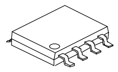
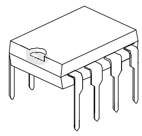
GENERAL PURPOSE, LOW VOLTAGE, RAIL-TO-RAIL OUTPUT OPERATIONAL AMPLIFIERS



SOP-8



DIP-8

DESCRIPTION

The UTC LMV358 are low voltage (2.7-5.5V) versions of the dual and quad commodity op amps, LM358, which currently operate at 5-30V. The LMV358 are the most cost effective solutions for the applications where low voltage operation, space saving and low price are needed. They offer specifications that meet or exceed the familiar LM358. The LMV358 have rail-to-rail output swing capability and the input common-mode voltage range includes ground. They alll exhibit excellent speed-power ratio, achieving 1 MHz of bandwidth and 1 V/µs of slew rate with low supply current.

The chips are built with National's advanced submicron silicon-gate BiCMOS process. The LMV358 have bipolar input and output stages for improved noise performance and higher output current drive.

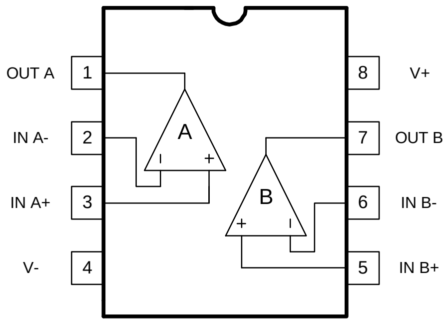
FEATURES

(For V^1 =5V and V=0V. Typical Unless Otherwise Noted)
*Guaranteed 2.7V and 5V Performance
*No Crossover Distortion
*Space Saving Package
*Industrial Temp. Range
*Gain-Bandwidth Product
*Low Supply Current: 210µA
*Rail-to-Rail Output Swing
@10kΩ Load V^1-10mV
V +65mV
*V_{CM} -0.2V to V^1 –0.8V

APPLICATIONS

*Active Filters
*General Purpose Low Voltage Applications
*General Purpose Portable Devices

PIN CONFIGURATIONS



ABSOLUTE MAXIMUM RATINGS

PARAMETER	VALUE	UNIT
ESD Tolerance(Note 2)		
Machine Model	100	V
Human Body Model	2000	V
Differential Input Voltage	+-Supply Voltage	
Supply Voltage (V^1-V)	5.5	V
Output Short Circuit to V^1	(Note 3)	
Output Short Circuit to V	(Note 4)	
Mounting Temp.		
Lead Temp. (Soldering 10 sec)	260	°C
Infrared (15 sec)	215	°C
Storage Temp. Range	-65 to 150	°C
Junction Temp. (Tj, max) (Note 5)	150	°C

OPERATING RATINGS (NOTE 1)

PARAMETER	VALUE	UNIT
Supply Voltage	2.7 to 5.5	V
Temperature Range	-40<=Tj<=85	°C
Thermal Resistance (θ_{JA}) (Note 10)	235	°C/W

2.7V DC ELECTRICAL CHARACTERISTICS

Unless otherwise specified, all limits guaranteed for Tj=25°C, V^1=2.7V, V=0V, V_{CM}=1.0V, Vo=V^1/2 and RL=1MΩ

PARAMETER	SYMBOL	CONDITIONS	TYP (note6)	LIMIT (note7)	UNIT
Input Offset Voltage	Vos		1.7	7	mV max
Input Offset Voltage Average Drift	TCVos		5		μV/°C
Input Bias Current	Is		11	250	nA max
Input Offset Current	Ios		5	50	nA max
Common Mode Rejection Ratio	CMRR	0V<=V_{CM}<=1.7V	63	50	dB min
Power Supply Rejection Ratio	PSRR	2.7V<=V^1<=5V Vo=1V	60	50	dB min
Input Common-Mode Voltage Range	V_{CM}	For CMRR>=50dB	-0.2	0	V min
			1.9	1.7	V max
Output Swing	Vo	RL=10kΩ to 1.35V	V^1-10	V^1-100	mV min
			60	180	mV max
Supply Current	Is	Both amplifiers	140	340	μA

PARAMETER	SYMBOL	CONDITIONS	TYP (note6)	LIMIT (note7)	UNIT
					max

2.7V AC ELECTRICAL CHARACTERISTICS

Unless otherwise specified, all limits guaranteed for Tj=25°C, V^1=2.7V, V=0V, V_{CM}=1.0V, Vo=V^1/2 and RL>1MΩ

