

8-CHANNEL ANALOG
MULTIPLEXER / DEMULTIPLEXER
(SC1018-0T1)
(Radiation Hardened)



DATA SHEET

Version 1.1, Jan' 2022



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RH 8-CHANNEL ANALOG MUX / DEMUX (SC1018-0T1)

PRODUCT DESCRIPTION:

The SC1018-0T1 is a Radiation Hardened 8-channel analog multiplexer de-multiplexer with three address inputs (S0 to S2), an active LOW enable input (\bar{E}), eight independent inputs/outputs (Y0 to Y7) and a common input/output (Z). The device contains eight bidirectional analog switches, each with one side connected to an independent input/output (Y0 to Y7) and other side connected to a common input/output (Z).

V_{DD} and V_{SS} are the supply voltage connections for the digital control inputs (S1 to S3, and \bar{E}). The analog inputs/outputs (Y0 to Y7, and Z) can swing between V_{DD} as a positive limit and V_{SS} as negative limit.

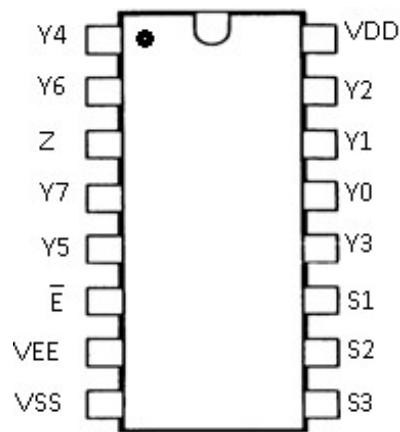
APPLICATIONS:

- Analog multiplexing and de-multiplexing
- Digital multiplexing and de-multiplexing
- Signal gating

Pin no.	Signal	Pin no.	Signal
1	Y4	9	S3
2	Y6	10	S2
3	Z	11	S1
4	Y7	12	Y3
5	Y5	13	Y0
6	\bar{E}	14	Y1
7	V_{EE}	15	Y2
8	V_{SS}	16	V_{DD}

FEATURES:

- Operating Voltage $5V \pm 0.5V$
- Low on resistance i.e. 200 ohm (Typ.)
- Low power dissipation (< 10uW at 5V static)
- Operating Ambient Temperature: $-55^{\circ}C$ to $125^{\circ}C$
- 16 pin CSOP/ Customized package / Die
- Pin compatible with CD4051
- Radiation Hardened up to 150 KRad TID
- SEL immune up to 70 MeV.cm²/mg.
- SET immune up to 52 MeV.cm²/mg
- Package $\Theta_{JC} = 3.1^{\circ}C/Watt$
- ESD Sensitivity Level: Class 0 (< 250V) HBM
- SCL's 180nm CMOS Technology



Device Pin diagram

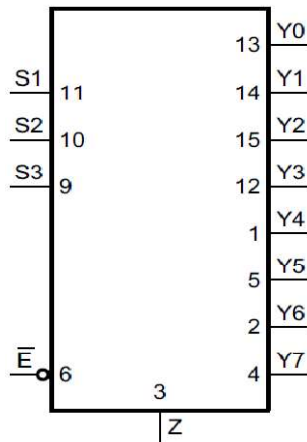


DEVICE PIN DESCRIPTION:

Symbol	Pin	Description
\bar{E}	6	enable input (active LOW)
V_{EE}	7	supply voltage ($V_{EE} = 0V$)
V_{SS}	8	ground supply voltage (0V)
S1, S2, S3	11,10,9	select input
Y0, Y1, Y2, Y3, Y4, Y5, Y6, Y7	13, 14, 15, 12, 1, 5, 2, 4	independent input or output
Z	3	common output or input
V_{DD}	16	supply voltage

Signal description

LOGIC DIAGRAM (POSITIVE LOGIC):



Device Logic Diagram

FUNCTIONAL TABLE:

Digital Inputs				Channel ON
\bar{E}	S3	S2	S1	
L	L	L	L	Y0 to Z
L	L	L	H	Y1 to Z
L	L	H	L	Y2 to Z
L	L	H	H	Y3 to Z
L	H	L	L	Y4 to Z
L	H	L	H	Y5 to Z
L	H	H	L	Y6 to Z
L	H	H	H	Y7 to Z
H	X	X	X	Switches off

Functional table



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ABSOLUTE MAXIMUM RATINGS (1):

