HIGH TEMPERATURE BIDIRECTIONAL LEVEL TRANSLATORS FAMILY

FEATURES

▲ Operational beyond the -60°C to +230°C temperature range.
▲ Supply voltage from 2.5V to 5.5V.
▲ OE/DIR input can be referenced to VCCA or VCCB.
▲ Up to ±8mA output drive (Directional).
▲ Max Data Rates (Bidirectional)
- 16Mbps (Translate to 5V)
- 12Mbps (Translate to 3.3V)
- 8Mbps (Translate to 2.5V)

▲ Max Data Rates (Directional)
- 60Mbps (3.3 to 5V)
- 40Mbps (2.5 to 5V)
- 30Mbps (Translate to 3.3V)
- 20Mbps (Translate to 2.5V)

▲ Ruggedized SMT packages.
▲ Also available as bare die.

APPLICATIONS

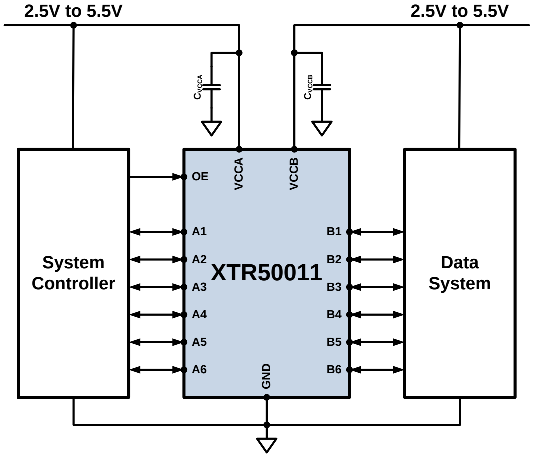
▲ Reliability-critical, Automotive, Aeronautics & Aerospace, Down-hole.
▲ Level shifted data transmission.

DESCRIPTION

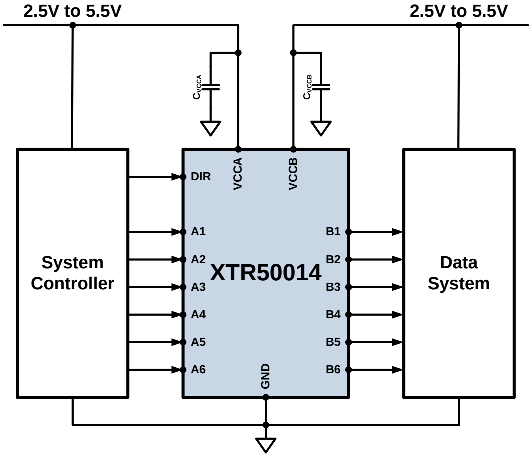
The XTR50010 is a family of bidirectional level translators that can be used for data communication between devices or systems operating at different supply voltages. XTR50010 is able to operate from -60°C to +230°C, with supply voltages from 2.5V to 5.5V.
In XTR50011 or XTR50012, the communication direction between An and Bn ports are automatically and independently sensed by the circuit. This allows simultaneous data flow in any direction.
In XTR50014 or XTR50015, the DIR logic-level input is used to control the data flow direction. The DIR input can be powered by either VCCA or VCCB. This brings more flexibility at system level.
Parts from the XTR50010 family are available in ruggedized SMT and through-hole packages. Parts are also available as bare dies.

PRODUCT HIGHLIGHT

Bidirectional data transmission



Directional data transmission



ORDERING INFORMATION

X	TR	50	010
Source: X = X-REL Semi	Process: TR = HiTemp, HiRel; R = HiRel	Part family	Part number

Product Reference	Temperature Range	Package	Pin Count	Marking
XTR50010-TD	-60°C to +230°C	Tested Bare die		XTR50010
XTR50011-S	-60°C to +230°C	Ceramic SOIC	16	XTR50011
XTR50011-D	-60°C to +230°C	Ceramic side braze DIP	16	XTR50011
XTR50012-FE	-60°C to +230°C	Gull-wing flat pack with ePad	8	XTR50012
XTR50012-D	-60°C to +230°C	Ceramic side braze DIP	8	XTR50012
XTR50014-S	-60°C to +230°C	Ceramic SOIC	16	XTR50014
XTR50014-D	-60°C to +230°C	Ceramic side braze DIP	16	XTR50014
XTR50015-FE	-60°C to +230°C	Gull-wing flat pack with ePad	8	XTR50015
XTR50015-D	-60°C to +230°C	Ceramic side braze DIP	8	XTR50015

Other packages and packaging configurations possible upon request. Contact X-REL for plastic packaged parts.

ABSOLUTE MAXIMUM RATINGS

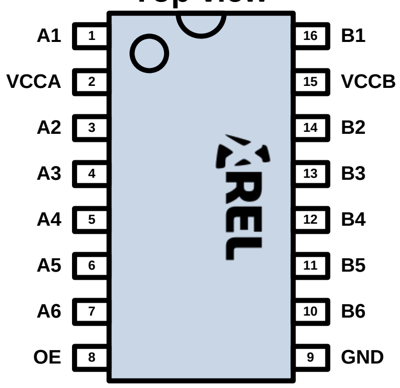
Voltage on any pin to GND	-0.5 to 6.0V
Storage Temperature Range	-70°C to +230°C
Operating Junction Temperature Range	-70°C to +300°C
ESD Classification	1kV HBM MIL-STD-883

Caution: *Stresses beyond those listed in "ABSOLUTE MAXIMUM RATINGS" may cause permanent damage to the device. These are stress ratings only and functionality of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to "ABSOLUTE MAXIMUM RATINGS" conditions for extended periods may permanently affect device reliability.*