PARAMETER	SYMBOL	CONDITIONS	TYP (note6)	LIMIT (note7)	UNIT
Gain-Bandwidth Product	GBWP	CL=200pF	1		MHz
Phase Margin	Φ(T)		60		Deg
Gain Margin	G(r)		10		dB
Input-Referred Voltage Noise	θr1	F=1kHz	46		$\frac{nV}{\sqrt{Hz}}$
Input-referred Current Noise	Ir1	F=1kHz	0.17		$\frac{pA}{\sqrt{Hz}}$

5V DC ELECTRICAL CHARACTERISTICS

Unless otherwise specified, all limits guaranteed for Tj=25°C, V^1=5V, V=0V, V_{CM}=2.0V, Vo=V^1/2 and RL>1MΩ.
Boldface limits apply at the temperature extremes.

PARAMETER	SYMBOL	CONDITIONS	TYP	LIMIT	UNIT
Input Offset Voltage	Vos		1.7	7 9	mV max
Input Offset Voltage Average Drift	TCVos		5		μV/°C
Input Bias Current	IB		15	250 500	nA max
Input Offset Current	Ios		5	50 150	nA max
Common Mode Rejection Ratio	CMRR	0V<=V_{CM}<=4V	65	50	dB min
Power Supply Rejection Ratio	PSRR	2.7V<=V^1<=5V Vo=1V V_{CM}=1V	60	50	dB min
Input Common-Mode Voltage Range	V_{CM}	For CMRR>=50dB	-0.2	0	V min
			4.2	4	V max
Large Signal Voltage Gain(Note 8)	Av	RL=2kΩ	100	15 10	V/mV min
Output Swing	Vo	RL=2kΩ to 2.5V	V^1-40	V^1-300 V^+-400	mV min
			120	300 400	mV max
	Vo	RL=10kΩ to 2.5V	V^1-10	V^1-100 V^+-200	mV min
			65	180 280	mV max
Output Short Circuit Current	Io	Sourcing,Vo=0V	60	5	mA min

PARAMETER	SYMBOL	CONDITIONS	TYP	LIMIT	UNIT
		Sinking,Vo=5V	160	10	mA min
Supply Current	Is	Both amplifiers	210	440 615	µA max

2.5V AC ELECTRICAL CHARACTERISTICS

Unless otherwise specified, all limits guaranteed for Tj=25°C, V^1=2.7V, V=0V, VCM=2.0V, Vo=V^1/2 and RL>1MΩ

PARAMETER	SYMBOL	CONDITIONS	TYP	LIMIT	UNIT
Slew Rate	SR	(Note 9)	1		V/µs
Gain-Bandwidth Product	GBWP	CL=200pF	1		MHz
Phase Margin	Φ(T)		60		Deg
Gain Margin	G(r)		10		dB
Input-Referred Voltage Noise	θr1	f=1kHz	39		$\frac{nV}{\sqrt{Hz}}$
Input-referred Current Noise	Ir1	f=1kHz	0.21		$\frac{pA}{\sqrt{Hz}}$

Note1: Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performances is not guaranteed. For guaranteed specifications and the test conditions, see the Electrical Characteristics.

Note2: Human body model 1.5kΩ in series with 100pF. Machine model, 0Ω in series with 200pF.

Note3: Shorting output to V^1 will adversely after reliability.

Note4: Shorting output to V^+ will adversely affect reliability.

Note5: The maximum power dissipation is a function of Tj(max) θJA and TA. The maximum allowable power dissipation at any ambient temperature is PD=(Tj(max)-TA)/θJA. All numbers apply for packages soldered directly into a PC board.

Note6: Typical values represent the most likely parametric norm.

Note7: All limits are guaranteed by testing or statistical analysis.

Note8: RL is connected to V. The output voltages is 0.5V<=Vo<=4.5V.

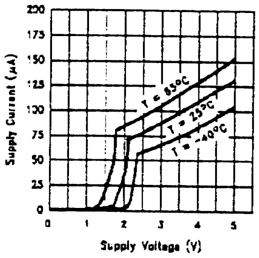
Note9: Connected as voltage follower with 3V step input. Number specified is thes lower of the positive and negative slew rates.

Note10: all numbers are typical, and apply for packages soldered directly note a PC board is still air.