Over operating free-air temperature range (unless otherwise noted),

PARAMETER	UNIT
V_{DD} , Supply voltage range	-0.5 V to 6.5V
V_I , Input voltage range	-0.5 V to 6.5 V
T_J , Operating 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.	Typ.	Max.	Unit
V_{DD}	Supply voltage	4.5	5.0	5.5	V
V_{IN}	Input voltage range (Analog)	0	-	V_{DD}	V
V_{IH}	High level input voltage	$0.7 \times V_{DD}$	-	-	V
V_{IL}	Low level input voltage	-	-	$0.3 \times V_{DD}$	V
T_{AMB}	Operating Temperature	-55	-	+125	°C

DC ELECTRICAL SPECIFICATIONS:

Test condition: $V_{DD} = 5V \pm 0.5V$, $V_{SS} = V_{EE} = 0V$, $T_A = -55^\circ C$ to $+125^\circ C$ (unless otherwise specified)

Symbol	Parameter	Test Conditions	Test Limits			Units
			Min.	Typ.	Max.	
I_{IH}	Control Inputs (Digital) Leakage Current	$V_{DD} = 5.5V, V_{IN} = V_{DD}$	-	0.02	± 1	μA
I_{IL}	Control Inputs (Digital) Leakage Current	$V_{DD} = 5.5V, V_{IN} = V_{SS}$	-	0.02	± 2	μA
$I_{S(OFF)}$	Off State Leakage Current Z Port (all channels OFF) or Y Port (per channel)	$\bar{E} = V_{DD},$ $V_{DD} = 5.5V, V_{IN} = V_{DD}$	-	0.01	± 1	μA
		$\bar{E} = V_{DD},$ $V_{DD} = 5.5V, V_{IN} = 0$	-	0.01	± 1	μA
R_{ON}	Channel ON Resistance (rail)	$V_{DD} = 5.0V,$ $V_{IN} = 0V$ or $5.0V,$ Channel selected	100	200	400	ohm
I_{DD}	Static Supply Current (Device Enable)	$V_{DD} = 5V \pm 0.5V$ $I_O = 0mA$	-	4.16	20	μA
	Static Supply Current (Device Disable)		-	3.97	20	μA



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AC ELECTRICAL SPECIFICATIONS:

Test condition: $V_{DD} = 5V$, $V_{IN} = 0V$ or $5V$ @1 MHz, $C_L = 10pF$, $R_L=10K\Omega$, $T_{AMB} = 22 \pm 3^\circ C$

Symbol	Parameter	From	To	Test Results (Typ.)	Max.	Units
t_{PLH}	LOW to HIGH propagation delay	Z	Y	3.07	15	ns
t_{PHL}	HIGH to LOW propagation delay			3.23	15	ns
t_{PZL}	OFF-state to LOW propagation delay	Ē	O/P	3.8	15	ns
t_{PLZ}	LOW to OFF-state propagation delay			5.6	15	ns
t_{PZH}	OFF-state to HIGH propagation delay	Ē	O/P	3.2	15	ns
t_{PHZ}	HIGH to OFF-state propagation delay			16.8	40	ns
f_{ON}	-3dB Cut off frequency (Channel ON) $C_L = 5pF, R_L=1K\Omega$	-	-	103	--	Mhz
THD	Total Harmonic Distortion $C_L = 5pF, R_L=1K\Omega$	-	-	0.723	--	%

