1MHz, 80μA, RRIO, Op Amps

Features

- Supply Voltage: 2.5V to 5.5V
- Low Supply Current: 80μA per channel
- Positive Offset Voltage: +1mV to +4mV when Vcm is close to Ground
- Offset Voltage Temperature Drift: 2 μV/°C
- High Output Capability: 100mA
- Rail to Rail Input and Output
- Bandwidth: 1 MHz
- Slew Rate: 0.7V/μs
- Excellent EMI Suppress Performance
- Low Noise: 35 nV/√Hz at 1kHz
- –40°C to 125°C Operation Temperature Range

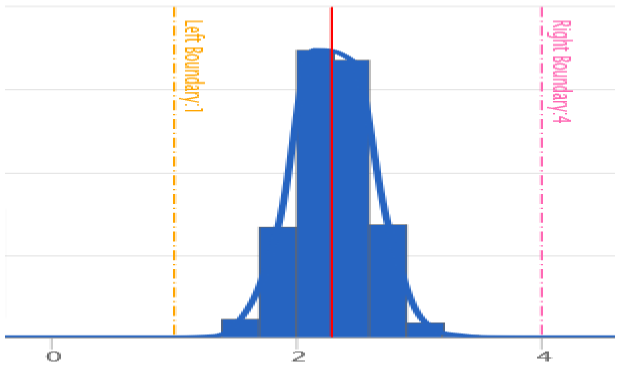
Applications

- Wireless Charger
- Smoke/Gas/Environment Sensors
- Portable Instruments and Mobile Device

Description

The LMV358BP is CMOS RRIO op-amps with low offset, low power and stable high frequency response. The product has 1MHz bandwidth, 0.7V/μs slew rate and low distortion while drawing only 80μA of quiescent current per amplifier. The input common-mode voltage range extends 100mV beyond V– and V+, and the outputs swing rail-to-rail.

The LMV358BP is optimized to achieve a positive Vos: +1mV to +4mV at Vcm extends 100mV beyond V-. The feature is very suitable for low side current sense, the positive Vos when Vcm is around to ground to keep the very small current signal showed up to amplifier input; the Vos is less than 4mV, 90% of parts is less than 3mV to keep the accuracy and dynamic range.



Distribution of Vos at Vcc=5V, Vcm=-0.1V

Pin Configuration

LMV358BP
8-Pin SOIC(-S Suffixes)

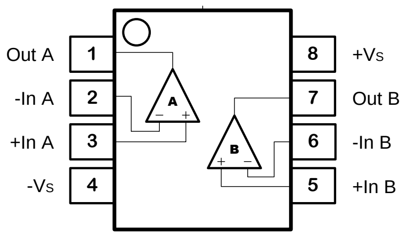


Table of Contents

Revision History

Date	Revision	Notes
2018/4/30	Rev.Pre	Pre-Release Version

Order Information

Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity
LMV358BP-SR	-40 to 125°C	8-Pin SOIC	V358B XXXX Note 3	3	Tape and Reel, 4000

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

Note 2: XX is the date code.

Note 3: XXXX is date code.

Absolute Maximum Ratings Note 1

Parameters	Rating
Supply Voltage, $(+V_S)-(-V_S)$	6 V
Input Voltage	$(-V_S) - 0.3$ to $(+V_S) + 0.3$
Differential Input Voltage	±6V
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.

ESD Rating

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	Human Body Model ESD	ANSI/ESDA/JEDEC JS-001	8	kV
CDM	Charged Device Model ESD	ANSI/ESDA/JEDEC JS-002	2	kV

