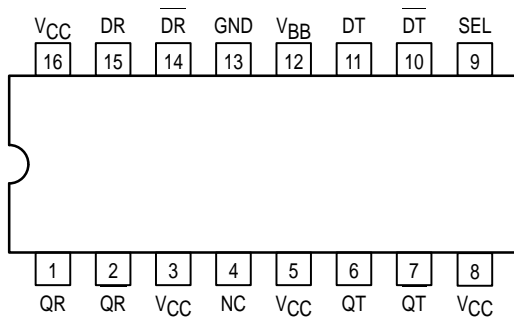# MOTOROLA
## SEMICONDUCTOR TECHNICAL DATA

# Fibre Channel Coaxial Cable Driver and Loop Resiliency Circuit

The MC10SX1189 is a differential receiver, differential transmitter specifically designed to drive coaxial cables. It incorporates the output cable drive capability of the MC10EL89 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.

- 425ps Propagation Delay
- 1.6V Output Swing on the Cable Driving Output
- Single +5V operation
- 75kΩ Internal Input Pull Down Resistors
- >1000 Volt ESD Protection

The MC10SX1189 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 EL89 style drive circuitry produces swings twice as large as a standard PECL output. When driving a coaxial cable, proper termination is required at both ends of the line to minimize reflections. The 1.6V 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, QT outputs are terminated into the thevenin equivalent of 50Ω to $V_{CC} - 3.0V$ instead of 50Ω to $V_{CC} - 2.0V$.

# MC10SX1189

## FIBRE CHANNEL COAXIAL CABLE DRIVER AND LOOP RESILIENCY CIRCUIT
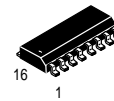
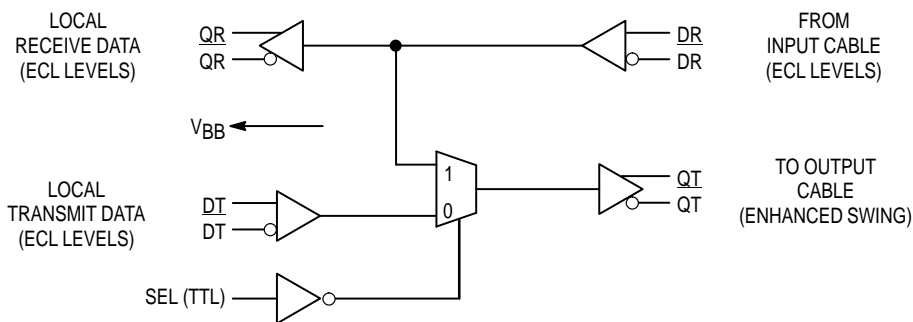**D SUFFIX**
PLASTIC SOIC PACKAGE
CASE 751B-05

## TRUTH TABLE

| SEL | Function |
|-----|----------|
| L | DR → QT |
| H | DT → QT |

## PIN NAMES

| Pins | Function |
|------|----------|
| DR/$\overline{DR}$ | Differential Input from Receive Cable |
| QR/$\overline{QR}$ | Buffered Differential Output from Receive Cable |
| DT/$\overline{DT}$ | Differential Input to Transmit Cable |
| QT/$\overline{QT}$ | Buffered Differential Output to Transmit Cable |
| SEL | Multiplexer Control Signal (TTL) |
| $V_{CC}$ | Positive Power Supply |
| GND | Ground |
| $V_{BB}$ | Reference Voltage Output |



Pinout: 16-Lead SOIC (Top View)

| $V_{CC}$ 16 | DR 15 | $\overline{DR}$ 14 | GND 13 | $V_{BB}$ 12 | DT 11 | $\overline{DT}$ 10 | SEL 9 |
|---|---|---|---|---|---|---|---|
| QR 1 | $\overline{QR}$ 2 | $V_{CC}$ 3 | NC 4 | $V_{CC}$ 5 | QT 6 | $\overline{QT}$ 7 | $V_{CC}$ 8 |

REV 1

**MOTOROLA**

# MC10SX1189

**LOGIC DIAGRAM**



LOCAL RECEIVE DATA (ECL LEVELS): $\overline{QR}$, QR

$V_{BB}$

LOCAL TRANSMIT DATA (ECL LEVELS): $\overline{DT}$, DT

SEL (TTL)