PRODUCT VARIANTS

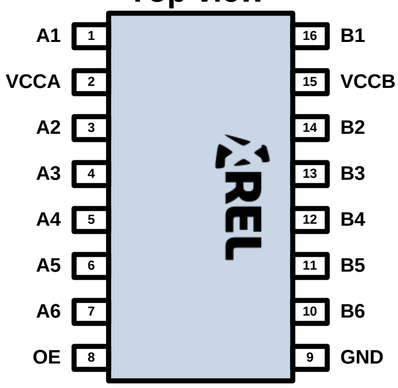
Side Brazed DIP16
XTR50011-D

Top view



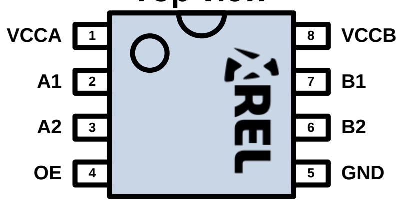
Ceramic SOIC16
XTR50011-S

Top view



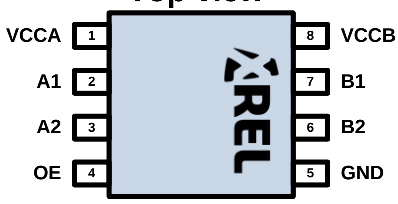
Side Brazed DIP8
XTR50012-D

Top view



CDFP8 with ePad
XTR50012-FE

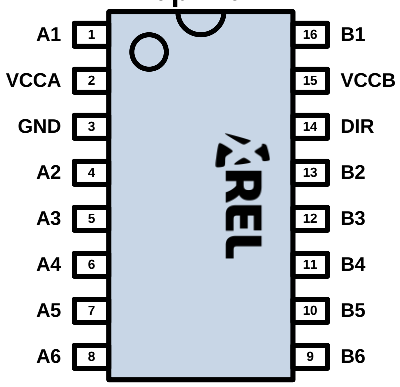
Top view



ePAD (bottom of package) connected to GND.
ePAD can be left floating on the PCB

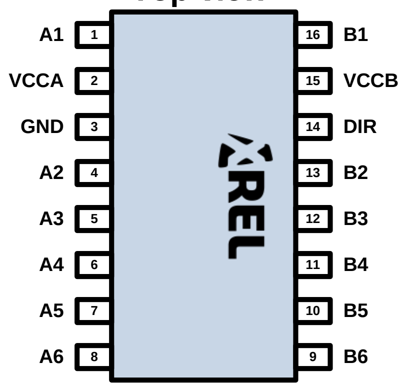
Side Brazed DIP16
XTR50014-D

Top view



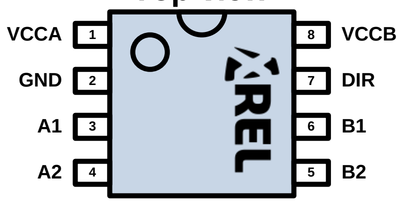
Ceramic SOIC16
XTR50014-S

Top view



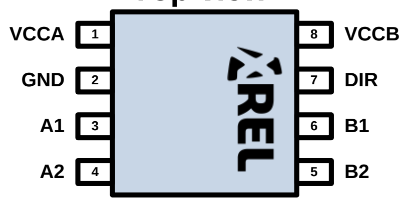
Side Brazed DIP8
XTR50015-D

Top view



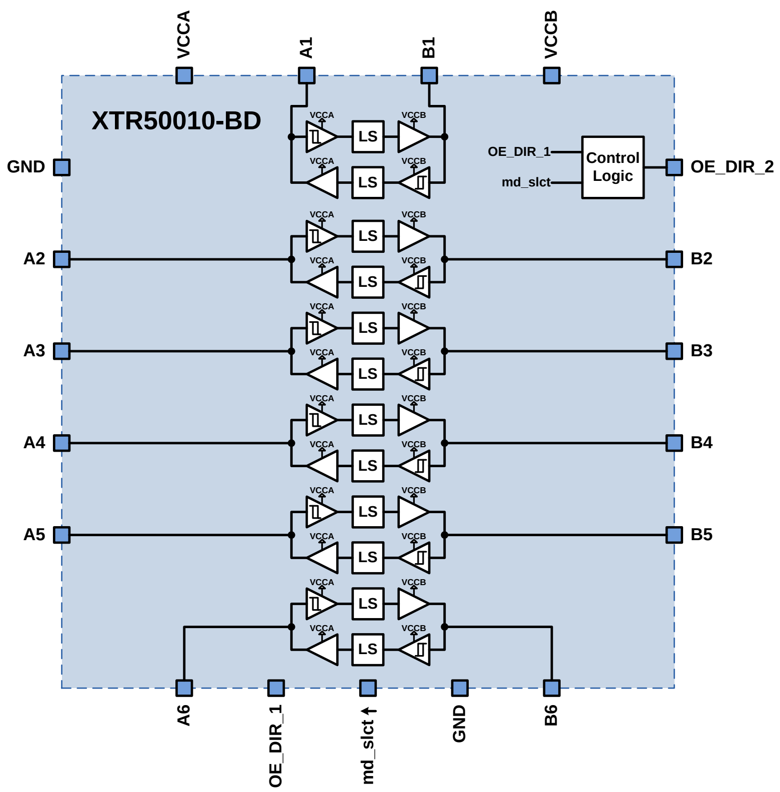
CDFP8 with ePad
XTR50015-FE

Top view



ePAD (bottom of package) connected to GND.
ePAD can be left floating on the PCB

BLOCK DIAGRAM: XTR50010-BD



Arrows aside pad names indicate whether the input is internally pulled up or down.

PIN DESCRIPTION

XTR50011 – 6 Channel bidirectional		
Pin Number	**Name**	**Description**
1	A1	Bidirectional input/output with respect to B1 input/output.
2	VCCA	Supply voltage of An input/output.
3	A2	Bidirectional input/output with respect to B2 input/output.
4	A3	Bidirectional input/output with respect to B3 input/output.
5	A4	Bidirectional input/output with respect to B4 input/output.
6	A5	Bidirectional input/output with respect to B5 input/output.
7	A6	Bidirectional input/output with respect to B1 input/output.
8	OE	Output enable pin. When driven low, it puts all the outputs An, Bn to high impedance. OE pin can be referenced either to VCCA or VCCB.
9	GND	Common ground of VCCA and VCCB supplies.
10	B6	Bidirectional input/output with respect to A6 input/output.
11	B5	Bidirectional input/output with respect to A5 input/output.
12	B4	Bidirectional input/output with respect to A4 input/output.
13	B3	Bidirectional input/output with respect to A3 input/output.
14	B2	Bidirectional input/output with respect to A2 input/output.
15	VCCB	Supply voltage of Bn input/output.
16	B1	Bidirectional input/output with respect to A1 input/output.

XTR50012 – 2 Channel bidirectional		
Pin Number	**Name**	**Description**
1	VCCA	Supply voltage of An input/output.
2	A1	Bidirectional input/output with respect to B1 input/output.
3	A2	Bidirectional input/output with respect to B2 input/output.
4	OE	Output enable pin. When driven low, it puts all the outputs An, Bn to high impedance. OE pin can be referenced either to VCCA or VCCB.
5	GND	Common ground of VCCA and VCCB supplies.
6	B2	Bidirectional input/output with respect to A2 input/output.
7	B1	Bidirectional input/output with respect to A1 input/output.
8	VCCB	Supply voltage of Bn input/output.

XTR50014 – 6 Channel directional		
Pin Number	**Name**	**Description**
1	**A1**	Bidirectional input/output with respect to B1 input/output. Data direction is set with DIR pin.
2	**VCCA**	Supply voltage of An inputs/outputs.
3	**GND**	Common ground of VCCA and VCCB supplies.
4	**A2**	Bidirectional input/output with respect to B2 input/output. Data direction is set by DIR pin.
5	**A3**	Bidirectional input/output with respect to B3 input/output. Data direction is set by DIR pin.
6	**A4**	Bidirectional input/output with respect to B4 input/output. Data direction is set by DIR pin.
7	**A5**	Bidirectional input/output with respect to B5 input/output. Data direction is set by DIR pin.
8	**A6**	Bidirectional input/output with respect to B4 input/output. Data direction is set by DIR pin.
9	**B6**	Bidirectional input/output with respect to A6 input/output. Data direction is set by DIR pin.
10	**B5**	Bidirectional input/output with respect to A5 input/output. Data direction is set by DIR pin.
11	**B4**	Bidirectional input/output with respect to A4 input/output. Data direction is set by DIR pin.
12	**B3**	Bidirectional input/output with respect to A3 input/output. Data direction is set by DIR pin.
13	**B2**	Bidirectional input/output with respect to A2 input/output. Data direction is set by DIR pin.
14	**DIR**	Sets the data direction between An and Bn input/output. If DIR pin is driven high the data direction is from An to Bn. If DIR pin is driven low the data direction is from Bn to An. DIR pin can be referenced either to VCCA or VCCB.
15	**VCCB**	Supply voltage of Bn input/output.
16	**B1**	Bidirectional input/output with respect to A1 input/output. Data direction is set by DIR pin.

