HEX SCHMITT-TRIGGER

INVERTER (5V)

SC1126-0

(Radiation Hardened)

DATA SHEET

(Version 1.1, February 2021)

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PRODUCT DESCRIPTION:

SC1126-0 is a Radiation Hardened Hex Inverter with Schmitt trigger action on all inputs. Schmitt trigger is a comparator which triggers at different points for positive and negative going signals and the difference between positive voltage (V_{TP}) and negative voltage (V_{TN}) is the Hysteresis voltage (V_H).

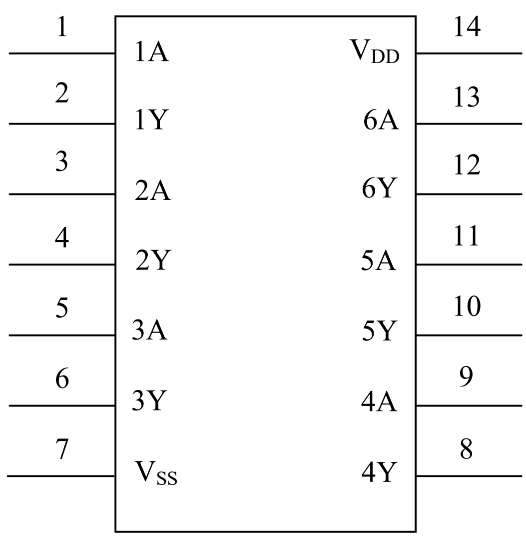
APPLICATIONS:

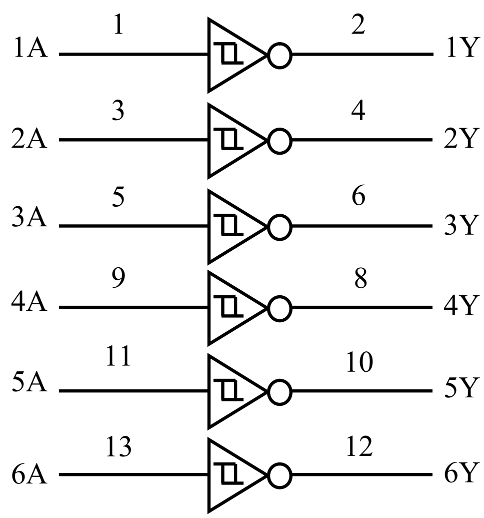
- NOT logic
- High-noise-environment systems
- Military
- Space

FEATURES:

- **Operating Supply Voltage 3.3V - 5.5V**
- **Cold Sparing feature at inputs**
- **Schmitt-trigger on each input with no external components.**
- **Noise immunity greater than 50%**
- **No limit on input rise and fall time**
- **Hysteresis voltage V_H = 1.1V (V_{DD} = 5.0V) T_A = 25°C (Typical)**
- **Radiation Hardened up to 200 KRad TID**
- **Operating Temperature: -55ºC to 125ºC**
- **SET/SEL immune up to 50 MeV-cm²/mg**
- **14-pin CSOP / Customized package / Die**
- **Package Θ_{JC} = 7.47 °C/Watt**
- **Pin compatible with SN5414**
- **ESD Sensitivity Level: Class 0 (< 250V) HBM**
- **SCL's 180nm CMOS Technology**

DEVICE PIN-OUT & LOGIC DIAGRAM:





$Y=\bar{A}$

PIN DESCRIPTION:

SYMBOL	PIN	DESCRIPTION
1A to 6A	1, 3, 5, 9, 11, 13	Input
1Y to 6Y	2, 4, 6, 8, 10, 12	Output
V_{DD}	14	Positive Supply Voltage
V_{SS}	7	Ground (0V)

FUNCTIONAL TRUTH TABLE:

INPUT	OUTPUT
nA	**nY**
0	H
1	L

ABSOLUTE MAXIMUM RATINGS (1):

