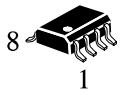
FLM358 DUAL OPERATIONAL AMPLIFIER AND VOLTAGE REFERENCE

OPERATIONAL AMPLIFIER

- LOW INPUT OFFSET VOLTAGE : 0.5 mV typ.
- LOW SUPPLY CURRENT : 350μA/op. (@ Vcc = 5V)
- MEDIUM BANDWIDTH (unity gain) : 0.9MHz
- LARGE OUTPUT VOLTAGE SWING : 0V to (Vcc – 1.5V)
- INPUT COMMON MODE VOLTAGE RANGE INCLUDES GROUND
- WIDE POWER SUPPLY RANGE : 3 to 32V ±1.5 to ±16V

VOLTAGE REFERENCE

- FIXED OUTPUT VOLTAGE REFERENCE 2.5V
- 0.4% AND 1% VOLTAGE PRECISION
- SINK CURRENT CAPABILITY : 1 to 100mA
- TYPICAL OUTPUT IMPEDANCE : 0.2Ω

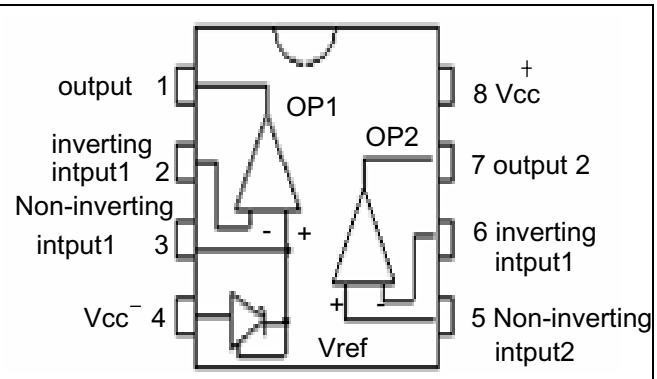


D
SO-8
(Plastic Micropackage

ORDERING NUMBER:

FLM358	Plastic Micropackage
IZ103A	Chip

PIN CONNECTIONS (top view)



DESCRIPTION

The FLM358 is a monolithic IC that includes one independent op-amp and another op-amp for which the non inverting input is wired to a 2.5V fixed Voltage Reference. This device is offering space and cost saving in many applications like power supply management or data acquisition systems.

Part Number	Temperature Range	Package
FLM358	-40ºC, +105ºC	**SOP- 8**

D = Small Outline Package (SO) – also available in Tape & Reel (DT)

Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
Vcc	Supply Voltage	36	V
V_{id}	Differential Input Voltage	36	V
V_i	Input Voltage	-0.3 to +36	V
Tj	Maximum Junction Temperature	150	ºC

Electrical Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
Icc	Total Supply Current, excluding Current in the Voltage Reference Vcc+ = 5 V, no load Tmin < Tamb < Tmax Vcc+ = 30 V, no load Tmin < Tamb < Tmax		0.7	1.2 2	mA

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OPERATOR 2 (independent op-amp)

Vcc^+ = +5 V, Vcc = Ground, V_o = 1.4 V, Tamb = 25 ºC (unless otherwise specified)

