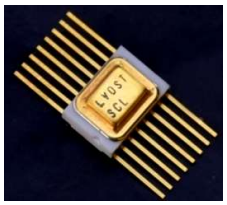
HIGH SPEED
QUAD LVDS DRIVER
(SC1002-1)
(Radiation Tolerant)



DATA SHEET

Version 1.0, March 2019

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PRODUCT DESCRIPTION:

The SC1002-1 is a quad, low-voltage, differential signaling (QLVDS) driver specifically designed and packaged for use in aerospace environments in a low-power and fast point-to-point baseband data transmission standard.

The intended application of these devices and signaling technique is point-to-point data transmission over controlled impedance media of approximately 100 ohm. The transmission media may be printed-circuit board traces, backplanes or cables.

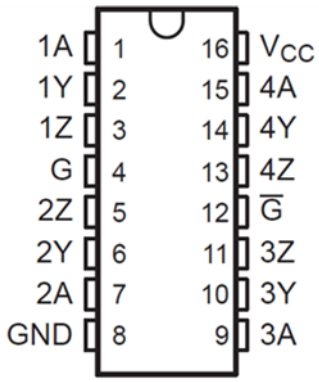
FEATURES:

- **Operating Power Supply 3.3V ±0.3V**
- **Cold sparing at LVDS output pins.**
- **LVTTL/CMOS logic input levels and LVDS output levels**
- **Compatible with ANSI/TIA/EIA-644 LVDS standard**
- **400 Mbps (200 MHz) switching rates**
- **±350 mV differential signaling**
- **Driver output at high impedance when disabled or with V_{DD} = 0**
- **Power dissipation 26 mW Typical per driver at 200MHz (V_{DD}=3.3V)**
- **Propagation delay ≤ 5 nsec.**
- **Operating Temperature Range: -55ºC to 125ºC**
- **16 Pin CSOP /Customized package /Die**
- **Radiation Tolerant up to 200 KRad**
- **SET/SEL immune up to 50 MeV.cm²/mg**
- **Pin compatible with QLVDS driver LVDS31**
- **ESD protection level: HBM class-1 (< 1999V)**
- **Latch up current protection, ±100mA**
- **Θ_{JC} = 3.1ºC/Watt**
- **SCL's 180nm CMOS Technology**

PIN CONFIGURATION:

Pin No.	Pin Name	Description
16	V_{DD}	+3.3V Supply
8	GND	Supply Ground
4,12	G / $\bar{G}$	Control inputs
1, 7, 9, 15	1A, 2A, 3A, 4A	Input Data 0 to 3.3V
2, 6, 10, 14	1Y, 2Y, 3Y, 4Y	LVDS O/P data (True)
3, 5, 11, 13	1Z, 2Z, 3Z, 4Z	LVDS O/P data (Complimentary)

Device Pin Description

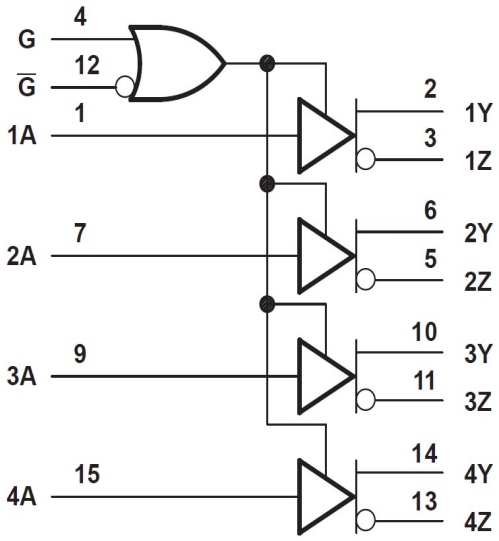


Device Pin Diagram

LOGIC DIAGRAM AND TRUTH TABLE:

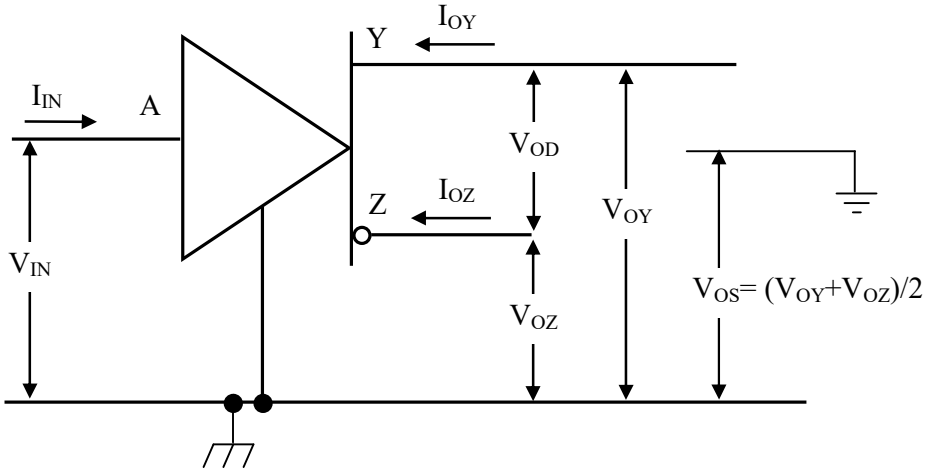
Input	Enables		Outputs	
A	G	$\bar{G}$	Y	Z
H	H	X	H	L
L	H	X	L	H
H	X	L	H	L
L	X	L	L	H
X	L	H	Z	Z
Open	H	X	L	H
Open	X	L	L	H
L=low level, H=high level, X=irrelevant, Z=high impedance				

Functional Truth Table



Logic Diagram

TEST CIRCUIT:



Typical Test Circuit

ABSOLUTE MAXIMUM RATINGS (1):

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

PARAMETER	UNIT
Supply Voltage Range (V_{DD})	–0.5V to 4.3V
Input Voltage Range (V_I)	–0.5V to V_{DD} + 0.5V
Max. Junction Temperature (T_J)	150°C
Storage Temperature Range (T_{STG})	–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	3.0	3.3	3.6	V
V_{IH}	High Level Input Voltage	2.0	-	-	V
V_{IL}	Low Level Input Voltage	-	-	0.8	V
T_A	Operating Free Air Temperature	-55	-	+125	ºC

DC ELECTRICAL SPECIFICATIONS:

Test condition: D_{IN} = GND or V_{DD}, R_L = 100Ω, V_{DD} =3.3V±0.3V, T_{AMB} = -55ºC to 125ºC

Symbol	Parameters	Test Conditions	Pin	Min.	Typ.	Max.	Units
V_{OD}	Differential Output Voltage	R_L=100Ω	Y, Z	250	430	500	mV
ΔV_{OD}	Change in Magnitude of V_{OD} for Complementary Output State			-	-	50	|mV|
V_{OS}	Offset Voltage			1.125	1.2	1.375	V
ΔV_{OS}	Change in Magnitude of V_{OS} for Complementary Output States			-	-	50	|mV|
V_{OH}	Output Voltage High			1.25	1.45	1.625	V
V_{OL}	Output Voltage Low			0.875	1.02	1.25	V
V_{IH}	Input Voltage High		A	2	-	V_{DD}	V
V_{IL}	Input Voltage Low			GND	-	0.8	V
I_{IH}	High level input current	V_{IH} = 2.0V	A	-	7	±20	uA
I_{IL}	Low level input current	V_{IL} = 0.8V		-	2.7	±10	uA
I_{DD} (static)	I_{DDNL} (Driver enable)	No load V_{IN} = 0.8V or 2V	V_{DD}	-	4	10	mA
	I_{DD} (Driver enable)	R_L=100Ω V_{IN} = 0.8V or 2V		-	20	30	mA
	I_{DDZ} (Driver disable)	R_L=100Ω V_{IN} = GND or V_{DD}		-	0.2	6	mA
I_{OS}	Short circuit o/p current (Driver Enabled)	A = V_{DD}, Y = 0V or A = GND, Z = 0V	Y, Z	-	-4.5	-9	mA
		A = V_{DD}, V_{OD}=0V (Y and Z shorted)		-	±4.5	±12	mA
I_{OZ}	High Impedance o/p current (Driver Disabled)	V_{OUT} = 0 or 2.4V (V_{DD} = 3.6V)		-	-	±10	uA
$I_{O(OFF)}$	Power off o/p current, (cold sparing leakage)	V_{DD} = GND D_{IN} = V_{SS} or Float V_{OUT} = 0 or 2.4V		-	-	±10	uA