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage	-0.5 to 6.5	V
$V_{I/O}$	Voltage at any Pin	-0.5 to 6.5	V
T_J	Max. Junction Temperature	150	°C
T_{STG}	Storage Temperature	-65 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	Value	Unit
V_{DD}	Supply Voltage	3.3 to 5.5	V
V_{IN}	Input Voltage	0 to V_{DD}	
I_{OH}	High Level Output Current (Source)	-5.2	mA
I_{OL}	Low Level Output Current (Sink)	5.2	
T_A	Free Air Operating Temperature	-55 to 125	°C

DC ELECTRICAL CHARACTERISTICS

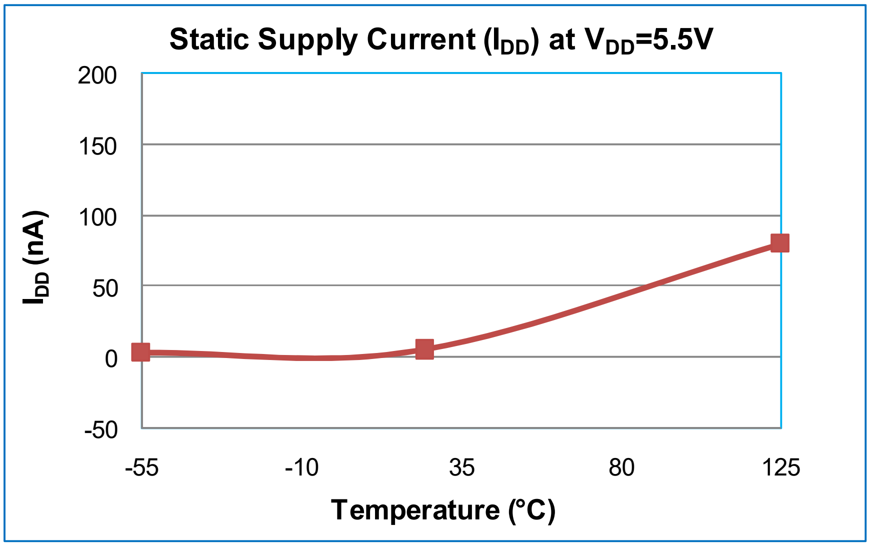
Test condition: V_{DD}=3.3V to 5.5V, V_{SS}=0V, T_A = -55°C to +125°C (unless otherwise specified)

