Ground Fault Interrupter Earth Leakage Current Detector

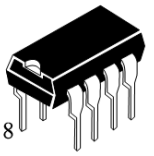
IL7101

DESCRIPTION

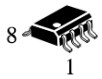
The IL7101 is designed for use in earth leakage circuit interrupters for operation directly off the AC Line in breakers.

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 connecting to the secondary node of zero current transformer.

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



N SUFFIX
DIP



D SUFFIX
SOP

ORDERING INFORMATION

IL7101N DIP
IL7101D SOP

FEATURE

- Low Power Consumption (P_D=5mW) 100V/200V
- 100V/200V Common Built-in Voltage Regulator
- High Gain Differential Amplifier
- High Input Sensitivity
- Minimum External Parts
- Large Surge Margin
- Wide Operating Temperature Range (T_A= -30 to 85°C)
- High Noise Immunity
- Meet U. L. 943 standards

ORDERING INFORMATION

Device	Operating Temperature Range	Package	Shipping
IL7101N	T_A = -30° to 85° C for all packages	DIP-8	Tube
IL7101D		SOIC-8	Tube
IL7101DT		SOIC-8	Tape& Reel

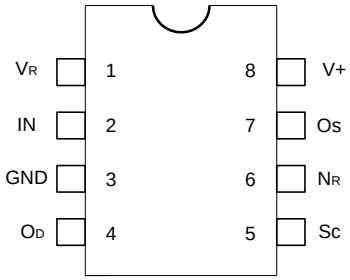
ABSOLUTE MAXIMUM RATINGS

- Supply Voltage 20V
- Supply Current 8mA
- Power Dissipation 200mW
- Operating Temperature - 30 to 85°C
- Storage Temperature - 55 to 125°C

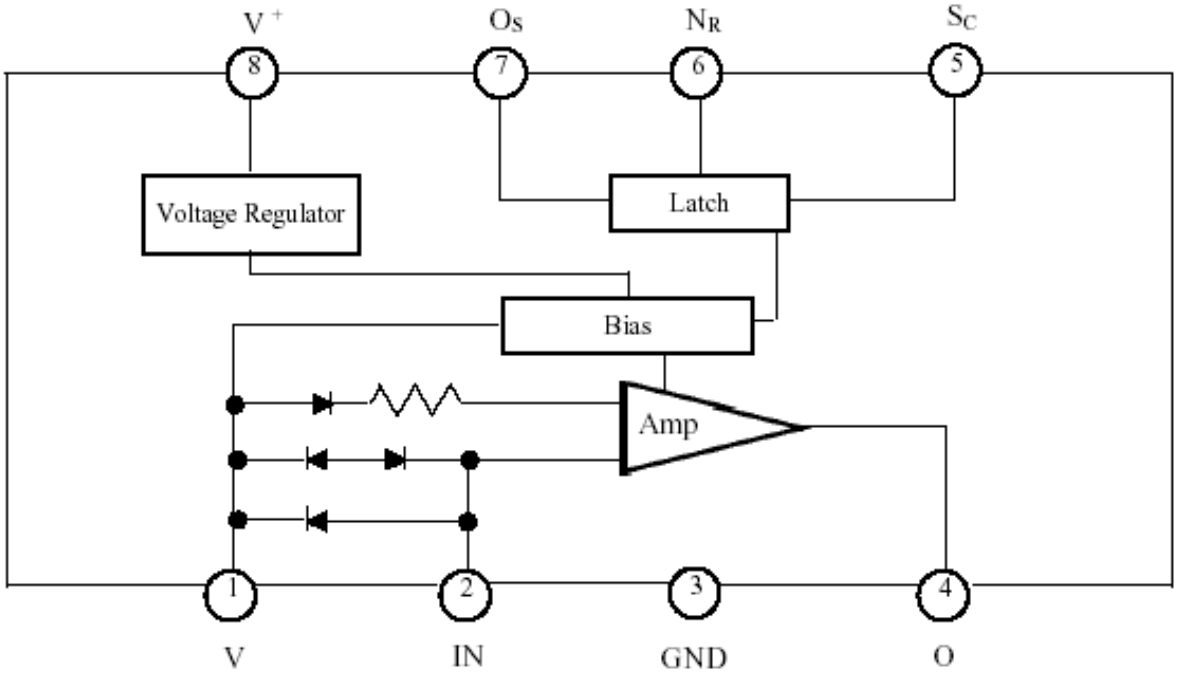
* Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied.
Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