AC Electrical Specification

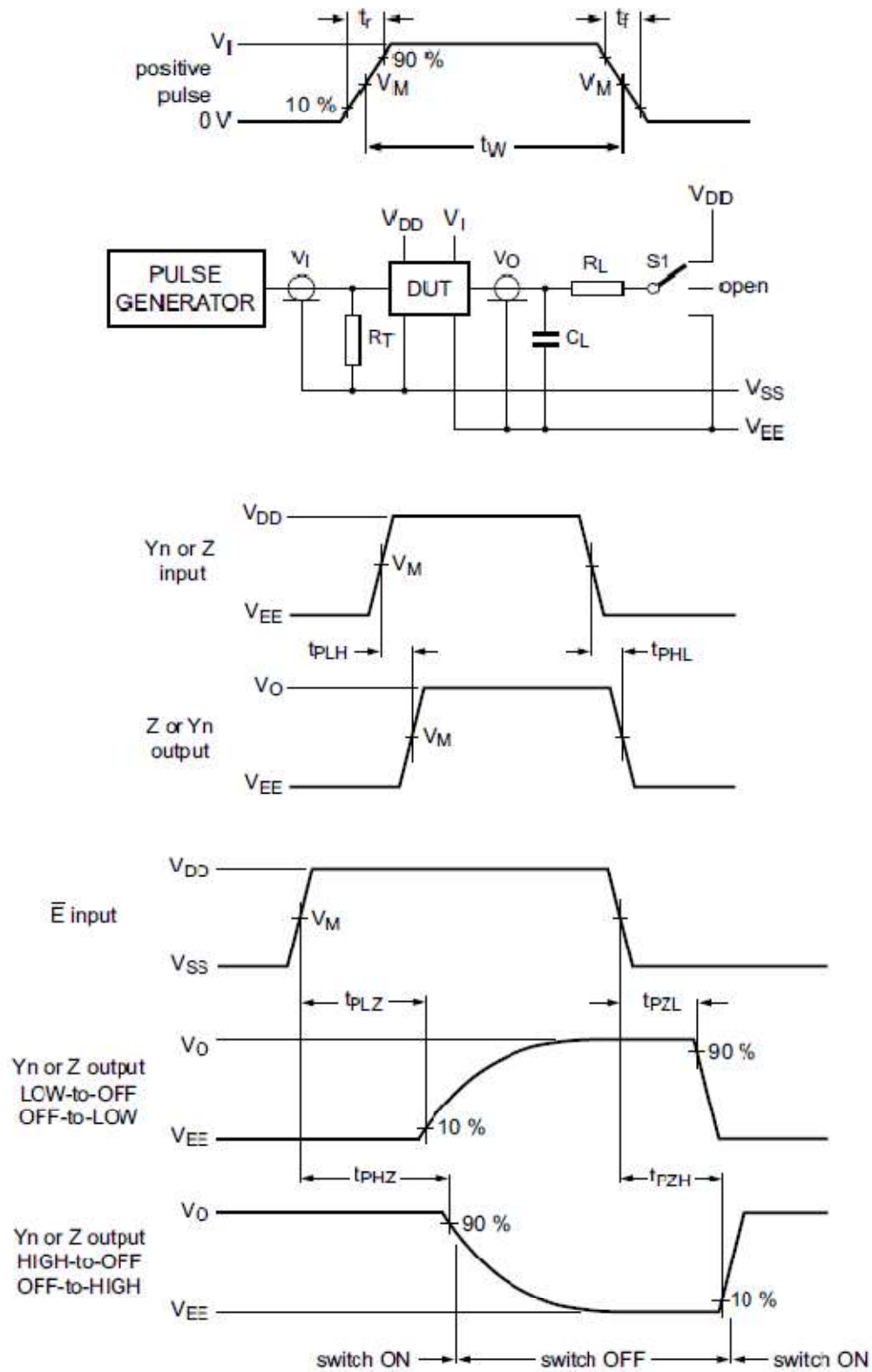


Delay (Z to Y) t_{PLH} , t_{PHL}



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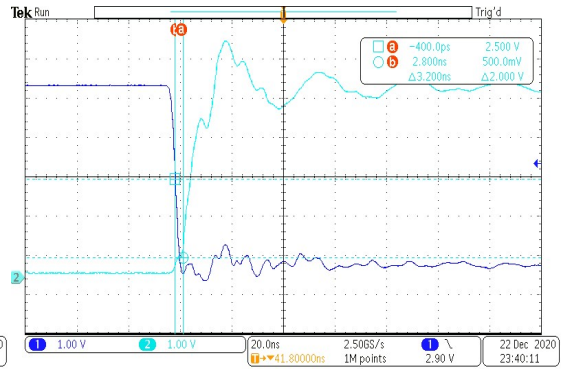
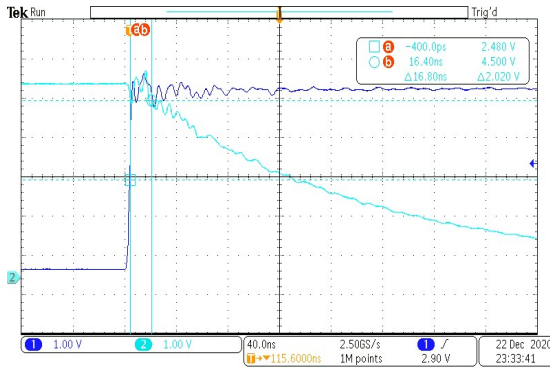
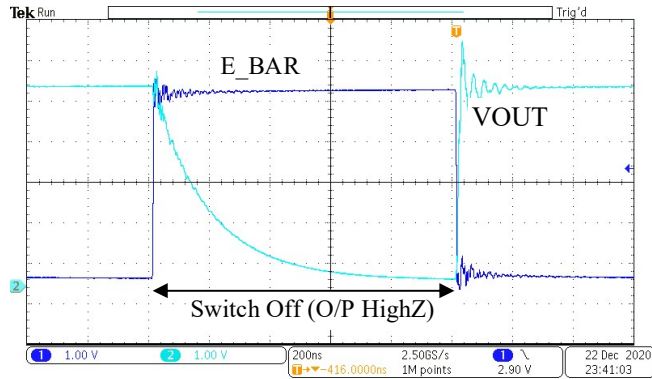
TEST CIRCUIT AND SWITCHING WAVEFORM FOR DELAY MEASUREMENTS:



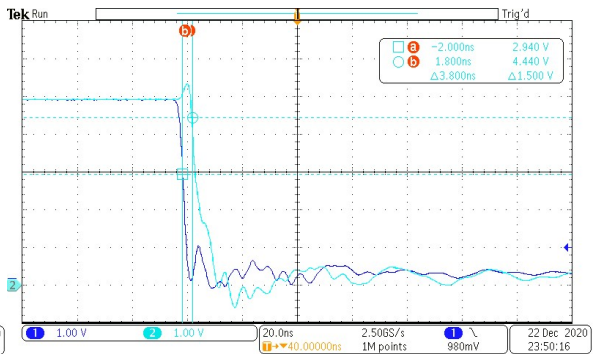
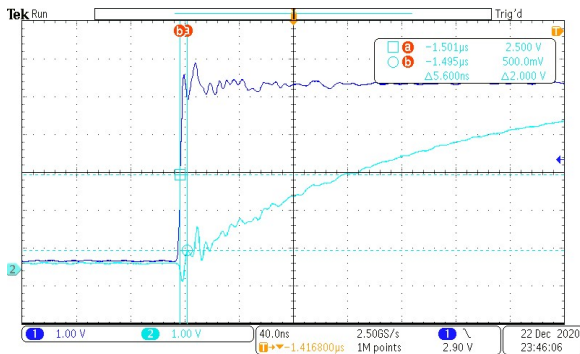
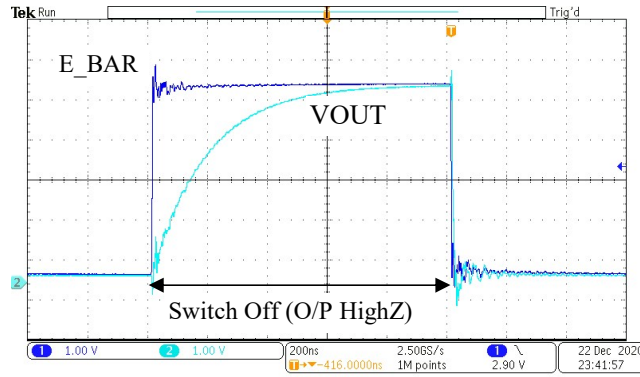


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High Z Delay waveforms (t_{PZH} / t_{PHZ}):

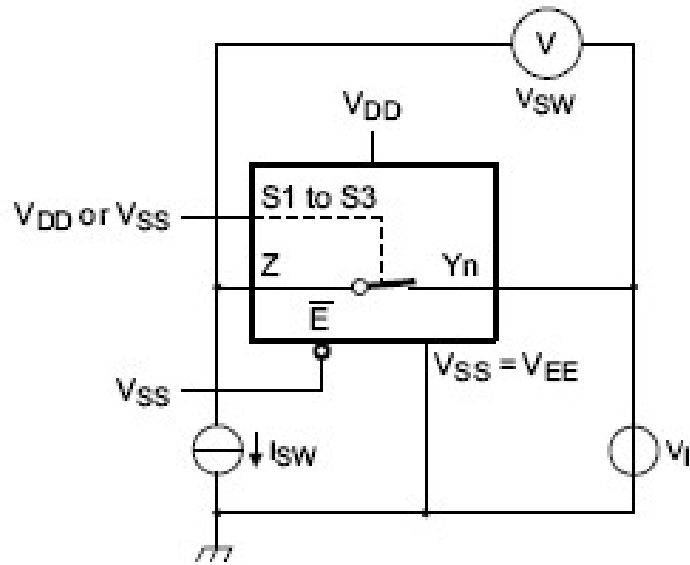


High Z Delay waveforms (t_{PZL} / t_{PLZ}):