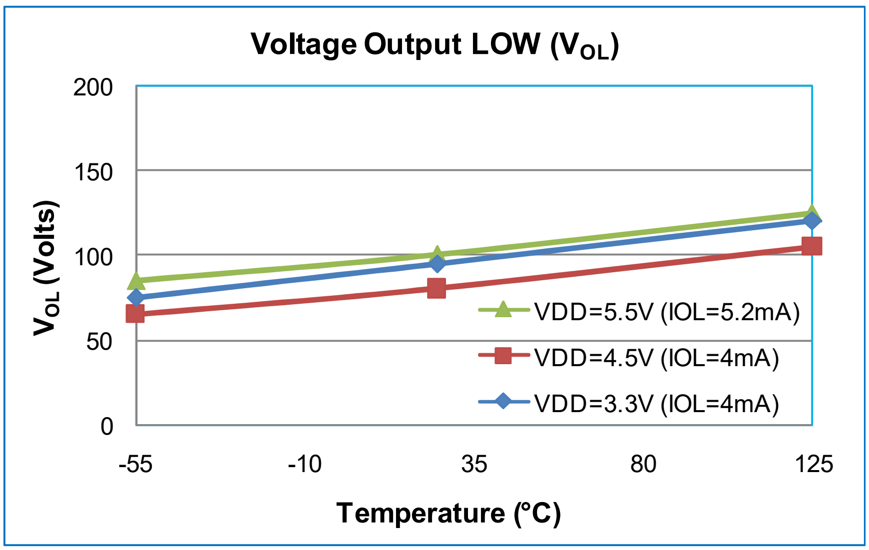
Symbol	Parameter	Test Condition	Test Limits			
			Min.	Typ.	Max.	Unit
I_{DD}	Quiescent Supply Current	V_{DD}=5.5V, V_{IL} = 0V or V_{IH} = 5.5V All Outputs Open	-	0.05	2.0	uA
I_{IL}	Low Level Input Current	V_{DD}=5.5V, V_{IN} = 0V, V_{SS}=0V	-	0.02	-1	uA
I_{IH}	High Level Input Current	V_{DD}=5.5V, V_{IN} = 5.5V, V_{SS}=0V	-	0.02	1	uA
V_{OL1}	Low Level Output Voltage 1	V_{DD}=3.3V, V_{SS}=0V V_{IH}=2.31V, I_{OL}=20μA	-	20	100	mV
V_{OL2}	Low Level Output Voltage 2	V_{DD}=4.5V, V_{SS}=0V V_{IH}=3.15V, I_{OL}=20μA	-	20	100	mV
V_{OL3}	Low Level Output Voltage 3	V_{DD}=5.5V, V_{SS}=0V V_{IH}=3.85V, I_{OL}=20μA	-	20	100	mV
V_{OL4}	Low Level Output Voltage 4	V_{DD}=3.3V, V_{SS}=0V V_{IH}=2.31V, I_{OL}=4mA	-	100	400	mV
V_{OL5}	Low Level Output Voltage 5	V_{DD}=4.5V, V_{SS}=0V V_{IH}=3.15V, I_{OL}=4mA	-	90	400	mV
V_{OL6}	Low Level Output Voltage 6	V_{DD}=5.5V, V_{SS}=0V V_{IH}=3.85V, I_{OL}=5.2mA	-	110	400	mV
V_{OH1}	High Level Output Voltage 1	V_{DD}=3.3V, V_{SS}=0V V_{IL}=0.165V, I_{OH}=-20μA	3.2	3.29	-	V
V_{OH2}	High Level Output Voltage 2	V_{DD}=4.5V, V_{SS}=0V V_{IL}=0.5V, I_{OH}=-20μA	4.4	4.49	-	V
V_{OH3}	High Level Output Voltage 3	V_{DD}=5.5V, V_{SS}=0V V_{IL}=0.9V, I_{OH}=-20μA	5.4	5.49	-	V
V_{OH4}	High Level Output Voltage 4	V_{DD}=3.3V, V_{SS}=0V V_{IL}=0.165V, I_{OH}= -4mA	2.5	2.99	-	V
V_{OH5}	High Level Output Voltage 5	V_{DD}=4.5V, V_{SS}=0V V_{IL}=0.5V, I_{OH}= -4mA	3.7	4.25	-	V
V_{OH6}	High Level Output Voltage 6	V_{DD}=5.5V, V_{SS}=0V V_{IL}=0.9V, I_{OH}= -5.2mA	4.7	5.21	-	V

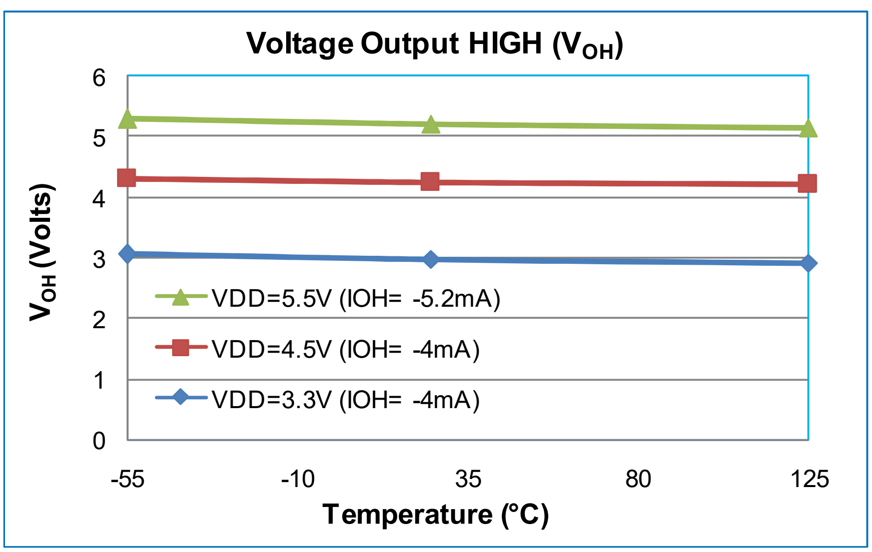
DC ELECTRICAL CHARACTERISTICS (Continued..)

