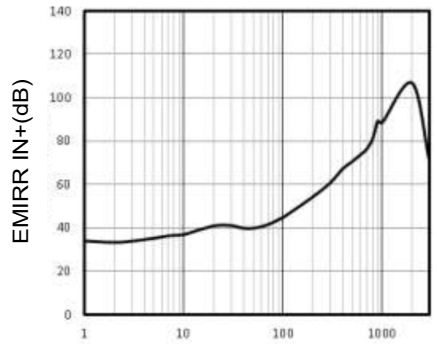


Figure 13: EMIRR IN+ vs. Frequency

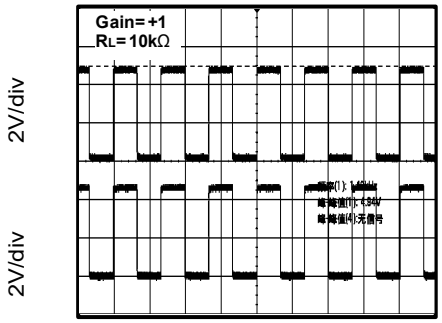


Figure 14: Large-Scale Step Response

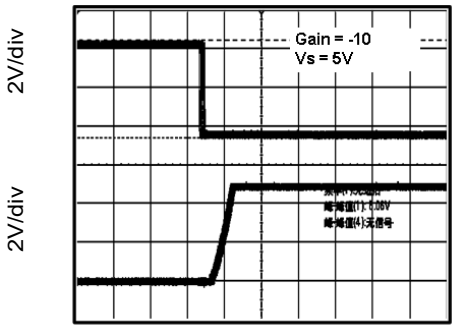


Figure 15: Negative Over-Voltage Recovery

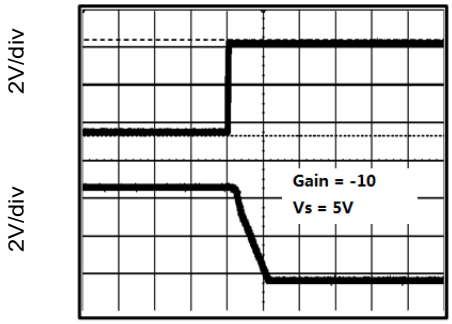


Figure 16: Positive Over-Voltage Recovery

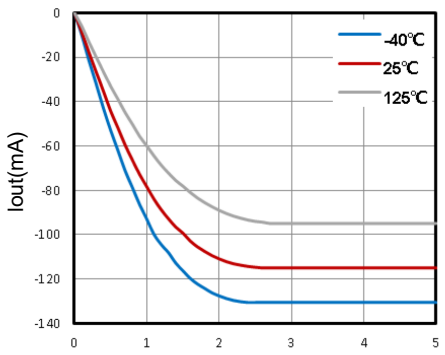


Figure 17: Negative Output Swing vs. Load Current

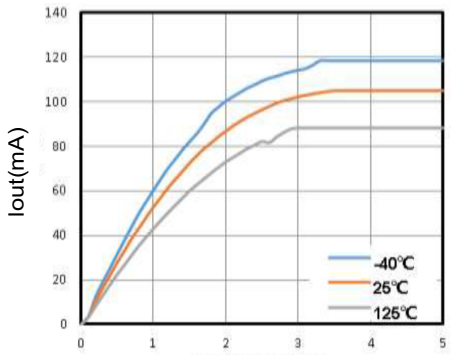
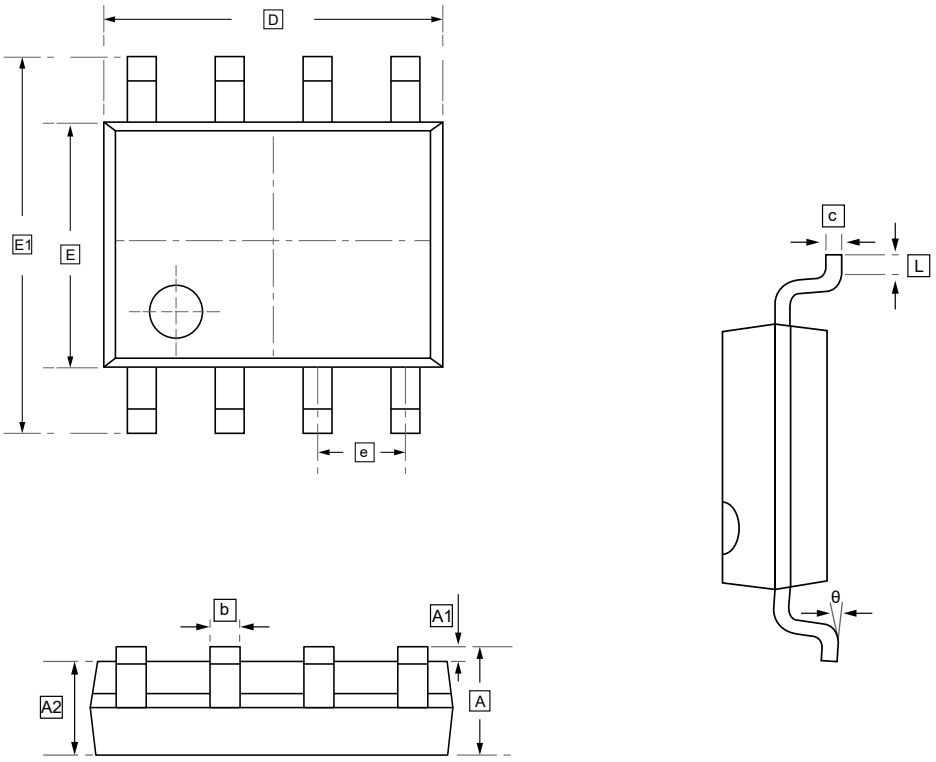