DC Electrical characteristics

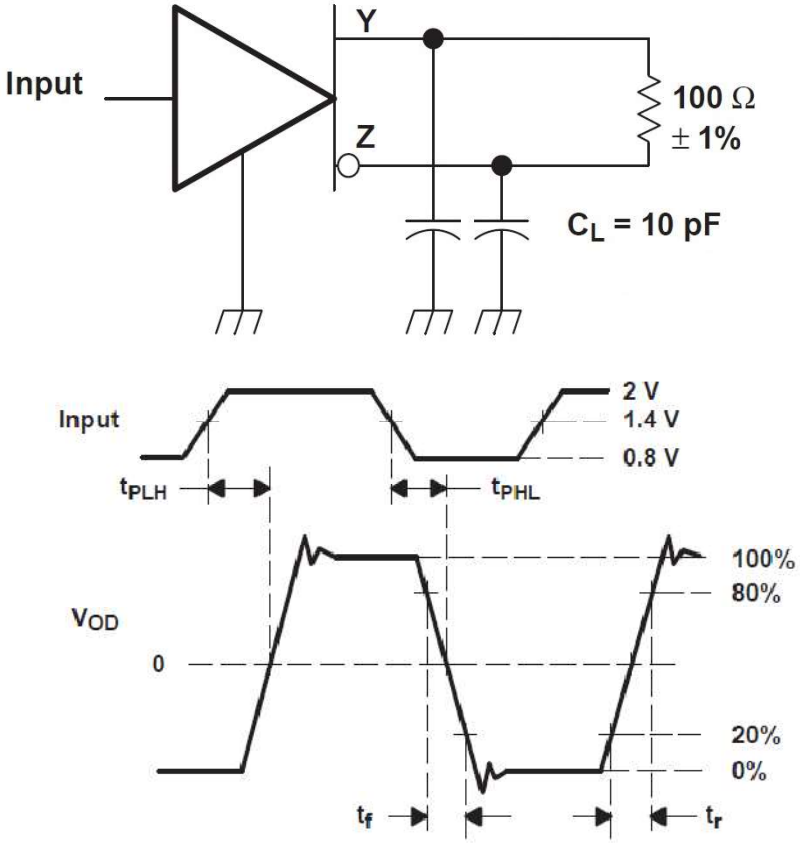
AC ELECTRICAL SPECIFICATIONS:

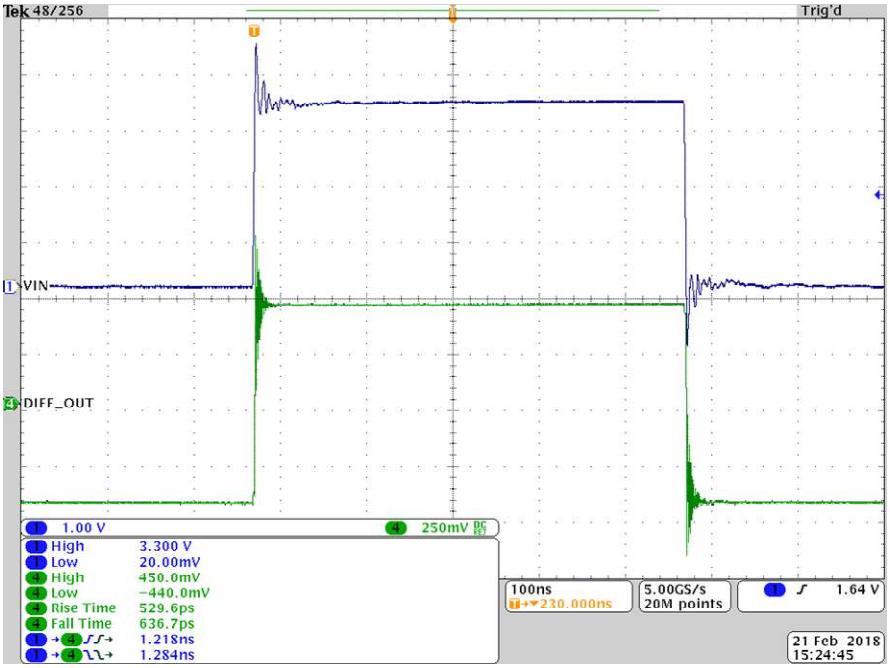
Test condition:
V_{DD}=3.3V, D_{IN}= GND or V_{DD} @ 1 MHz, T_{AMB} = -55ºC to 125ºC, R_L=100Ω, C_L=10pF

