

# 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  $\Omega$  to  $V_{CC} - 3.0$  V instead of 50  $\Omega$  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 k $\Omega$  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

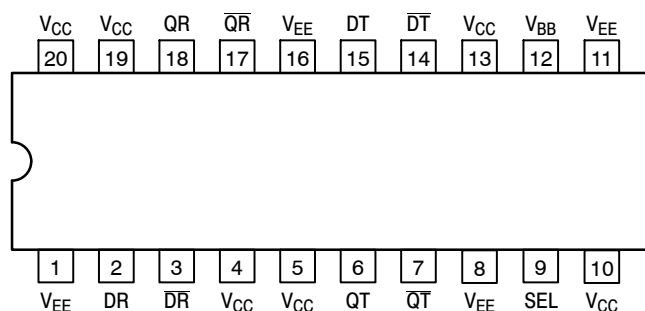
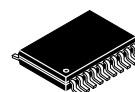


Figure 1. 20-Lead TSSOP Pinout: (Top View)



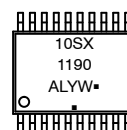
ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)



TSSOP-20 WB  
DT SUFFIX  
CASE 948E

### MARKING DIAGRAM



- 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

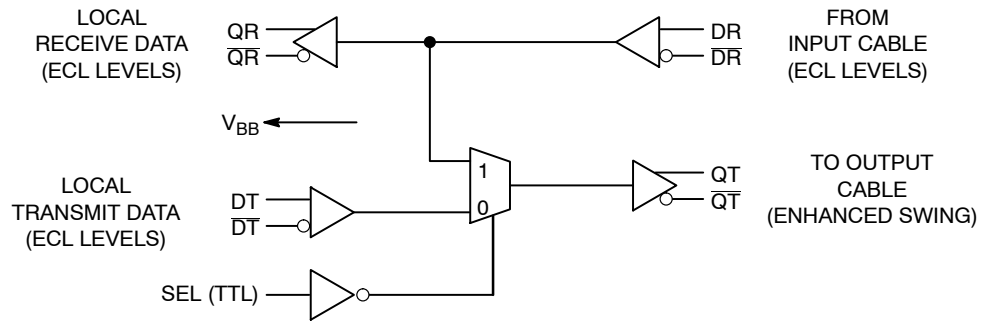
### TRUTH TABLE

SEL	Function
L	DR $\rightarrow$ QT
H	DT $\rightarrow$ QT

### 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
$\theta_{JA}$	Thermal Resistance (Junction-to-Ambient) Still Air 500 lfpm	90 60	$^{\circ}\text{C}/\text{W}$
$\theta_{JC}$	Thermal Resistance (Junction-to-Case)	30 to 35	$^{\circ}\text{C}/\text{W}$
$T_A$	Operating Temperature Range	-40 to +85	$^{\circ}\text{C}$
$T_{STG}$	Storage Temperature Range	-50 to +150	$^{\circ}\text{C}$

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.

# MC10SX1190

**Table 2. DC CHARACTERISTICS** ( $V_{CC} = 3.3\text{ V}$ ,  $V_{EE} = 0\text{ V}$ ) (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 lpm. 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  $\Omega$  to  $V_{CC} - 2.0\text{ V}$
3. QT outputs loaded with 50  $\Omega$  to  $V_{CC} - 3.0\text{ V}$
4. Outputs open circuited.
5. TTL signal threshold is 1.5 V above  $V_{EE}$ .

**Table 3. DC CHARACTERISTICS** ( $V_{CC} = 5.0\text{ V}$ ,  $V_{EE} = 0\text{ V}$ ) (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	$\mu\text{A}$
$I_{IH}$	Input LOW Current	0.5			0.5			0.5			$\mu\text{A}$

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 lpm. 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  $\Omega$  to  $V_{CC} - 2.0\text{ V}$
3. QT outputs loaded with 50  $\Omega$  to  $V_{CC} - 3.0\text{ V}$
4. Outputs open circuited.
5. TTL signal threshold is 1.5 V above  $V_{EE}$ .

