GROUND FAULT INTERRUPTER EARTH LEAKAGE CURRENT DETECTOR

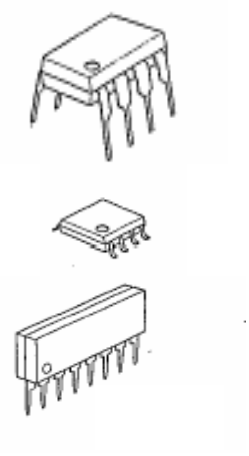
IL54123

Description

The IL54123N/D is designed for use in earth leakage circuit interrupters for operation directly off the AC Line in breakers.

It contains pre regulator, main regulator, after regulator, differential amplifier, level comparator, latch circuit. The input in the differential amp latch circuit. The input in the differential amplifier is connect to the secondary node of zero current transformer.

The level comparator generates high level when earth leakage current is greater than some level.



ORDERING INFORMATION

IL54123N Plastic
IL54123D SOIC
IL54123S SIP-8
T_A = -40° to 85° C for all packages.

Feature

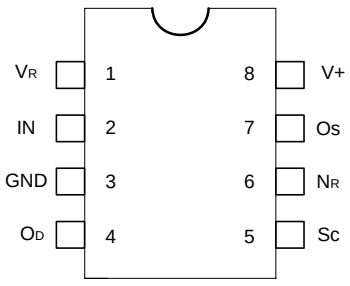
- Low Power Consumption (P_D=5mW) 100V/200V
- 100V/200V Common Built-in Voltage Regulator
- High Gain Differential Amplifier
- High Input Sensitivity (V_T = 6.1mV Typ.)
- Minimum External Parts
- Large Surge Margin
- Wide Operating Temperature Range (T_A= -40 to 85°C)
- High Noise Immunity
- Meet U. L. 943 standards

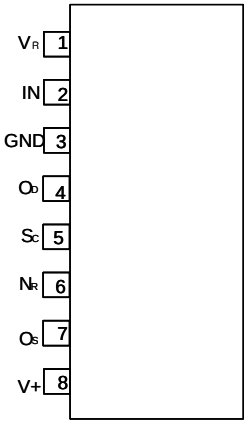
Absolute Maximum Ratings (T^=25°c)

▪ Supply Voltage	20V
▪ Supply Current	8mA
▪ Power Dissipation	200m W
▪ Operating Temperature	- 40 to 85°C
▪ Storage Temperature	- 55 to 125°C