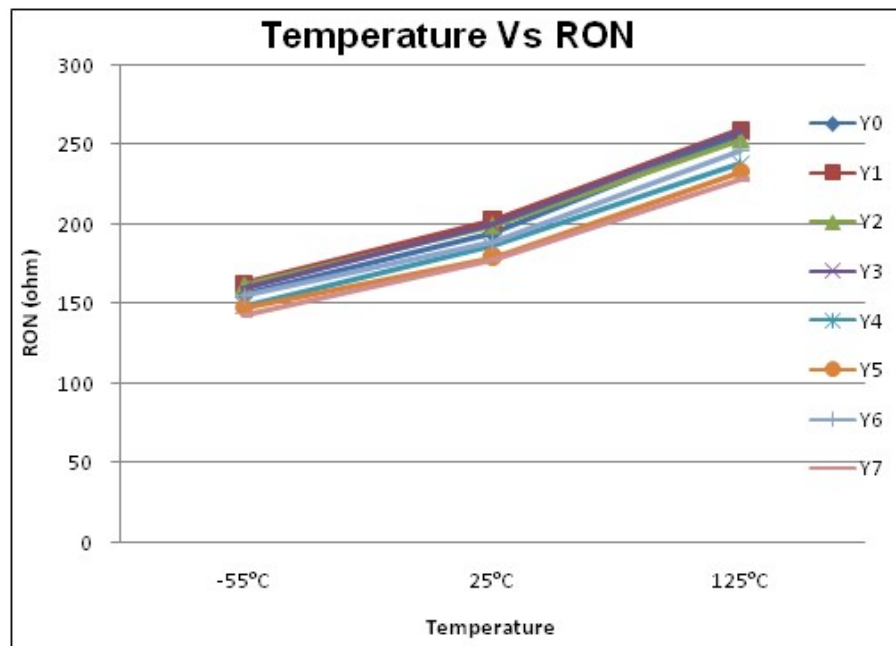




Test Circuit (RON):

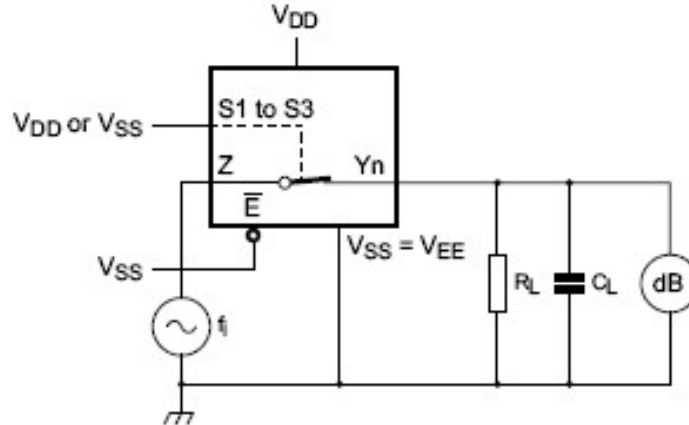


Test circuit for measuring R_{ON} , ($R_{ON} = V_{SW} / I_{SW}$)

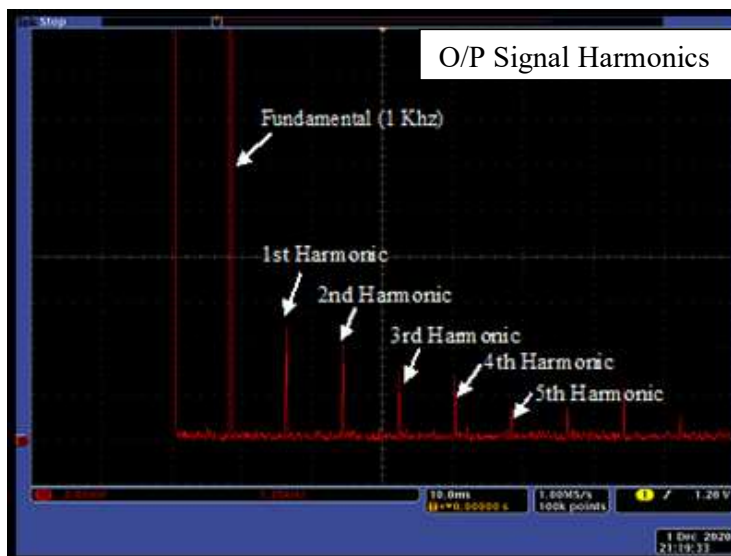
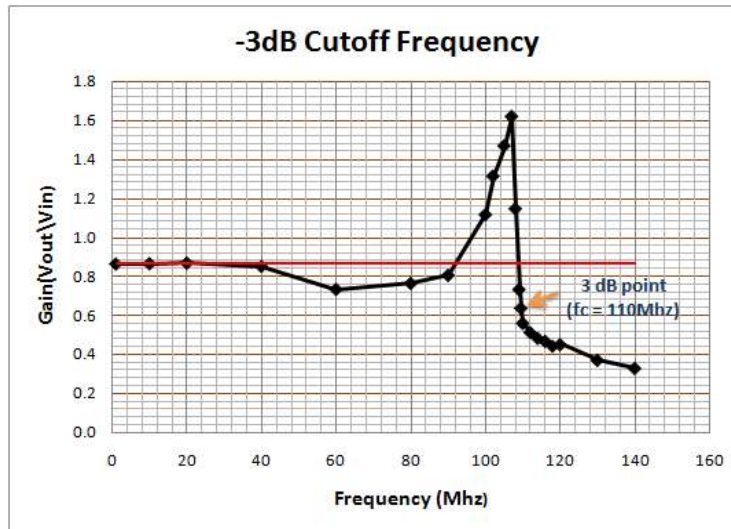