FROM INPUT CABLE (ECL LEVELS): $\overline{DR}$, DR

TO OUTPUT CABLE (ENHANCED SWING): $\overline{QT}$, QT

## ABSOLUTE MAXIMUM RATINGS*

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_{CC}$ | Power Supply Voltage (Referenced to GND) | | 0 to +7.0 | Vdc |
| $V_{IN}$ | Input Voltage (Referenced to GND) | | 0 to +6.0 | Vdc |
| $I_{OUT}$ | Output Current | Continuous  Surge | 50  100 | mA |
| $T_A$ | Operating Temperature Range | | −40 to +85 | °C |
| $T_{STG}$ | Storage Temperature Range | | −50 to +150 | °C |
| $V_{CC}$ | Operating Voltage Range[1] | | 4.5 to 5.5 | Vdc |

\* Absolute Maximum Ratings are those values beyond which damage to the device may occur.  Functional operation should be restricted to the Recommended Operating Conditions.

1. Parametric values specified at 4.75 to 5.25V.

## DC CHARACTERISTICS[1]

| Symbol | Characteristic | -40°C | | | 0°C | | | 25°C | | | 85°C | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | Min | Typ | Max | |
| $V_{OH}$ | Output Voltage High (QR,$\overline{QR}$)  $V_{CC}$ = 5.0V, GND = 0V (Notes 2,3) | 3.92 | 4.05 | 4.11 | 3.98 | 4.09 | 4.16 | 4.02 | 4.11 | 4.19 | 4.09 | 4.16 | 4.28 | V |
| $V_{OL}$ | Output Voltage Low (QR,$\overline{QR}$)  $V_{CC}$ = 5.0V, GND = 0V (Notes 2,3) | 3.05 | 3.23 | 3.35 | 3.05 | 3.24 | 3.37 | 3.05 | 3.24 | 3.37 | 3.05 | 3.25 | 3.41 | V |
| $V_{OH}$ | Output Voltage High (QT,$\overline{QT}$)  $V_{CC}$ = 5.0V, GND = 0V (Notes 2,4) | 3.71 | 3.89 | 4.08 | 3.79 | 3.98 | 4.17 | 3.83 | 4.02 | 4.20 | 3.90 | 4.09 | 4.28 | V |
| $V_{OL}$ | Output Voltage Low (QT,$\overline{QT}$)  $V_{CC}$ = 5.0V, GND = 0V (Notes 2,4) | 1.94 | 2.22 | 2.50 | 1.83 | 2.12 | 2.41 | 1.80 | 2.10 | 2.39 | 1.77 | 2.06 | 2.35 | V |
| $I_{CC}$ | Quiescent Supply Current (Note 5) | 20 | 25 | 42 | 22 | 26 | 47 | 23 | 27 | 47 | 25 | 28 | 47 | mA |
| $V_{IH}$ | Input Voltage High (DR,$\overline{DR}$ & DT,$\overline{DT}$)  $V_{CC}$ = 5.0V, GND = 0V (Note 2) | 3.77 | | 4.11 | 3.83 | | 4.16 | 3.87 | | 4.19 | 3.94 | | 4.28 | V |
| $V_{IL}$ | Input Voltage Low (DR,$\overline{DR}$ & DT,$\overline{DT}$)  $V_{CC}$ = 5.0V, GND = 0V (Note 2) | 3.05 | | 3.50 | 3.05 | | 3.52 | 3.05 | | 3.52 | 3.05 | | 3.56 | V |
| $V_{IH}$ | Input Voltage High SEL | 2.0 | | | 2.0 | | | 2.0 | | | 2.0 | | | V |
| $V_{IL}$ | Input Voltage Low SEL | | | 0.8 | | | 0.8 | | | 0.8 | | | 0.8 | V |
| $V_{BB}$ | Output Reference Voltage  $V_{CC}$ = 5.0V, GND = 0V (Note 2) | 3.57 | 3.63 | 3.70 | 3.62 | 3.67 | 3.73 | 3.65 | 3.70 | 3.75 | 3.69 | 3.75 | 3.81 | V |

1. 10SX circuits are designed to meet the DC specifications shown in the table after thermal equilibrium has been established. The circuit is mounted in a test socket or mounted on a printed circuit board and transverse air greater than 500lfm is maintained.
2. Values will track 1:1 with the $V_{CC}$ supply.
3. Outputs loaded with 50Ω to +3.0V
4. Outputs loaded with 50Ω to +2.0V
5. Outputs open circuited.

