Dual Operational Amplifier – LM358A

Low power, Dual Operational Amplifier in bare die form

Rev 1.1
21/01/18

Description

The LM358A consists of x2 independent, high gain, internally frequency compensated operational amplifiers operating from a single power supply as low as 3V or as high as 32V. The device is useful in interface circuits with digital systems and can be operated from the single common 5V power supply. The device also finds use in transducer amplifiers, DC gain blocks & many other conventional op-amp circuits which benefit from the single power supply capability. I_Q per amplifier is about 1/5 of the industry 741. Split-supply operation is also possible with supply current drain independent of voltage supplied for low power. The die size is one of the smallest in the industry.

Features:

- Temperature compensated bandwidth (unity gain)
- Temperature compensated I_B: 45nA
- Wide power supply range, single supply: 3V-32V or dual supplies: ±1.5V to ±16V
- Low V_{OS}: 2mV, and I_{OS}: 5nA
- Differential input voltage range equal to the power supply voltage
- Large output voltage: 0V to V_{CC} -1.5V swing
- Input Common-Mode Voltage range includes GND

Ordering Information

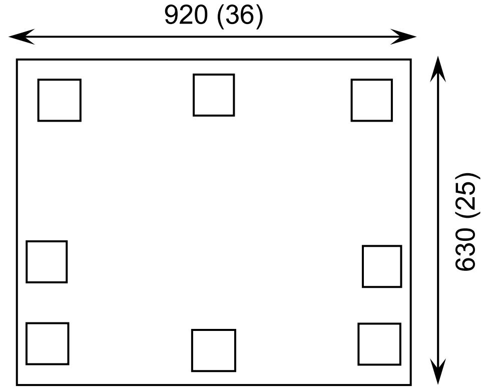
The following part suffixes apply:

- No suffix - MIL-STD-883 /2010B Visual Inspection

For High Reliability versions of this product please see

LM158 and LM158A

Die Dimensions in µm (mils)



Supply Formats:

- Default – Die in Waffle Pack (400 per tray capacity)
- Sawn Wafer on Tape – On request
- Unsawn Wafer – On request
- Die Thickness <> 350µm(15 Mils) – On request
- Assembled into Ceramic Package – On request

Mechanical Specification

Die Size (Unsawn)	920 x 630 36 x 25	µm mils
Minimum Bond Pad Size	85 x 85 3.35 x 3.35	µm mils
Die Thickness	350 (±20) 13.78 (±0.79)	µm mils
Top Metal Composition	Al 1%Si 1.1µm	
Back Metal Composition	N/A – Bare Si	

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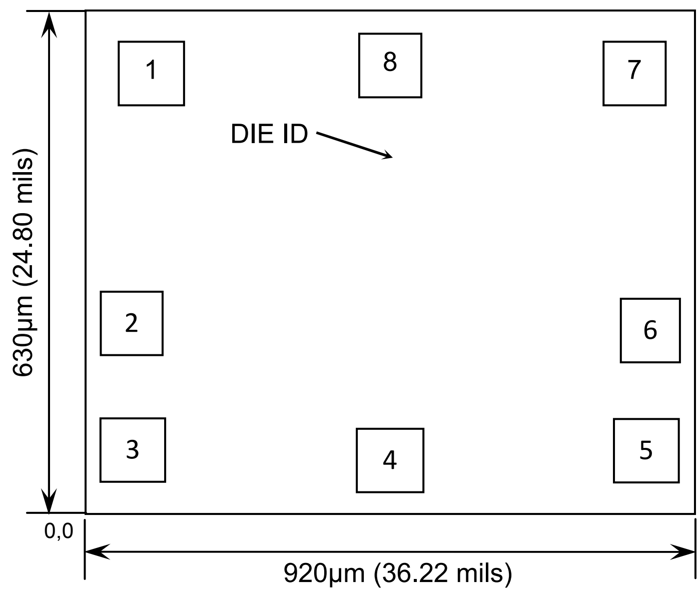
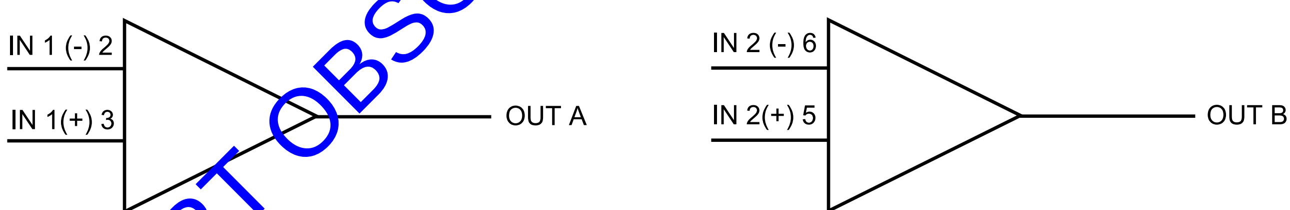
Pad Layout and Functions



