Features

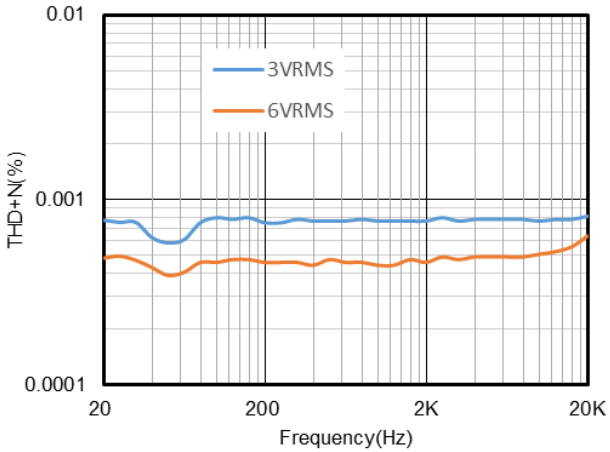
- Supply Voltage: 3V to 36V
- Differential Input Voltage Range to Supply Rail
- Input Rail to $-V_S$, Rail to Rail Output
- Fast Response: 10 MHz Bandwidth, 8V/μs Slew Rate, 100ns Overload Recovery
- Low Offset Voltage:
  - ±3mV Maximum at 25°C,
  - ±3.5mV Maximum at -40°C to 85°C
  - ±4mV Maximum at -40°C to 125°C
- Very Low THD+N: 0.0007% at Gain = 1, 20kHz
- Excellent EMIRR: 58dB at 900MHz
- 2KV HBM, 1KV CDM, 150mA Latch Up
- –40°C to 125°C Operation Temperature Range

Applications

- Audio
- Sensor Interface
- Motor Control

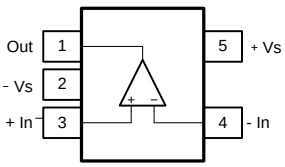
Description

The TP258X series amplifiers are newest high supply voltage amplifiers with low offset, low power and stable high frequency response. They incorporate 3PEAK's proprietary and patented design techniques to achieve very good AC performance with 10MHz bandwidth, 8V/μs slew rate, and 100ns overload recovery time while drawing only 3mA of quiescent current per amplifier; the TP258X family achieve the best THD+N performance in audio signal range, it's the ideal choices for motor control and audio amplification.

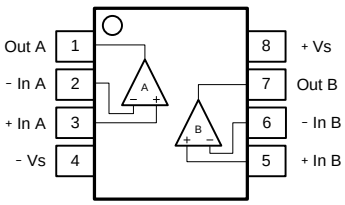


Pin Configuration

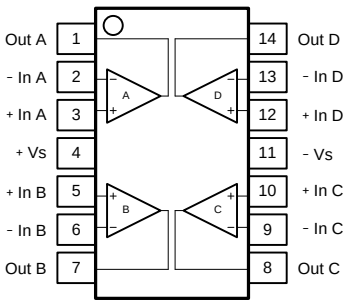
TP2581
5-Pin SOT23
-T and -C Suffixes



TP2582
8-Pin SOIC/TSSOP/MSOP
-S, -TS and -V Suffixes



TP2584
14-Pin SOIC/TSSOP
-S and -T Suffixes



TP2581
8-Pin SOIC
(-S Suffix)

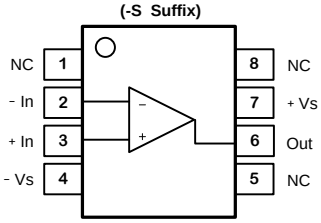


Table of Contents

Revision History

Date	Revision	Notes
2018/7/21	Rev.Pre	Pre-Release Version
2019/3/1	Rev.0	Initial Version
2019/10/23	Rev.0.01	Add new product: TP2581-TR
2019/12/6	Rev.0.02	Update Iq Spec of TP2581
2020/4/25	Rev.A	Add Figure: PSRR vs. Freq, CMRR vs. Freq
2020/7/21	Rev.A.1	Update Figure: PSRR vs. Freq
2020/9/24	Rev.A.2	Update the description of Absolute Maximum Ratings: “Maximum Junction Temperature” -> “Maximum Operating Junction Temperature”

Order Information

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity
TP2581-SR Note 2	-40 to 125°C	8-Pin SOIC	2581 XXXX Note 1	3	Tape and Reel, 4000
TP2581-TR	-40 to 125°C	5-Pin SOT23	258XX Note 1	3	Tape and Reel, 3000
TP2582-SR	-40 to 125°C	8-Pin SOIC	2582 XXXX Note 1	3	Tape and Reel, 4000
TP2582-TSR	-40 to 125°C	8-Pin TSSOP	2582 XXXX Note 1	3	Tape and Reel, 3000
TP2582-VR	-40 to 125°C	8-Pin MSOP	2582 XXXX Note 1	3	Tape and Reel, 3000
TP2584-SR	-40 to 125°C	14-Pin SOIC	2584 XXXX Note 1	3	Tape and Reel, 2500
TP2584-TR	-40 to 125°C	14-Pin TSSOP	2584 XXXX Note 1	3	Tape and Reel, 3000

Note 1: “XXXX” and “XX” identify the manufacture site and date code information.

Note 2: The sample will be ready in 1 month.