XTR50015 – 2 Channel directional		
Pin Number	**Name**	**Description**
1	**VCCA**	Supply voltage of An input/output.
2	**GND**	Common ground of VCCA and VCCB supplies.
3	**A1**	Bidirectional input/output with respect to B1 input/output. Data direction must be set with DIR pin.
4	**A2**	Bidirectional input/output with respect to B2 input/output. Data direction must be set with DIR pin.
5	**B2**	Bidirectional input/output with respect to A2 input/output. Data direction must be set with DIR pin.
6	**B1**	Bidirectional input/output with respect to A1 input/output. Data direction must be set with DIR pin.
7	**DIR**	Sets the data direction between An and Bn input/output. If DIR pin is driven high the data direction is from An to Bn. If DIR pin is driven low the data direction is from Bn to An. DIR pin can be referenced either to VCCA or VCCB.
8	**VCCB**	Supply voltage of Bn input/output.

RECOMMENDED OPERATING CONDITIONS

Parameter	Min	Typ	Max	Units
Supply voltage **VCCA/VCCB**	2.5		5.5	V
Voltage on An	-0.5		VCCA+0.5	V
Voltage on Bn	-0.5		VCCB+0.5	V
Voltage on OE, DIR	-0.5		max(VCCA,VCCB)+0.5	V
Input transition rise or fall time (An and Bn ports) **$\Delta t/\Delta V$**			1	µs/V
Junction Temperature[1] **T_j**	-60		230	°C

[1] Operation beyond the specified temperature range is achieved.

XTR50011/XTR50012 ELECTRICAL SPECIFICATIONS

Unless otherwise stated, specification applies for -60°C<T_j<230°C , VCCA=VCCB=5V and C_{OUT}=50pF.

Parameter	Condition	Min	Typ	Max	Units
Quiescent current					
Quiescent current I_{CC}	on VCCA+VCCB supplies, OE high, An and Bn low				
	T_C=85°C,		19	40	µA
	T_C=230°C		30	60	
	on VCCA+VCCB supplies, OE low, An and Bn low				
	T_C =85°C,		9	20	µA
	T_C=230°C		20	40	
Input voltage A_n, B_n					
High-level Input Voltage V_{IH}	VCCA/VCCB=2.5V	1.8	1.5		V
	VCCA/VCCB=3.3V	2.4	1.9		
	VCCA/VCCB=5.5V	3.0	2.4		
Low-level Input Voltage V_{IL}	VCCA/VCCB=2.5V		1.2	0.8	
	VCCA/VCCB=3.3V		1.5	1.1	
	VCCA/VCCB=5.5V		2.1	1.7	
Enable voltage OE					
High-level Input Voltage V_{IH_OE}	VCCA/VCCB=2.5V to 5.5V	2.4	2.0		V
Low-level Input Voltage V_{IL_OE}	VCCA/VCCB=2.5V to 5.5V		1.3	0.8	V
Output voltage					
High-level Output Voltage V_{CC} - V_{OH}	VCCA/VCCB=2.5V to 5.5V , I_{OUT}=20µA (sink)				
	T_C=-60°C		270	350	mV
	T_C=85°C,		210	290	
	T_C=230°C		180	260	
Low-level Output Voltage V_{OL}	VCCA/VCCB=2.5V to 5.5V , I_{OUT}=20µA (source)				
	T_C=-60°C		270	350	mV
	T_C=85°C,		220	300	
	T_C=230°C		190	270	
Switching Characteristics					
Propagation delay t_{PD}[1]	VCC Input=2.5V and VCC Output=2.5V		42	75	ns
	VCC Input=2.5V and VCC Output=3.3V		33	60	
	VCC Input=2.5V and VCC Output=5V		30	55	
	VCC Input=3.3V and VCC Output=2.5V		32	60	
	VCC Input=3.3V and VCC Output=3.3V		23	45	
	VCC Input=3.3V and VCC Output=5V		19	35	
	VCC Input=5V and VCC Output=2.5V		26	50	
	VCC Input=5V and VCC Output=3.3V		18	35	
	VCC Input=5V and VCC Output=5V		14	25	
OE Propagation delay $t_{PD\_OE\_LH}$	OE to An or Bn, VCC Input =2.5V		140	250	ns
	OE to An or Bn, VCC Input =3.3V		120	220	
	OE to An or Bn, VCC Input =5V		100	190	
OE Propagation delay $t_{PD\_OE\_HL}$	OE to An or Bn, VCC Input=2.5V		310	450	ns
	OE to An or Bn, VCC Input=3.3V		200	350	
	OE to An or Bn, VCC Input=5V		140	250	
Rise time t_{RISE}[2]	VCC Output=2.5V, C_{OUT}=50pF		7	16	ns
	VCC Output=3.3V, C_{OUT}=50pF		4.2	10	
	VCC Output=5V, C_{OUT}=50pF		3.0	6	
Fall time t_{FALL}[2]	VCC Output=2.5V, C_{OUT}=50pF		15	22	ns
	VCC Output=3.3V, C_{OUT}=50pF		6.4	12	
	VCC Output=5V, C_{OUT}=50pF		2.4	6	
Maximum data rate[3]	VCC Input=2.5-5V, VCC Output=2.5V	8			Mbps
	VCC Input=2.5-5V, VCC Output=3.3V	12			
	VCC Input=2.5-5V, VCC Output=5V	16			

[1] Propagation delay from A to B or from B to A with thresholds at 50% of VCCA or VCCB.
[2] Output Rise and fall time on A or B threshold are between 10% and 90% of VCC Output and VCC Input = 2.5V-5V
[3] Maximum data rate from A to B or from B to A.

XTR50014/XTR50015 ELECTRICAL SPECIFICATIONS

Unless otherwise stated, specification applies for -60°C<T_j<230°C, VCCA=VCCB=5V and C_{OUT}=50pF.