PAD	FUNCTION	COORDINATES (mm)	
		X	Y
1	OUTPUT A	0.1285	0.5015
2	– INPUT A	0.1125	0.2425
3	+ INPUT A	0.1125	0.1125
4	GND	0.4600	0.1075
5	+ INPUT B	0.8075	0.1125
6	– INPUT B	0.8075	0.2425
7	OUTPUT B	0.7915	0.5015
8	V_{CC}	0.4600	0.5175
CHIP BACK POTENTIAL IS FLOAT			

Logic Diagram



PAD 8 = V_{CC}

PAD 4 = GND

Absolute Maximum Ratings[1]

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage – Single Supply	V_{CC}	32	V
Supply Voltage – Split Supply		±16	V
Input Differential Voltage Range	V_{IDR}	32	V
Input Common Mode Voltage Range	V_{ICR}	-0.3 to 32	V
Output Short Circuit to Ground	-	Continuous	-
Junction Temperature	T_J	150	°C
Input Current (per pin)[2]	I_{IN}	50	mA

1. Operation above the absolute maximum rating may cause device failure. Operation at the absolute maximum ratings, for extended periods, may reduce device reliability.
2. $V_{IN} < -0.3V$. This input current exists when voltage is driven negative at any of the input leads

Recommended Operating Conditions

PARAMETER	SYMBOL	MIN	MAX	UNITS
DC Supply Voltage	V_{CC}	±2.5 or 5	±15 or 30	V
Operating Temperature	T_A	0	+70	°C

DC Electrical Characteristics (T_A = 0 to 70°C unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS		LIMITS			UNITS
				MIN	TYP	MAX	
Input Offset Voltage	V_{IO}	V_O =1.4V, V_{CC} = 5V - 30V; R_S = 0Ω, V_{ICM}=0V to V_{CC}-1.7V	25°C	-	2	3	mV
			70°C	-	-	5	
Input Offset Voltage Drift	$\Delta V_{IO}/\Delta T$	V_{CC} = 30V; R_S = 0Ω		-	7	20	µV/°C
Input Offset Current	I_{IO}	V_{CC} = 5V	25°C	-	5	30	nA
			70°C	-	-	75	
Input Offset Current Drift	$\Delta I_{IO}/\Delta T$	V_{CC} = 30V; R_S = 0Ω		-	10	300	pA/°C
Input Bias Current	I_{IB}	V_{CC} = 5V	25°C	-	45	100	nA
			70°C	-	40	200	
Supply Current	I_{CC}	R_L=∞,V_{CC}=5V, V_O = 0V		-	0.5	1.2	mA
		R_L=∞,V_{CC}=30V, V_O = 0V		-	1	2	
Common Mode Input Voltage range	V_{ICR}	V_{CC} = 30V	25°C	0	-	V_{CC} -1.5	V
			70°C	0	-	V_{CC} -2	
Differential Input Voltage range	V_{IDR}	All V_{IN} ≥ GND or V_{CC}- (if used)		-	-	V_{CC}	V

