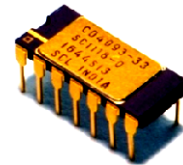


QUAD 2-INPUT NAND
SCHMITT-TRIGGER (3.3V)

SC1118-0
(Radiation Tolerant)



DATA SHEET
(Version 1.0, Dec 2020)



Semi-Conductor Laboratory
Government of India
S.A.S. Nagar, Punjab-160071
www.scl.gov.in



PRODUCT DESCRIPTION:

SC1118-0 is a Quad Two input NAND gate with Schmitt trigger action on both inputs. Schmitt trigger is a comparator which triggers at different points for positive and negative going signals and the difference between positive voltage (V_T^+) and negative voltage (V_T^-) is the Hysteresis voltage (V_H).

All outputs have equal source and sink currents.

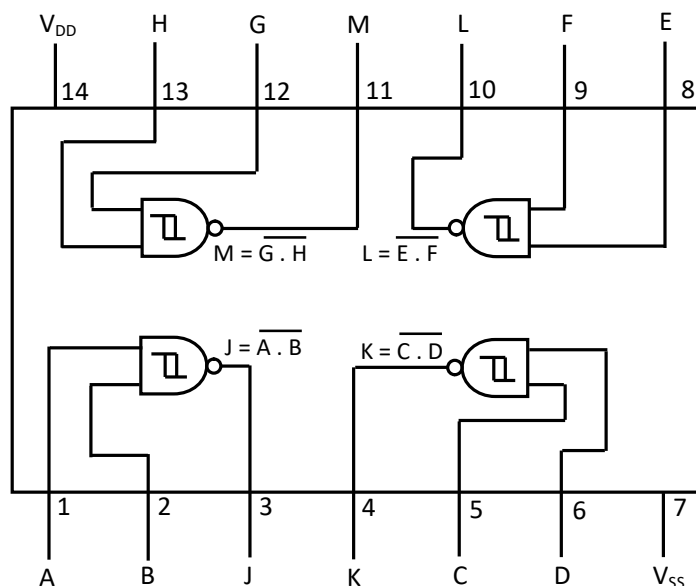
APPLICATIONS:

- Wave and pulse shapers
- High-noise-environment systems
- Monostable multivibrators
- Astable multivibrators
- NAND logic

FEATURES:

- **Operating Supply Voltage: $3.3V \pm 0.3V$**
- **Schmitt-trigger on each input with no external components.**
- **Noise immunity greater than 50%**
- **Equal source and sink currents**
- **No limit on input rise and fall time**
- **Hysteresis voltage $V_H = 0.8V$ ($V_{DD} = 3.3V$)**
 $T_A = 25^\circ C$ (Typical)
- **Operating Temperature: $-55^\circ C$ to $125^\circ C$**
- **Radiation Tolerant up to 100 KRad TID**
- **SET/ SEL immune up to 50.7 MeV.cm²/mg**
- **14 Pin CSOP / 14 pin CDIP / Customized package options / Die**
- **Thermal Resistance (CSOP), $\Theta_{JC} = 7.47^\circ C/W$**
- **Pin compatible with CD4093**
- **ESD Sensitivity Level: HBM Class 1C (1000V to 1999V), passed up to 2000V**
- **SCL's 180nm CMOS Technology**

DEVICE PIN CONFIGURATION:



**PIN DESCRIPTION:**

PIN NUMBER	PIN NAME	DESCRIPTION
14	V _{DD}	Positive Power Supply
7	V _{SS}	Ground
1, 2, 5,6, 8,9, 12, 13	A, B, C, D, E, F, G, H	Input
3,4,10, 11	J, K, L, M	Output

FUNCTIONAL TABLE:

TRUTH TABLE OF NAND GATE		
INPUT-1 (A, C, E, G)	INPUT-2 (B, D, F, H)	OUTPUT (J, K, L, M)
1	1	0
1	0	1
0	1	1
0	0	1

ABSOLUTE MAXIMUM RATINGS (1):

SYMBOL	PARAMETER	UNIT
V _{DD}	Supply Voltage Range	-0.5V to 4.3V
V _{IN}	Input Voltage Range	-0.5V to V _{DD} +0.5V
T _J	Max. Junction Temperature	150°C
T _{stg}	Storage Temperature Range	-65°C to 150°C

- (1) 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.