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
8-Pin SOIC	158	43	°C/W

Electrical Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Power Supply						
V_S	Supply Voltage Range		2.5		5.5	V
I_Q	Quiescent Current per Amplifier			80	130	μA
PSRR	Power Supply Rejection Ratio		70	75		dB
Input Characteristics						
V_{OS}	Input Offset Voltage	V_{CM} = -0.1V to 3V	+1	+2	+4	mV
V_{OS} TC	Input Offset Voltage Drift	T_A = -40°C to 125°C		2		μV/°C
I_B	Input Bias Current	T_A = 25 °C		1		pA
		T_A = 85 °C		25		pA
I_{OS}	Input Offset Current			1		pA
C_{IN}	Input Capacitance	Differential Mode		8		pF
		Common Mode		7		pF
Av	Open-loop Voltage Gain	R_{LOAD} = 10kΩ	85	110		dB
V_{CMR}	Common-mode Input Voltage Range		(V-) - 0.1		(V+) + 0.1	V
CMRR	Common Mode Rejection Ratio	V_{CM} = 0V to 3V	65	85		dB
Xtalk	Channel Separation	f = 1kHz, RL = 2kΩ		110		dB
Output Characteristics						
V_{OH}, V_{OL}	Maximum Output Voltage Swing	R_{LOAD} = 10kΩ		3	15	mV
I_{SC}	Output Short-Circuit Current		90	100		mA
AC Specifications						
GBW	Gain-Bandwidth Product			1		MHz
SR	Slew Rate	A_V = 1, V_{OUT} = 1.5V to 3.5V, C_{LOAD} = 60pF, R_{LOAD} = 1kΩ		0.7		V/μs
t_S	Settling Time, 0.1%	AV = 1, 2V Step, C_{LOAD} = 60pF, R_{LOAD} = 1kΩ		3.5		μs
	Settling Time, 0.01%			4.8		μs
PM	Phase Margin	R_{LOAD} = 1kΩ, C_{LOAD} = 60pF		60		°
GM	Gain Margin	R_{LOAD} = 1kΩ, C_{LOAD} = 60pF		15		dB
Noise Performance						
E_N	Input Voltage Noise	f = 0.1Hz to 10Hz		3		$μV_{RMS}$
e_N	Input Voltage Noise Density	f = 1kHz		35		nV/√Hz
i_N	Input Current Noise	f = 1kHz		2		fA/√Hz
THD+N	Total Harmonic Distortion and Noise	f = 1kHz, AV =1, RL = 2kΩ, VOUT = 1Vp-p		0.003		%

Typical Performance Characteristics

V_S = 5V, V_{CM} = 2.5V, R_L = Open, unless otherwise specified.