Symbol	Parameter	Min	Typ	Max	Unit
V_{io}	Input Offset Voltage T_{amb} = 25 ºC $T_{min} \le T_{amb} \le T_{max}$		0.5	3 5	mV
DV_{io}	Input Offset Voltage Drift			7	µV/ ºC
I_{io}	Input Offset Current $T_{min.} \le T_{amb} \le T_{max}$		2	30 50	nA
I_{ib}	Input Bias Current $T_{min.} \le T_{amb} \le T_{max}$		20	150 200	nA
Avd	Large Signal Voltage Gain Vcc = 15V, R_L = 2k, V_o = 1.4V to 11.4V $T_{min.} \le T_{amb} \le T_{max}$	50 25	100		V/mV
SVR	Supply Voltage Rejection Ratio Vcc = 5V to 30V	65	100		dB
Vicm	Input Common Mode Voltage Range Vcc = +30V – see note [1)] $T_{min.} \le T_{amb} \le T_{max}$	0 0		(Vcc^+) -1.5 (Vcc^+) -2	V
CMR	Common Mode Rejection Ratio $T_{min.} \le T_{amb} \le T_{max}$	70 60	85		dB
I_{source}	Output Current Source Vcc = +15V, Vo = 2V, V_{id} = +1V	20	40		mA
I_o	Short Circuit to Ground Vcc = +15V		40	60	mA
I_{sink}	Output Current Sink V_{id} = -1V, Vcc = +15V, Vo = 2V	10	20		mA
V_{OH}	High Level Output Voltage Vcc^+ = 30V, Tamb = 25 ºC, R_L = 10k $T_{min.} \le T_{amb} \le T_{max}$	27 27	28		V
V_{OL}	Low Level Output Voltage R_L = 10k $T_{min.} \le T_{amb} \le T_{max}$		5	20 20	mV
SR	Slew Rate at Unity Gain V_i = 0.5 to 3V, Vcc = 15V R_L = 2k, C_L = 100pF, unity gain	0.2	0.4		V/ µs
GBP	Gain Bandwidth Product Vcc = 30V, R_L = 2k, C_L = 100pF f = 100kHz, V_{in} = 10mV	0.5	0.9		MHz
THD	Total Harmonic Distortion f = 1kHz A_V = 20dB, R_L = 2k, Vcc = 30V C_L = 100pF, Vo = $2V_{pp}$		0.02		%

1 The input common-mode voltage of either input signal voltage should not be allowed to go negative by more than 0.3V. The upper end of the common-mode voltage range is Vcc^+ -1.5V.
But either of both inputs can go to +36V without damage.

FLM358 DUAL OPERATIONAL AMPLIFIER AND VOLTAGE REFERENCE

OPERATOR 1 (op-amp with non-inverting input connected to the internal Vref)
Vcc^+ = +5 V, Vcc = Ground, Tamb = 25 ºC (unless otherwise specified)

Symbol	Parameter	Min	Typ	Max	Unit
V_{io}	Input Offset Voltage V_{icm} = 0V T_{amb} = 25 ºC $T_{min} \le T_{amb} \le T_{max}$		0.5	3 5	mV
DV_{io}	Input Offset Voltage Drift			7	µV/ ºC
I_{ib}	Input Bias Current Negative input		20		nA
Avd	Large Signal Voltage Gain V_{icm} = 0V @Vcc = 15V, R_L = 2k		100		V/mV
SVR	Supply Voltage Rejection Ratio V_{icm} = 0V Vcc^+ = 5V to 30V	65	100		dB
I_{source}	Output Current Source Vo = 2V Vcc = +15V, V_{id} = +1V	20	40		mA
I_o	Short Circuit to Ground Vcc = +15V		40	60	mA
I_{sink}	Output Current Sink V_{id} = -1V, Vcc = +15V, Vo = 2V	10	20		mA
V_{OH}	High Level Output Voltage Vcc^+ = 30V, Tamb = 25 ºC, R_L = 10k $T_{min.} \le T_{amb} \le T_{max}$	27 27	28		V
V_{OL}	Low Level Output Voltage R_L = 10k $T_{min.} \le T_{amb} \le T_{max}$		5	20 20	mV
SR	Slew Rate at Unity Gain V_i = 0.5 to 2V, Vcc = 15V R_L = 2k, C_L = 100pF, unity gain	0.2	0.4		V/ µs
GBP	Gain Bandwidth Product Vcc = 30V, R_L = 2k, C_L = 100pF f = 100kHz, V_{in} = 10mV	0.5	0.9		MHz
THD	Total Harmonic Distortion f = 1kHz A_V = 20dB, R_L = 2k, Vcc = 30V C_L = 100pF, Vo = $2V_{pp}$		0.02		%

