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ON Semiconductor
MC10SX1190DT

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MC10SX1190

Fibre Channel Coaxial Cable Driver and Loop Resiliency Circuit

Description

The MC10SX1190 is a differential receiver, differential transmitter specifically designed to drive coaxial cables. It incorporates the output cable drive capability of the MC10EP89 Coaxial Cable Driver with additional circuitry to multiplex the output cable drive source between the cable receiver or the local transmitter inputs. The multiplexer control circuitry is TTL compatible for ease of operation.

The MC10SX1190 is useful as a bypass element for Fibre Channel-Arbitrated Loop (FC-AL) or Serial Storage Architecture (SSA) applications, to create loop style interconnects with fault tolerant, active switches at each device node. This device is particularly useful for back panel applications where small size is desirable.

The EP89 style drive circuitry produces swings approximately 70% larger than a standard PECL output. When driving a coaxial cable, proper termination is required at both ends of the line to minimize reflections. The 1.4 V output swings allow for proper termination at both ends of the cable, while maintaining the required swing at the receiving end of the cable. Because of the larger output swings, the QT, $\overline{QT}$ outputs are terminated into the thevenin equivalent of 50 Ω to V_{CC} − 3.0 V instead of 50 Ω to V_{CC} − 2.0 V.

Features

- 2.5 Gb/s Operation
- 425 ps Propagation Delay
- 1.4 V Output Swing on the Cable Driving Output
- Single Positive Supply Operation Ranges:
  V_{CC} = 3.0 V to 3.6 V, V_{EE} = 0 V
  V_{CC} = 4.5 V to 5.5 V, V_{EE} = 0 V
- 75 kΩ Internal Input Pull Down Resistors
- ESD Protection:
  - 2000 V Human Body Model
  - >100 V Machine Model
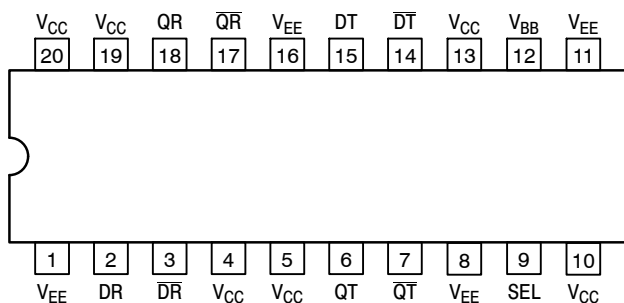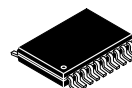- This Device is Pb-Free, Halogen Free and is RoHS Compliant

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**TSSOP−20 WB
DT SUFFIX
CASE 948E**

MARKING DIAGRAM

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10SX
1190
ALYW■
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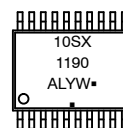
A	= Assembly Location
L	= Wafer Lot
Y	= Year
W	= Work Week
■	= Pb-Free Package

(Note: Microdot may be in either location)

*For additional marking information, refer to Application Note AND8002/D.

PIN DESCRIPTION

PIN	FUNCTION
DR/$\overline{DR}$	ECL Diff. Inputs from Receive Cable
QR/$\overline{QR}$	ECL Buffered Differential Outputs from Receive Cable
DT/$\overline{DT}$	ECL Differential Input to Transmit Cable
QT/$\overline{QT}$	ECL Buffered Differential Output to Transmit Cable
SEL	TTL Multiplexer Control Signal
V_{BB}	Reference Voltage Output
V_{CC}	ECL Positive Supply
V_{EE}	ECL Negative, 0 Supply