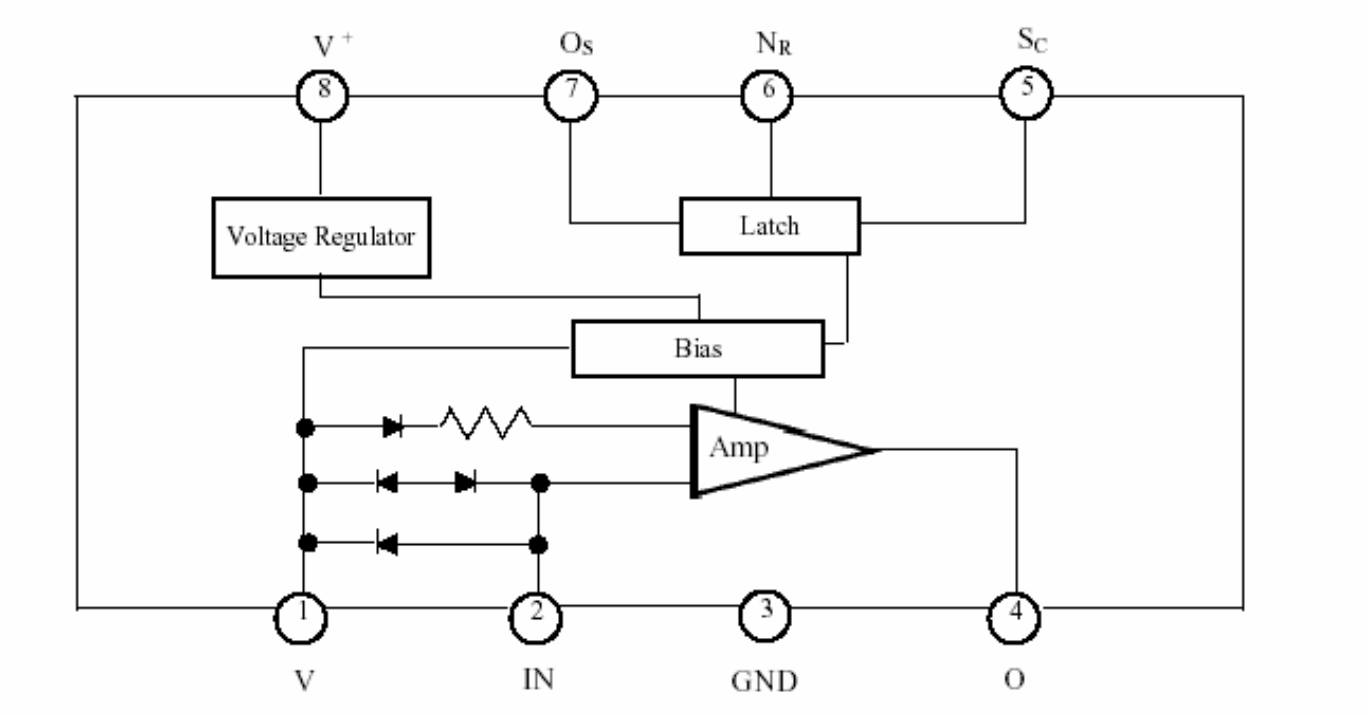
Pin Configuration

(Top View)





Block Diagram



Recommended Operating Condition: T_A=-30°C to 80°C

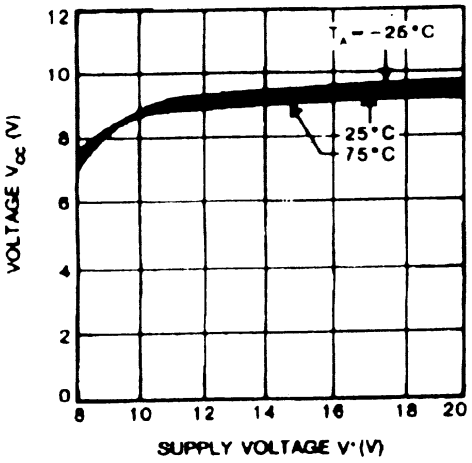
PARAMETER	SYMBOL	MIN.	TYP.	MAX	UNIT
Supply Voltage	V^+	12			V
Vs-GND Capacitor	Cvs	1			µF
O_S-GND Capacitor	Cos			1	µF

Electrical Characteristics

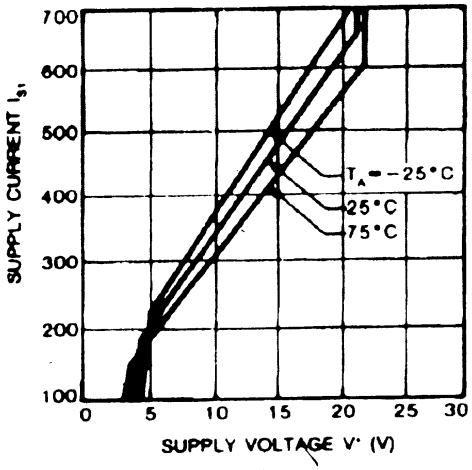
PARAMETER	SYMBOL	CONDTIONS	TEMP. (°C)	MIN.	TYP.	MAX.	UNIT
Supply Current 1	I_{S1}	V^+=12V, V_R - V_I = 30 mV	-30	-	-	580	µA
			25	-	400	530	
			85	-	-	480	
* Trip Voltage	V_T	V^+ = 16V, V_R - V_I = X	-30 85	4	6.1	9	mV (rms)
Differential Amplifier Output Current 1	I_{TD1}	V^+ = 16 V, V_R - V_I = 30 mV V_{OD} = 1.2 V	25	-12	-	-30	µA
Differential Amplifier Output current 2	I_{TD2}	V^+ = 16 V, V_R - V_I = short V_{OD} = 0.8 V	25	17	-	37	µA
Output Current	I_O	V_{SC} = 1.4 V, V_{OS} = 0.8 V, I_{SI} = 580µA	-30	-200	-		µA
		I_{SI} = 530µA	25	-100	-		
		I_{SI} = 480µA	85	-75	-		
S_C ON Voltage	V_{SC} ON	V^+ = 16 V	25	0.7	-	1.4	V
S_C Input Current	I_{SC} ON	V^+ = l2V	25	-	-	5	µA
Output "L" Current	I_{OSL}	V^+ = 12 V, V_{OSL} = 0.2 V	-30 85	200	-	-	µA
Input Clamp Voltage	V_{IC}	V^+ = 12 V, I_{IC} = 20 mA	-30 85	4.3	-	6.7	V
Differential Input Clamp Voltage	V_{IDC}	I_{IDC} = 100mA	-30 85	0.4	-	2	V
Max. Current Voltage	V_{SM}	I_{SM} = 7 mA	25	20	-	28	V
Supply Current 2	I_{S2}	V_{OS} = 0.5 V, V_R - V_I = X	-30 85	-	-	1200	µA
Latch Circuit Off Supply Voltage	V+ OFF		25	0.5			V
Response Time	T_{ON}	V^+ = 16 V, V_R - V_I = 0.3 V	25	1	-	4	ms