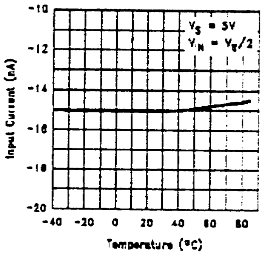
TYPICAL PERFORMANCE CHARACTERISTICS

(Unless otherwise specified, V_E=+5V, single supply. TA=25°C)

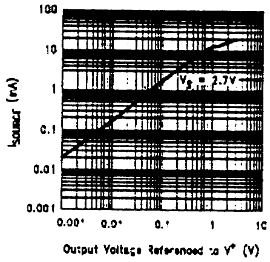
Supply Current vs Supply Voltage (LMV321)



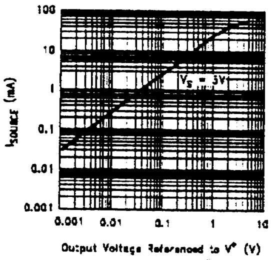
Input Current vs Temperature



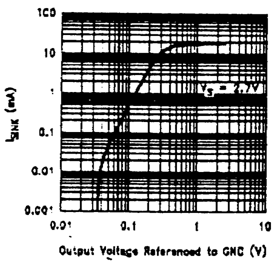
Sourcing Current vs Output Voltage



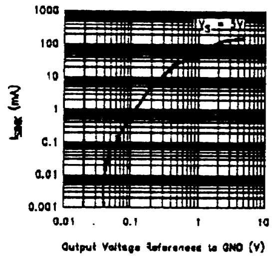
Sourcing Current vs Output Voltage



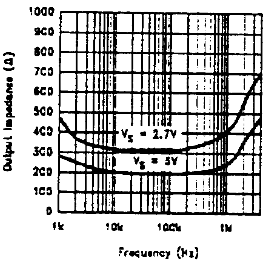
Sinking Current vs Output Voltage



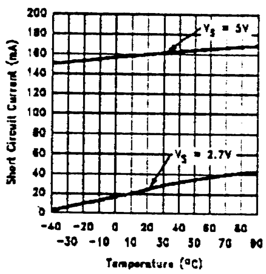
Sinking Current vs Output Voltage



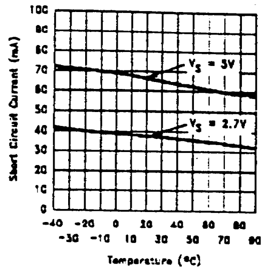
Open Loop Output Impedance vs Frequency



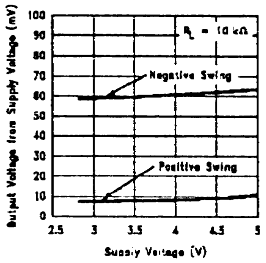
Short Circuit Current vs Temperature (Sinking)



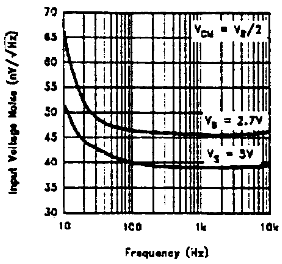
Short Circuit Current vs Temperature (Sourcing)