TRUTH TABLE

SEL	Function
L	DR → QT
H	DT → QT

Figure 1. 20-Lead TSSOP Pinout: (Top View)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.
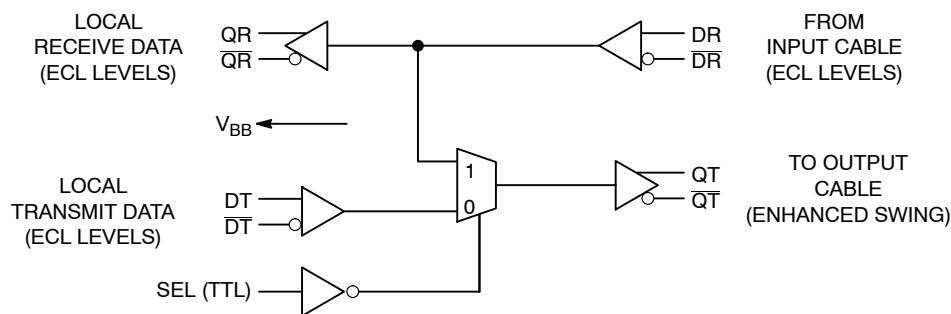
MC10SX1190

Figure 2. Logic Diagram

Table 1. ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Power Supply Voltage (V_{EE} = 0 V)	0 to +6.0	Vdc
V_{EE}	Power Supply Voltage (V_{CC} = 0 V)	−6.0 to 0	Vdc
V_{IN}	Input Voltage (V_{EE} = 0 V, V_{IN} not more positive than V_{CC})	0 to +6.0	Vdc
V_{IN}	Input Voltage (V_{CC} = 0 V, V_{IN} not more negative than V_{EE})	−6.0 to 0	Vdc
I_{OUT}	Output Current 　Continuous 　Surge	50 100	mA
θ_{JA}	Thermal Resistance (Junction-to-Ambient) 　Still Air 　500 lfpm	90 60	°C/W
θ_{JC}	Thermal Resistance (Junction-to-Case)	30 to 35	°C/W
T_A	Operating Temperature Range	−40 to +85	°C
T_{STG}	Storage Temperature Range	−50 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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Datasheet of MC10SX1190DT - IC DRIVER COAX CABLE 20TSSOP
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Table 2. DC CHARACTERISTICS (V_{CC} = 3.3 V, V_{EE} = 0 V) (Note 1))

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
V_{OH}	Output Voltage High (QR,$\overline{QR}$) (Note 2)	2.22	2.35	2.52	2.27	2.39	2.57	2.30	2.40	2.60	V
V_{OL}	Output Voltage Low (QR,$\overline{QR}$) (Note 2)	1.35	1.54	1.65	1.37	1.57	1.67	1.40	1.57	1.71	V
V_{OH}	Output Voltage High (QT,$\overline{QT}$) (Note 3)	2.13	2.29	2.40	2.18	2.33	2.46	2.20	2.34	2.48	V
V_{OL}	Output Voltage Low (QT,$\overline{QT}$) (Note 3)	0.50	0.67	1.10	0.48	0.64	1.06	0.44	0.63	1.06	V
I_{CC}	Quiescent Supply Current (Note 4)	30	60	90	30	60	90	30	60	90	mA
V_{IH}	Input Voltage High	2070		2410	2170		2490	2240		2580	mV
V_{IL}	Input Voltage Low	1350		1800	1350		1820	1350		1860	mV
V_{IH}	Input Voltage High SEL (Note 5)	2.0			2.0			2.0			V
V_{IL}	Input Voltage Low SEL (Note 5)			0.8			0.8			0.8	V
V_{BB}	Output Reference Voltage (Note 1)	1.80	1.90	2.05	1.80	1.90	2.05	1.85	1.95	2.05	V

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

1. Input and output parameters will track 1:1 V_{CC}. V_{EE} can vary +0.3 V to −0.3 V.
2. QR outputs loaded with 50 Ω to V_{CC} − 2.0 V
3. QT outputs loaded with 50 Ω to V_{CC} − 3.0 V
4. Outputs open circuited.
5. TTL signal threshold is 1.5 V above V_{EE}.