Symbol	Parameter	Min.	Typical	Max.	Units
t_r	VOD1 rise time (20% to 80%)	-	0.53	1.5	ns
t_f	VOD1 fall time (20% to 80%)	-	0.64	1.5	ns
t_{PHLD}	Differential Propagation delay	1.0	1.28	5	ns
t_{PLHD}	Differential Propagation delay	1.0	1.22	5	ns
T_{SKD} $\lvert t_{PHLD} - t_{PLHD} \rvert$	Differential Skew in delay	-	0.1	0.6	ns
t_{PZH}	high-impedance-to-high-level output	-	6	15	ns
t_{PZL}	high-impedance-to-low-level output	-	18	25	ns
t_{PHZ}	high-level-to-high-impedance output	-	5	15	ns
t_{PLZ}	low-level-to-high-impedance output	-	8	15	ns

Switching Characteristics

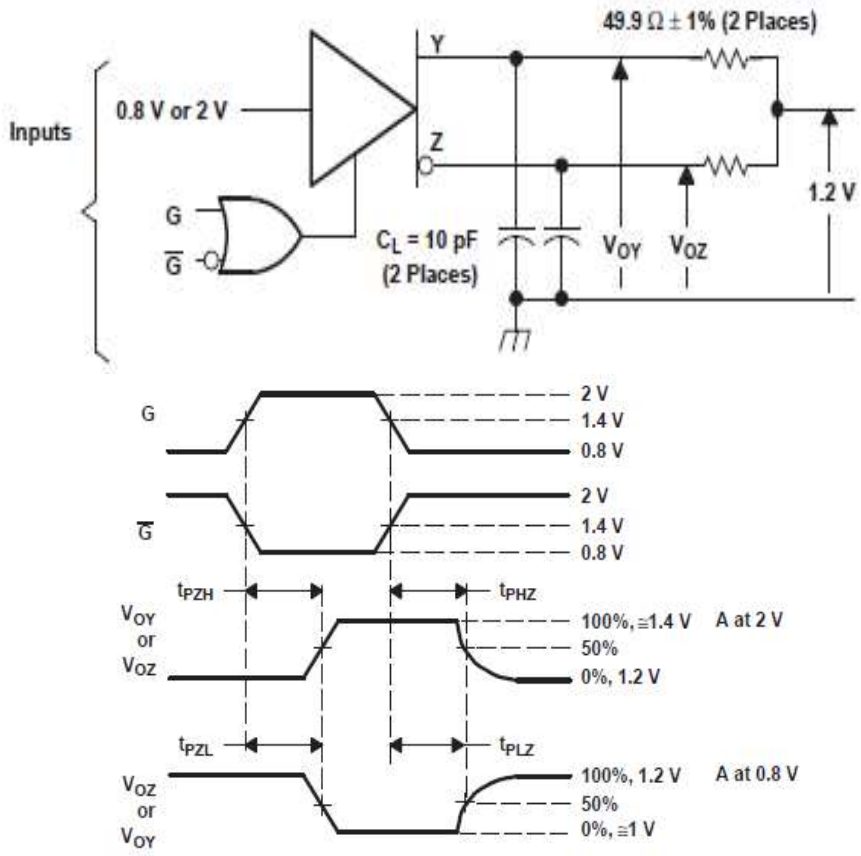
TEST CIRCUIT AND SWITCHING WAVEFORM :