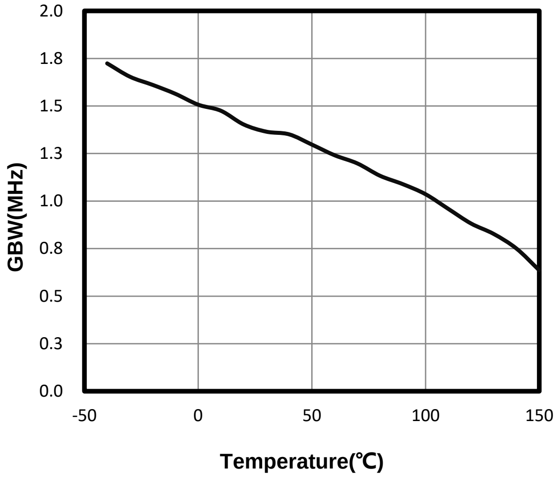


Figure 1. Unity Gain Bandwidth vs. Temperature

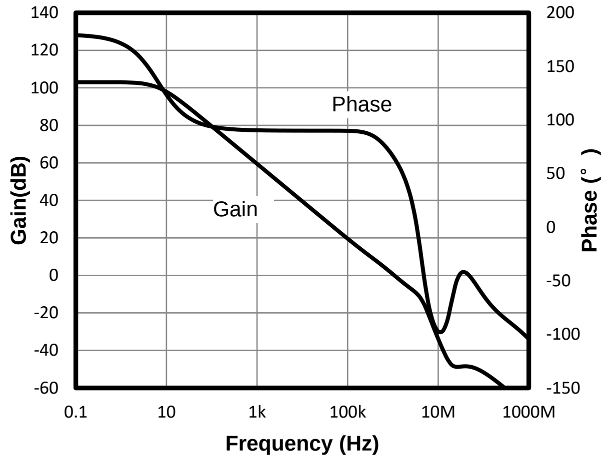


Figure 2. Open-Loop Gain and Phase

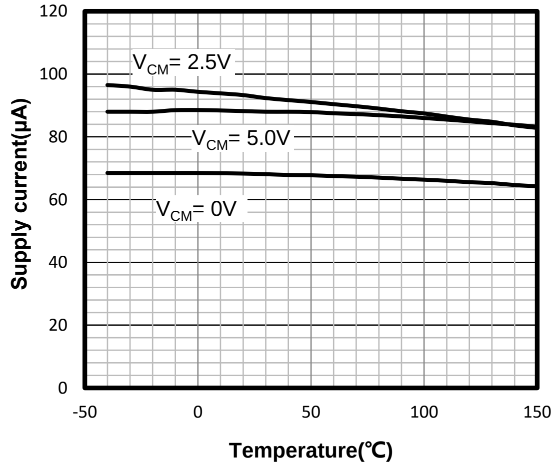


Figure 3. Supply Current vs. Temperature

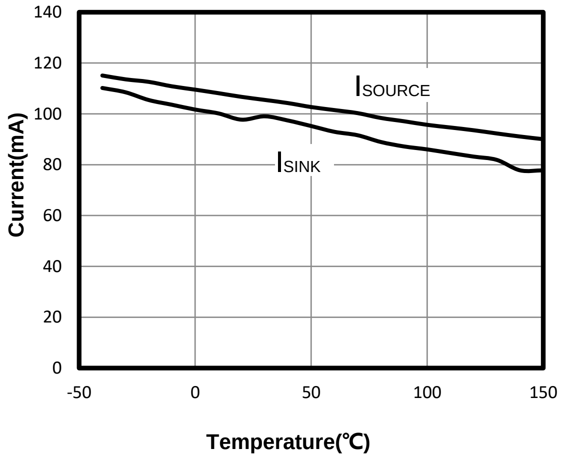


Figure 4. Short Circuit Current vs. Temperature