Typical Performance Curves

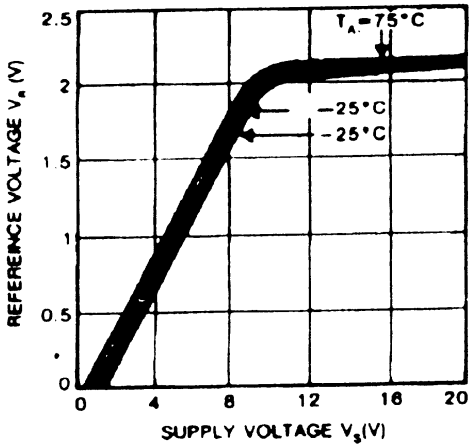
VOLTAE-SUPPLY VOLTAGE



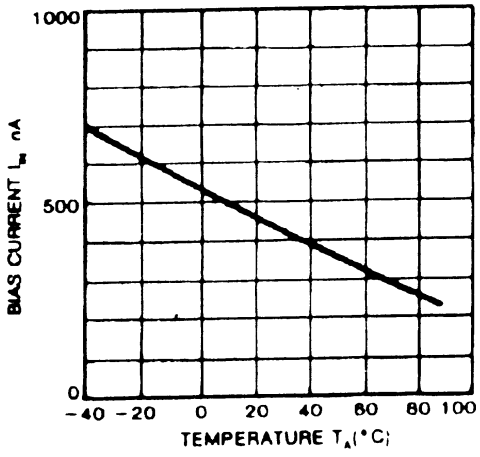
SUPPLY CURRENT-SUPPLY VOLTAGE



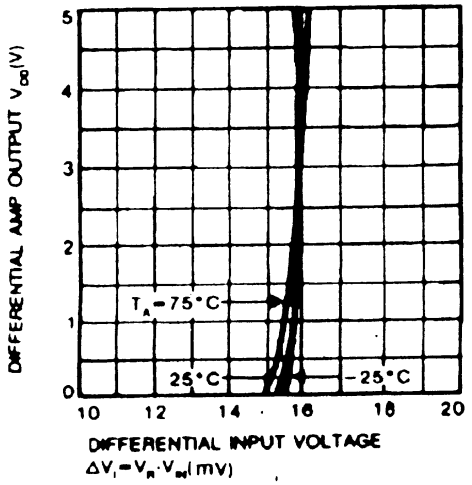
REFERENCE VOLTAGE-SUPPLY VOLTAGE



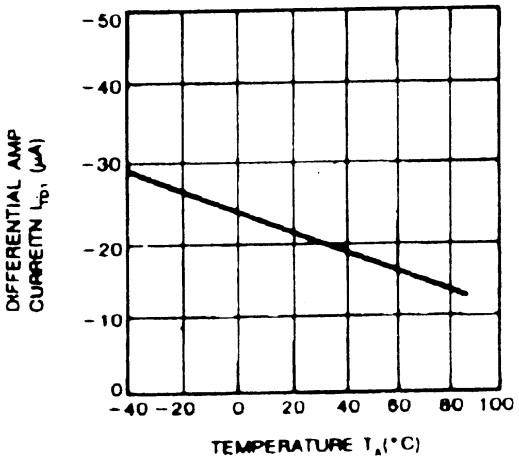
BIAS CURRENT-TEMPERATURE



DIFFERENTIAL AMPLIFIER OUTPUT VOLTAGE—DIFFERENTIAL INPUT VOLTAGE

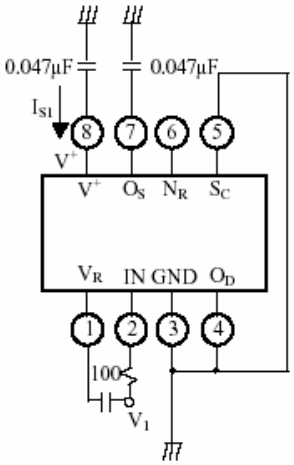


DIFFERENTIAL AMPLIFIER OUTPUT CURRENT-TEMP



Test Circuit

1.



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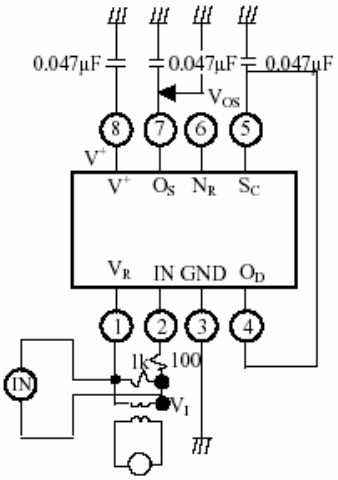