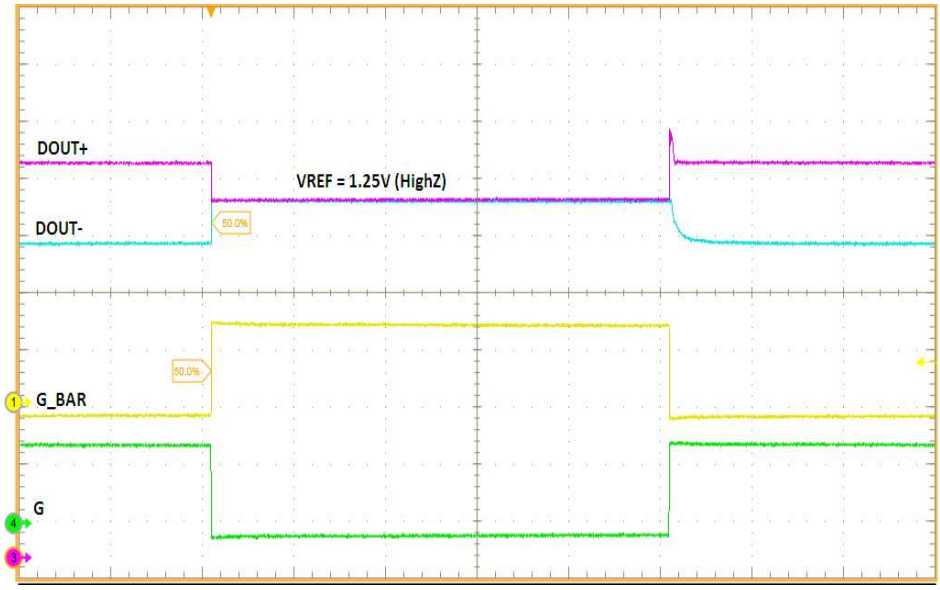


Waveform for Transition Time and Propagation Delay

TEST CIRCUIT AND SWITCHING WAVEFORM (HIGH IMPEDANCE) :

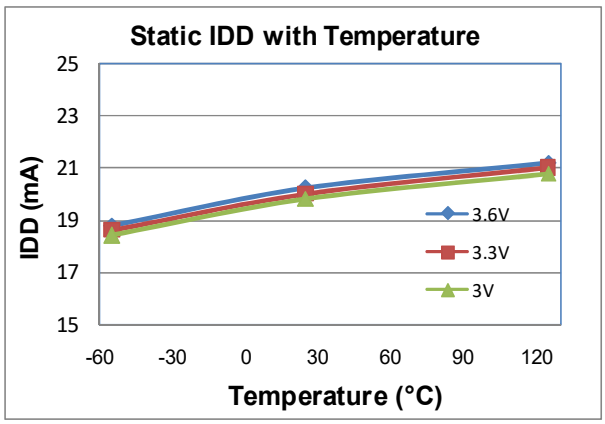


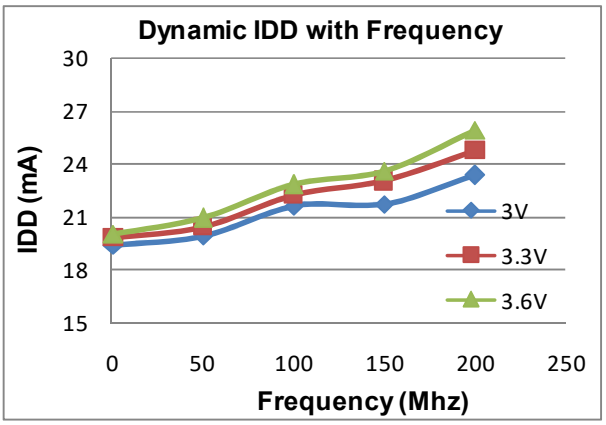
Input and Output waveform for driver high impedance state

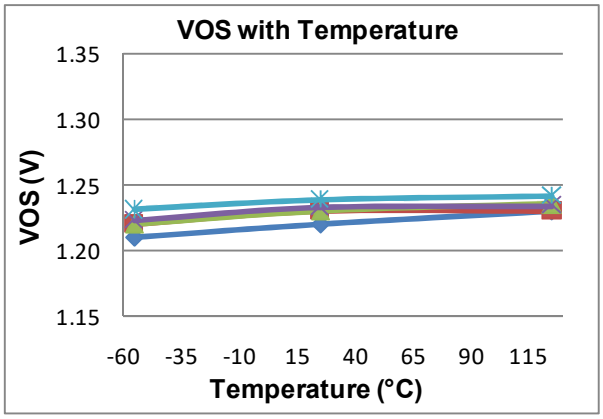


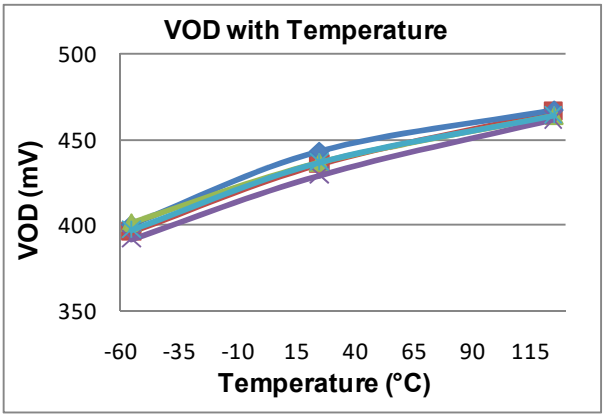
Test circuit and test waveform for high impedance functionality