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

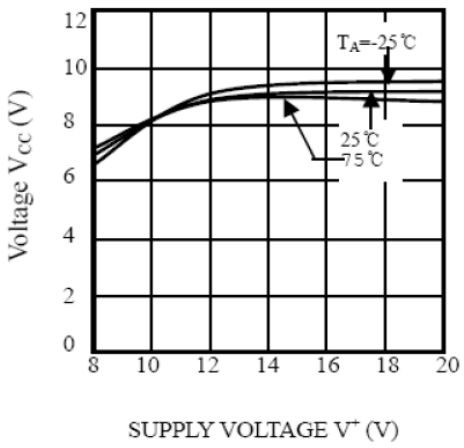
Electrical Characteristics

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	9	13.5	18	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^+ = I2V		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

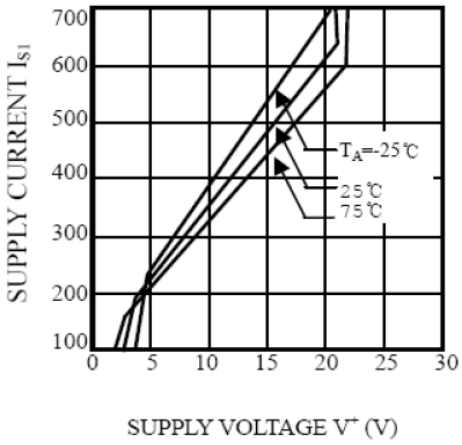
* S : 8.65~10.35mV, A: 10.35~11.50mV

Typical Performance Curves

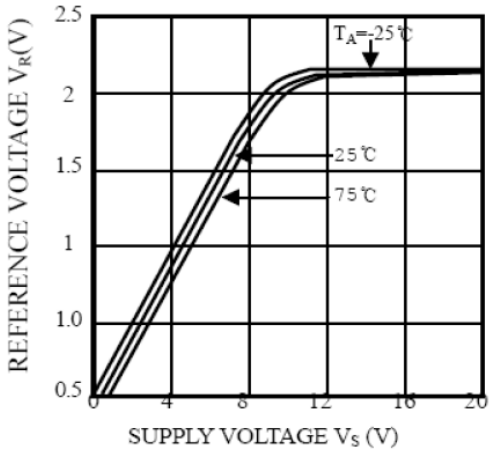
VOLTAE-SUPPLY VOLTAGE



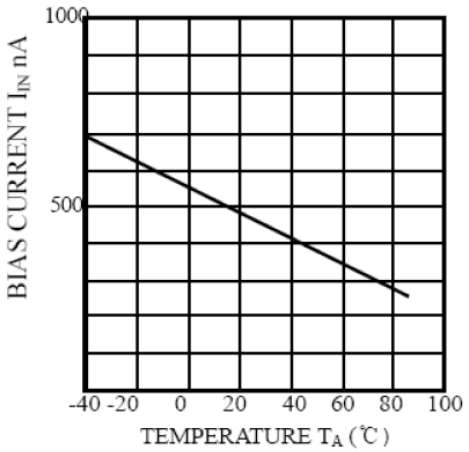
SUPPLY CURRENT-SUPPLY VOLTAGE



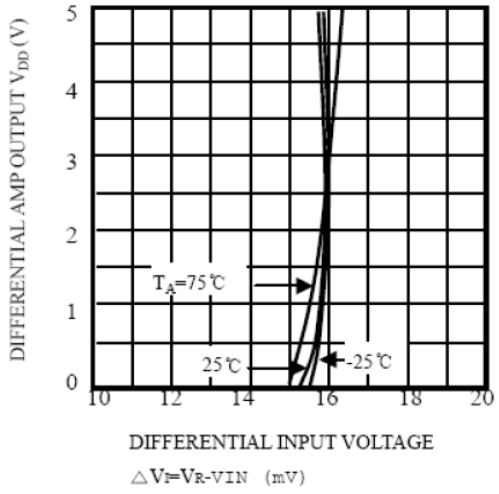