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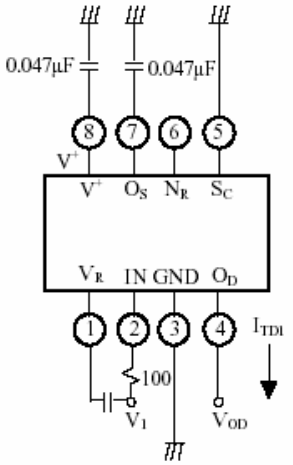

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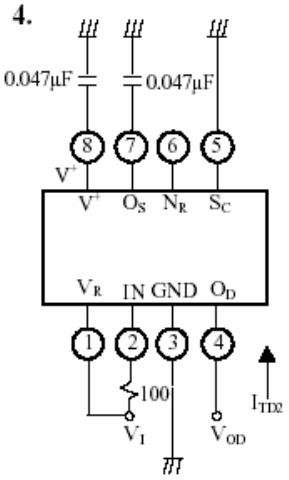

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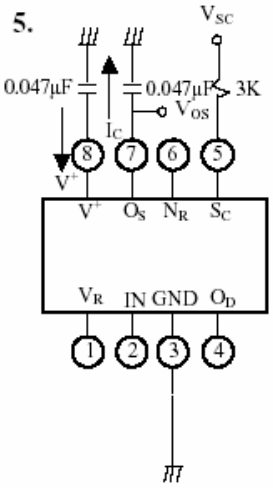

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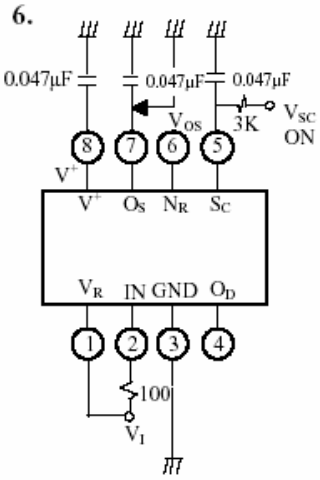

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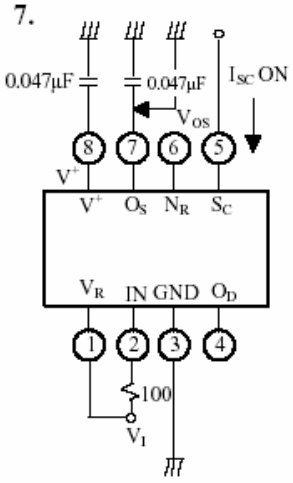

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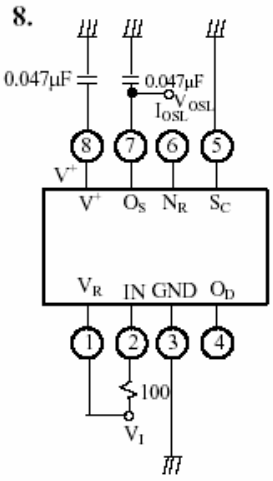