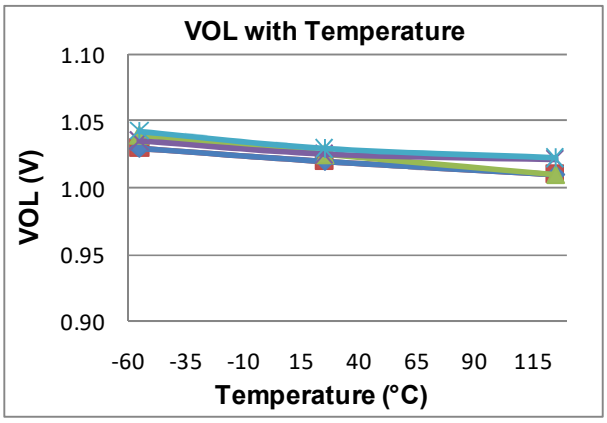
DEVICE CHARACTERISTICS:

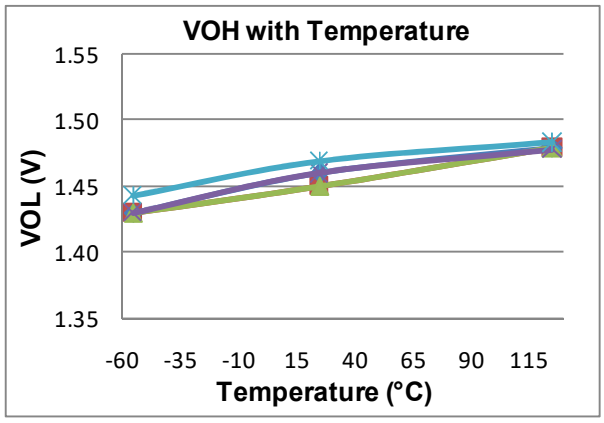










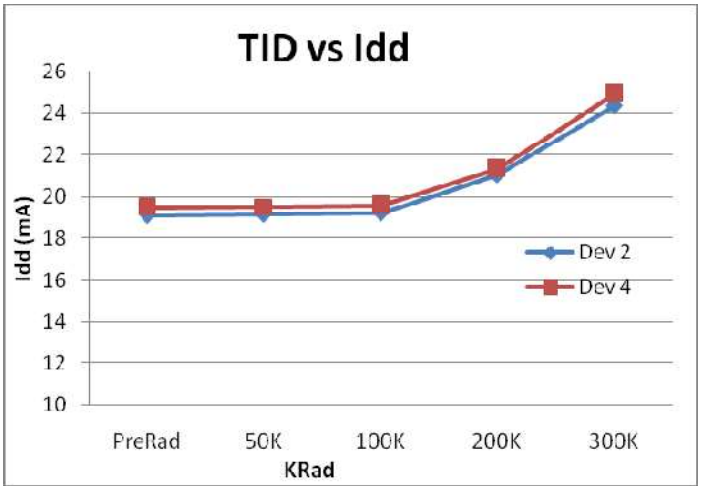


Typical Device Parameter Characteristics

RADIATION CHARACTERISTICS:

❖ Total Ionization Dose (TID) Testing

- TID testing of QLVDS Transmitter (SC1002-1) is performed for radiation level up to 300 KRad.
- No functional degradation and no significant change in device parameters such as IIL, IIH, VOL & VOH was observed up to 200KRad.
- Static supply current increases with radiation dose, shown in figure below.