Parameter	Condition	Min	Typ	Max	Units
Quiescent current					
Quiescent current **I_{CC}**	on VCCA+VCCB supplies, DIR high, input low T_C=85°C, T_C=230°C		9 19	20 40	µA
	on VCCA+VCCB supplies, DIR low, Bn low T_C=85°C, T_C=230°C		0.01 10	0.5 20	µA
Input					
High-level Input Voltage **V_{IH}**	VCCA/VCCB=2.5V	1.8	1.5		V
	VCCA/VCCB=3.3V	2.4	1.9		
	VCCA/VCCB=5.5V	3.0	2.4		
Low-level Input Voltage **V_{IL}**	VCCA/VCCB=2.5V		1.2	0.8	
	VCCA/VCCB=3.3V		1.5	1.1	
	VCCA/VCCB=5.5V		2.1	1.7	
Input Current **I_I**	Input =0V or 5.5V, T_C=230°C (worst case)		±0.6	±3	uA
DIR voltage					
High-level Input Voltage **V_{IH_DIR}**	VCCA/VCCB=2.5V to 5.5V	2.4	2.0		V
Low-level Input Voltage **V_{IL_DIR}**	VCCA/VCCB=2.5V to 5.5V		1.3	0.8	V
Output voltage					
High-level Output Voltage **V_{CC} - V_{OH}**	VCCA/VCCB=2.5V, I_{OUT}=2mA (sink) T_C=230°C		100	200	mV
	VCCA/VCCB=3.3V, I_{OUT}=4mA (sink) T_C=230°C		150	220	
	VCCA/VCCB=5V, I_{OUT}=8mA (sink) T_C=230°C		210	300	
Low-level Output Voltage **V_{OL}**	VCCA/VCCB=2.5V, I_{OUT}=2mA (source) T_C=230°C		105	200	mV
	VCCA/VCCB=3.3V, I_{OUT}=4mA (source) T_C=230°C		150	220	
	VCCA/VCCB=5V, I_{OUT}=8mA (source) T_C=230°C		204	300	
Switching Characteristics					
Propagation delay **t_{PD}**[1]	VCC Input=2.5V and VCC Output=2.5V		57	100	ns
	VCC Input=2.5V and VCC Output=3.3V		40	70	
	VCC Input=2.5V and VCC Output=5V		30	55	
	VCC Input=3.3V and VCC Output=2.5V		52	95	
	VCC Input=3.3V and VCC Output=3.3V		35	65	
	VCC Input=3.3V and VCC Output=5V		25	45	
	VCC Input=5V and VCC Output=2.5V		47	85	
	VCC Input=5V and VCC Output=3.3V		30	55	
	VCC Input=5V and VCC Output=5V		21	40	
DIR Propagation delay **$t_{PD\_DIR\_LH}$**	DIR to An , VCCA=2.5V		140	250	ns
	DIR to An , VCCA=3.3V		100	180	
	DIR to An , VCCA=5V		85	150	
DIR Propagation delay **$t_{PD\_DIR\_HL}$**	DIR to Bn , VCCA=2.5V		310	560	ns
	DIR to Bn , VCCA=3.3V		230	410	
	DIR to Bn , VCCA=5V		180	320	
Rise time **t_{RISE}**[2]	VCC Output=2.5V, C_{OUT}=50pF		7	18	ns
	VCC Output=3.3V, C_{OUT}=50pF		3	11	
	VCC Output=5V, C_{OUT}=50pF		2.3	6	
Fall time **t_{FALL}**[2]	VCC Output=2.5V, C_{OUT}=50pF		15	21	ns
	VCC Output=3.3V, C_{OUT}=50pF		8	13	
	VCC Output=5V, C_{OUT}=50pF		2.5	6	
Maximum data rate[3]	VCC Input=2.5-5V, VCC Output=2.5V	20	28		Mbps
	VCC Input=2.5-5V, VCC Output=3.3V	30	50		
	VCC Input=2.5V, VCC Output=5V	40			
	VCC Input=3.3V, VCC Output=5V	60			

[1] Propagation delay from A to B or from B to A with thresholds at 50% of VCCA or VCCB.
[2] Output Rise and fall time on A or B threshold are between 10% and 90% of VCC Output and VCC Input = 2.5V-5V
[3] Maximum data rate from A to B or from B to A.

XTR50011/XTR50012 TYPICAL PERFORMANCE

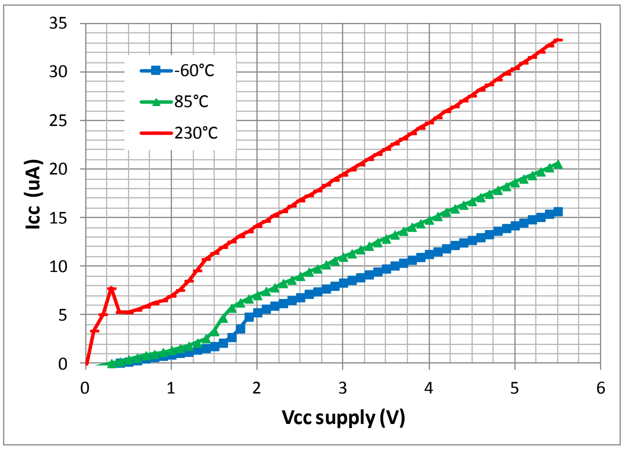


Figure 1. Total Quiescent Current (I_{CC}) vs. Supply Voltage for different Case Temperatures.
VCCA=VCCB=VCC, An=Bn=GND and OE=VCC

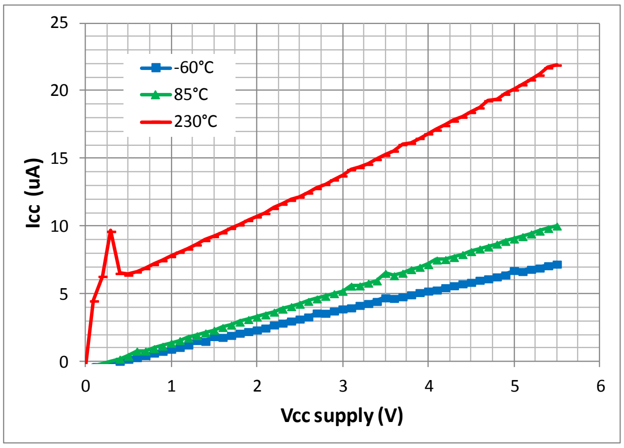


Figure 2. Total Quiescent Current (I_{CC}) vs. Supply Voltage for different Case Temperatures.
VCCA=VCCB=VCC, An=Bn=GND and OE=GND

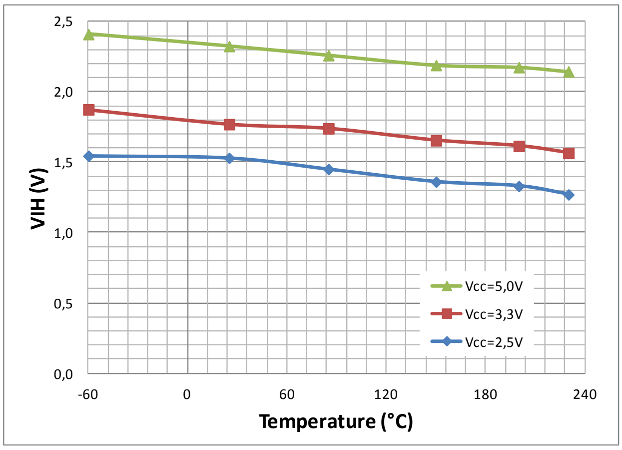


Figure 3. HIGH-level Input Voltage (V_{IH}) vs. Case Temperature for inputs An and Bn at different Supply Voltages.
VCCA=VCCB=VCC

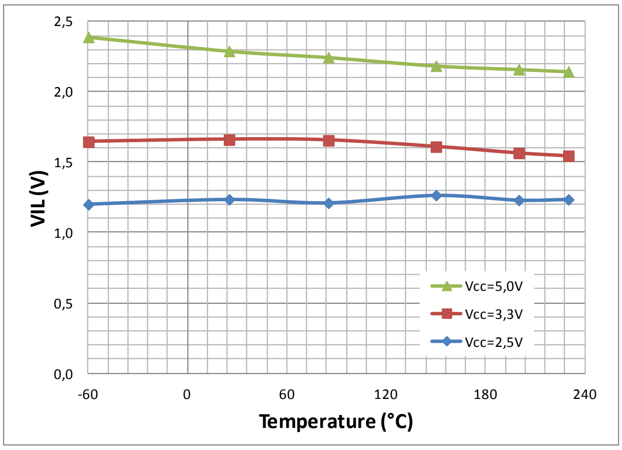


Figure 4. LOW-level Input Voltage (V_{IL}) vs. Case Temperature for inputs An and Bn at different Supply Voltages.
VCCA=VCCB=VCC