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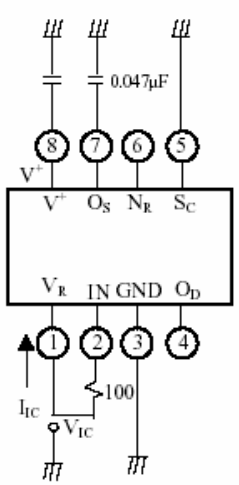

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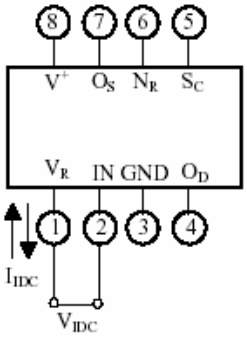
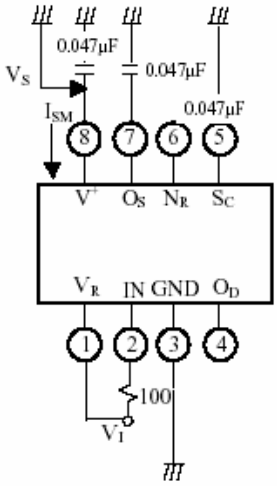
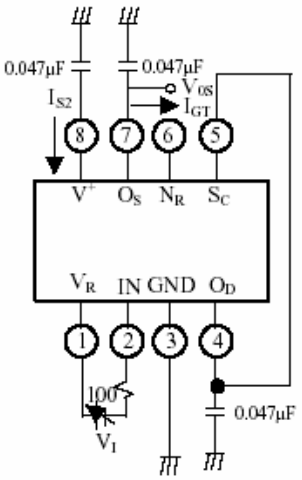

8 7 6 5
V+ OS NR SC
VR IN GND OD
1 2 3 4
IIDC
VIDC

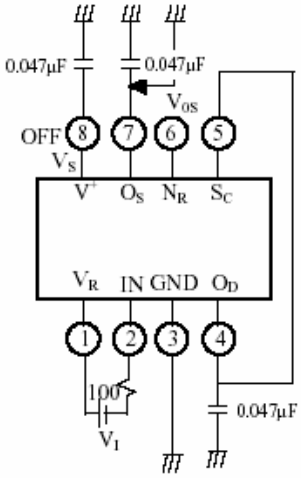
11.


0.047μF
0.047μF
0.047μF
VS
ISM
8 7 6 5
V+ OS NR SC
VR IN GND OD
1 2 3 4
100
VI

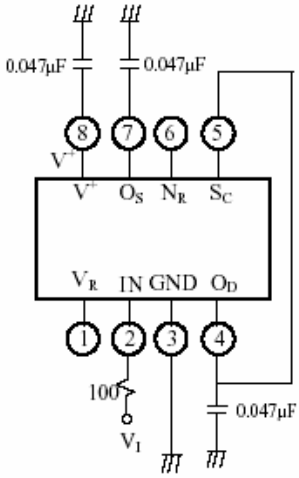
12.