Absolute Maximum Ratings Note 1

Parameters	Rating
Supply Voltage, $(+V_S)$– $(-V_S)$	40 V
Input Voltage	$(-V_S)$ – 0.3 to $(+V_S)$ + 0.3
Differential Input Voltage	$(+V_S)$ - $(-V_S)$
Input Current: +IN, –IN Note 2	±10mA
Output Short-Circuit Duration Note 3	Infinite
Maximum Operating 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.

ESD Rating

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001	2	kV
CDM	Charged Device Model ESD	ANSI/ESDA/JEDEC JS-002	1	kV

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
5-Pin SOT23	250	81	°C/W
8-Pin SOIC	158	43	°C/W
8-Pin TSSOP	191	44	°C/W
8-Pin MSOP	210	45	°C/W
14-Pin SOIC	120	36	°C/W
14-Pin TSSOP	180	35	°C/W

Electrical Characteristics

All test condition is V_S = 30V, T_A = 25°C, R_L = 10kΩ, unless otherwise noted.

Symbol	Parameter	Conditions	T_A	Min	Typ	Max	Unit
Power Supply							
V_S	Supply Voltage Range			3		36	V
I_Q	Quiescent Current per Amplifier	V_S = 30V, TP2581			4.2	5.4	mA
			-40°C to 125°C			5.9	mA
		V_S = 5V, TP2581			3.5	4.9	mA
			-40°C to 125°C			5.2	mA
		V_S = 30V, TP2582/TP2584			3	4	mA
			-40°C to 125°C			4.5	mA
		V_S = 5V, TP2582/TP2584			2.5	3.75	mA
			-40°C to 125°C			4	mA
PSRR	Power Supply Rejection Ratio	V_S = 3V to 36V		95	120		dB
			-40°C to 125°C	90			dB
Input Characteristics							
V_{OS}	Input Offset Voltage	V_S = 30V, V_{CM} = 0V to 28.5V		-3	0.1	3	mV
			-40°C to 85°C	-3.5		3.5	mV
			-40°C to 125°C	-4		4	mV
		V_S = 5V, V_{CM} = 2.5V		-3	0.1	3	mV
			-40°C to 125°C	-4		4	mV
V_{OS} TC	Input Offset Voltage Drift		-40°C to 125°C		2		μV/°C
I_B	Input Bias Current				25		pA
			-40°C to 85°C		80		pA
			-40°C to 125°C		1000		pA
I_{OS}	Input Offset Current				25		pA
I_{IN}	Different Input Current	V_S = 36V, V_{ID} = 36V			10		nA
			-40°C to 125°C		100		nA
C_{IN}	Input Capacitance	Differential Mode			5		pF
		Common Mode			2.5		pF
Av	Open-loop Voltage Gain			105	120		dB
			-40°C to 125°C	95			dB
V_{CMR}	Common-mode Input Voltage Range			(V-)		(V+) – 1.5	V
CMRR	Common Mode Rejection Ratio	V_{CM} = 0V to 28V		105	130		dB
			-40°C to 125°C	100			dB

Output Characteristics							
V_{OH}	Output Swing from Positive Rail	R_{LOAD} = 10kΩ to V_S/2			0.4	0.7	V
			-40°C to 125°C			1.2	V
		R_{LOAD} = 2kΩ to V_S/2			1.3	1.7	V
			-40°C to 125°C			2.5	V
V_{OL}	Output Swing from Negative Rail	R_{LOAD} = 10kΩ to V_S/2			0.2	0.5	V
			-40°C to 125°C			1	V
		R_{LOAD} = 2kΩ to V_S/2			0.8	1.2	V
			-40°C to 125°C			2	V
I_{SC}	Output Short-Circuit Current			25	32		mA
			-40°C to 85°C	20			mA
			-40°C to 125°C	15			mA
AC Specifications							
GBW	Gain-Bandwidth Product				10		MHz
SR	Slew Rate	G = 1, 10V step			8		V/μs
		Open Loop		6.5	8		V/μs
			-40°C to 125°C	5.5			V/μs
t_{OR}	Overload Recovery				100		ns
t_S	Settling Time, 0.1%	G = 11, 2.5V step			0.8		μs
	Settling Time, 0.01%				1		μs
PM	Phase Margin	V_S = 36V, R_L=10K, C_L=100pF			60		°
GM	Gain Margin	V_S = 36V, R_L=10K, C_L=100pF			15		dB
Noise Performance							
E_N	Input Voltage Noise	f = 0.1Hz to 10Hz			1.2		μV_{RMS}
e_N	Input Voltage Noise Density	f = 1kHz			35		nV/√Hz
		f = 10kHz			17		nV/√Hz
i_N	Input Current Noise	f = 1kHz			2		fA/√Hz
THD+N	Total Harmonic Distortion and Noise	f = 1kHz, G =1, R_L = 10kΩ, V_{OUT} = $6V_{RMS}$			0.0005		%

Typical Performance Characteristics

V_S = ±15V, V_{CM} = 0V, R_L = 10kΩ, unless otherwise specified.