# MC10SX1190

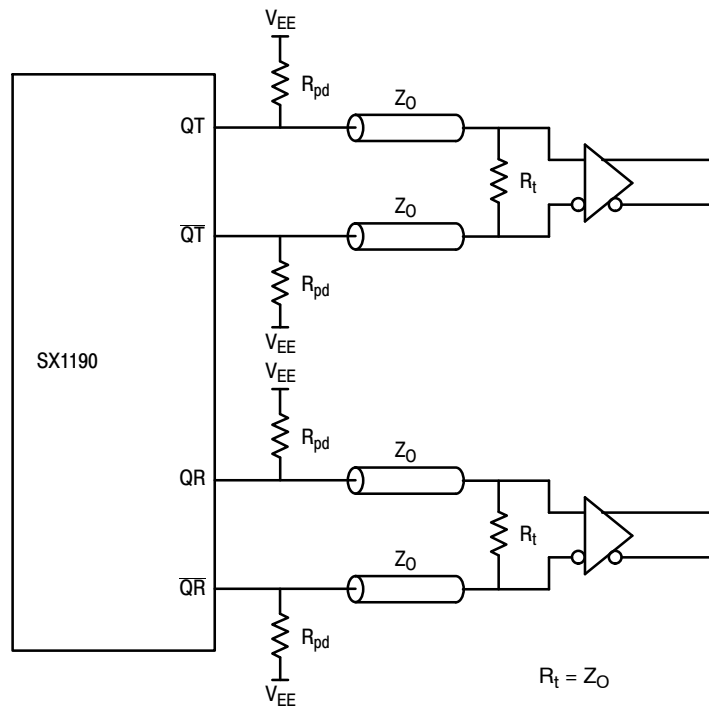
**Table 4. AC CHARACTERISTICS** ( $V_{CC} = 3.0\text{ V to }5.5\text{ V}$ ,  $V_{EE} = 0\text{ V}$ ) (Note 1))

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 (1.5 V to 50% Pt) SEL → QT, $\overline{QT}$	400	700	1000	400	700	1000	ps
$t_r$ , $t_f$	Rise Time (20% to 80%) Fall Time (80% to 20%) QR, $\overline{QR}$	70	140	200	90	155	250	ps
$t_r$ , $t_f$	Rise Time (20% to 80%) Fall Time 80% to 20% QT, $\overline{QT}$	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

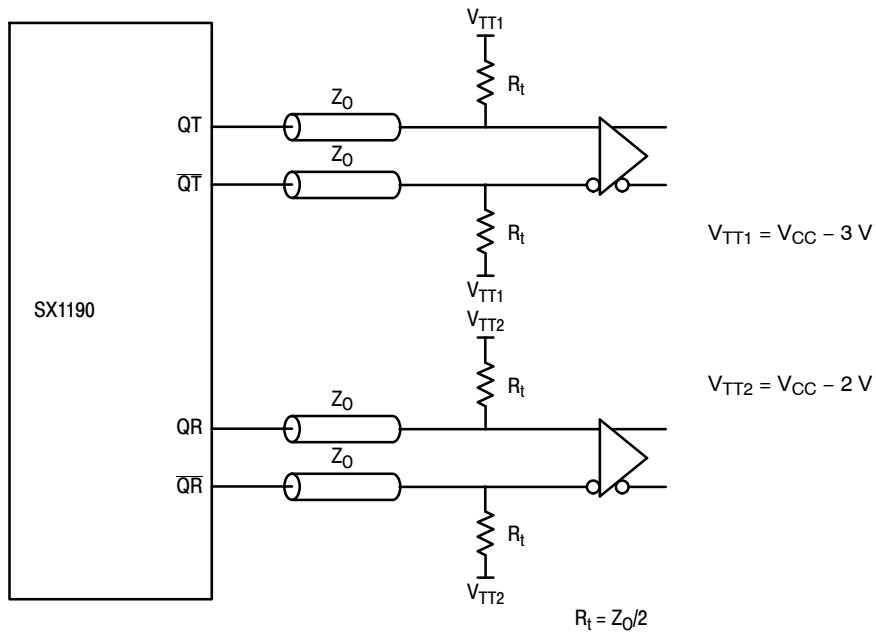
NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional 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  $V_{PP\text{ Min}}$  and 1.0 V.