REFERENCE VOLTAGE-SUPPLY VOLTAGE



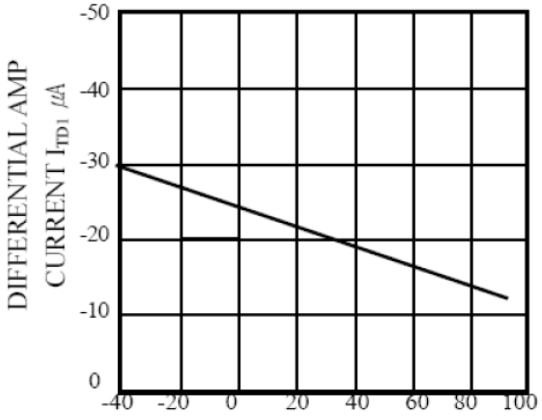
BIAS CURRENT-TEMPERATURE



DIFFERENTIAL AMPLIFIER OUTPUT VOLTAGE - DIFFERENTIAL INPUT VOLTAGE

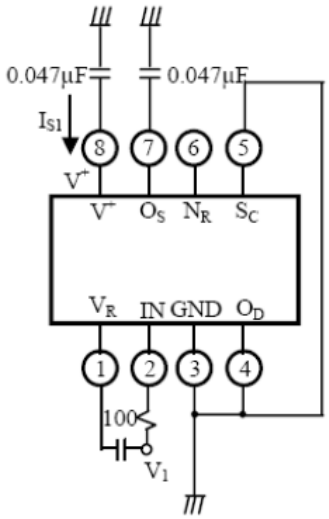


DIFFERENTIAL AMPLIFIER OUTPUT CURRENT-TEMP



Test Circuit

1.



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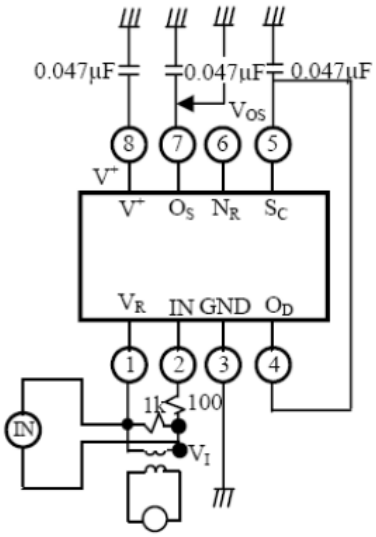

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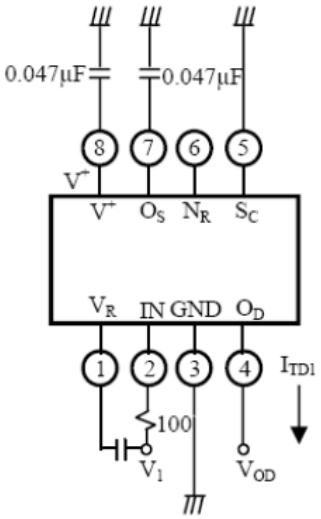

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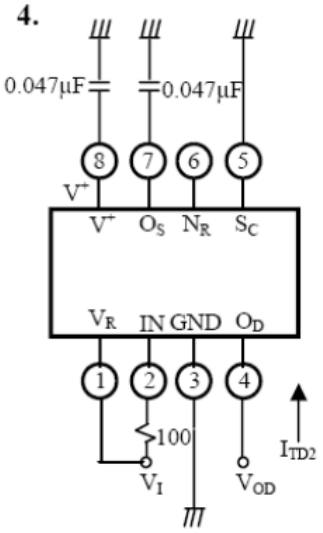