RECOMMENDED OPERATING CONDITIONS:

SYMBOL	PARAMETER	Min	Max	Unit
V _{DD}	Supply Voltage	3.0	3.6	V
V _{IN}	Input Voltage Range	0	V _{DD}	V
I _{OH}	High Level Output Current (Source)	-	-2.0	mA
I _{OL}	Low Level Output Current (Sink)	-	2.0	mA
T _{AMB}	Operating Ambient Temperature	-55	125	°C



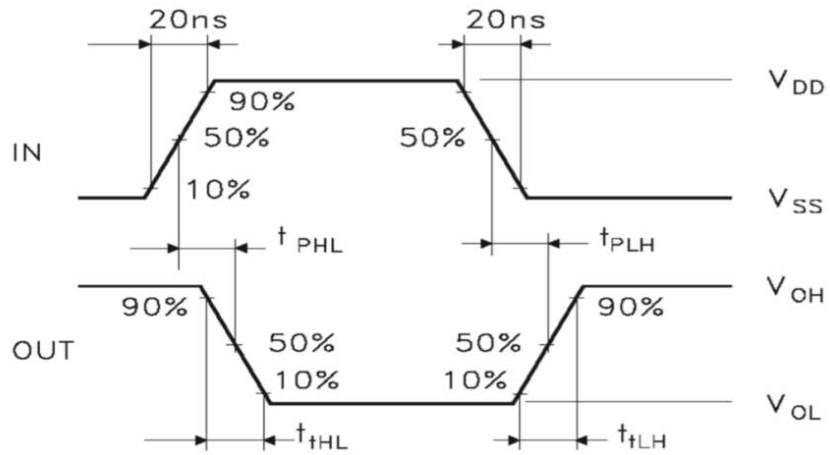
ELECTRICAL CHARACTERISTICS

Test Condition: $V_{DD} = 3.3V \pm 0.3V$, $V_{SS} = 0V$, $T_A = -55^{\circ}C$ to $+125^{\circ}C$ (unless otherwise specified)

Parameter	Symbol	Test Condition	Test Limits			
			Min.	Typ.	Max.	Unit
Static Supply Current	$I_{DD\ Low}$	$V_{IN} = V_{SS}$	-	0.2	2.0	μA
	$I_{DD\ High}$	$V_{IN} = V_{DD}$	-	0.2	2.0	μA
Input Gate Leakage Current	I_{IL}	$V_{IN} = V_{SS}$	-	0.02	± 0.1	μA
	I_{IH}	$V_{IN} = V_{DD}$	-	0.02	± 0.1	μA
Output Voltage Level Low	V_{OL}	$V_{DD} = 3.3V$ $V_{IN} = V_{SS}/V_{DD}$ ($I_{OL} = 0\ mA$)	V_{SS}	0.01	0.05	V
		$V_{DD} = 3.3V$ $V_{IN} = V_{SS}/V_{DD}$ ($I_{OL} = 2\ mA$)	V_{SS}	0.07	0.3	V
Output Voltage Level High	V_{OH}	$V_{DD} = 3.3V$ $V_{IN} = V_{SS}/V_{DD}$ ($I_{OH} = 0\ mA$)	3.25	3.29	V_{DD}	V
		$V_{DD} = 3.3V$ $V_{IN} = V_{SS}/V_{DD}$ ($I_{OH} = -2\ mA$)	2.97	3.17	V_{DD}	V
Hysteresis Voltage	$V_H = (V_{T+} - V_{T-})$	$V_{DD} = 3.3V$ $V_{IN1} = V_{RAMP} (0\ to\ V_{DD})$ $V_{IN2} = V_{DD}$	0.3	0.6	1.0	V
Positive Trigger Threshold Voltage	V_{T+}	$V_{IN1} = V_{RAMP} (0\ to\ V_{DD})$ $V_{IN2} = V_{DD}$	1.5	2.0	2.5	V
Negative Trigger Threshold Voltage	V_{T-}	$V_{IN1} = V_{RAMP} (V_{DD}\ to\ 0)$ $V_{IN2} = V_{DD}$	0.9	1.2	1.5	V
Functional Test	Functional	Verify Truth Table without Load $V_{IL} = 0.2V_{DD}$, $V_{IH} = 0.8V_{DD}$	-	-	-	-
Propagation Delay Time	t_{PDLH}	$V_{DD} = 3.3V$ $V_{IN} = V_{SS}/V_{DD}$ $C_L = 50\ pf$	-	16	50	ns
	t_{PDHL}		-	16	50	ns
Output Transition Time	t_{TLH}	$V_{DD} = 3.3V$ $V_{IN} = V_{SS}/V_{DD}$ $C_L = 50\ pf$	-	9.1	-	ns
	T_{THL}		-	6.3	-	ns