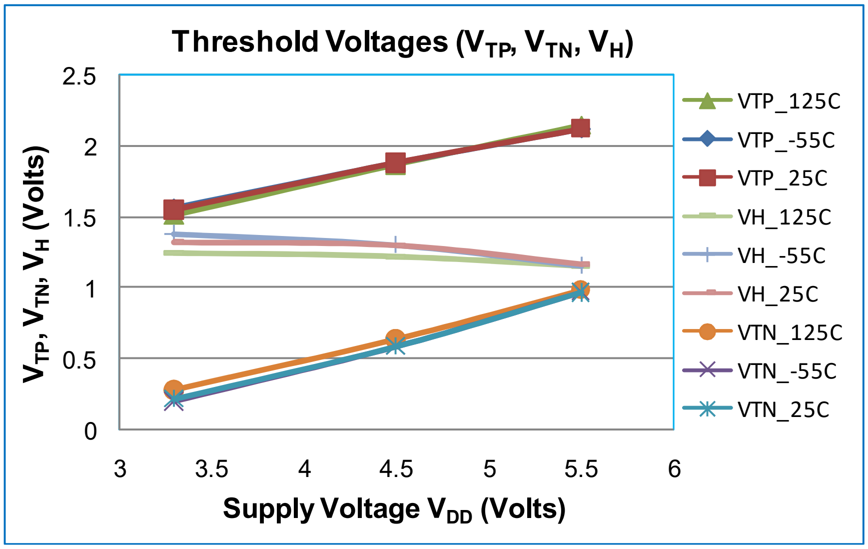
Symbol	Parameter	Test Condition		Test Limits			
				Min.	Typ.	Max.	Unit
Functional (Truth Table Verification without Load) @ 1Mhz	Functional Test 1	V_{DD}=5.5V,V_{SS}=0V V_{IL}=0.9V,V_{IH}=3.85V		-	-	-	-
	Functional Test 2	V_{DD}=4.5V,V_{SS}=0V V_{IL}=0.5V,V_{IH}=3.15V		-	-	-	-
	Functional Test 3	V_{DD}=3.3V,V_{SS}=0V V_{IL}=0.165V,V_{IH}=2.31V		-	-	-	-
	Functional Test 4 (Level Translation Test)	V_{DD}=3.0V V_{IL}=0V, V_{IH}=5.5V $V_{OL}\leq$ 0.5V, $V_{OH}\geq$2.5V		-	-	-	-
I_{OFF}	Power Off Input Leakage Current (Cold Spare)	V_{DD} = 0V	V_{IN} = 0V	-	.006	±1	uA
			V_{IN} = 5.5V	-	0.4	±5	uA
V_{TP1} V_{TP3} V_{TP3}	Positive Trigger Threshold Voltage	V_{IN}=0V to V_{TP}, V_{DD}=3.6V V_{DD}=4.5V V_{DD}=5.5V		1.15 1.55 1.90	1.54 1.87 2.13	2.31 3.15 3.85	V
V_{TN1} V_{TN2} V_{TN3}	Negative Trigger Threshold Voltage	V_{IN}=V_{DD} to V_{TN}, V_{SS}=0V V_{DD}=3.6V V_{DD}=4.5V V_{DD}=5.5V		0.16 0.5 0.9	0.20 0.58 0.96	1.8 2.4 3.0	V
V_{H1} V_{H2} V_{H3}	Hysteresis Voltage V_H = (V_{TP}-V_{TN})	V_H=V_{TP}-V_{TN}, V_{SS}=0V V_{DD}=3.6V V_{DD}=4.5V V_{DD}=5.5V		0.3 0.4 0.5	1.35 1.3 1.17	1.5 2.1 2.5	V
V_{IC}	Input Clamp Voltage to V_{SS}	I_{IN} = -100µA V_{SS}=0V		-0.1	-0.6	-1.0	V
t_{PLH}	Propagation Delay Low to High	V_{DD}=4.5V V_{IL} = 0V, V_{IH}=4.5V 1 MHz Pulse, C_L=30 pF		-	12	27	ns
t_{PHL}	Propagation Delay High to Low	V_{DD}=4.5V V_{IL} = 0V, V_{IH}=4.5V 1 MHz Pulse, C_L=30 pF		-	17	27	ns