0.047μF
0.047μF
VOS
IS2
IGT
8 7 6 5
V+ OS NR SC
VR IN GND OD
1 2 3 4
100
VI
0.047μF

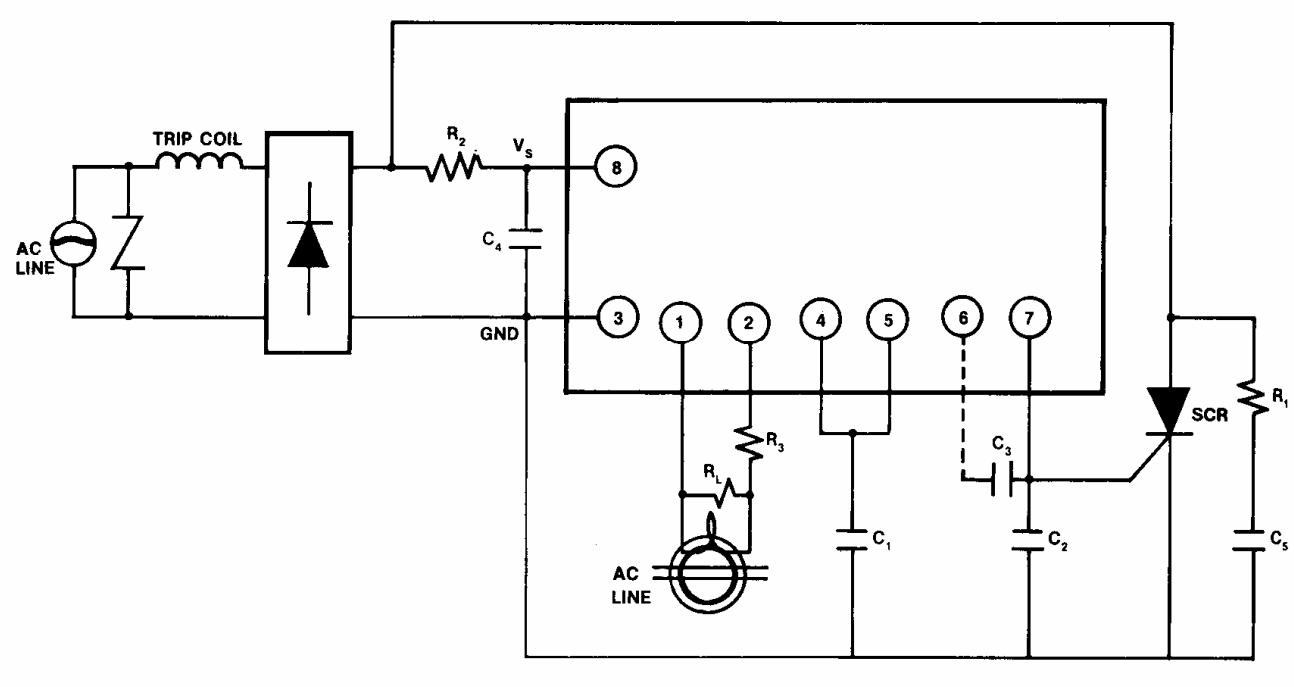
13.


0.047μF
0.047μF
VOS
OFF
VS
8 7 6 5
V+ OS NR SC
VR IN GND OD
1 2 3 4
100
VI
0.047μF

14.


0.047μF
0.047μF
V+
8 7 6 5
V+ OS NR SC
VR IN GND OD
1 2 3 4
100
VI
0.047μF

Typical Application



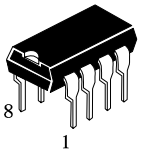
Supply voltage circuit is connected as a previous diagram. Please decide constants R1, R2, C4, and C5 of a filter in order to keep at least 12V in Vs, when normal supply current flows.
In this case, please connect C4 (more than 1 ㎌) and C2 (less than 1 ㎌). ZCT and load resistance R_L of ZCT are connected between input pin① and ②. In this case protective resistance (R3=100Ω) must be insulted. Sensitivity current is regulated by RL, and output of amplifier shows in pin④. External capacitor C1 between pin④ and GND is used for noise removal.

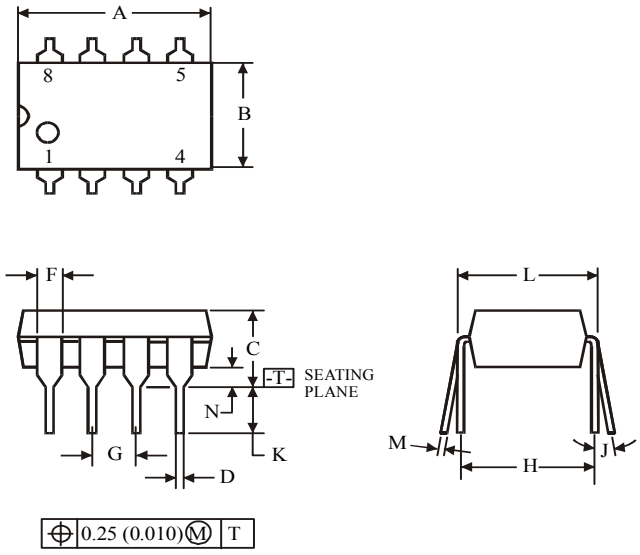
When large current is grounded in the primary side (AC line) of ZCT, the wave form in the secondary side of ZCT is distorted and some signals doesn't appear in the output of amplifier. So please connect a varistor or a diode (2pcs.) to ZCT in parallel.