DC Electrical Characteristics continued (T_A = 0 to 70°C unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS		LIMITS MIN	TYP	MAX	UNITS
Large-Signal Open-Loop Voltage Gain	A_{VOL}	V_{CC} =15V, $R_L \geq 2K\Omega$	25°C	25	100	-	V/mV
			70°C	15	-	-	
Output High-Level Voltage swing	V_{OH}	V_{CC} =30V, R_L=2KΩ		26	-	-	V
		V_{CC} =30V, R_L=10KΩ		27	28	-	
Output Low-Level Voltage swing	V_{OL}	V_{CC} =5V, R_L=10KΩ		-	5	20	mV
Common-Mode Rejection Ratio	CMRR	V_{CC} =30V, R_S=10KΩ, T_A = 25°C		65	85	-	dB
Power Supply Rejection Ratio	PSSR	V_{CC} =30V, T_A = 25°C		65	100	-	dB
Crosstalk Attenuation	V_{O1}/V_{O2}	f =1KHz to 20KHz, V_{CC}=30V, T_A = 25°C		-	-120	-	dB
Output Short-Circuit current to GND	I_{SC}	V_{CC} = 5V, V_O = 0V, T_A = 25°C		-	40	60	mA
Output Source Current	I_{SOURCE}	V_{IN}+ = 1V, V_{IN}- =0V, V_{CC} =15V, V_O = 2V	25°C	20	40	-	mA
			70°C	10	20	-	
Output Sink Current	I_{SINK}	V_{IN}+ = 0V, V_{IN}- =1V, V_{CC} =15V, V_O = 2V	25°C	10	20	-	mA
			70°C	5	8	-	
		V_{IN}+ = 0V, V_{IN}- =1V, V_{CC} =15V, V_O = 0.2V, T_A = 25°C		12	50	-	µA