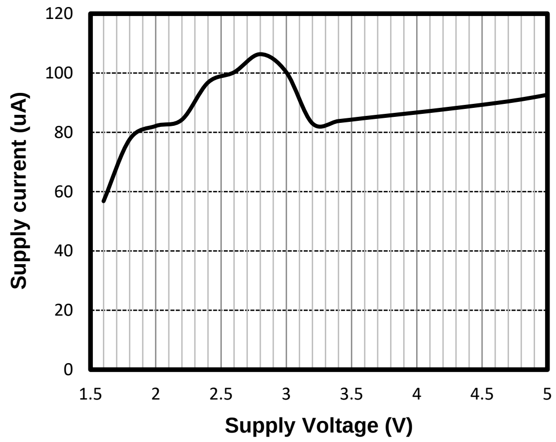


Figure 5. Quiescent Current vs. Supply Voltage

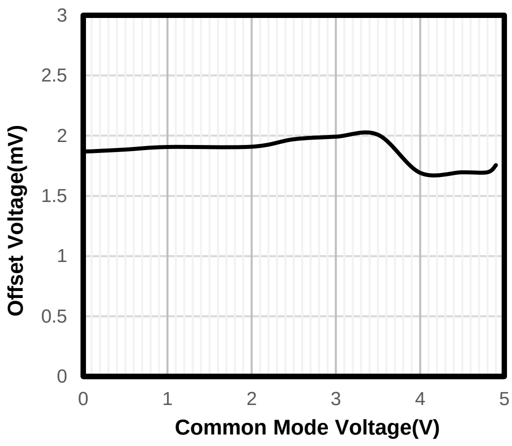


Figure 6. Offset Voltage vs. Common-Mode Voltage

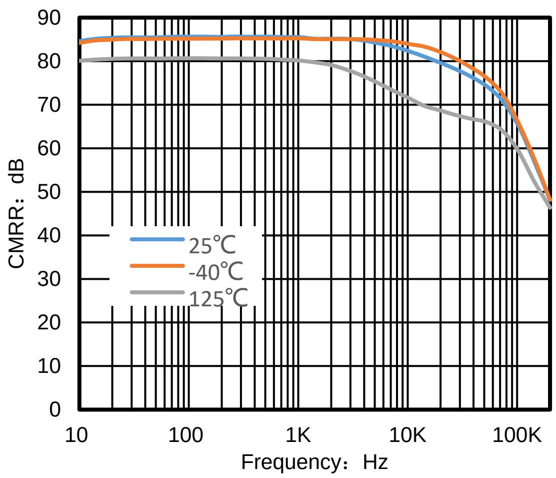


Figure 7. CMRR vs. Frequency

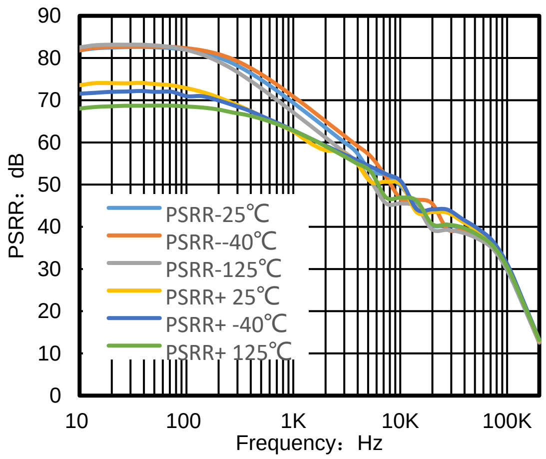


Figure 8. PSRR vs. Frequency

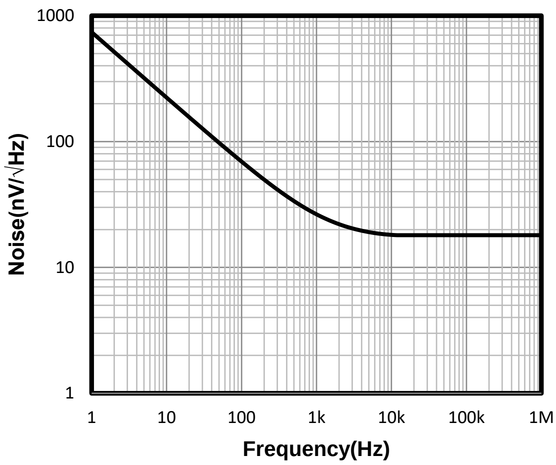