Latch circuit is used to inspect the output level of amplifier and to supply gate current on the external SCR. When input pin becomes more than 1.1V (Typ.) latch circuit operates and supply gate current in the gate of SCR connected to the output pin⑦.

Pin⑥ can be used in the open state, but please connect capacitor (about 0.047 ㎌) between pin⑥ and ⑦.
Capacitor C6 between pin① and GND is used to remove noise and is about 0.047 ㎌.

N SUFFIX PLASTIC DIP
(MS – 001BA)



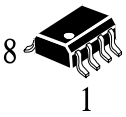


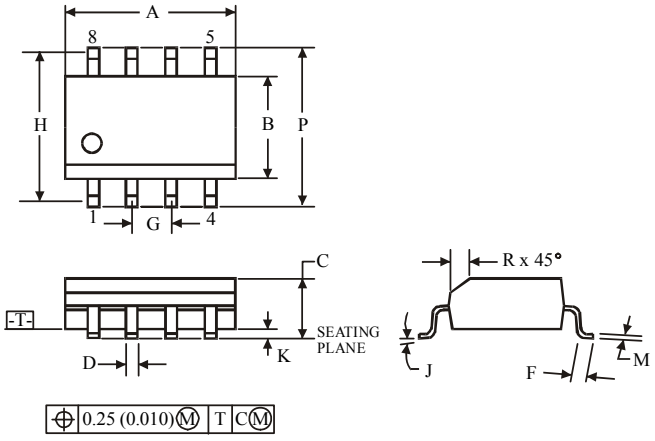
	Dimension, mm	
Symbol	**MIN**	**MAX**
A	8.51	10.16
B	6.1	7.11
C		5.33
D	0.36	0.56
F	1.14	1.78
G	2.54	
H	7.62	
J	0°	10°
K	2.92	3.81
L	7.62	8.26
M	0.2	0.36
N	0.38	

NOTES:

1. Dimensions “A”, “B” do not include mold flash or protrusions.
   Maximum mold flash or protrusions 0.25 mm (0.010) per side.

D SUFFIX SOIC
(MS - 012AA)



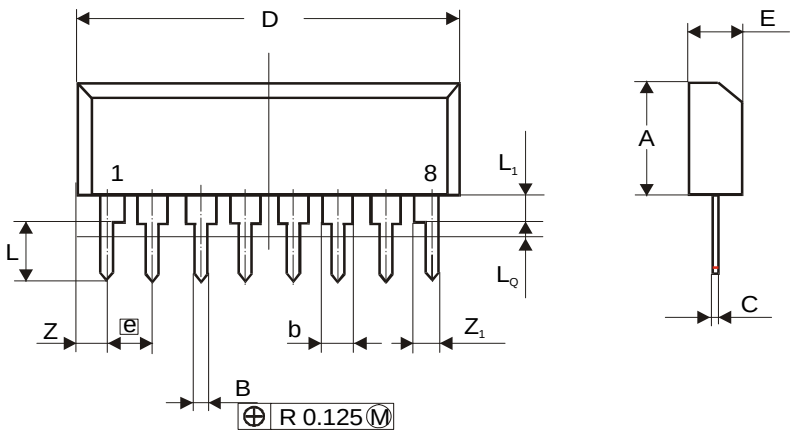


	Dimension, mm	
Symbol	**MIN**	**MAX**
A	4.8	5
B	3.8	4
C	1.35	1.75
D	0.33	0.51
F	0.4	1.27
G	1.27	
H	5.72	
J	0°	8°
K	0.1	0.25
M	0.19	0.25
P	5.8	6.2
R	0.25	0.5

NOTES:

1. Dimensions A and B do not include mold flash or protrusion.
2. Maximum mold flash or protrusion 0.15 mm (0.006) per side
   for A; for B – 0.25 mm (0.010) per side.

8-Pin Plastic Single-in-Line (SIP)



Dimension	mm	
	min	max
A	6.24	6.60
B	0.40	0.54
b	1.15	1.40
C	0.23	0.35
D	19.68	20.20
E	2.675	2.925
e	2.54	
L	2.95	3.25
L_1	1.61	1.97
L_Q		0.70
Z		1.21
Z_1		1.40