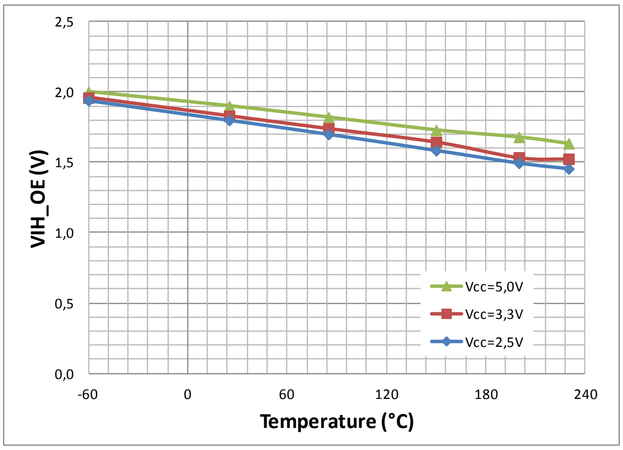


Figure 5. HIGH-level Input Voltage (V_{IH_OE}) vs. Case Temperature for input OE at different Supply Voltages.
VCCA=VCCB=VCC

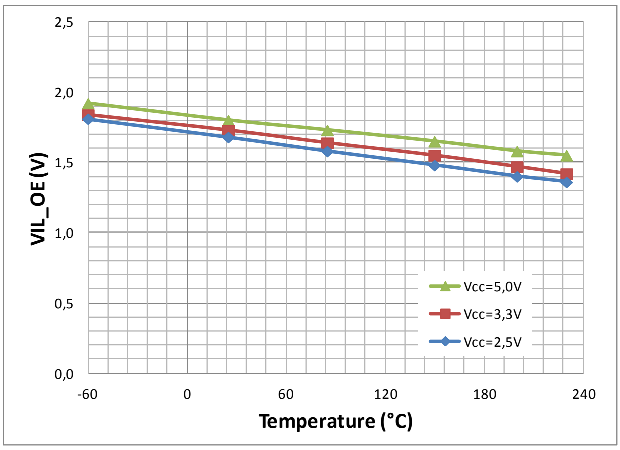


Figure 6. LOW-level Input Voltage (V_{IL_OE}) vs. Case Temperature for input OE at different supply voltages.
VCCA=VCCB=VCC

XTR50011/XTR50012 TYPICAL PERFORMANCE (CONTINUED)

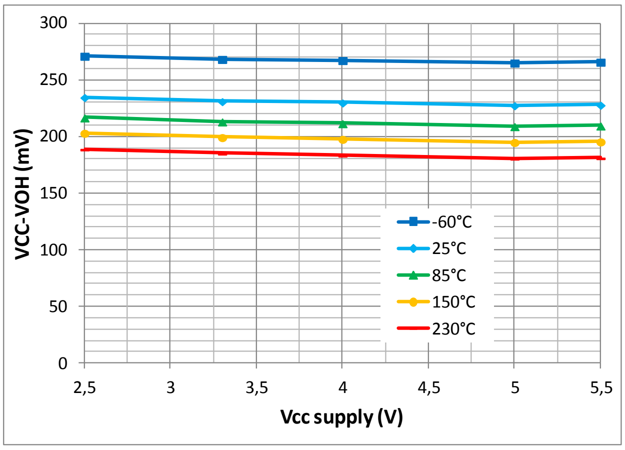


Figure 7. HIGH-level Output Voltage (V_{OH}) vs. Supply Voltage for different Case Temperatures and Iout=20µA sink. VCC refers to VCCA or VCCB.

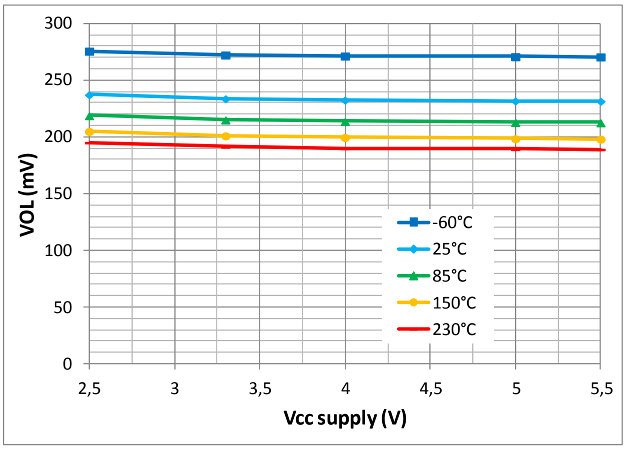


Figure 8. LOW-level Output Voltage (V_{OL}) vs. Supply Voltage for different Case Temperatures and Iout=20µA source. VCC refers to VCCA or VCCB.

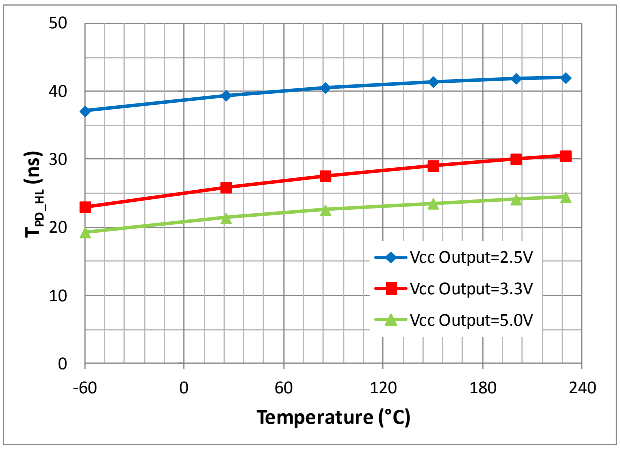


Figure 9. Propagation Delay (t_{PD_HL}) vs. Case Temperature for different Supply Voltages.
VCC_{INPUT}=2.5V; falling Input to falling Output.

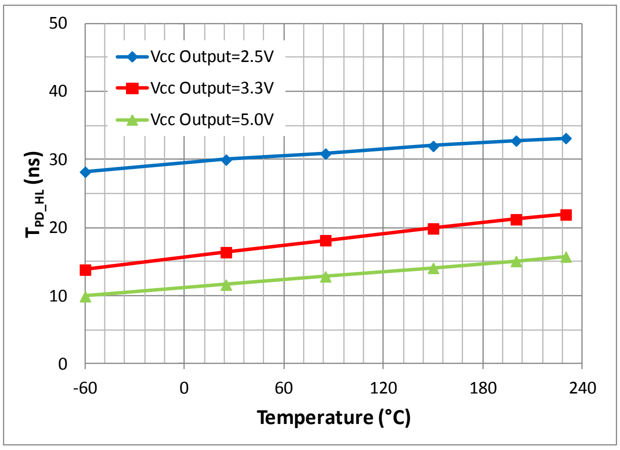


Figure 10. Propagation Delay (t_{PD_HL}) vs. Case Temperature for different Supply Voltages.
VCC_{INPUT}=5V; falling Input to falling Output.

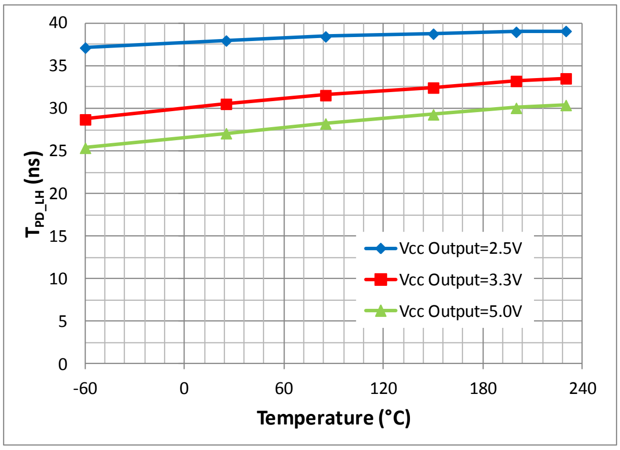


Figure 11. Propagation Delay (t_{PD_LH}) vs. Case Temperature for different Supply Voltages.
VCC_{INPUT}=2.5V; rising Input to rising Output.