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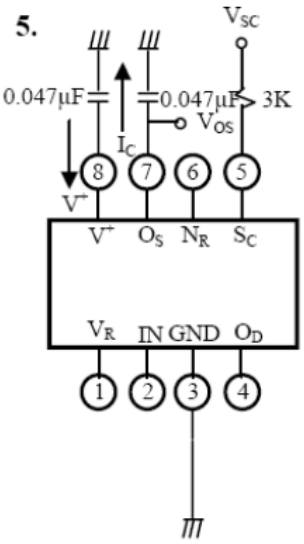

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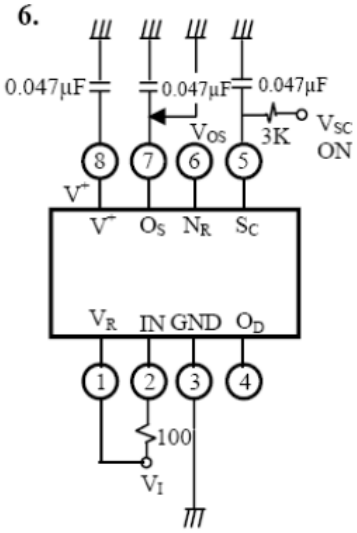

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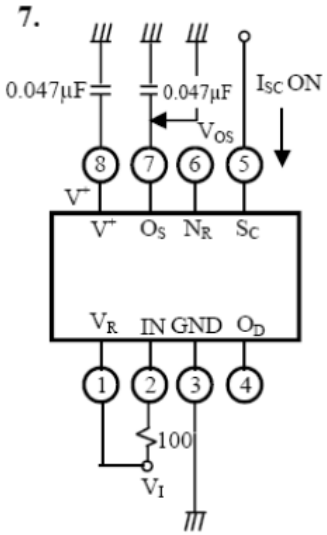

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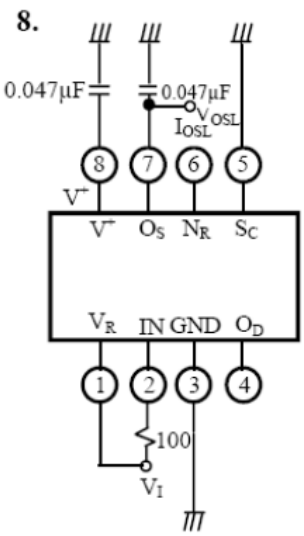

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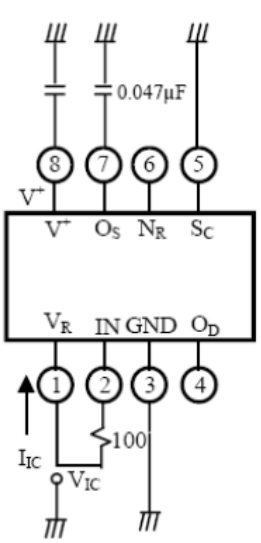

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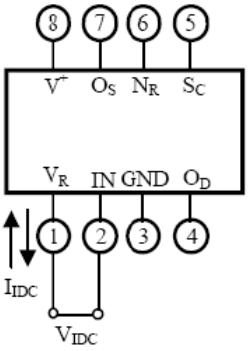
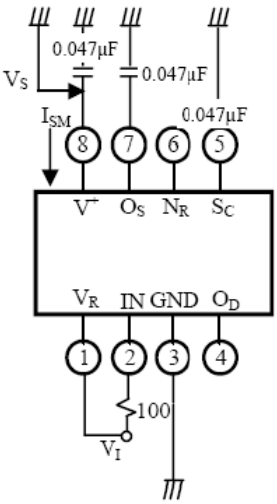
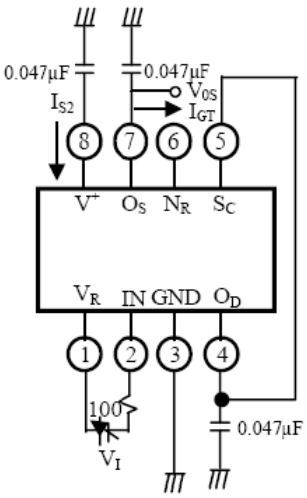