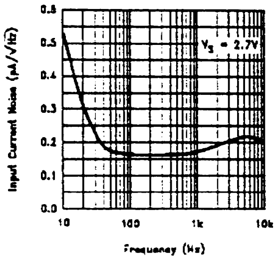
Output Voltage Swing
vs Supply Voltage



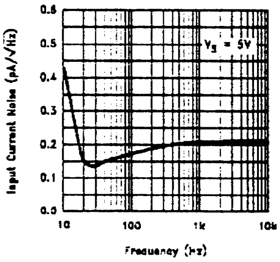
Input Voltage Noise vs Frequency



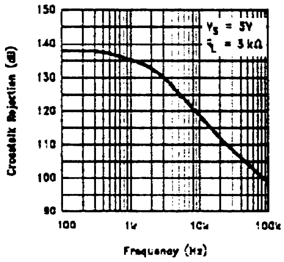
Input Current Noise vs Frequency



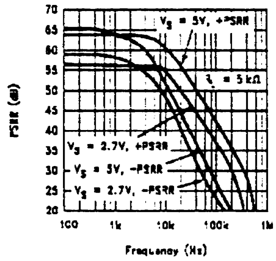
Input Current Noise vs Frequency



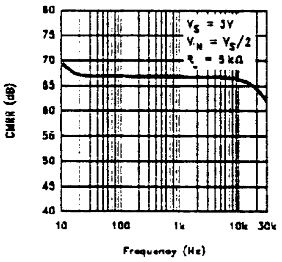
Crosstalk Rejection vs Frequency



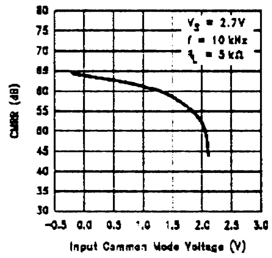
PSRR vs Frequency



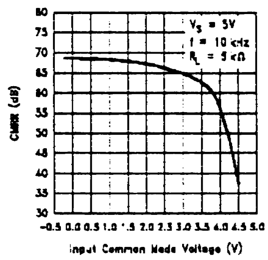
CMRR vs Frequency



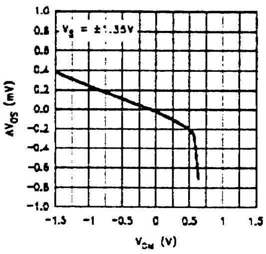
CMRR vs Input
Common Mode Voltage



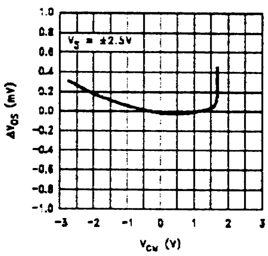
CMRR vs Input
Common Mode Voltage



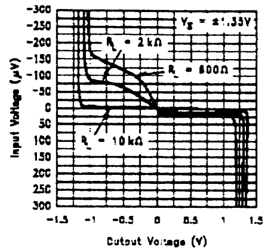
Δ V_{OS} vs CMR



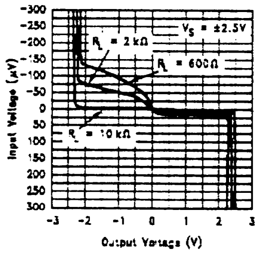
Δ V_{OS} vs CMR



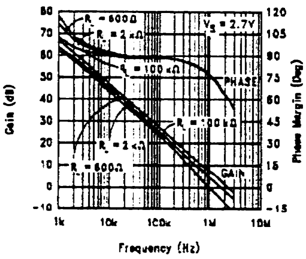
Input Voltage vs Output Voltage



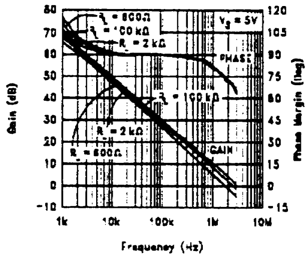
Input Voltage vs Output Voltage



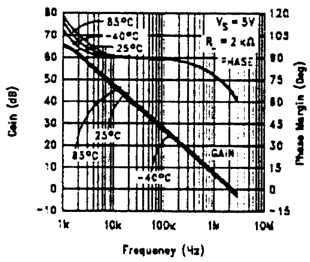
Open Loop Frequency Response



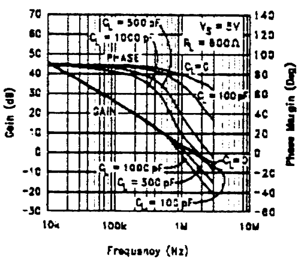
Open Loop Frequency Response



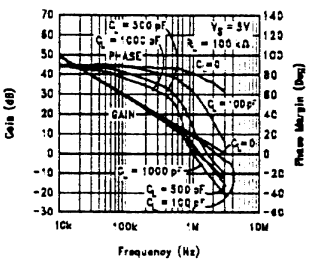
Open Loop Frequency Response vs Temperature