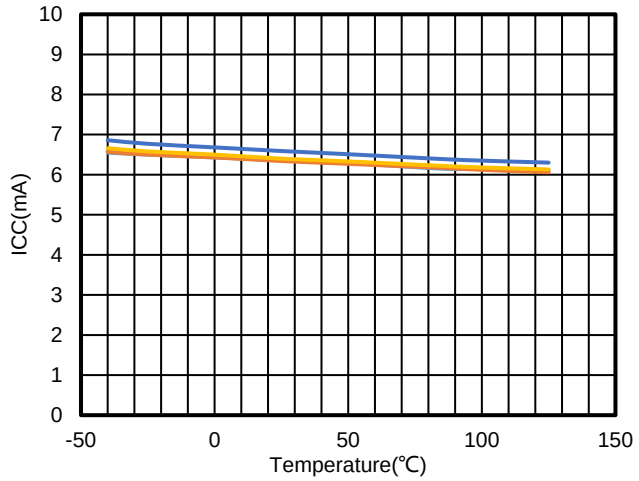


Figure 1. Quiescent Current vs. Temperature, TP2582, 3 Samples

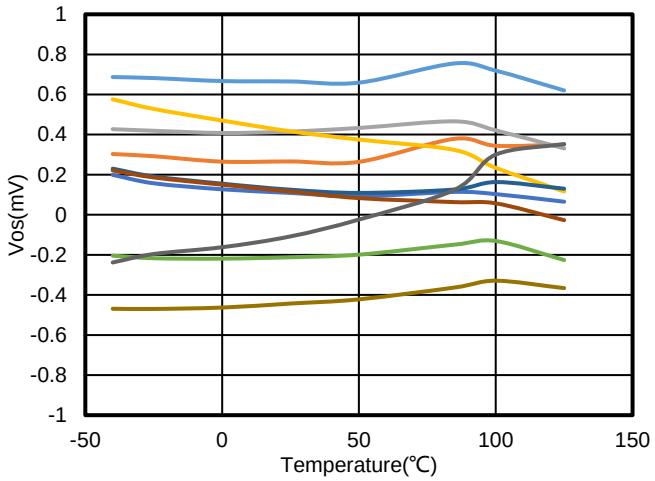


Figure 2. V_{OS} vs. Temperature, 10ch Data

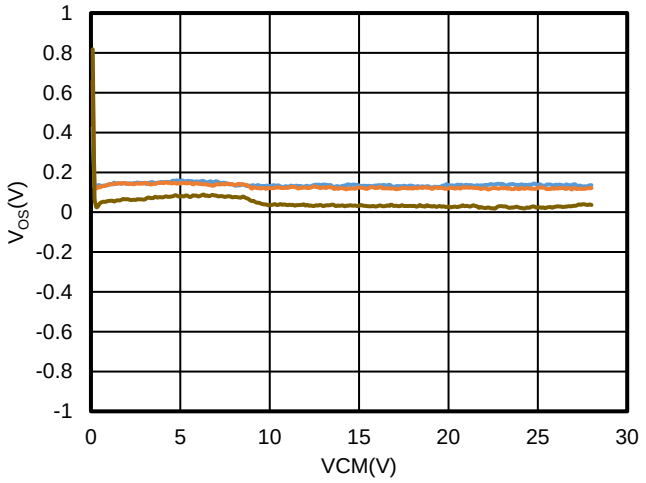


Figure 3. Offset Voltage vs. Common Mode Voltage, 3ch Data

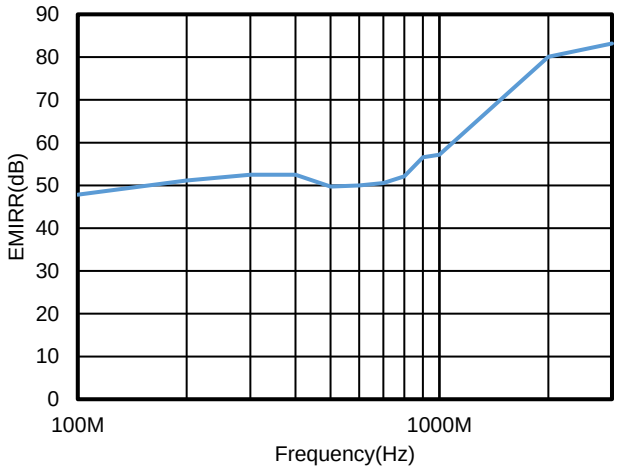


Figure 4. EMIRR

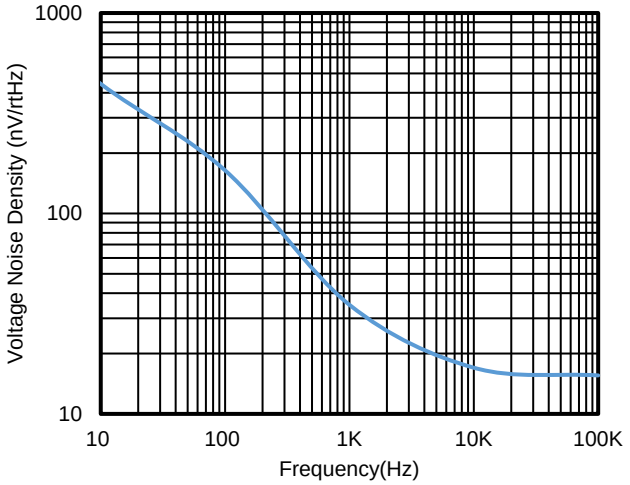


Figure 5. Voltage Noise Density vs. Frequency