Figure 18: Positive Output Swing vs. Load Current

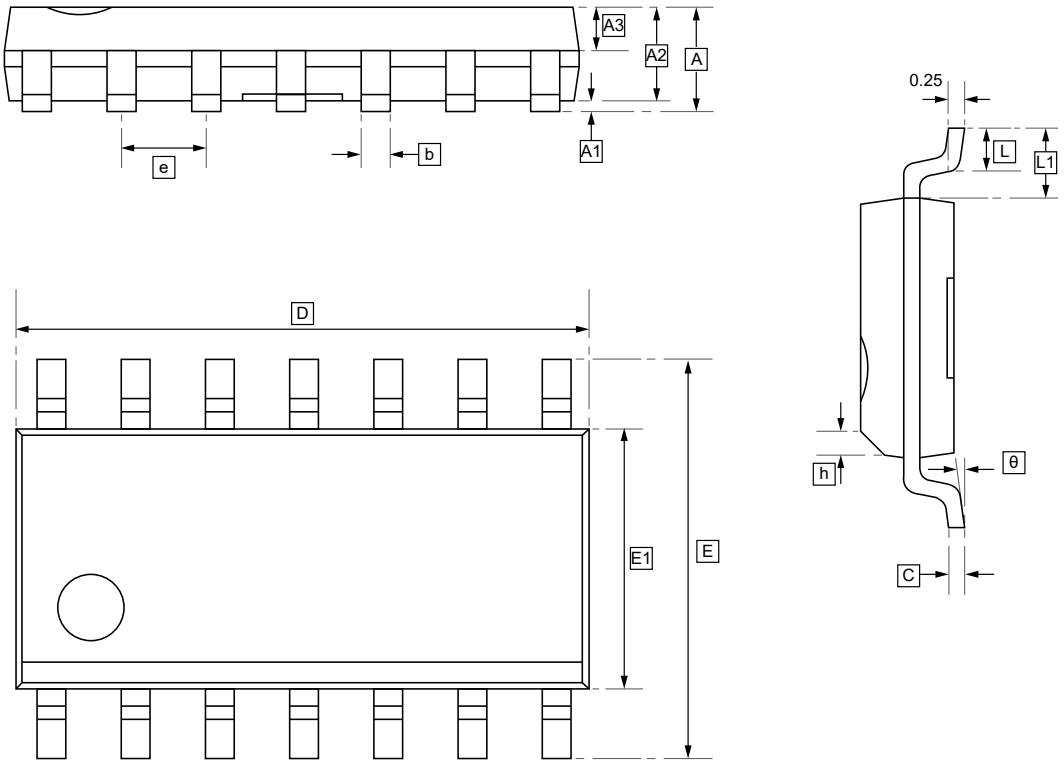
11.1 SOP-8 Package Outline Dimensions



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°

11.2 SOP-14 Package Outline Dimensions

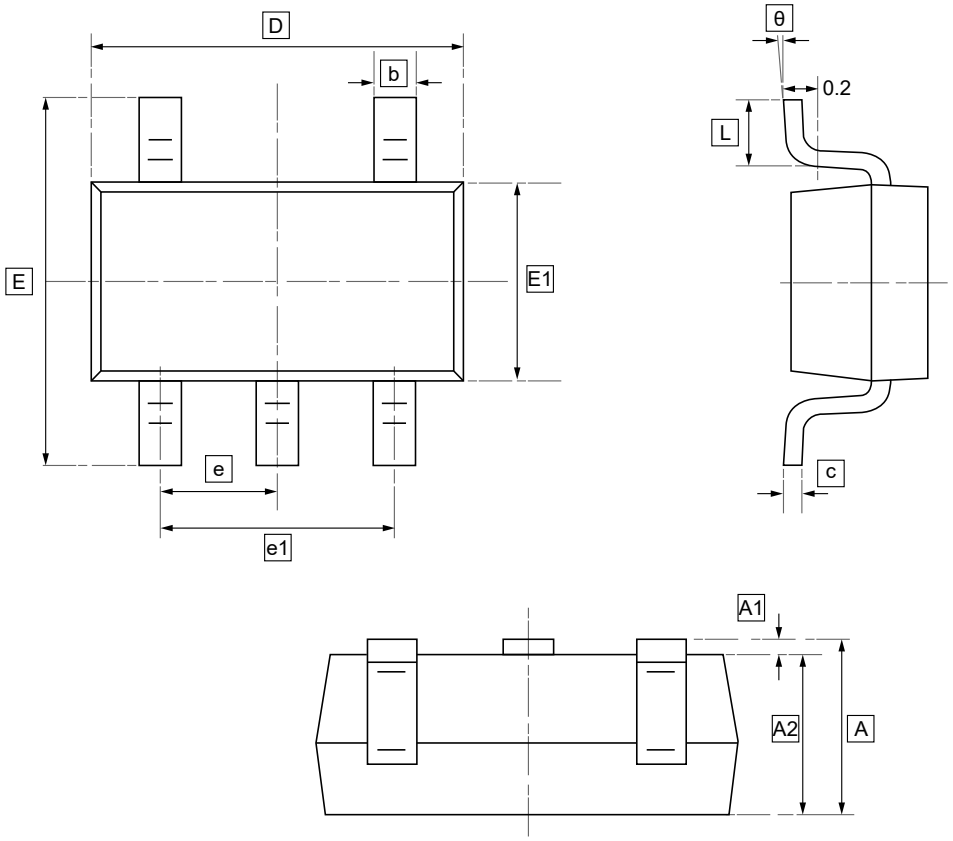


DIMENSIONS (mm are the original dimensions)

Symbol	A	A1	A2	A3	b	C	D	E	E1	e	h	L
Min	-	0.05	1.35	0.65	0.203	0.17	8.45	5.80	3.80	1.24	0.25	0.40
Max	1.75	0.25	1.55	0.75	0.305	0.25	8.85	6.20	4.00	1.30	0.50	0.80

Symbol	L1	θ
Min	1.00	0°
Max	1.10	8°

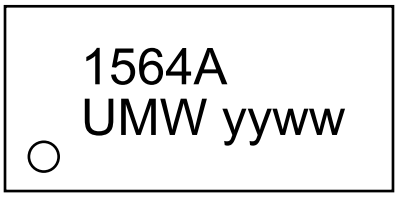
11.3 SOT-23-5 Package Outline Dimensions



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°

12.Ordering information



yy: Year Code
ww: Week Code

Order Code	Marking	Package	Base QTY	Delivery Mode
UMW TP1562AL1-SR	1562A	SOP-8	2500	Tape and reel
UMW TP1564AL1-SR	1564A	SOP-14	2500	Tape and reel
UMW TP1561A-TR	561G P	SOT23-5	3000	Tape and reel

13.Disclaimer

UMW reserves the right to make changes to all products, specifications. Customers should obtain the latest version of product documentation and verify the completeness and currency of the information before placing an order.

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.

Unless explicitly stated in writing, UMW products are not intended for use in medical, life-saving, or life-sustaining applications, nor for any other applications where product failure could result in personal injury or death. If customers use or sell the product for such applications without explicit authorization, they assume all associated risks.

When reselling, applying, or exporting, please comply with export control laws and regulations of China, the United States, the United Kingdom, the European Union, and other relevant countries, regions, and international organizations.

This document and any actions by UMW do not grant any intellectual property rights, whether express or implied, by estoppel or otherwise. The product names and marks mentioned herein may be trademarks of their respective owners.