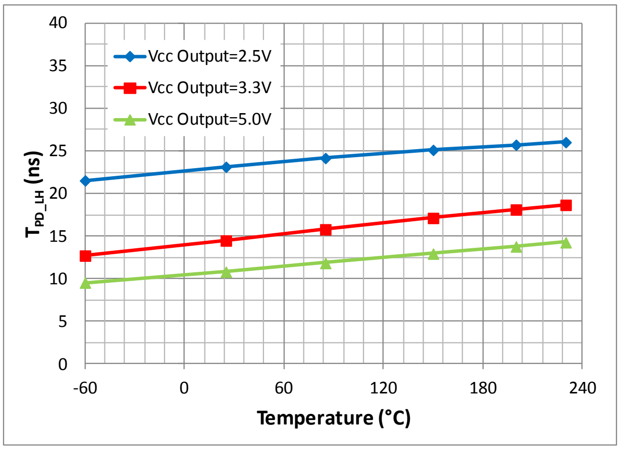


Figure 12. Propagation Delay (t_{PD_LH}) vs. Case Temperature for different Supply Voltages.
VCC_{INPUT}=5V; rising Input to rising Output.

XTR50011/XTR50012 TYPICAL PERFORMANCE (CONTINUED)

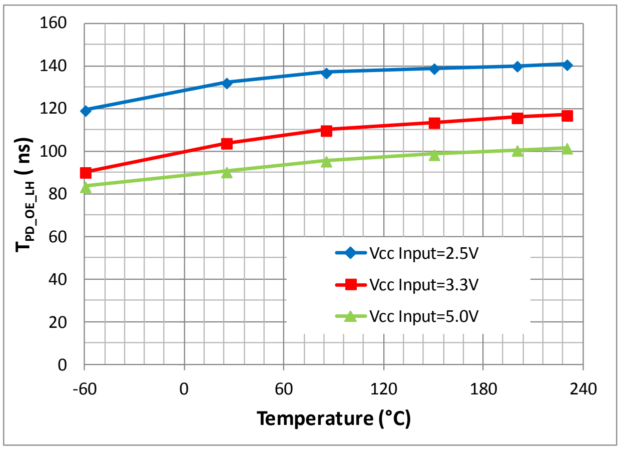


Figure 13. Propagation Delay ($t_{PD\_OE\_LH}$) vs Case Temperature for different Supply Voltages. VCC_{OUTPUT}=2.5V; rising OE to active Output.

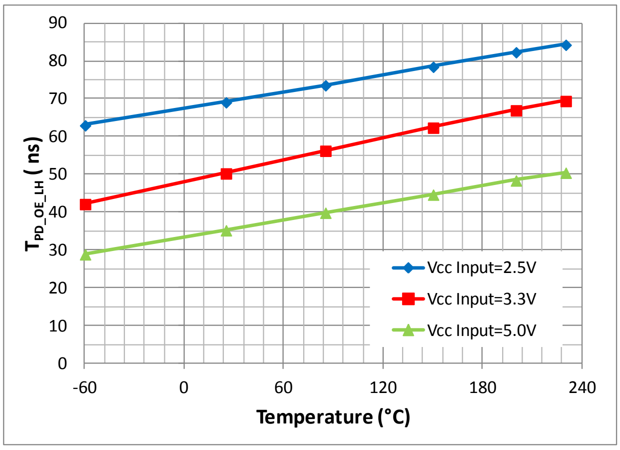


Figure 14. Propagation Delay ($t_{PD\_OE\_LH}$) vs Case Temperature for different Supply Voltages. VCC_{OUTPUT}=5V; rising OE to active Output.

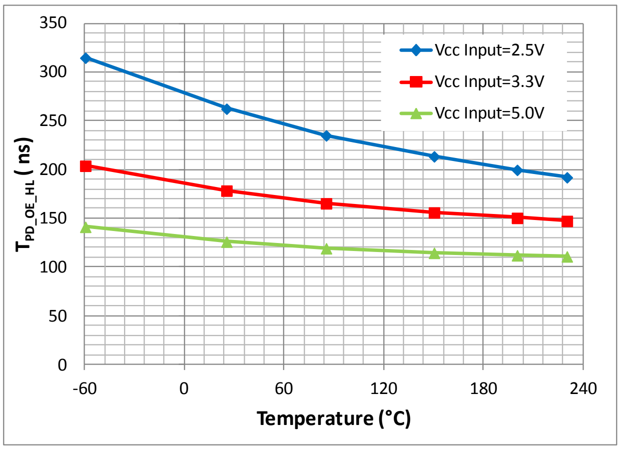


Figure 15. Propagation Delay ($t_{PD\_OE\_HL}$) vs Case Temperature for different Supply Voltages. VCC_{OUTPUT}=2.5V , falling OE to Hi-Z Output.

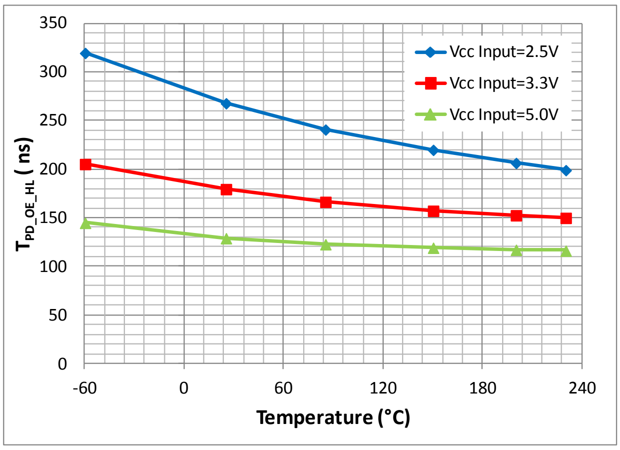


Figure 16. Propagation Delay ($t_{PD\_OE\_HL}$) vs Case Temperature for different Supply Voltages. VCC_{OUTPUT}=5V; falling OE to Hi-Z Output.

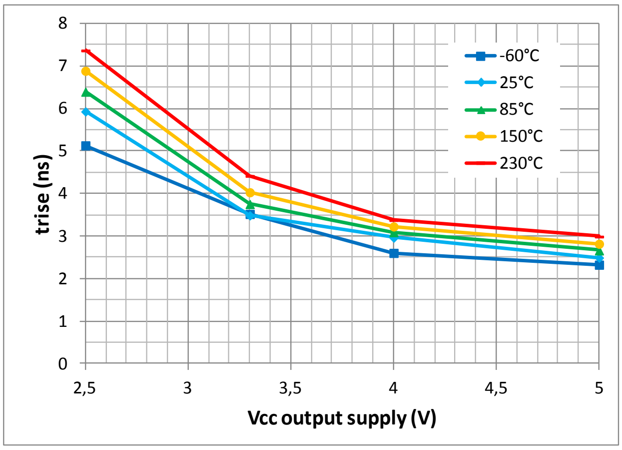


Figure 17. Rising Time (t_{RISE}) vs. Output Supply Voltage for different Case Temperatures. VCC input=5V; Cout=50pF.