Test Circuit (Cutoff frequency, THD):



Test circuit for measuring frequency response and total harmonic distortion



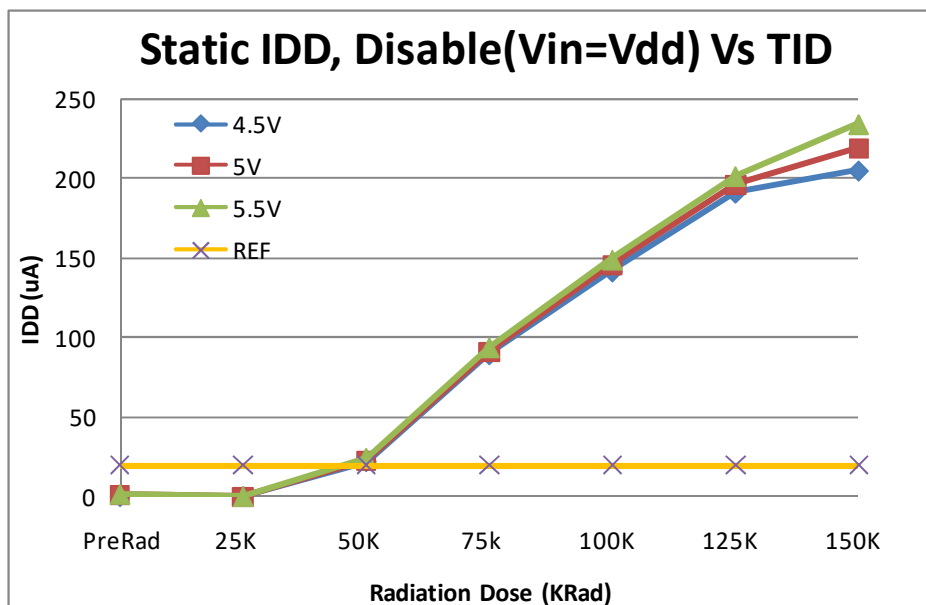
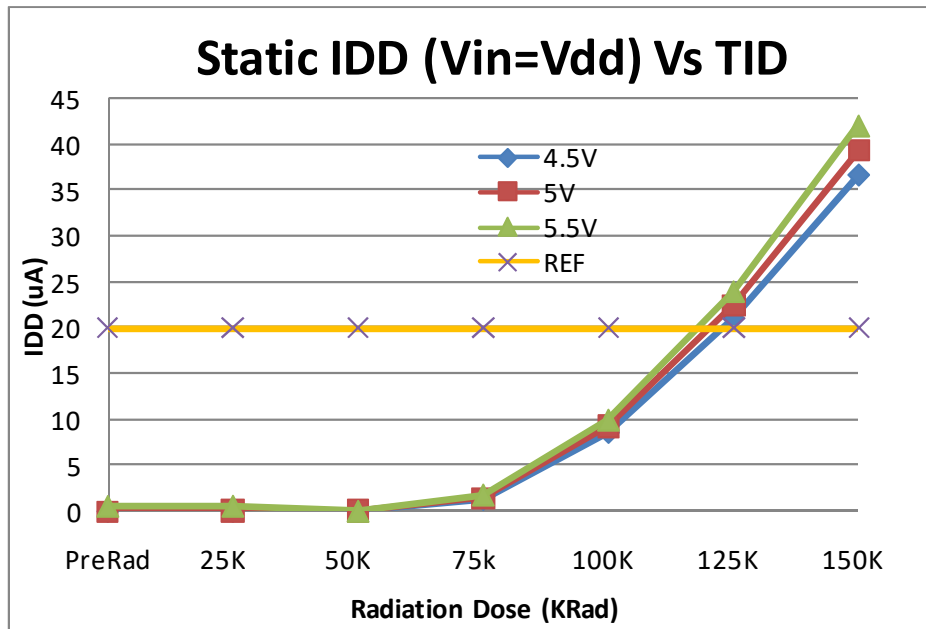