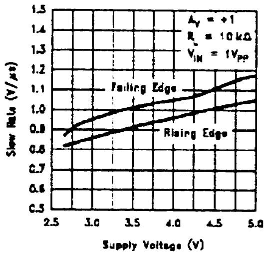
Gain and Phase vs Capacitive Load



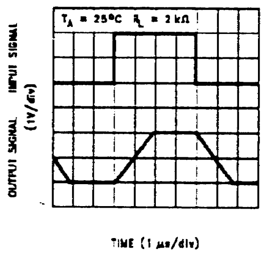
Gain and Phase vs Capacitive Load



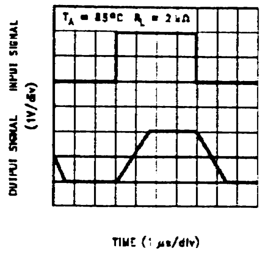
Slew Rate vs Supply Voltage



Non-Inverting Large Signal Pulse Response



Non-Inverting Large Signal Pulse Response



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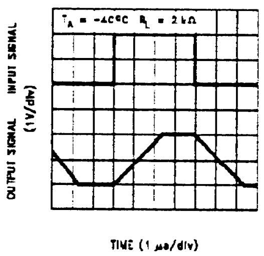
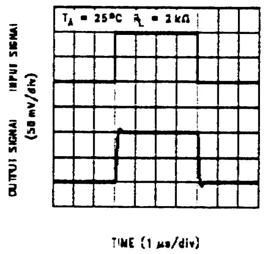
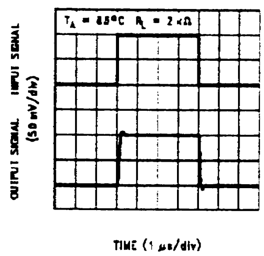


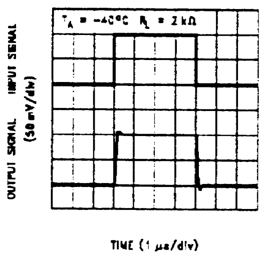
Non-Inverting Small Signal Pulse Response



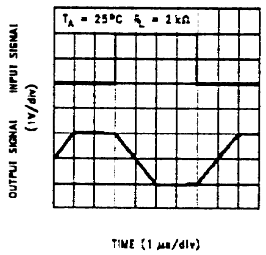
Non-Inverting Small Signal Pulse Response



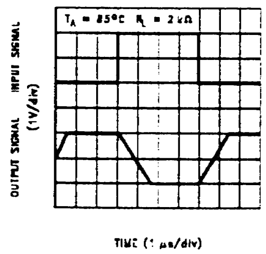
Non-Inverting Small Signal Pulse Response



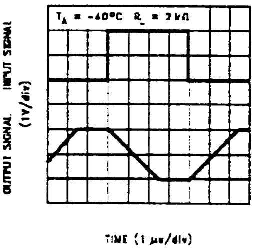
Inverting Large Signal Pulse Response



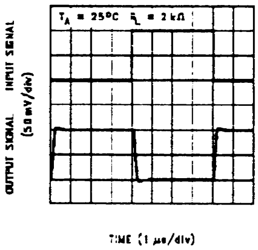
Inverting Large Signal Pulse Response



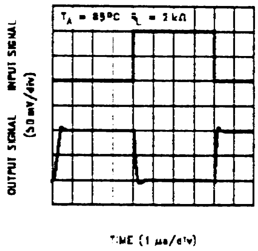
Inverting Large Signal Pulse Response



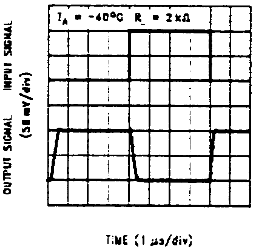
Inverting Small Signal Pulse Response



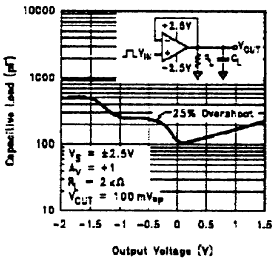
Inverting Small Signal Pulse Response



Inverting Small Signal Pulse Response



Stability vs Capacitive Load



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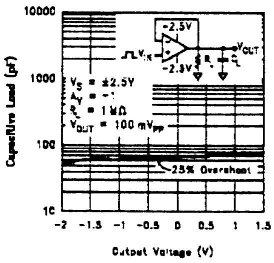

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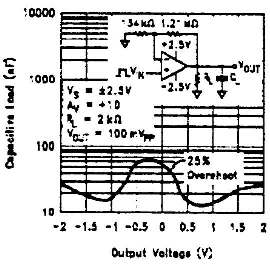
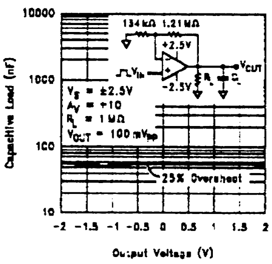


Stability vs Capacitive Load



THD vs Frequency