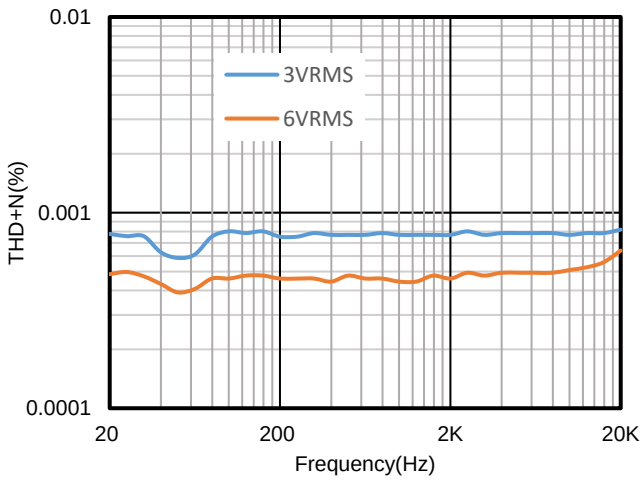


Figure 6. THD+N vs. Frequency

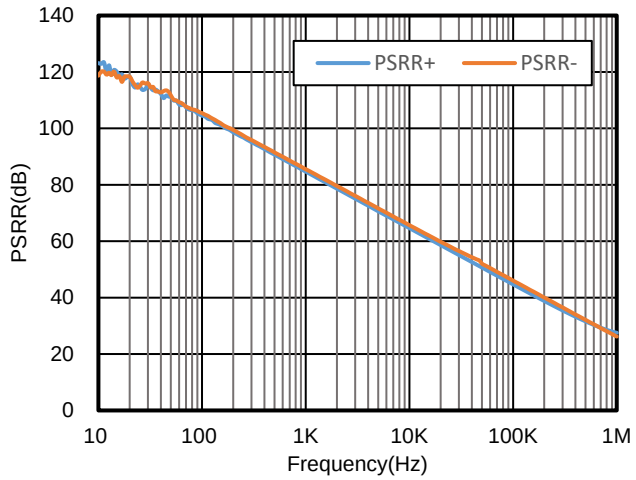


Figure 7. PSRR vs. Frequency

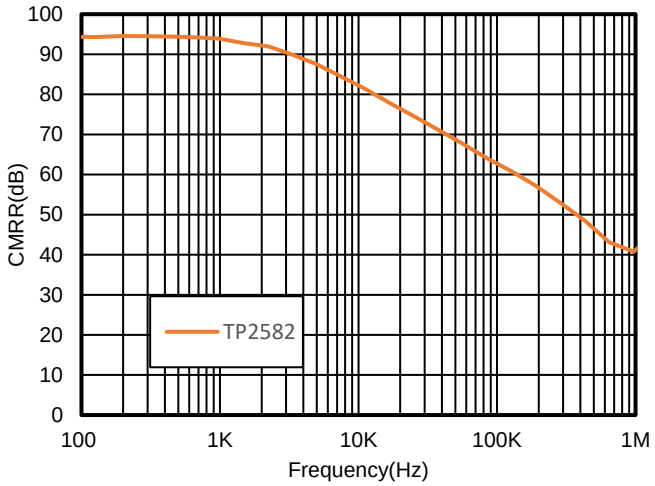


Figure 8. CMRR vs. Frequency

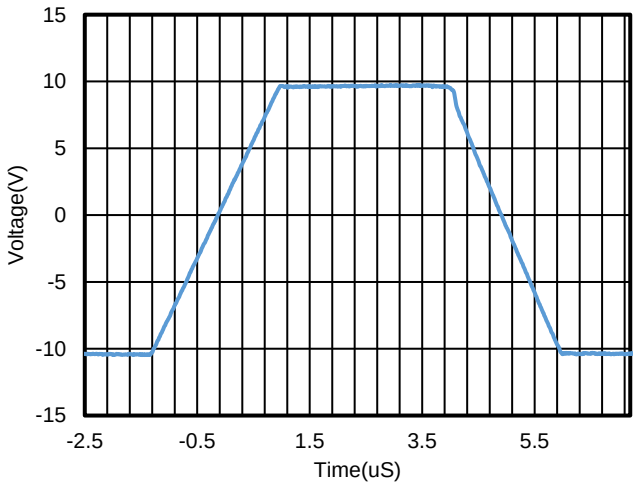


Figure 9. Large Signal Step Response,

G = 1, R_L = 10kΩ, C_L = 100pF

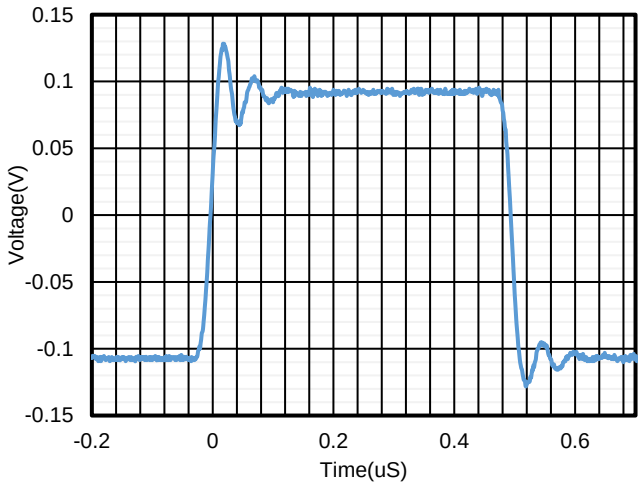


Figure 10. Small Signal Step Response,

G = 1, R_L = 10kΩ, C_L = 100pF