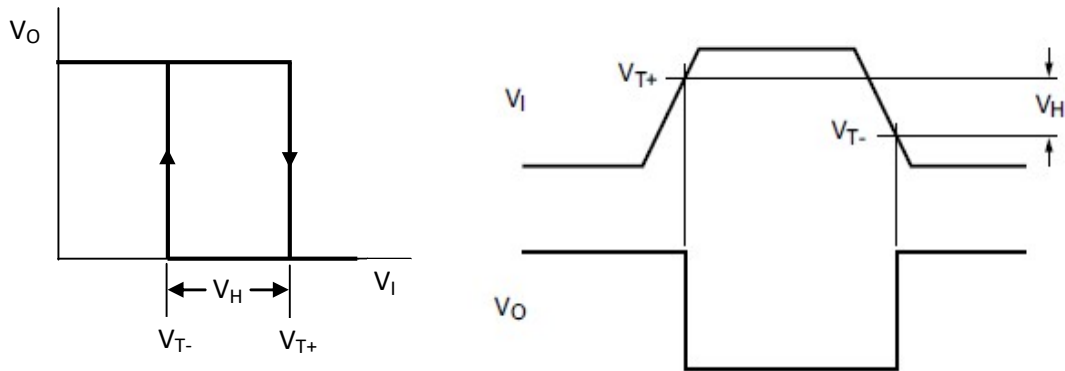
SWITCHING WAVEFORM:



HYSTERESIS CURVE:

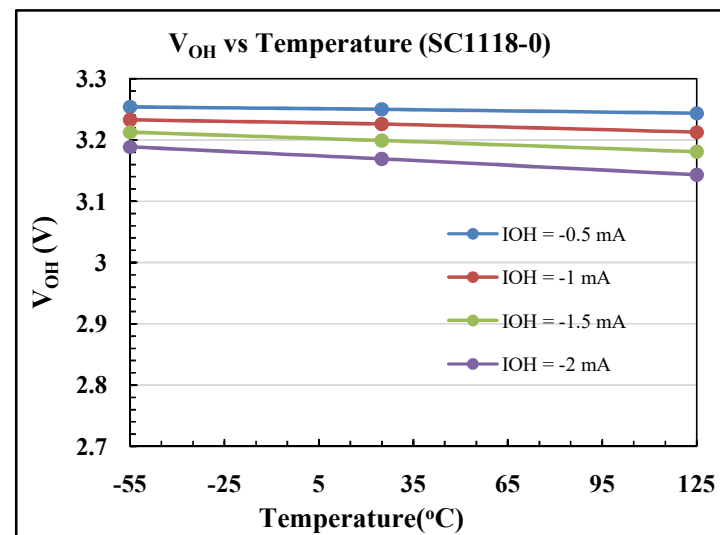
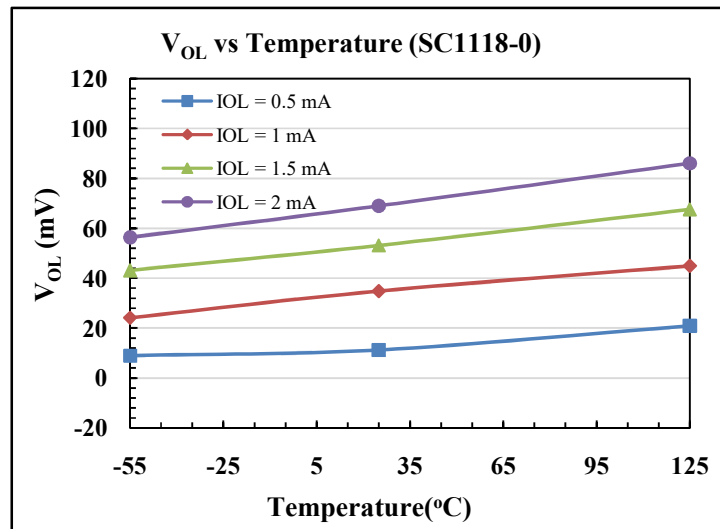
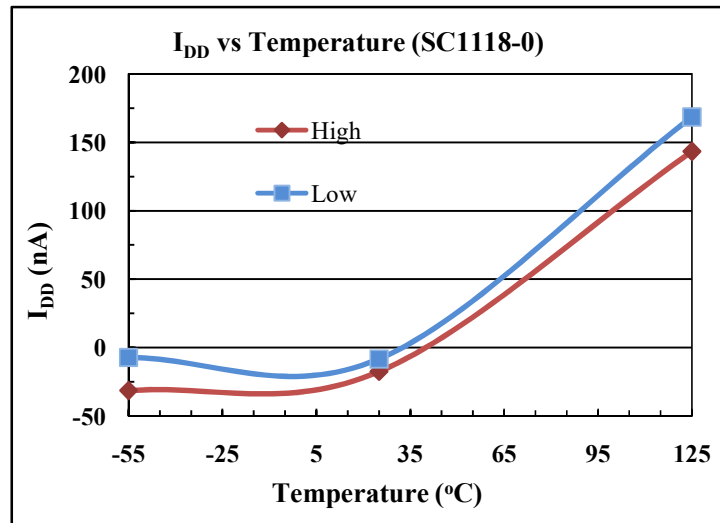
Test Conditions:

$V_{DD}=3.3V$, $V_{IN1}=3.3V$ & V_{IN2} =Square wave (20 ns rise / fall time), freq. = 1MHz, Amplitude = $3.3V_{PP}$





TEMPERATURE CHARACTERISTICS:



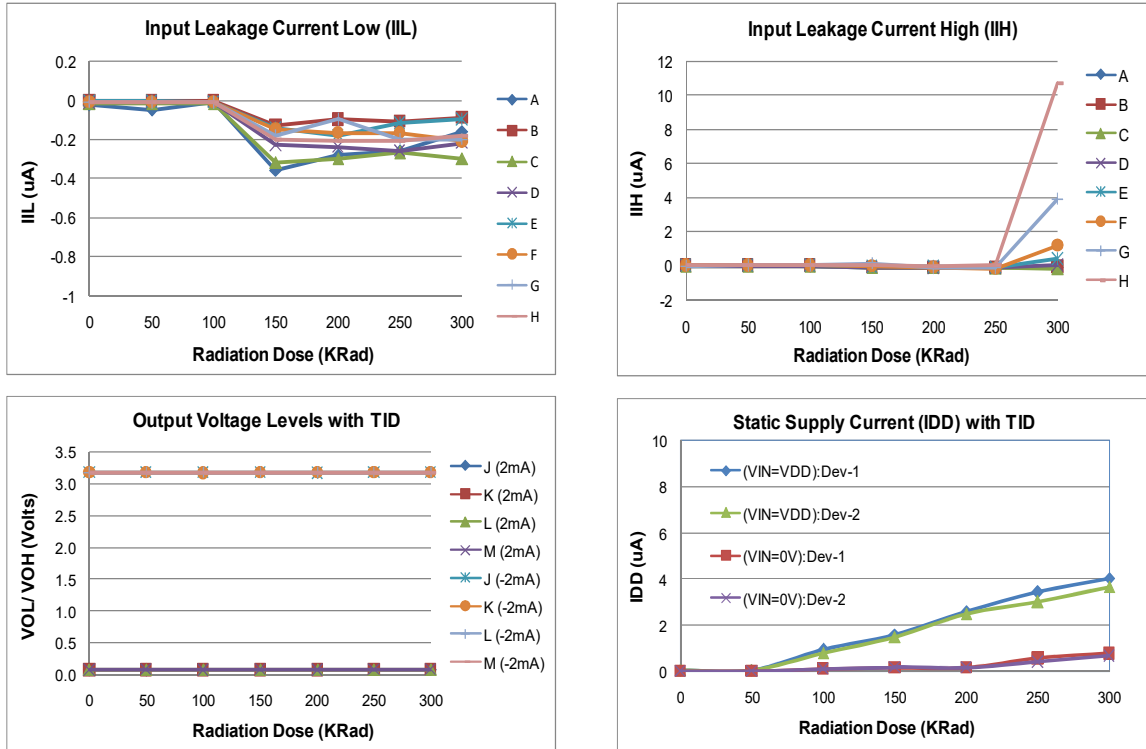


RADIATION CHARACTERISTIC:

TID (Total Ionizing Dose)

SC1118-0 is tested and characterized between dose rate of 50 and 300 rad/s (full CMOS technology).