### Table 3. DC CHARACTERISTICS (V_{CC} = 5.0 V, V_{EE} = 0 V) (Note 1))

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
V_{OH}	Output Voltage High (QR,$\overline{QR}$) (Note 2)	3.92	4.05	4.22	3.97	4.09	4.27	4.0	4.10	4.30	V
V_{OL}	Output Voltage Low (QR,$\overline{QR}$) (Note 2)	3.05	3.24	3.35	3.07	3.27	3.37	3.10	3.27	3.41	V
V_{OH}	Output Voltage High (QT,$\overline{QT}$) (Note 3)	3.83	3.99	4.11	3.88	4.03	4.16	3.90	4.04	4.18	V
V_{OL}	Output Voltage Low (QT,$\overline{QT}$) (Note 3)	1.90	2.14	2.50	1.85	2.09	2.45	1.85	2.08	2.45	V
I_{CC}	Quiescent Supply Current (Note 4)	30	60	90	30	60	90	30	60	90	mA
V_{IH}	Input Voltage High	3770		4110	3870		4190	3940		4280	mV
V_{IL}	Input Voltage Low	3050		3500	3050		3520	3050		3560	mV
V_{IH}	Input Voltage High SEL (Note 5)	2.0			2.0			2.0			V
V_{IL}	Input Voltage Low SEL (Note 5)			0.8			0.8			0.8	V
V_{BB}	Output Reference Voltage (Note 1)	3.50	3.60	3.75	3.50	3.60	3.75	3.55	3.65	3.75	V
I_{IL}	Input High Current			150			150			150	μA
I_{IH}	Input LOW Current	0.5			0.5			0.5			μA

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

1. Input and output parameters will track 1:1 V_{CC}. V_{EE} can vary +0.5 V to −0.5 V.
2. QR outputs loaded with 50 Ω to V_{CC} − 2.0 V
3. QT outputs loaded with 50 Ω to V_{CC} − 3.0 V
4. Outputs open circuited.
5. TTL signal threshold is 1.5 V above V_{EE}.

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Table 4. AC CHARACTERISTICS (V_{CC} = 3.0 V to 5.5 V, V_{EE} = 0 V) (Note 1))

Symbol	Characteristic	−40°C			25°C to 85°C			Unit
		Min	Typ	Max	Min	Typ	Max	
t_{pd}	Propagation Delay-to-Output DR → QR (Diff) (Notes 2 and 3) DR → QT (Diff) DT → QT (Diff)	140 300 280	240 400 380	340 500 480	180 350 350	280 470 440	380 650 650	ps
t_{PLH}, t_{PHL}	Propagation Delay SEL → QT,$\overline{QT}$ (1.5 V to 50% Pt)	400	700	1000	400	700	1000	ps
t_r, t_f	Rise Time (20% to 80%) QR,$\overline{QR}$ Fall Time (80% to 20%)	70	140	200	90	155	250	ps
t_r, t_f	Rise Time (20% to 80%) QT,$\overline{QT}$ Fall Time 80% to 20%	150	200	280	150	230 230	500	ps
t_{skew}	Within Device Skew (Note 4)		15			15		ps
V_{PP}	Input Swing (Differential Configuration)	200		1000	200		1000	mV
V_{CMR}	Common Mode Range (Note 5)	3.0		4.35	3.0		4.35	V
f_{max}	Maximum Operation Frequency	2.5			2.5			Gb/s

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

1. V_{EE} can vary +0.3 V to −0.3 V
2. The differential propagation delay is defined as the delay from the crossing points of the differential input signals to the crossing point of the differential output signals.
3. The single-ended propagation delay is defined as the delay from the 50% point of the input signal to the 50% point of the output signal.
4. Duty cycle skew is the difference between t_{PLH} and t_{PHL} propagation delay through a device.
5. The CMR range is referenced to the most positive side of the differential input signal. Normal operation is obtained if the HIGH level falls within the specified range and the peak-to-peak voltage lies between $V_{PP\ Min}$ and 1.0 V.