Typical Characteristics

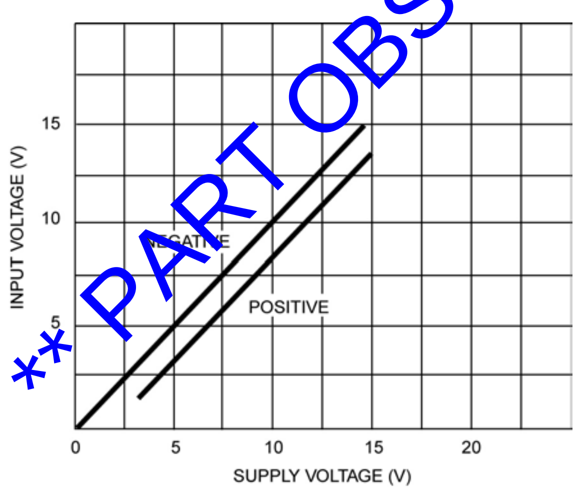


FIGURE 1. Input Voltage Range versus Supply Voltage

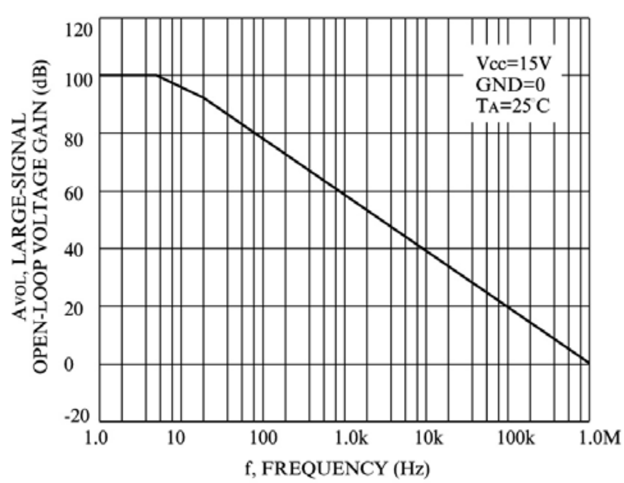


FIGURE 2. Open-Loop Frequency

Typical Characteristics continued

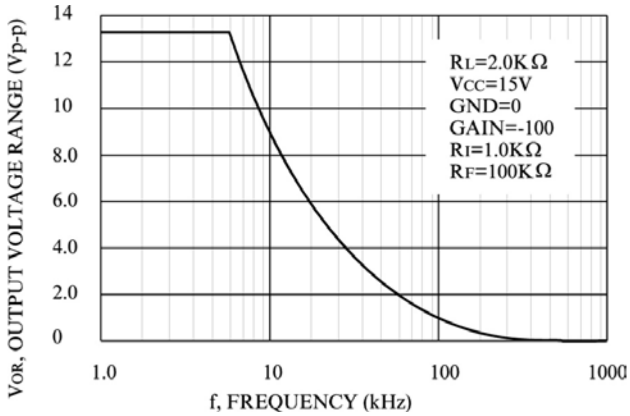


FIGURE 3. Large-Signal Frequency response

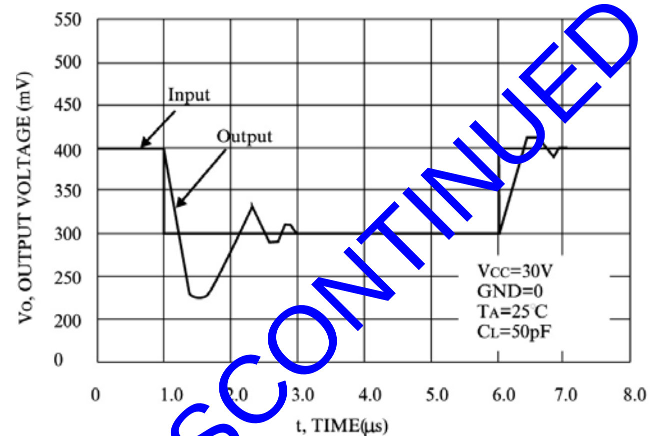


FIGURE 4. Small-Signal Voltage Follower Pulse Response (Non-inverting)

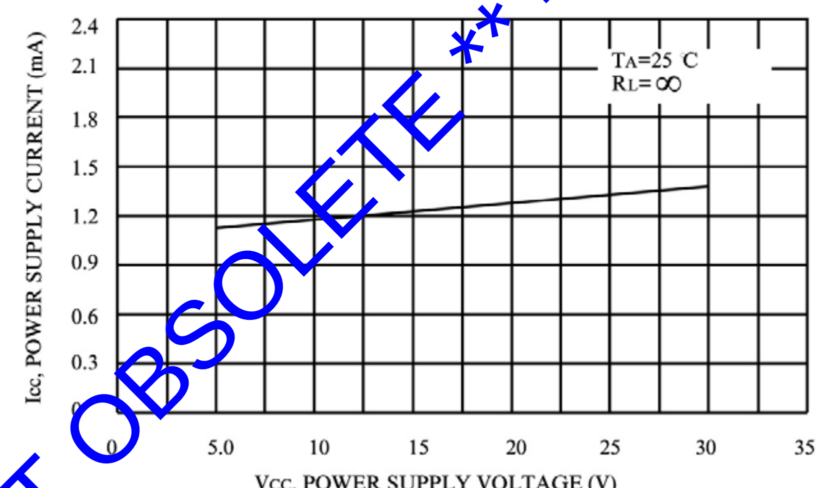


FIGURE 5. Power Supply Current versus Power Supply Voltage

Typical Characteristics continued

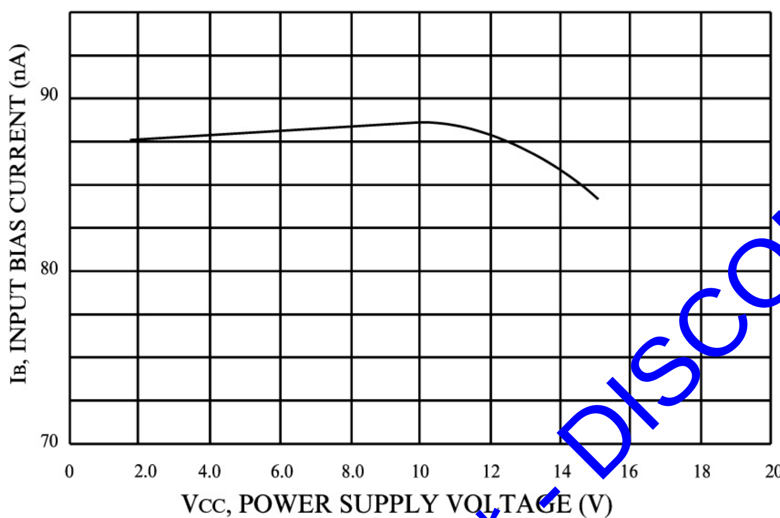


FIGURE 6. Low frequency Op-Amp with Offset adjust