RADIATION TESTING

Total Dose (TID)

SC1018-0T1 is tested and characterized between dose rate of 50 and 300 rad/s (full CMOS technology). TID testing is conducted up to cumulative dose of 150 KRad. No functional failure observed upto 150 KRad.

RADIATION CHARACTERISTICS:





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Heavy Ions (SET)

- SEE testing of SC1018-0T1 is completed at three different ion beams of LET 30, LET 52 and 70.7 MeV-cm²/mg for a Fluence of 10⁶ ions/cm².
- No SEL is observed for LET up to 70.4 MeV-cm²/mg.
- No SET is observed for LET up to 52 MeV-cm²/mg.

Radiation Type	Characteristics	Value	Unit
TID	High-dose rate (50 - 300 rad/sec) up to:	150	kRad
Heavy ions	SEL immune up to:	70	MeV-cm ² /mg
	SET immune up to:	52	

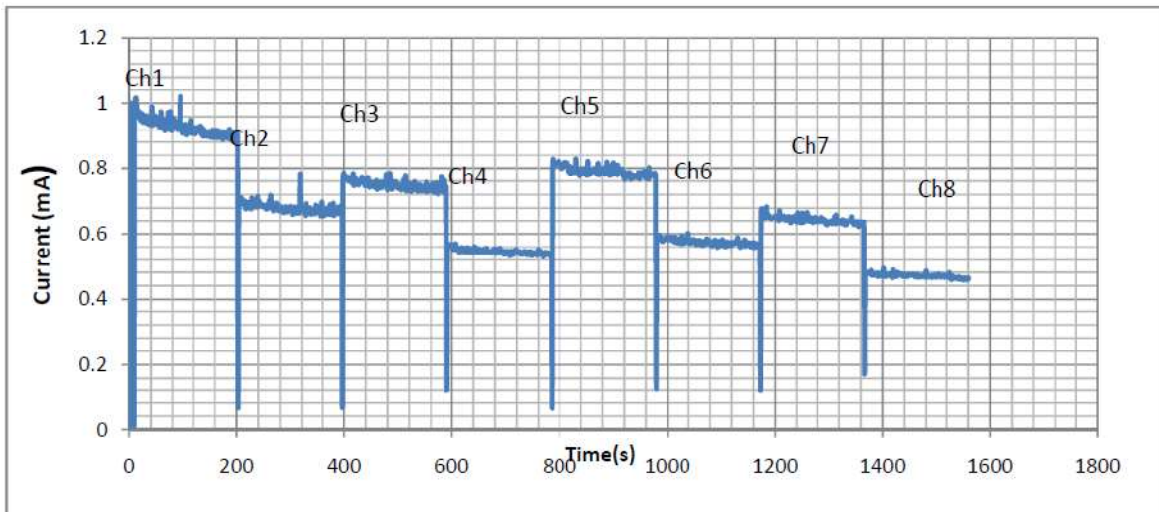


Figure: MUX Current Monitoring at LET-70 MeV-cm²/mg

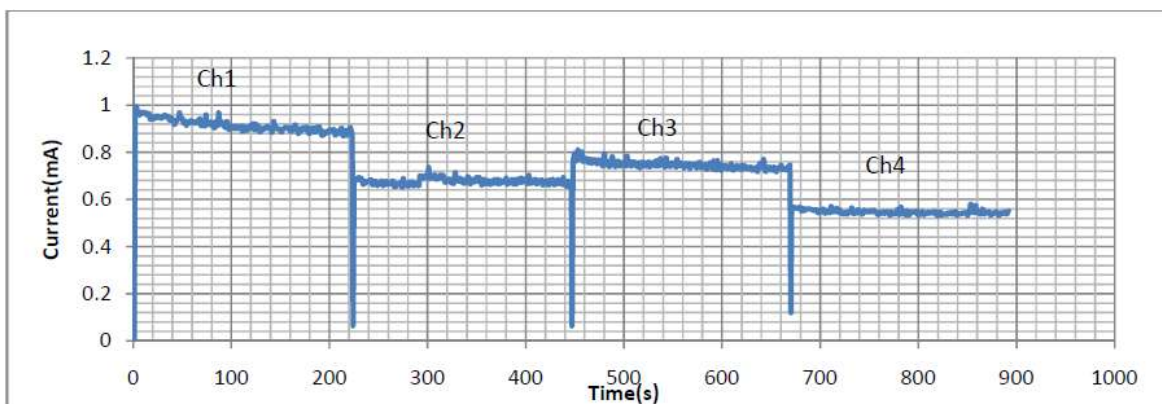
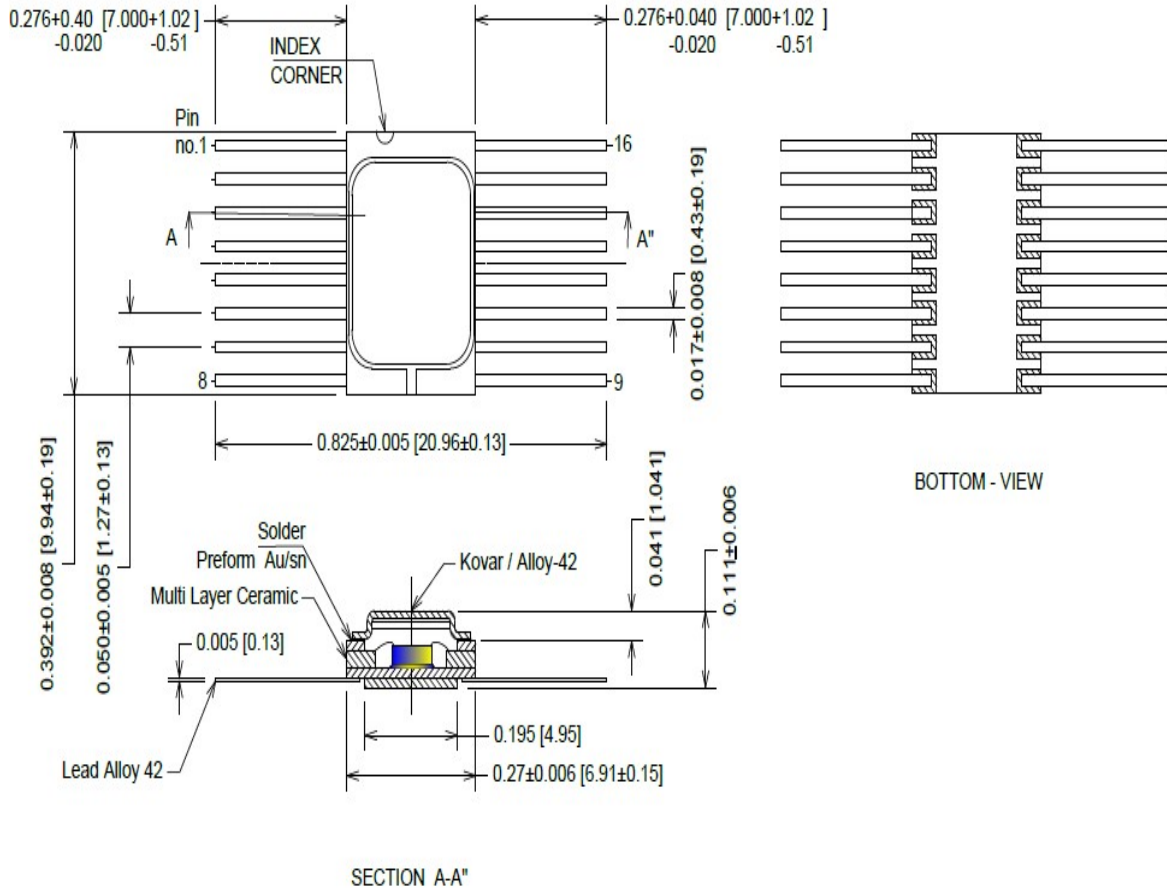


Figure: DEMUX Current Monitoring at LET-70 MeV-cm²/mg



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PACKAGE DRAWING (CSOP-16):



Revision History			
S. No.	Version	Date of release	Description
1	1.0	Dec. 2020	--
2	1.1	Jan. 2022	Radiation test results added, page-10

IMPORTANT NOTICE

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