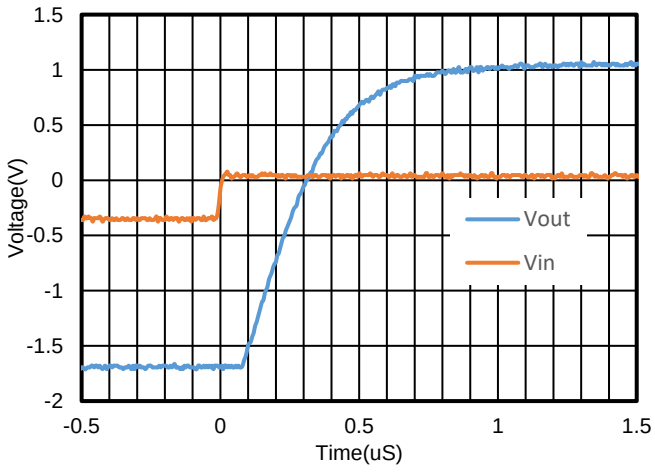


Figure 11. Positive Settling Time,

V_S = 3.3V, V_{CM} = 1.65V, G = 11

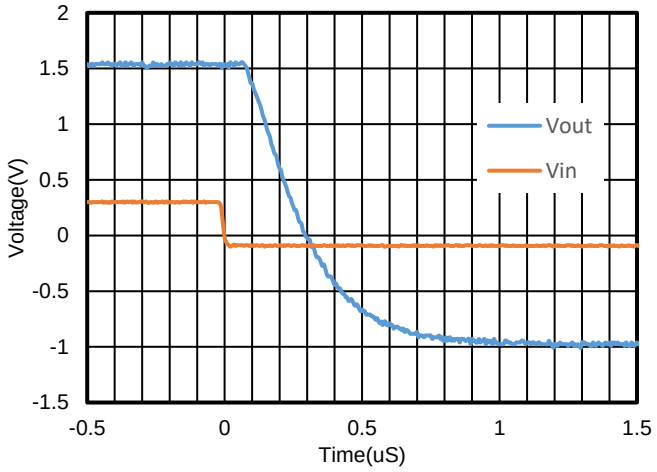


Figure 12. Negative Settling Time,

V_S = 3.3V, V_{CM} = 1.65V, G = 11

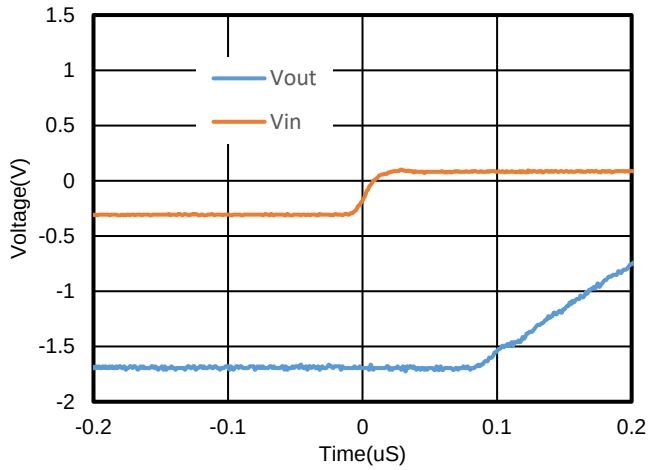


Figure 13. Positive Overload Recovery,

V_S = 3.3V, V_{CM} = 1.65V, G = 11

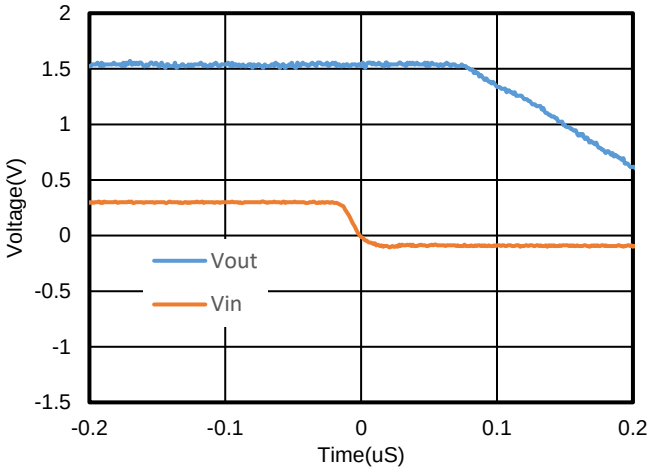
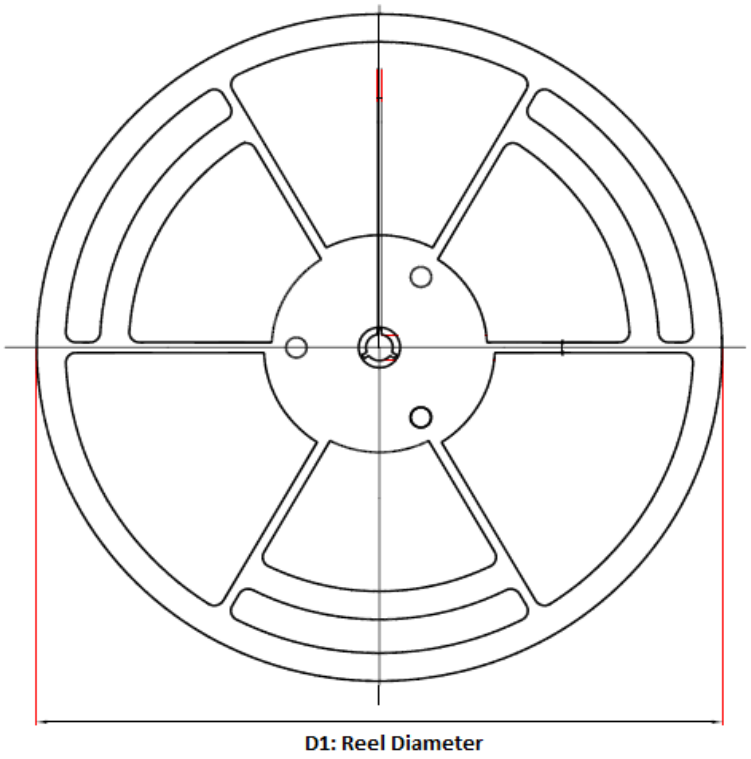