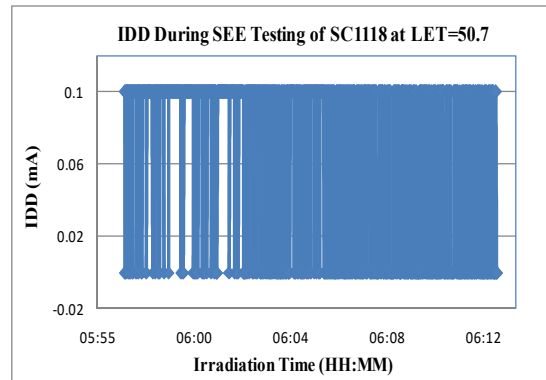
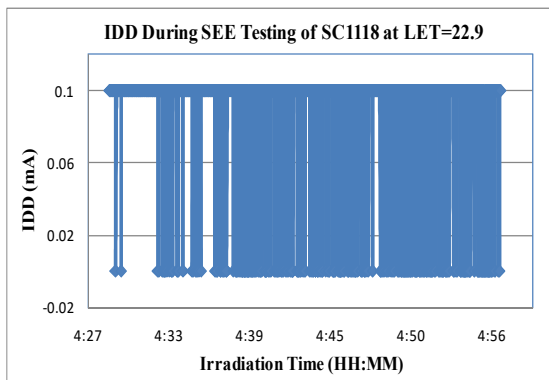
TID testing is conducted upto cumulative dose of 300 Krad and no functional failure observed.



SEE (Single Event Effect, Heavy Ions)

SEE testing of SC1118-0 is performed at LET of 22.9 MeV-cm²/mg (Ti-48, 10+) and 50.7 MeV-cm²/mg (Ag-107, 11+) with a fluence of 10⁶ ions/cm².

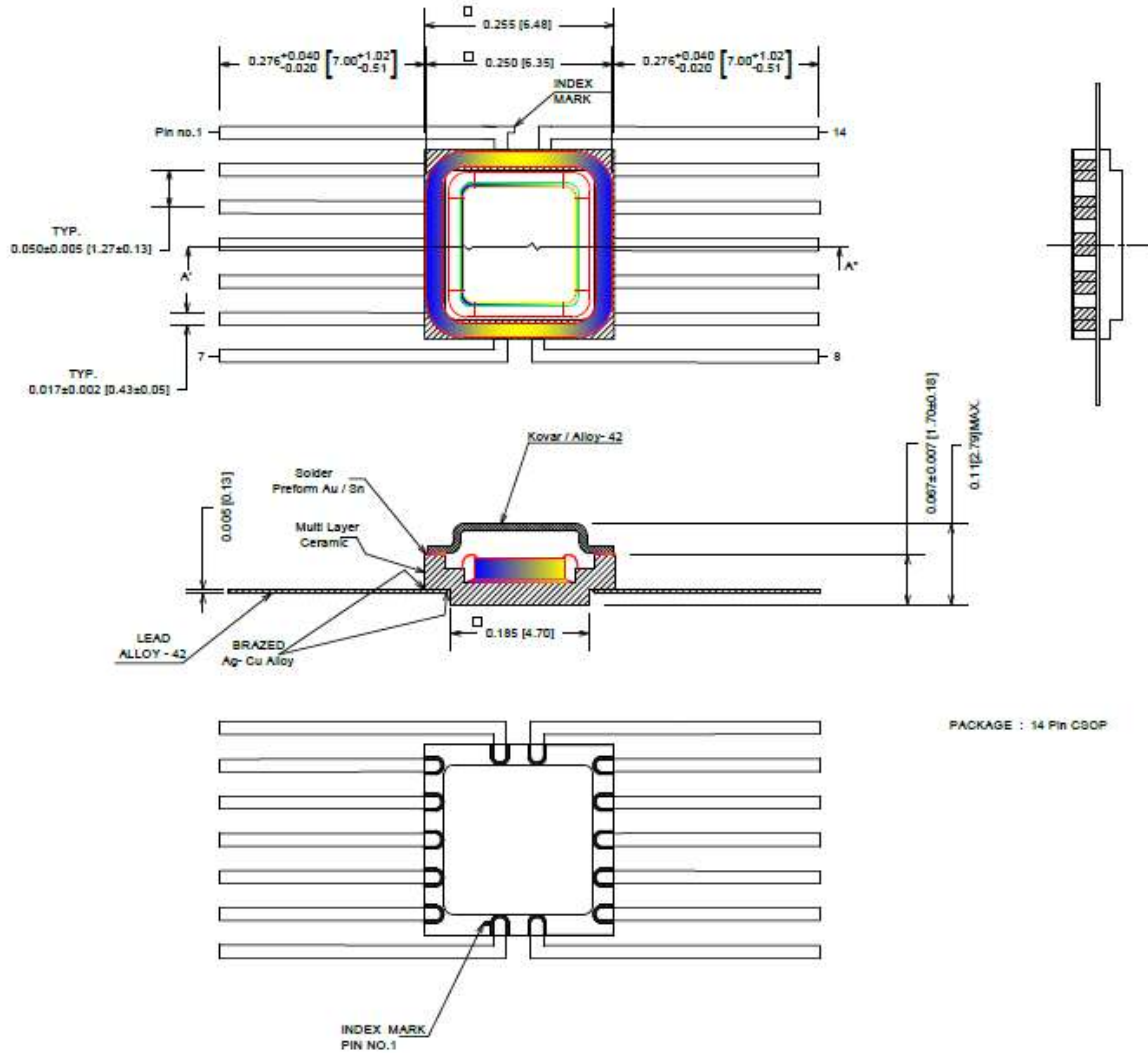
Type	Characteristics	Value	Unit
TID	High-dose rate (50 - 300 rad/sec) up to:	100	krad
Heavy ions	SEL immune up to:	50.7	MeV-cm ² /mg
	SET immune up to:	50.7	