Figure 9. Input Voltage Noise Spectral Density

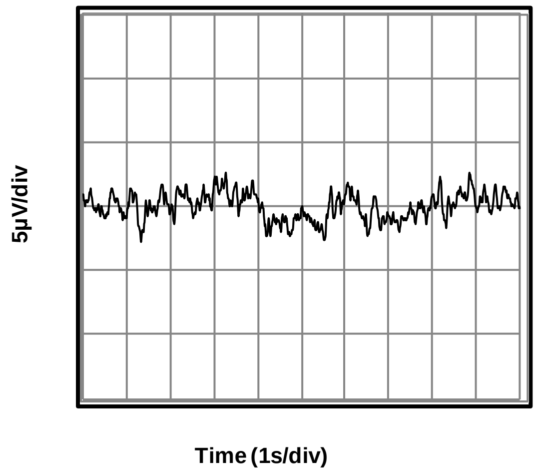


Figure 10. 0.1 Hz to 10 Hz Input Voltage Noise

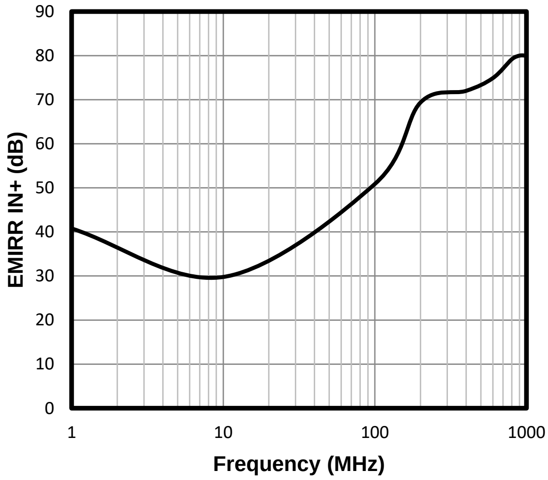


Figure 11. EMIRR IN+ vs. Frequency

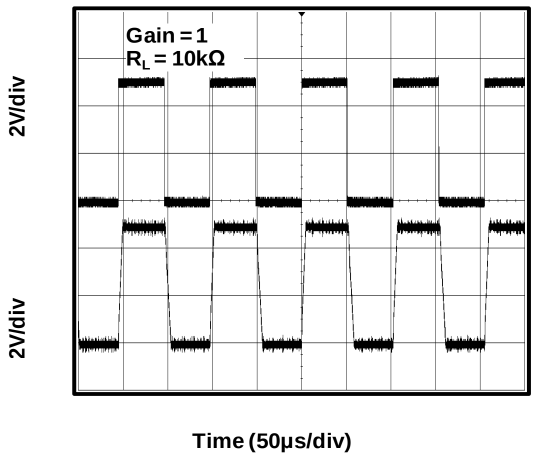


Figure 12. Large-Scale Step Response

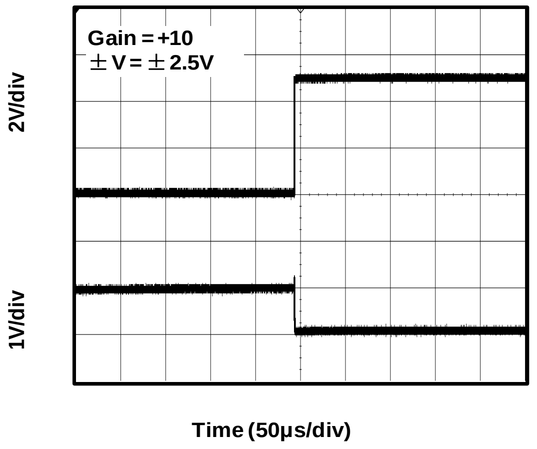