**AC CHARACTERISTICS[1]** ($V_{CC}$ = 4.75 to 5.25V)

| Symbol | Characteristic | | –40°C | | | 0 to 85°C | | | Unit | Condition |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ | Max | Min | Typ | Max | | |
| $t_{PLH}$, $t_{PHL}$ | Propagation Delay to Output | DR → QR (Diff) (SE) | 175 150 | 300 300 | 450 500 | 225 175 | 325 325 | 500 550 | ps | Note 2 Note 3 |
| | | DR → QT (Diff) (SE) | 250 225 | 425 425 | 650 700 | 300 250 | 450 450 | 650 700 | | |
| | | DT → QT (Diff) (SE) | 225 200 | 400 400 | 650 725 | 275 225 | 425 425 | 650 725 | | |
| $t_{PLH}$, $t_{PHL}$ | Propagation Delay | SEL → QT,QT | 450 | 600 | 850 | 500 | 650 | 800 | ps | 1.5V to 50% Pt |
| $t_r$, $t_f$ | Rise Time Fall Time | QR,QR | 100 100 | 275 275 | 400 400 | 125 125 | 275 275 | 400 400 | ps | 20% to 80% 80% to 20% |
| $t_r$, $t_f$ | Rise Time Fall Time | QT,QT | 150 150 | 300 300 | 550 550 | 150 150 | 300 300 | 550 550 | ps | 20% to 80% 80% to 20% |
| $t_{skew}$ | Within Device Skew | | | 15 | | | 15 | | ps | Note 4 |
| $V_{PP}$ | Minimum Input Swing | | 200 | | | 200 | | | mV | Note 5 |
| $V_{CMR}$ | Common Mode Range | | 3.00 | | 4.35 | 3.00 | | 4.35 | V | Note 6 |

1. 10SX circuits are designed to meet the AC specifications shown in the table after thermal equilibrium has been established. The circuit is mounted in a test socket or mounted on a printed circuit board and transverse air greater than 500lfm is maintained.
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, Stretch input is left open.
5. Minimum input swing for which AC parameters are guaranteed.
6. 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 1.0V.

## OUTLINE DIMENSIONS

**D SUFFIX**
PLASTIC PACKAGE
CASE 751B-05
ISSUE J
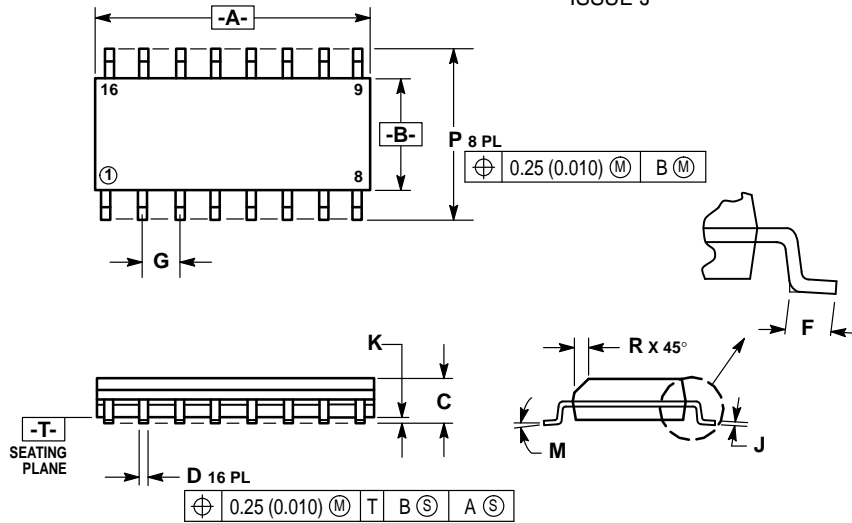
NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS | | INCHES | |
|-----|------|------|------|------|
| | MIN | MAX | MIN | MAX |
| A | 9.80 | 10.00 | 0.386 | 0.393 |
| B | 3.80 | 4.00 | 0.150 | 0.157 |
| C | 1.35 | 1.75 | 0.054 | 0.068 |
| D | 0.35 | 0.49 | 0.014 | 0.019 |
| F | 0.40 | 1.25 | 0.016 | 0.049 |
| G | 1.27 BSC | | 0.050 BSC | |
| J | 0.19 | 0.25 | 0.008 | 0.009 |
| K | 0.10 | 0.25 | 0.004 | 0.009 |
| M | 0° | 7° | 0° | 7° |
| P | 5.80 | 6.20 | 0.229 | 0.244 |
| R | 0.25 | 0.50 | 0.010 | 0.019 |

-A-

-B-

P 8 PL

⊕ 0.25 (0.010) Ⓜ B Ⓜ

G

K

C

-T-
SEATING PLANE

D 16 PL

⊕ 0.25 (0.010) Ⓜ T B Ⓢ A Ⓢ

R X 45°

F

M

J

Ⓜ **MOTOROLA**

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