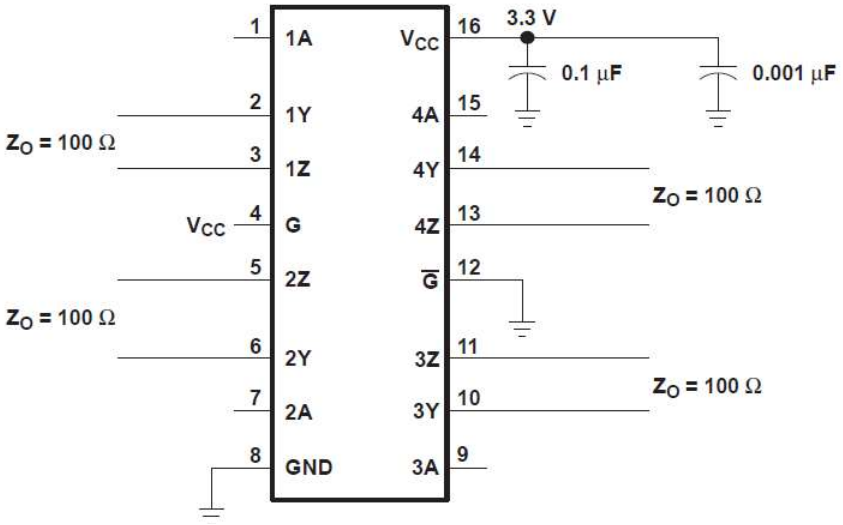


❖ Single Event Effect (SEE) Testing

SEE testing of QLVDS Transmitter (SC1002-1) is performed at two different LET energy ion beams Ni+ (30 MeV-cm2/mg) and Ag+ (50 MeV-cm2/mg) for a Fluence of 10^6 ions/cm^2.

- No Single Event latch-up (SEL) was observed up to LET of 50 MeV-cm2/mg. Supply current (IDD) remains within specification throughout testing.
- No Single Event transient (SET) was observed up to LET of 50 MeV-cm2/mg.

APPLICATION CIRCUIT:



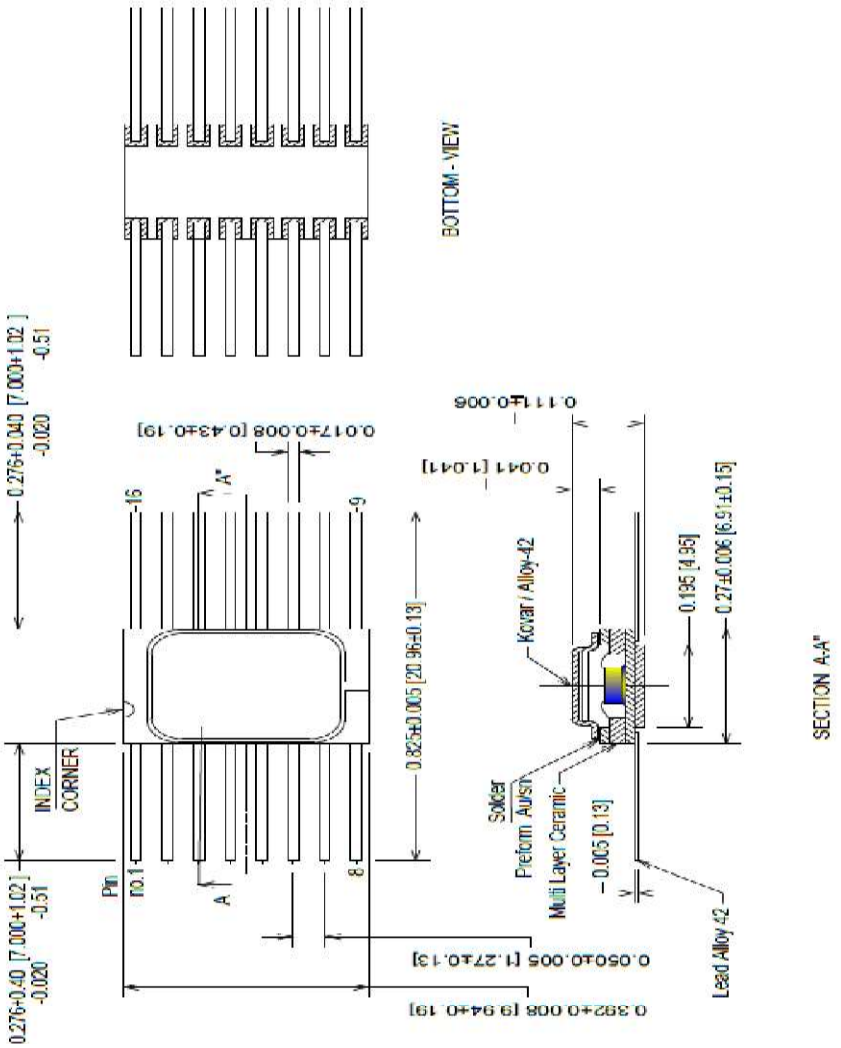
Typical Application Circuit of QLVDS driver

REVISION HISTORY

S. No.	Version	Date of release	Description
1	1.0	26th March 2019	New

PACKAGE DRAWING (CSOP-16PIN):

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



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