8 7 6 5
V+ OS NR SC
VR IN GND OD
1 2 3 4
IIDC
VIDC

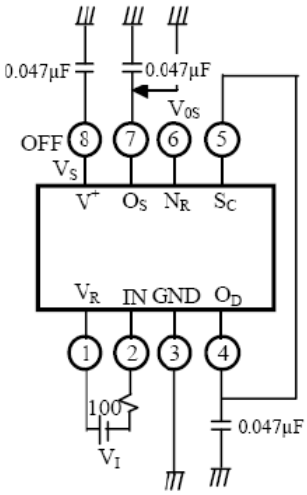
11.


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

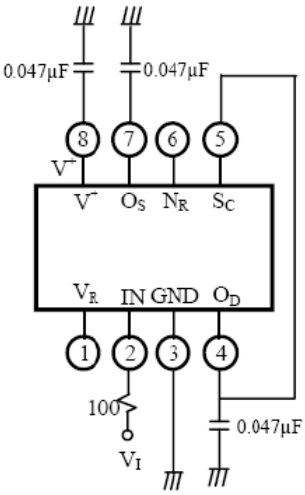
12.


0.047μF
0.047μF
IS2
V0S
IGT
8 7 6 5
V+ OS NR SC
VR IN GND OD
1 2 3 4
100
VI
0.047μF

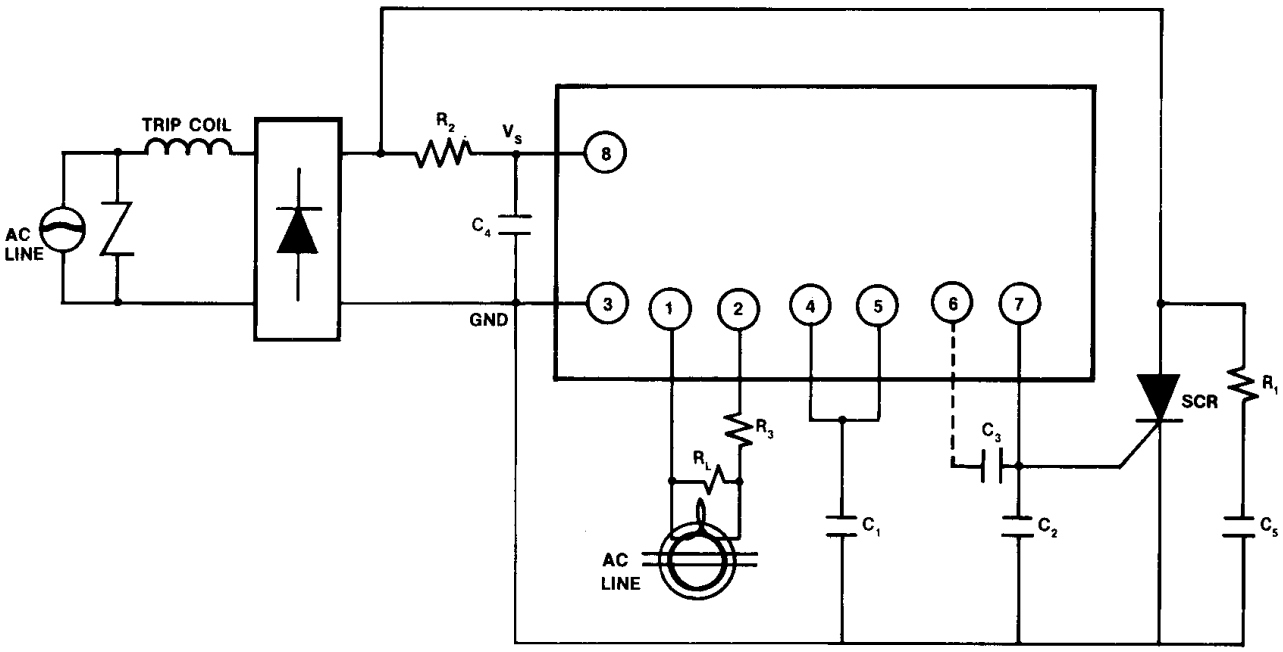
13.