TYPICAL ELECTRICAL CHARACTERISTICS:



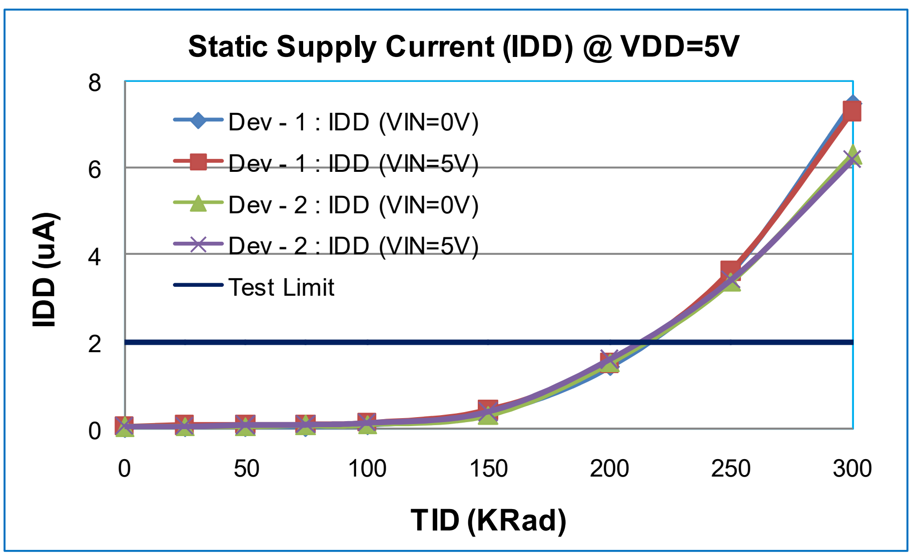






RADIATION CHARACTERISTICS:

Total Ionization Dose (TID)



TID Test Conclusion:

- No significant change in supply current observed upto 100 Krad. I_{DD} remains within specifications (2 uA) upto 200 Krad.
- There is no substantial change in device parameters (leakages, output levels, hysteresis voltage) up to 300KRad.
- The device is fully functional up to 300 Krad.

Single Event Effect (SEE)

Single Event Effects	LET in Silicon (MeV-cm2/mg)	
	22.9 (Ti)	50.7 (Ag)
Transient (SET)	PASS	PASS
Latch-Up (SEL)	PASS	PASS

SEE Test Conclusion:

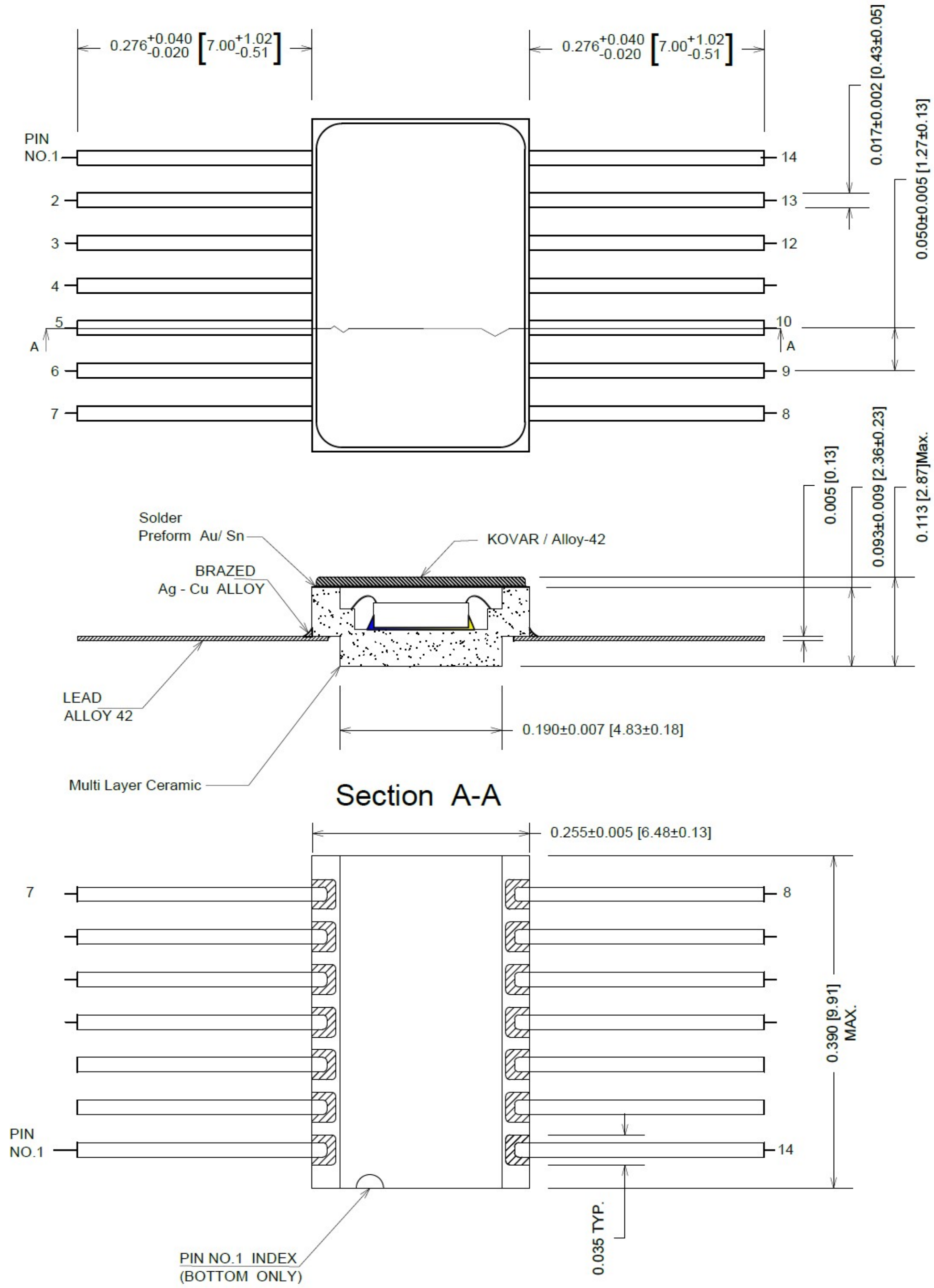
- SEE testing of Hex Schmitt Trigger Inverter (SC1126-0) is done at two different LET 22.9 & 50.7 MeV-cm2/mg for a fluence of 10^6 ions/cm^2.
- No transient and Latch-up observed during irradiation.
- The Device is passed in SET, SEL up to LET of 50 MeV-cm2/mg.

Revision History			
S. No.	Version	Date of release	Description
1	1.0	Mar. 2020	--
2	1.1	Feb. 2021	Cold sparing test results added (Ioff)

MECHANICAL DRAWING OF PACKAGE

14-Pin Ceramic-Dual-Flat Pack

NOTE: All linear dimensions are in inches (mm.)



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