VOLTAGE REFERENCE

Symbol	Parameter	Value	Unit
I_k	Cathode Current	1 to 100	mA

Symbol	Parameter	Min	Typ	Max	Unit
V_{ref}	Reference Input Voltage T_{amb} = 25 ºC $T_{min} \le T_{amb} \le T_{max}$	2.49 2.48	2.5	2.51 2.52	V
ΔV_{ref}	Reference Input Voltage Deviation Over Temperature Range $V_{KA} = V_{ref}$, I_k = 10mA $T_{min} \le T_{amb} \le T_{max}$		5	24	mV
I_{min}	Minimum Cathode Current for Regulation $V_{KA} = V_{ref}$		0.5	1	mA
$\lvert Z_{KA} \rvert$	Dynamic Impedance-note [1)] $V_{KA} = V_{ref}$, ΔI_K = 1 to 100mA, f < 1kHz		0.2	0.5	Ω

1 The Dynamic impedance is defined as $\lvert Z_{KA} \rvert = \Delta V_{KA} / \Delta I_K$

Typical Performance Characteristics

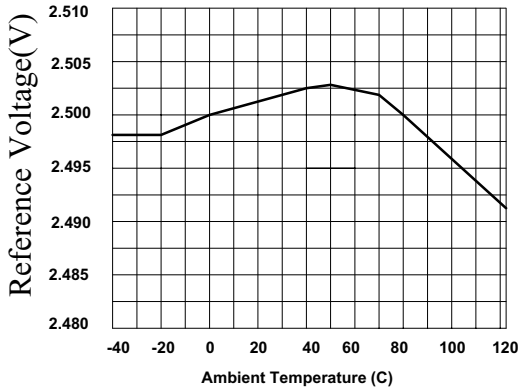

Figure 1. Reference Voltage vs. Ambient Temperature

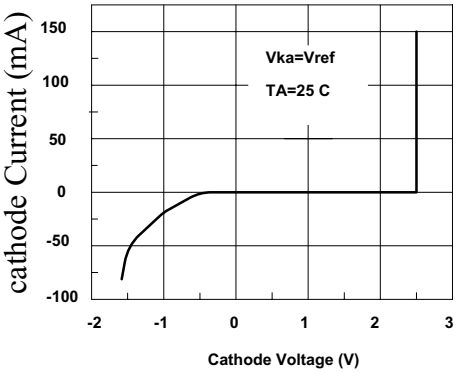

Figure 2. Cathode Current vs. Cathode Voltage

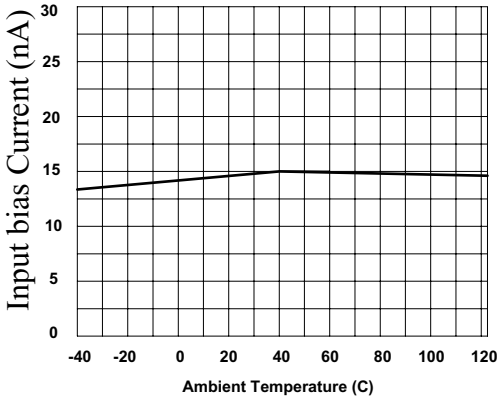

Figure 3. Input Bias Current vs. Ambient Temperature

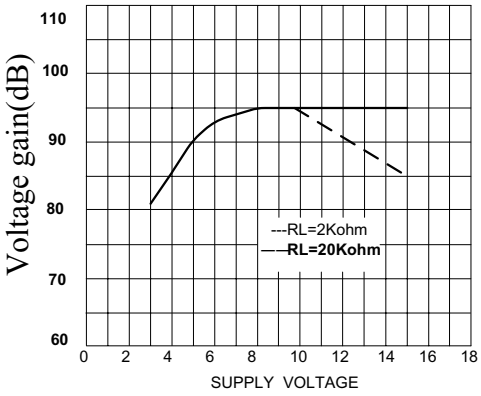

Figure 4. Operational Amplifier Voltage Gain

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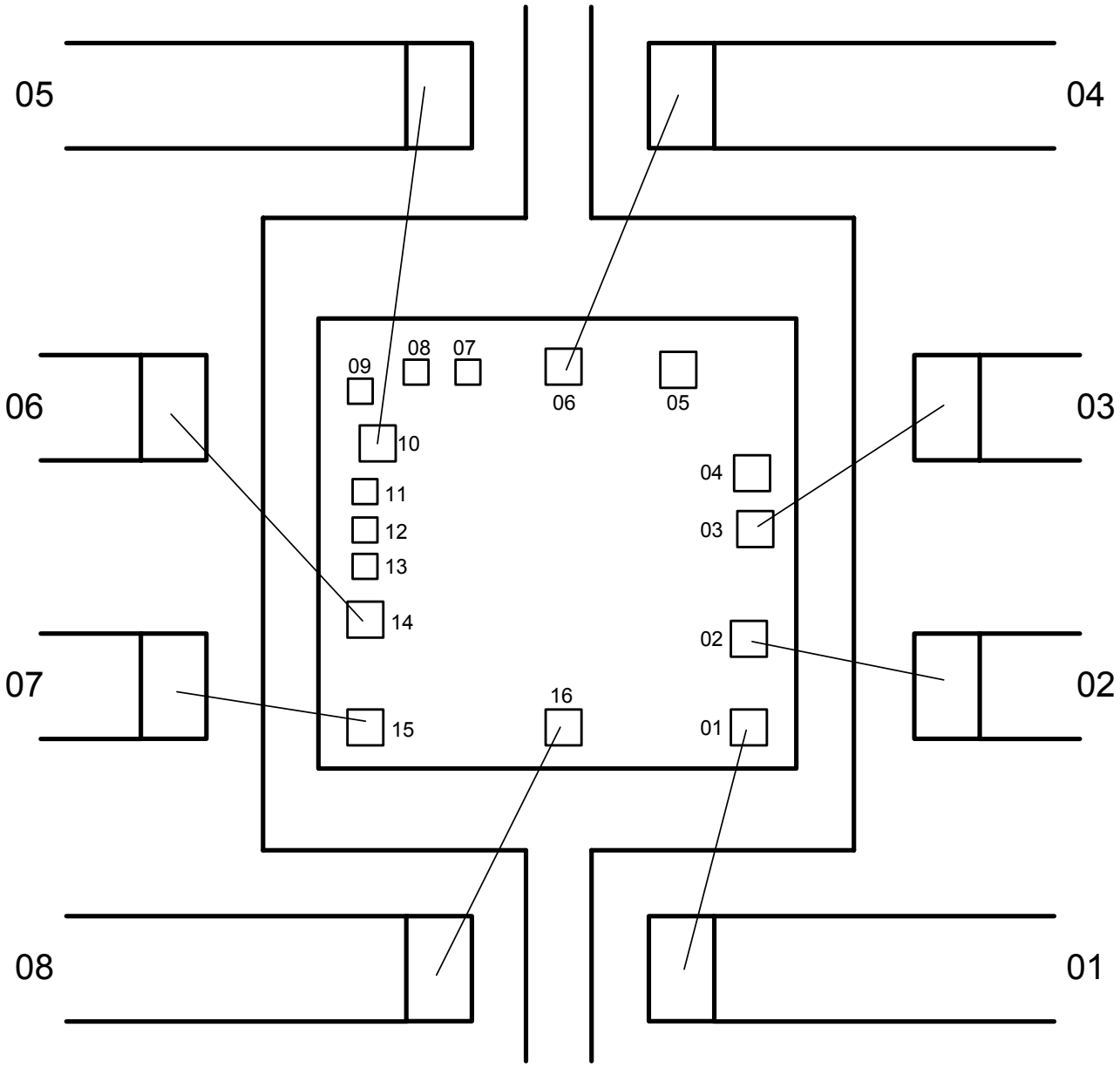
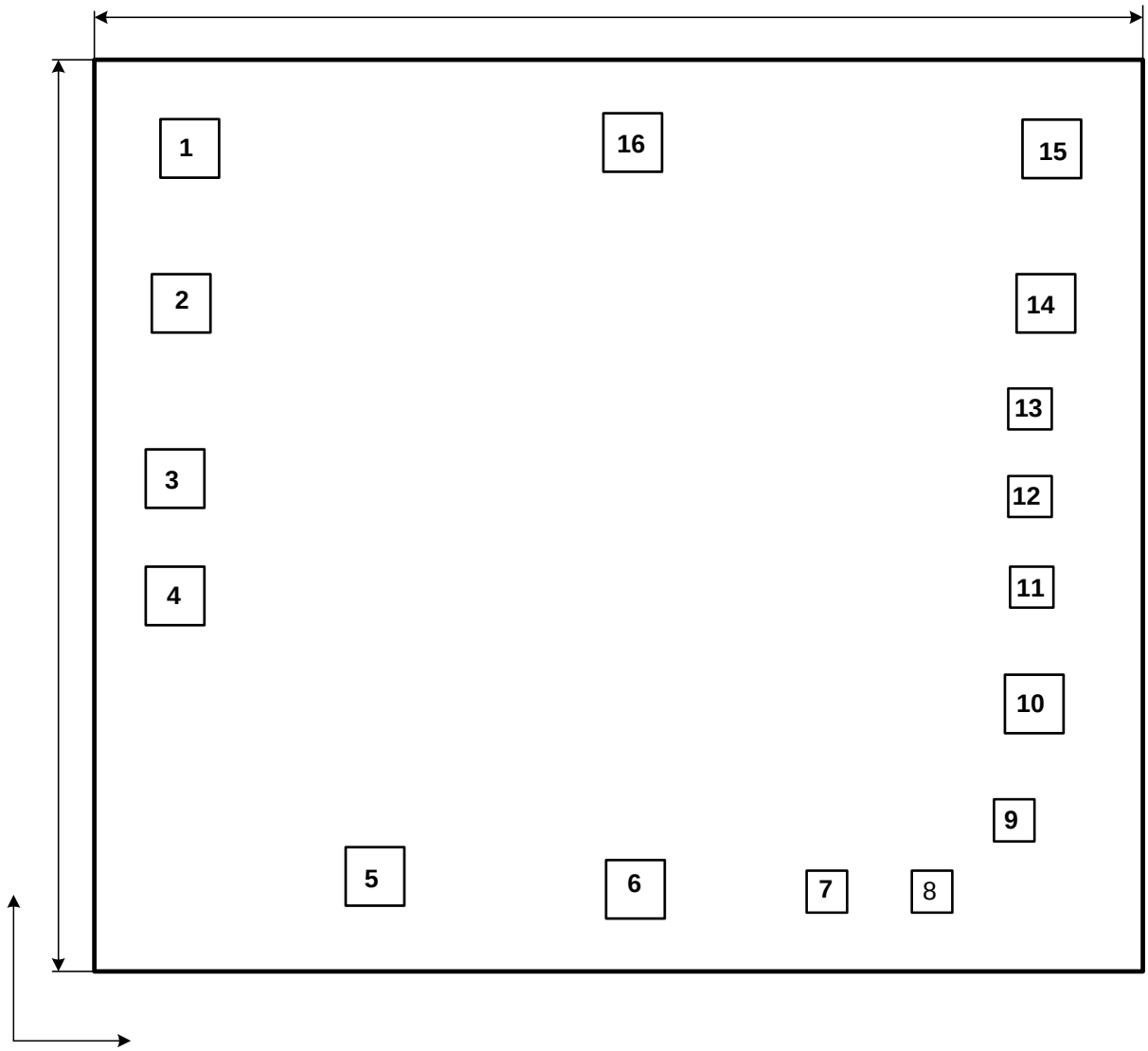


Bonding diagram of FLM358



Pads 04, 05, 07, 08, 09, 11, 12, 13 are not for bonding

Pads location of FLM358

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Die size Xr=1.75mm, Yr=1.75mm (pad size measured by layer “passivation”)
Coordinates of pads

No of pad (by layer “passivation”)	Coordinates left bottom, mkm		pad size, mkm
	X	У	
01	157	1542	100×100
02	107	1285	100×100
03	102	996	100×100
04	103	836	100×100
05	500	153	100×100
06	827	98	100×100
07	1298	128	70×70
08	1428	128	70×70
09	1542	226	70×70
10	1549	392	100×100
11	1521	588	70×70
12	1523	776	70×70
13	1523	917	70×70
14	1543	1285	100×100
15	1493	1542	100×100
16	825	1557	100×100