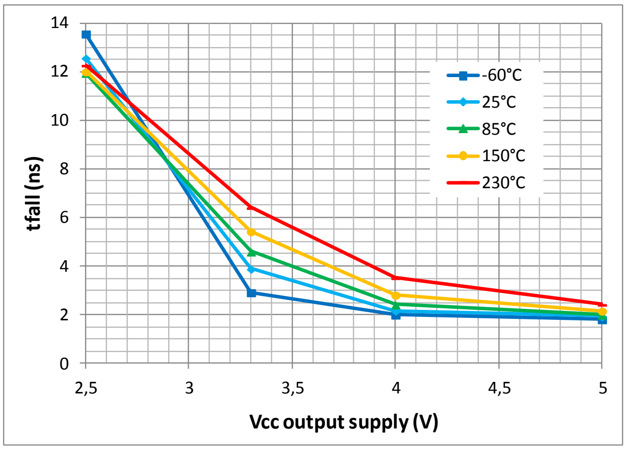


Figure 18. Falling Time (t_{FALL}) vs. Output Supply Voltage for different Case Temperatures. VCC input=5V; Cout=50pF.

XTR50011/XTR50012 TYPICAL PERFORMANCE (CONTINUED)

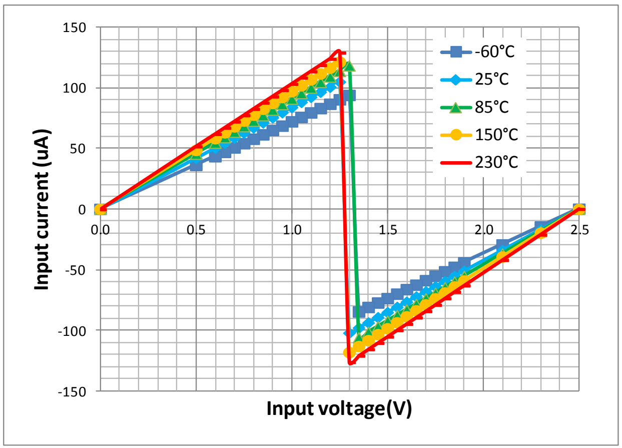


Figure 19. Input current (I_{IN}) vs. Input Voltage for different Case Temperatures. VCC input=2.5V

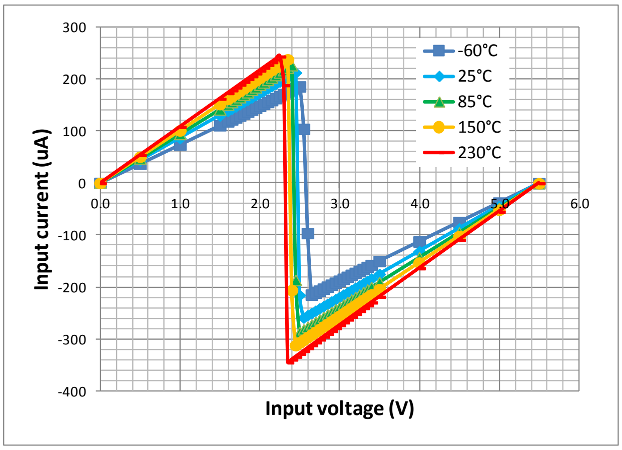


Figure 20. Input current (I_{IN}) vs. Input Voltage for different Case Temperatures. VCC input=5.5V

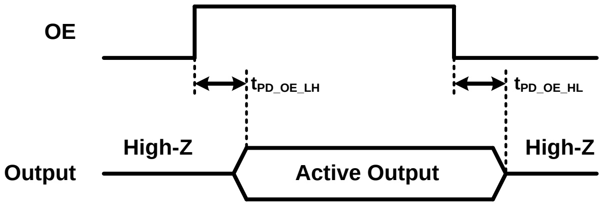


Figure 21. Timing diagram for OE operation

XTR50014/XTR50015 TYPICAL PERFORMANCE

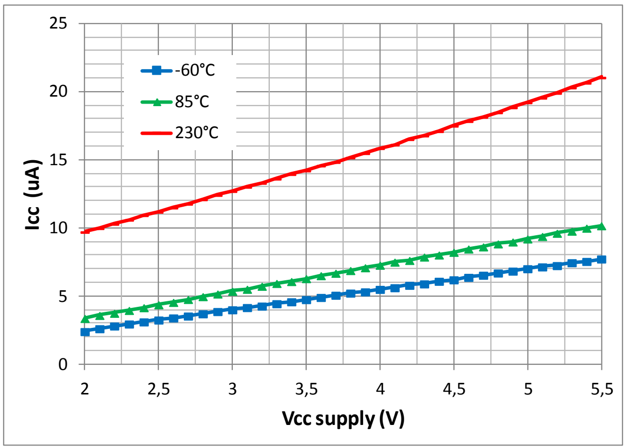


Figure 22. Total Quiescent Current (I_{CC}) vs. Supply Voltage for different Case Temperatures. VCCA=VCCB=VCC, An=Bn=GND and DIR=VCC

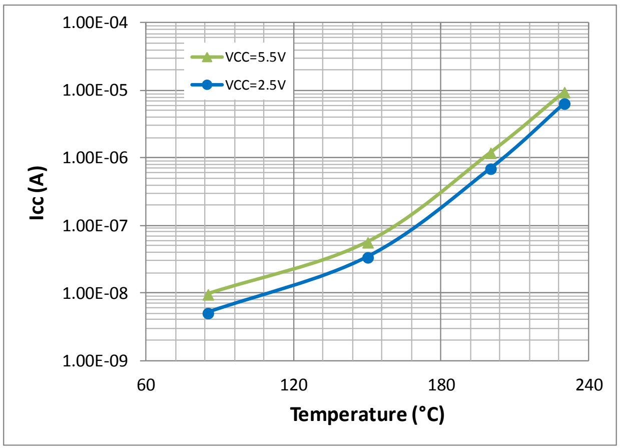


Figure 23. Total Quiescent Current (I_{CC}) vs. Supply Voltage for different Case Temperatures. VCCA=VCCB=VCC, An=Bn=GND and DIR=GND

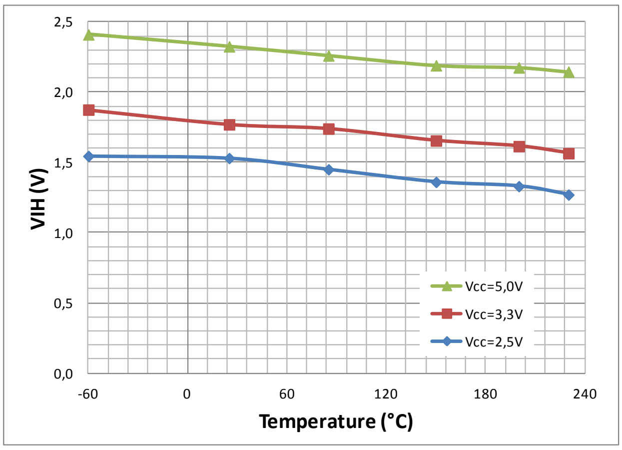


Figure 24. HIGH-level Input Voltage (V_{IH}) vs. Case Temperature for inputs An and Bn at different Supply Voltages. VCCA=VCCB=VCC

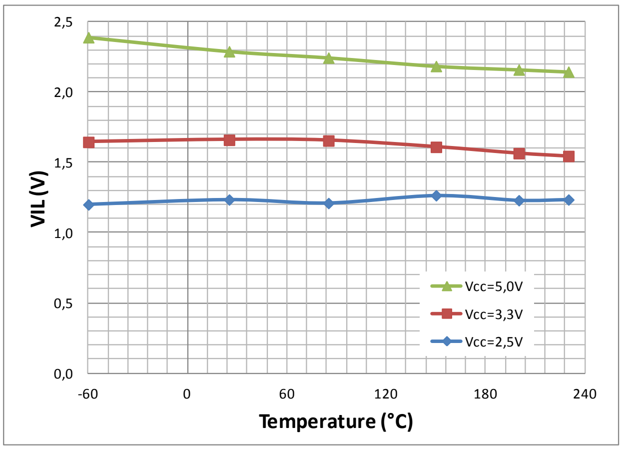


Figure 25. LOW-level Input Voltage (V_{IL}) vs. Case Temperature for inputs An and Bn at different Supply Voltages. VCCA=VCCB=VCC