# MC10SX1190



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



**Figure 3. SX1190 Termination Configuration**

## ORDERING INFORMATION

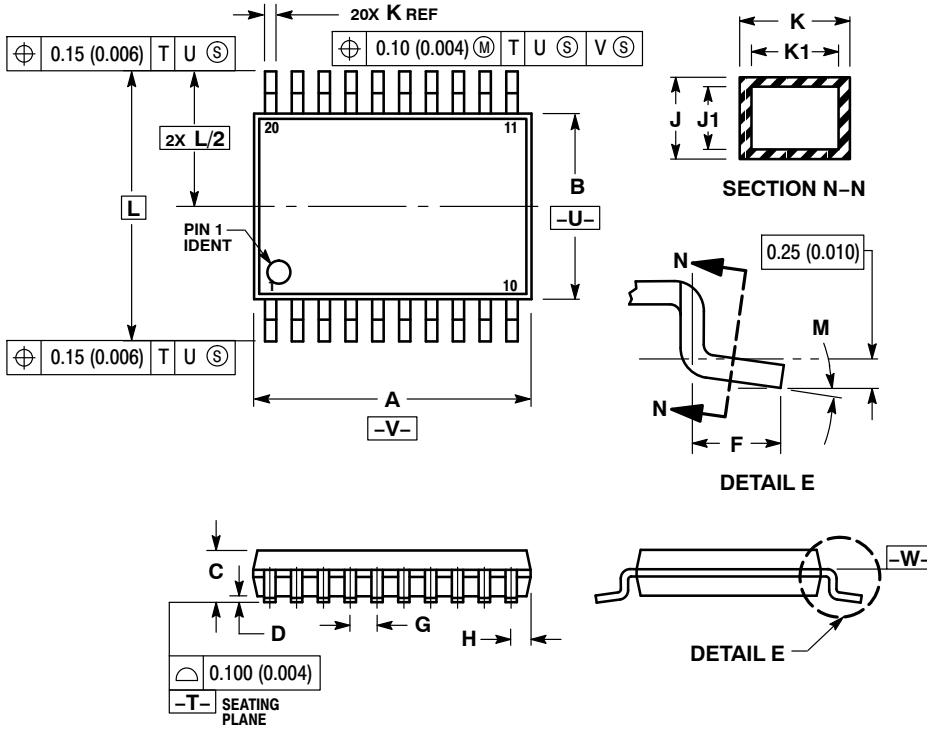
Device	Package	Shipping <sup>†</sup>
MC10SX1190DTG	TSSOP-20 WB (Pb-Free)	75 Units / Tube
MC10SX1190DTR2G	TSSOP-20 WB (Pb-Free)	2500 / Tape & Reel

<sup>†</sup>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

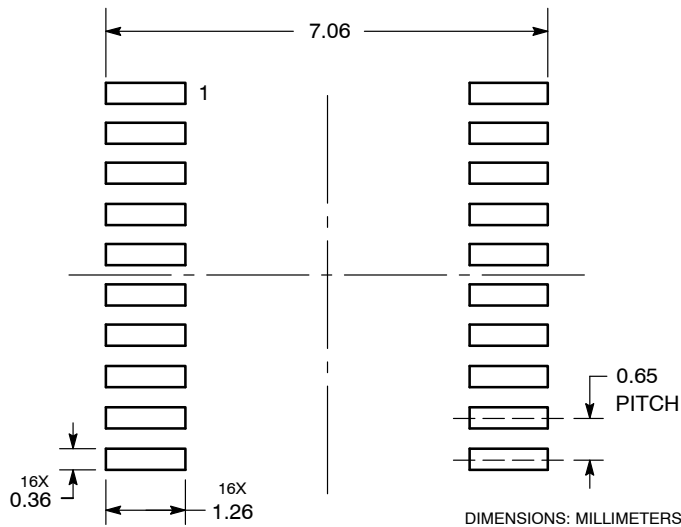
TSSOP-20 WB  
DT SUFFIX  
CASE 948E  
ISSUE D



### 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-.

### SOLDERING FOOTPRINT



# MC10SX1190

ECLinPS is a trademark of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries.

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
19521 E. 32nd Pkwy, Aurora, Colorado 80011 USA  
**Phone:** 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada  
**Europe, Middle East and Africa Technical Support:**  
Phone: 421 33 790 2910  
**Japan Customer Focus Center**  
Phone: 81-3-5817-1050

**ON Semiconductor Website:** [www.onsemi.com](http://www.onsemi.com)  
**Order Literature:** <http://www.onsemi.com/orderlit>  
For additional information, please contact your local  
Sales Representative

MC10SX1190/D