0.047μF
0.047μF
V0S
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 RL 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.

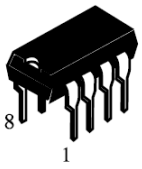
When large current is grounded in the primary side (AC line) of ZCT, the wave form in the secondary side of ZCT is distorted and some signals doesn't appear in the output of amplifier. So please connect a varistor or a diode (2pcs.) to ZCT in parallel.

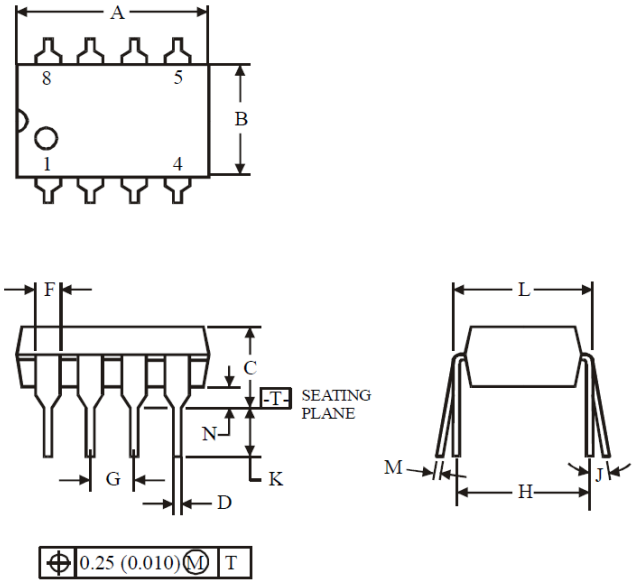
Latch circuit is used to inspect the output level of amplifier and to supply gate current on the external SCR. When input pin becomes more than 1.1V (Typ.) latch circuit operates and supply gate current in the gate of SCR connected to the output pin⑦.

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 DIP
(MS – 001BA)



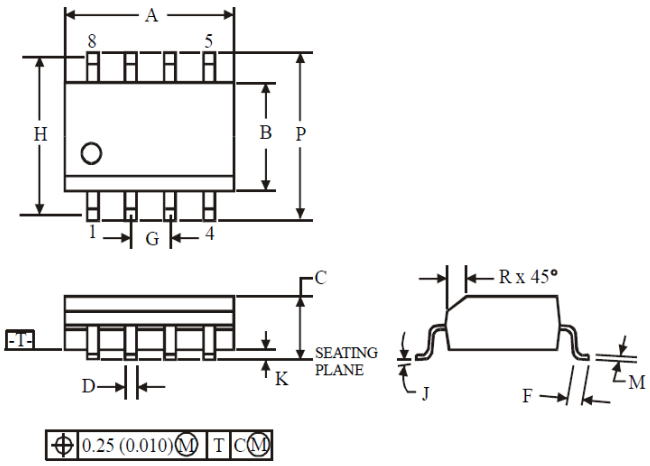


	Dimension, mm	
Symbol	MIN	MAX
A	8.51	10.16
B	6.10	7.11
C		5.33
D	0.36	0.56
F	1.14	1.78
G	2.54	
H	7.62	
J	0°	10°
K	2.92	3.81
L	7.62	8.26
M	0.20	0.36
N	0.38	

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 SOP
(MS - 012AA)



	Dimension, mm	
Symbol	MIN	MAX
A	4.80	5.00
B	3.80	4.00
C	1.35	1.75
D	0.33	0.51
F	0.40	1.27
G	1.27	
H	5.72	
J	0°	8°
K	0.10	0.25
M	0.19	0.25
P	5.80	6.20
R	0.25	0.50

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.