Figure 14. Negative Overload Recovery,

V_S = 3.3V, V_{CM} = 1.65V, G = 11

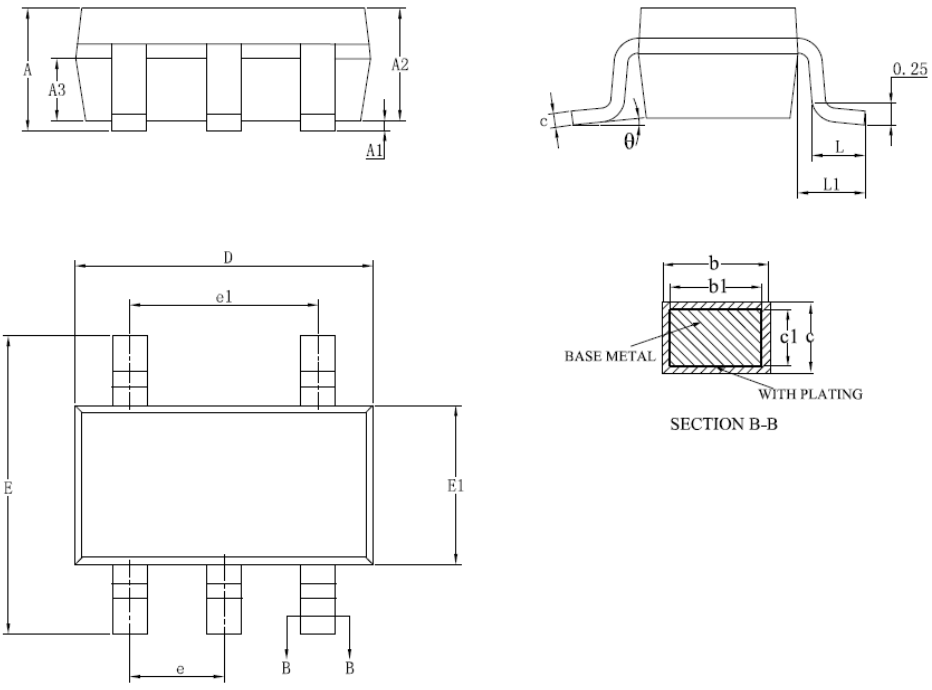
Tape and Reel Information



Order Number	Package	D1	W1	A0	B0	K0	P0	W0	Pin1 Quadrant
TP2581-TR	5-Pin SOT23	180.0	13.1	3.2	3.2	1.4	4.0	8.0	Q3
TP2581-SR	8-Pin SOIC	330.0	17.6	6.4	5.4	2.1	8.0	12.0	Q1
TP2582-SR	8-Pin SOIC	330.0	17.6	6.4	5.4	2.1	8.0	12.0	Q1
TP2582-VR	8-Pin MSOP	330.0	17.6	5.2	3.3	1.5	8.0	12.0	Q1
TP2582-TSR	8-Pin TSSOP	330.0	17.6	6.8	3.3	1.2	8.0	12.0	Q1
TP2584-SR	14-Pin SOIC	330.0	21.6	6.5	9.0	2.1	8.0	16.0	Q1
TP2584-TR	14-Pin TSSOP	330.0	17.6	6.8	5.4	1.2	8.0	12.0	Q1