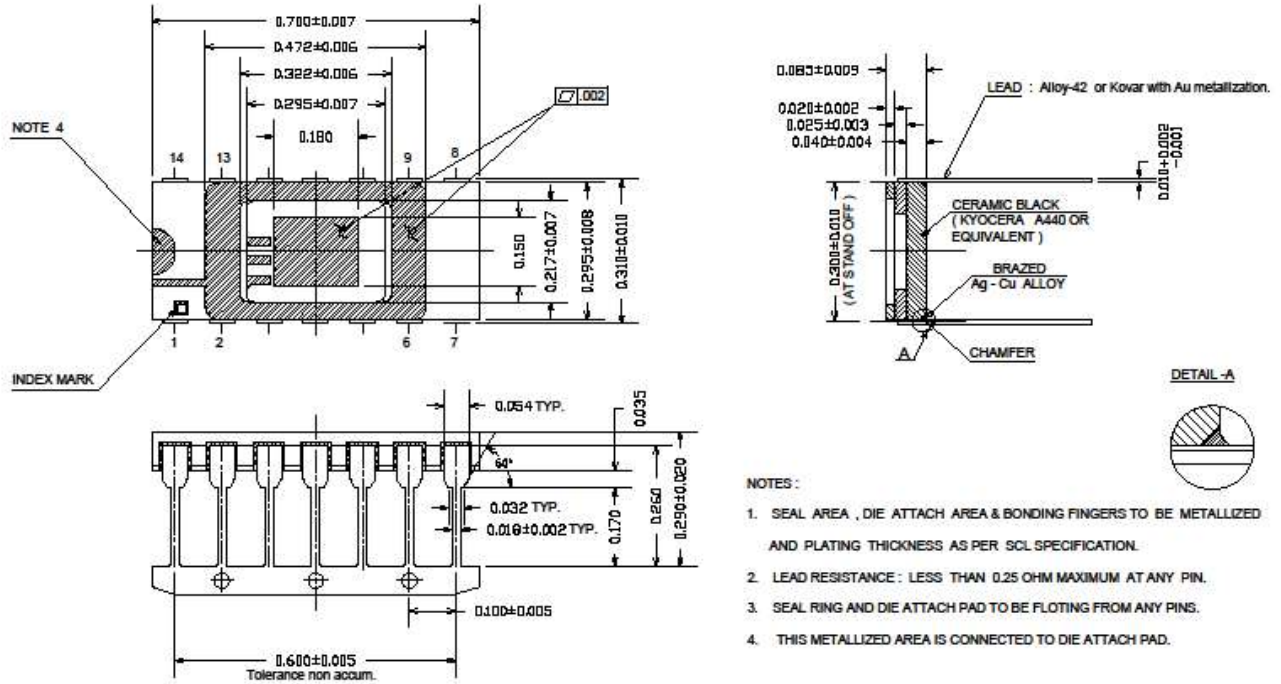
MECHANICAL DRAWING OF PACKAGE:

A. 14 PIN FLAT PACKAGE





B. 14 PIN DIP PACKAGE



IMPORTANT NOTICE

Semi Conductor Laboratory (SCL) reserves the right to make corrections, enhancements, improvements and other changes to its semiconductor products and specifications, and to discontinue any product. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. Reproduction of significant portions of SCL information in SCL data sheets is permissible only if reproduction is without alteration and is accompanied by all associated conditions, limitations, and notices. SCL is not responsible or liable for such altered documentation.