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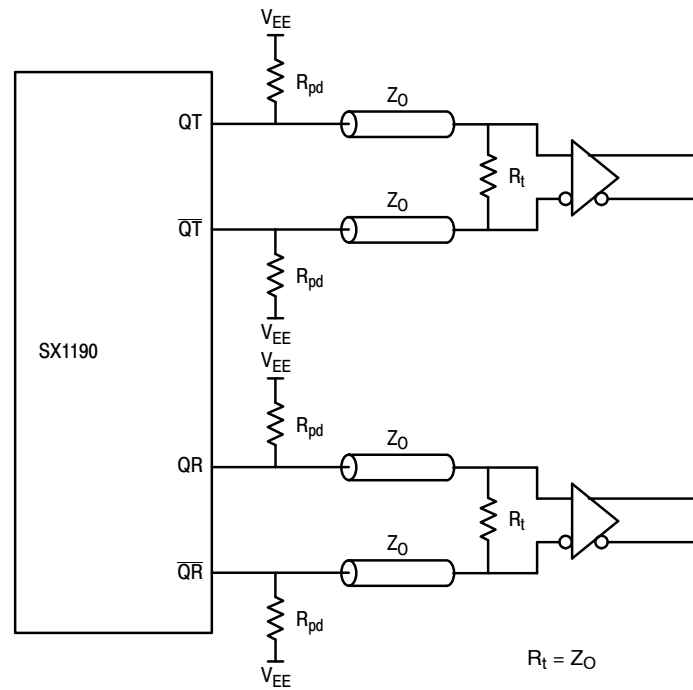
Typical value for R_{pd} is 160 Ω to 260 Ω, depending on the application. The minimum value of R_{pd} should not be less than 50 Ω.
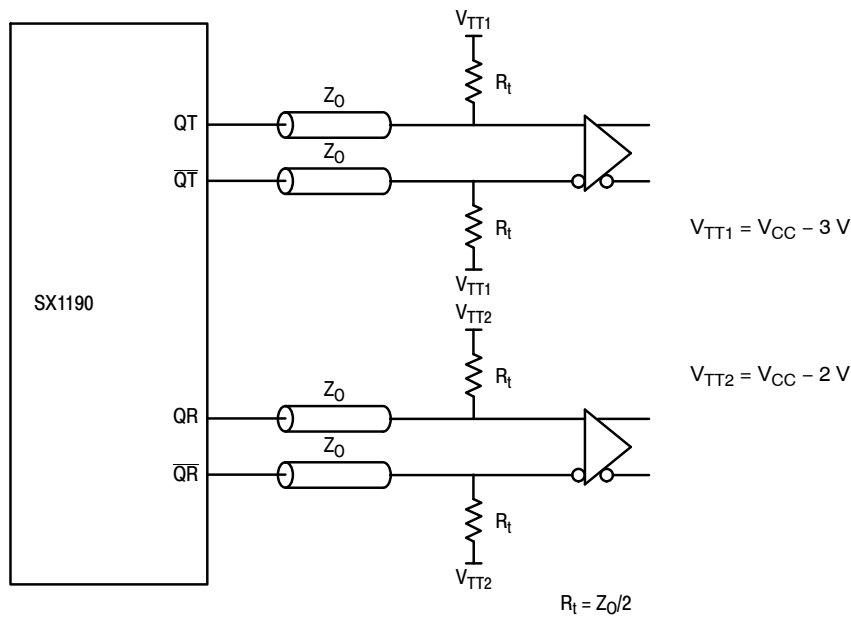

Figure 3. SX1190 Termination Configuration

ORDERING INFORMATION

Device	Package	Shipping†
MC10SX1190DTG	TSSOP–20 WB (Pb-Free)	75 Units / Tube
MC10SX1190DTR2G	TSSOP–20 WB (Pb-Free)	2500 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

MC10SX1190

PACKAGE DIMENSIONS

TSSOP−20 WB
DT SUFFIX
CASE 948E
ISSUE D

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE −W−.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	6.40	6.60	0.252	0.260
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.27	0.37	0.011	0.015
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0°	8°	0°	8°

SOLDERING FOOTPRINT

DIMENSIONS: MILLIMETERS

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