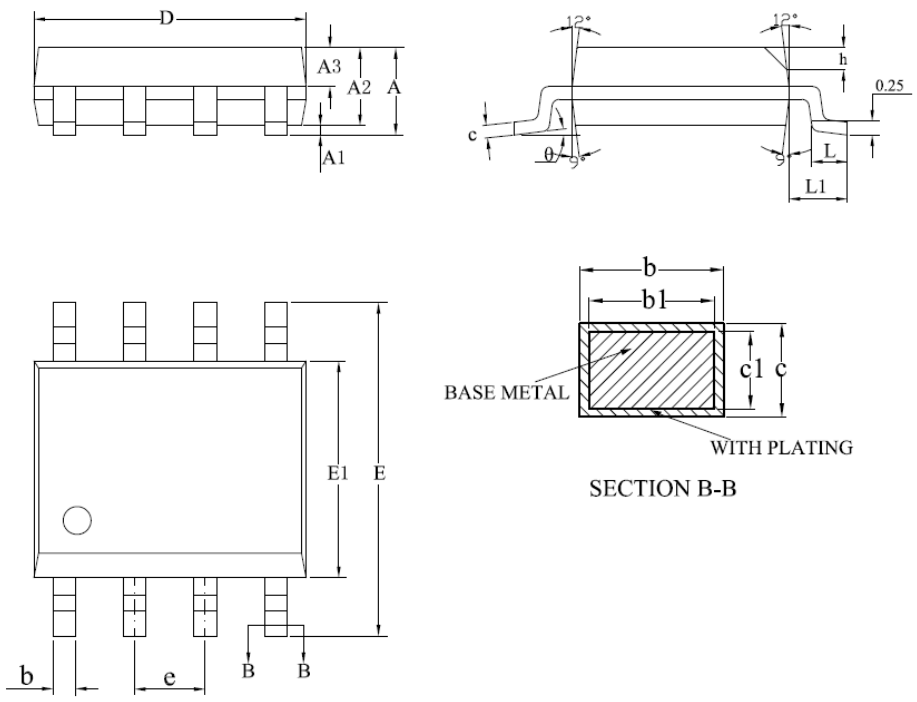
Package Outline Dimensions

SOT23-5



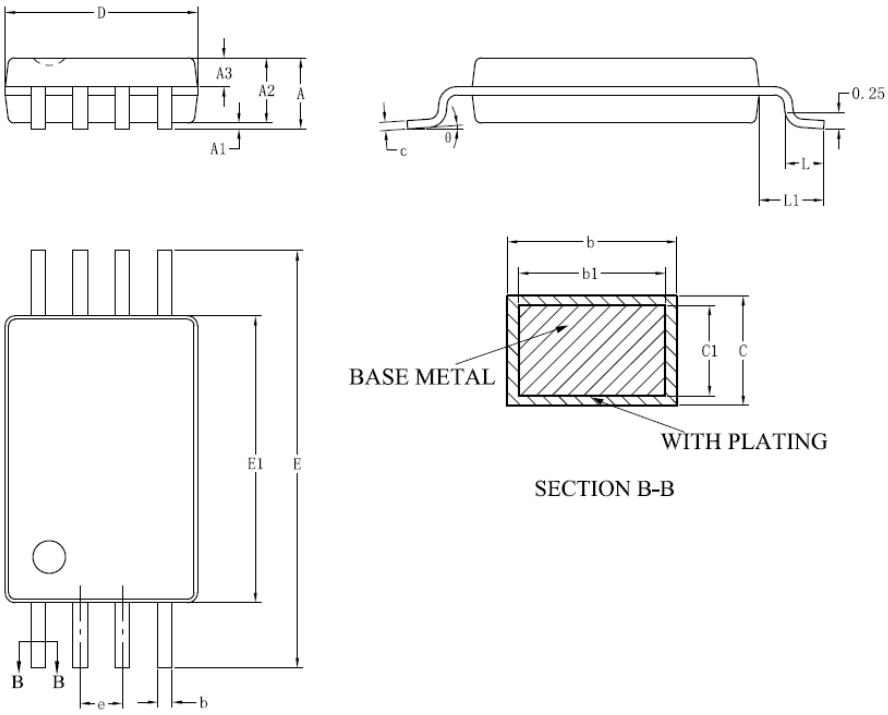
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.25
A1	0.04	—	0.10
A2	1.00	1.10	1.20
A3	0.60	0.65	0.70
b	0.33	—	0.41
b1	0.32	0.35	0.38
c	0.15	—	0.19
c1	0.14	0.15	0.16
D	2.82	2.92	3.02
E	2.60	2.80	3.00
E1	1.50	1.60	1.70
e	0.95BSC		
e1	1.90BSC		
L	0.30	—	0.60
L1	0.60REF		
θ	0	—	8°

SOIC-8



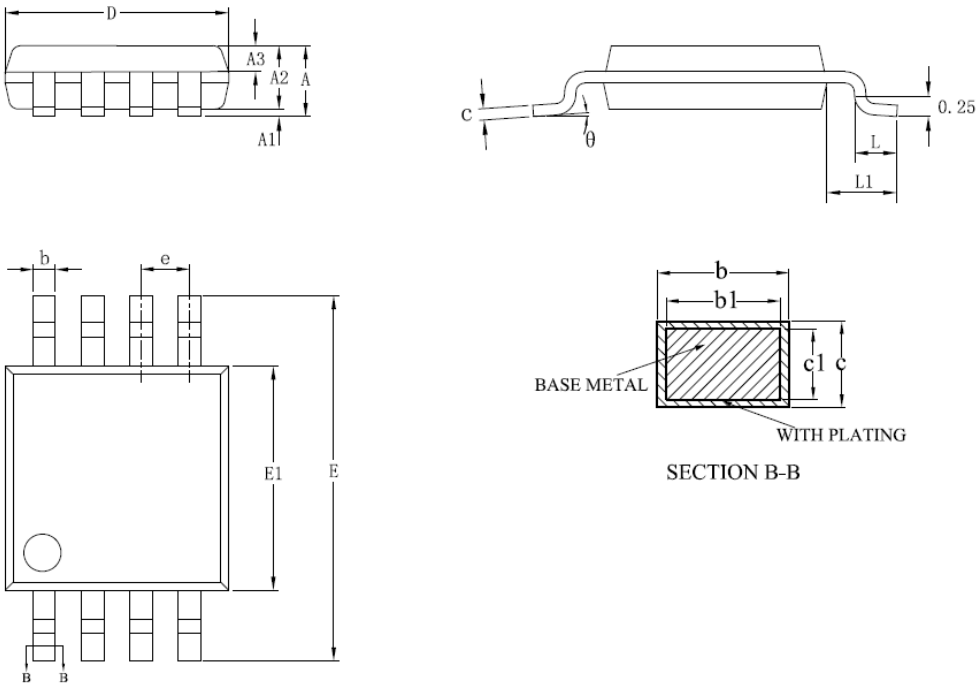
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.10	—	0.225
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	—	0.47
b1	0.38	0.41	0.44
c	0.20	—	0.24
c1	0.19	0.20	0.21
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
h	0.25	—	0.50
L	0.50	—	0.80
L1	1.05REF		
θ	0	—	8°