Figure 13. Negative Over-Voltage Recovery

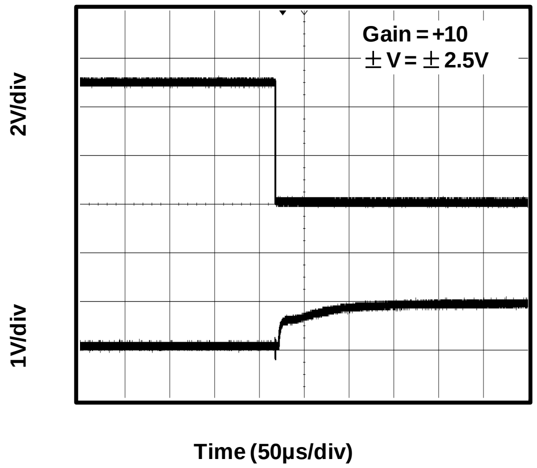


Figure 14. Positive Over-Voltage Recovery

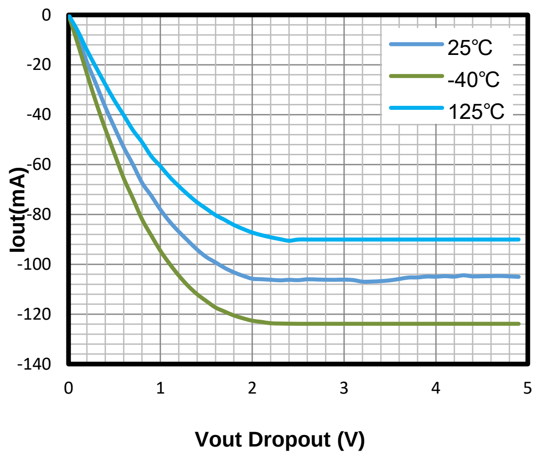


Figure 15. Negative Output Swing vs. Load Current

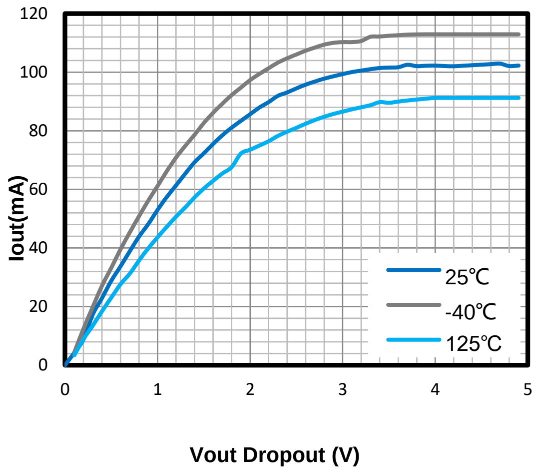
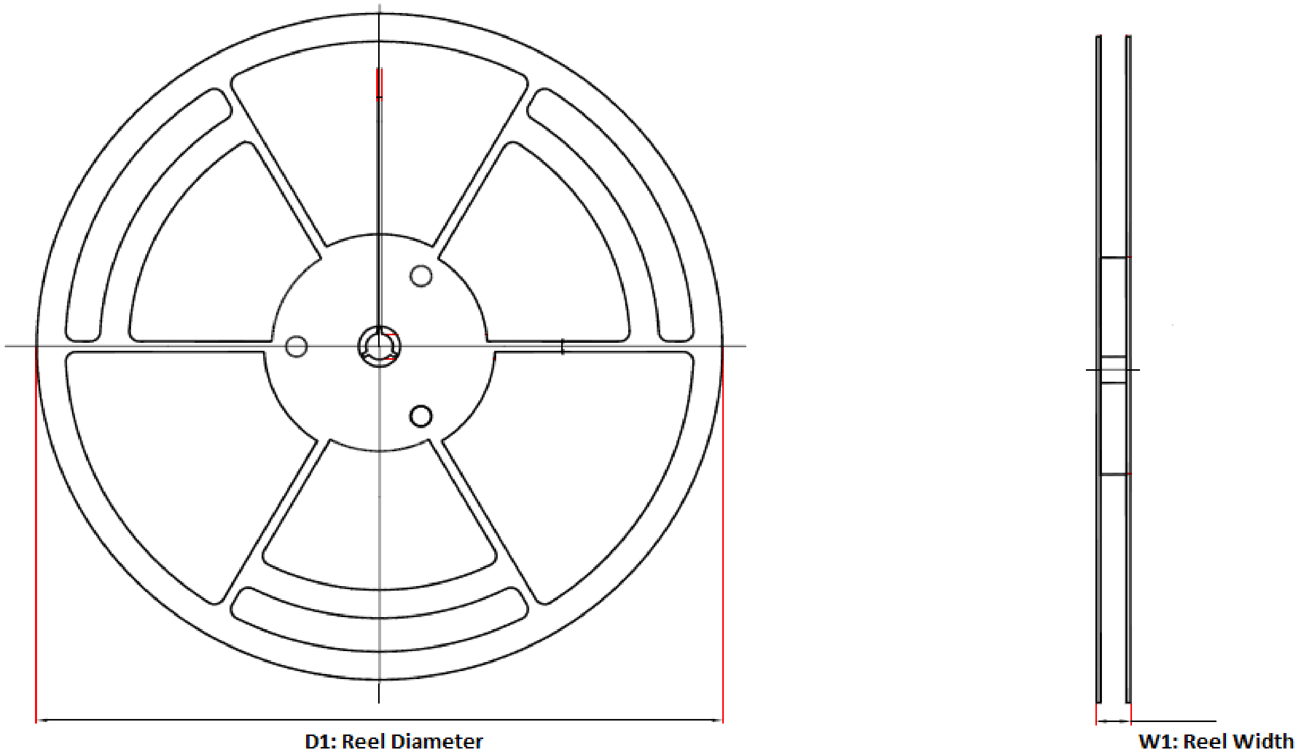
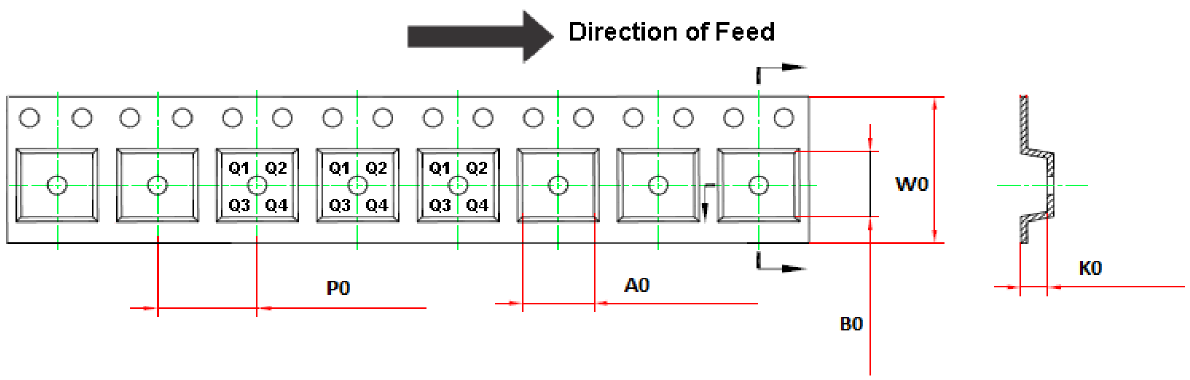