TSSOP-8



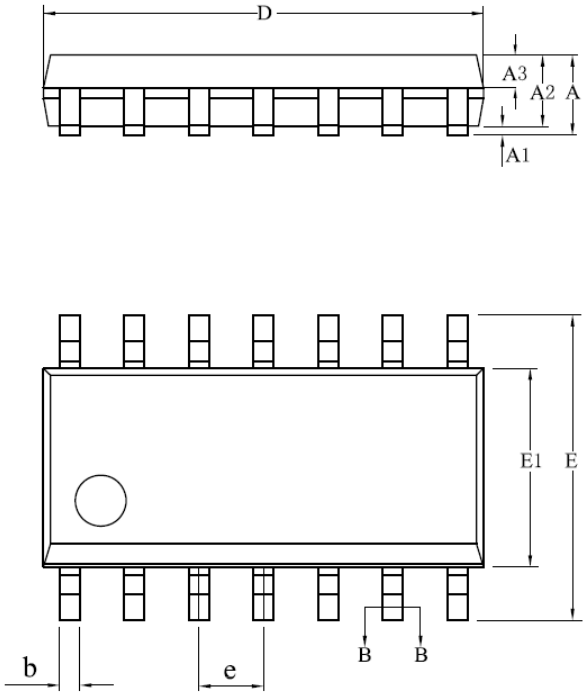
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0.90	1.00	1.05
A3	0.39	0.44	0.49
b	0.20	—	0.28
b1	0.19	0.22	0.25
c	0.13	—	0.17
c1	0.12	0.13	0.14
D	2.90	3.00	3.10
E1	4.30	4.40	4.50
E	6.20	6.40	6.60
e	0.65BSC		
L	0.45	—	0.75
L1	1.00REF		
θ	0	—	8°

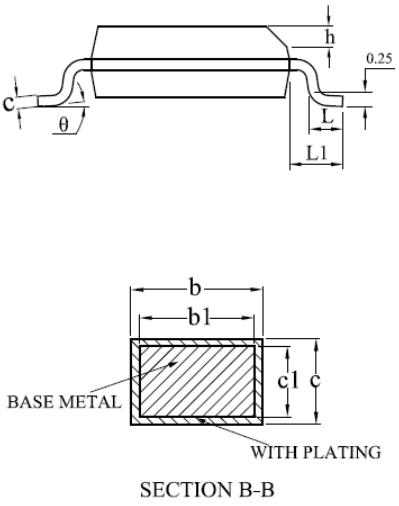
MSOP-8



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.10
A1	0.05	—	0.15
A2	0.75	0.85	0.95
A3	0.30	0.35	0.40
b	0.28	—	0.36
b1	0.27	0.30	0.33
c	0.15	—	0.19
c1	0.14	0.15	0.16
D	2.90	3.00	3.10
E	4.70	4.90	5.10
E1	2.90	3.00	3.10
e	0.65BSC		
L	0.40	—	0.70
L1	0.95REF		
θ	0	—	8°

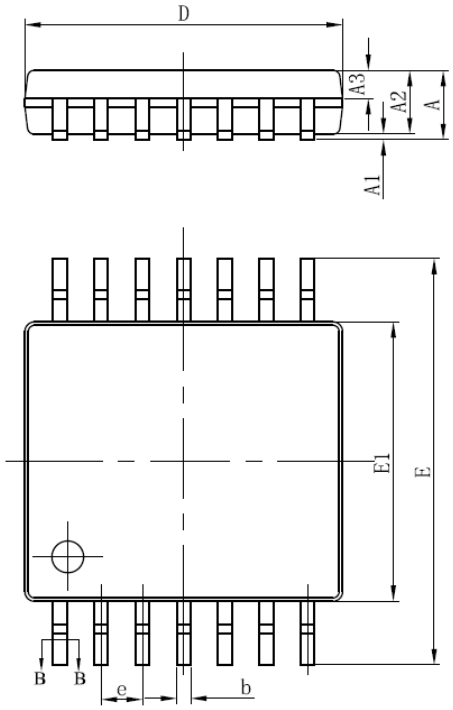
SOIC-14

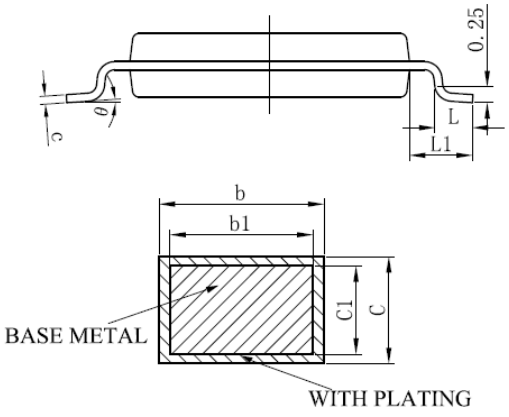




SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.05	—	0.225
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	—	0.47
b1	0.38	0.41	0.44
c	0.20	—	0.24
c1	0.19	0.20	0.21
D	8.55	8.65	8.75
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
h	0.25	—	0.50
L	0.50	—	0.80
L1	1.05REF		
θ	0	—	8°

TSSOP-14





SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.20
A1	0.05	—	0.15
A2	0.90	1.00	1.05
A3	0.39	0.44	0.49
b	0.20	—	0.28
b1	0.19	0.22	0.25
c	0.13	—	0.17
c1	0.12	0.13	0.14
D	4.90	5.00	5.10
E1	4.30	4.40	4.50
E	6.20	6.40	6.60
e	0.65BSC		
L	0.45	0.60	0.75
L1	1.00BSC		
θ	0	—	8°