Figure 16. Positive Output Swing vs. Load Current

Tape and Reel Information

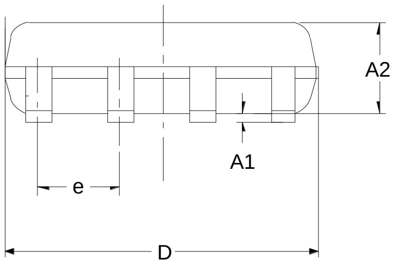


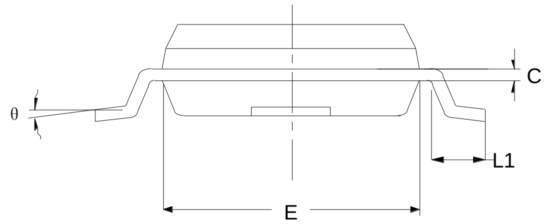


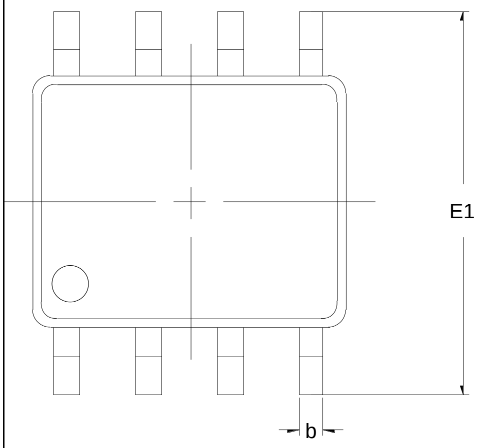
Order Number	Package	D1	W1	A0	B0	K0	P0	W0	Pin1 Quadrant
LMV358BP-SR	8-Pin SOIC	330.0	17.6	6.4	5.4	2.1	8.0	12.0	Q1

Package Outline Dimensions

SOP-8/ SOIC-8







Symbol	Dimensions In Millimeters	
	Min	Max
A1	0.100	0.250
A2	1.300	1.550
b	0.330	0.510
C	0.170	0.250
D	4.780	5.000
E	3.800	4.000
E1	5.800	6.300
e	1.270TYP	
L1	0.400	0.900
θ	0°	8°