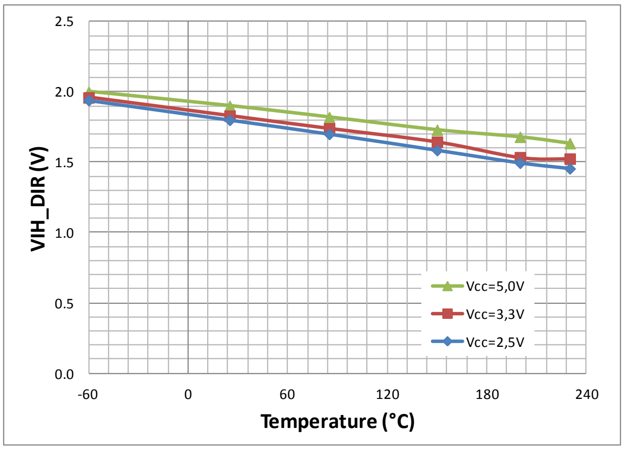


Figure 26. HIGH-level Input Voltage (V_{IH_OE}) vs. Case Temperature for input DIR at different Supply Voltages. VCCA=VCCB=VCC

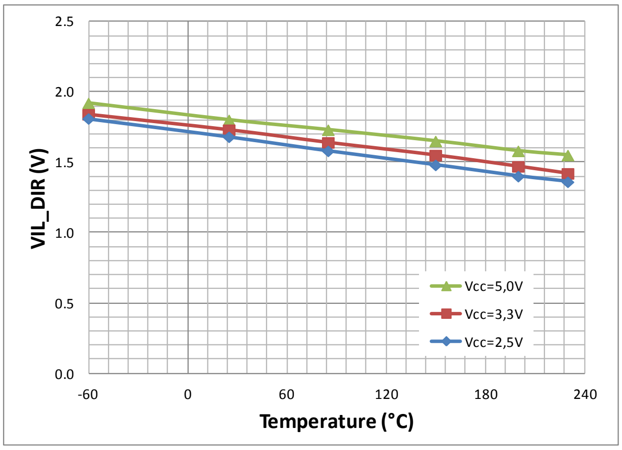


Figure 27. LOW-level Input Voltage (V_{IL_OE}) vs. Case Temperature for input DIR at different Supply Voltages. VCCA=VCCB=VCC

XTR50014/XTR50015 TYPICAL PERFORMANCE (CONTINUED)

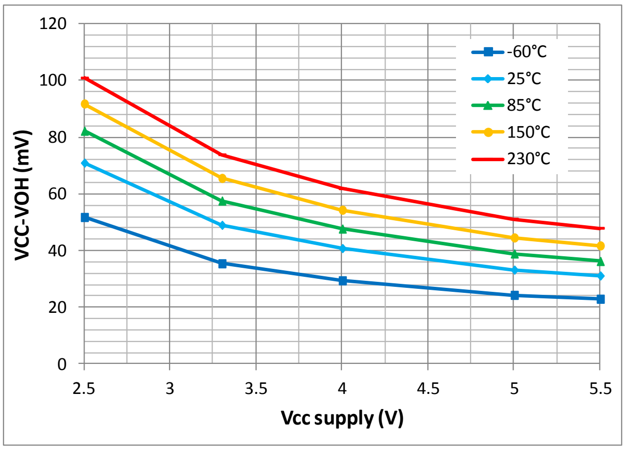


Figure 28. HIGH-level Output Voltage (V_{OH}) vs. Supply Voltage for different Case Temperatures and Iout=2mA sink.
VCC refers to VCCA or VCCB.

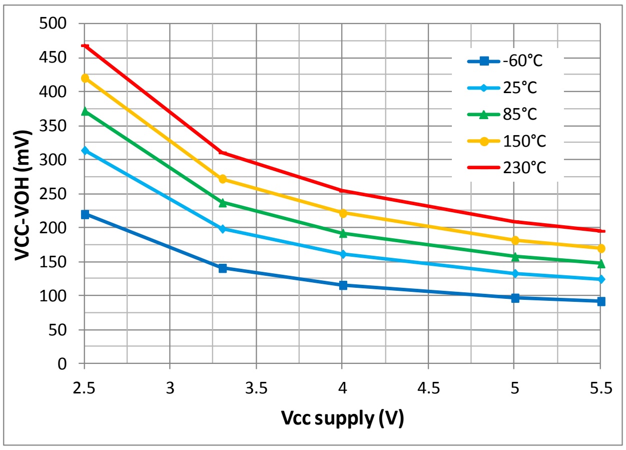


Figure 29. HIGH-level Output Voltage (V_{OH}) vs. Supply Voltage for different Case Temperatures and Iout=8mA sink.
VCC refers to VCCA or VCCB.

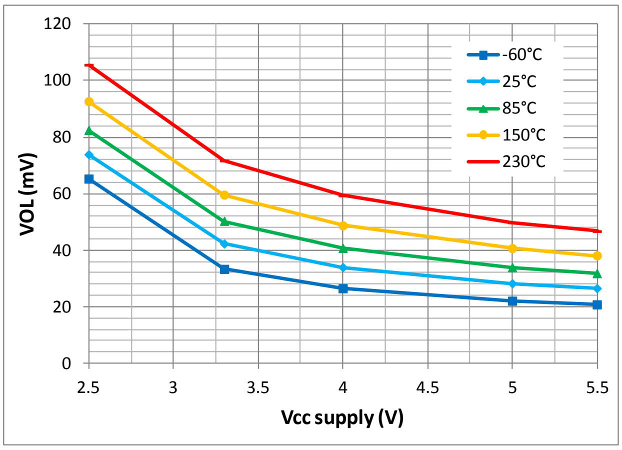


Figure 30. LOW-level Output Voltage (V_{OL}) vs. Supply Voltage for different Case Temperatures and Iout=2mA source.
VCC refers to VCCA or VCCB.

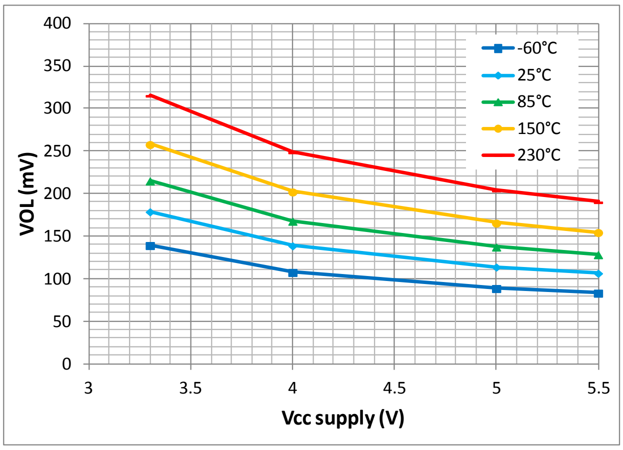


Figure 31. LOW-level Output Voltage (V_{OL}) vs. Supply Voltage for different Case Temperatures and Iout=8mA source.
VCC refers to VCCA or VCCB.

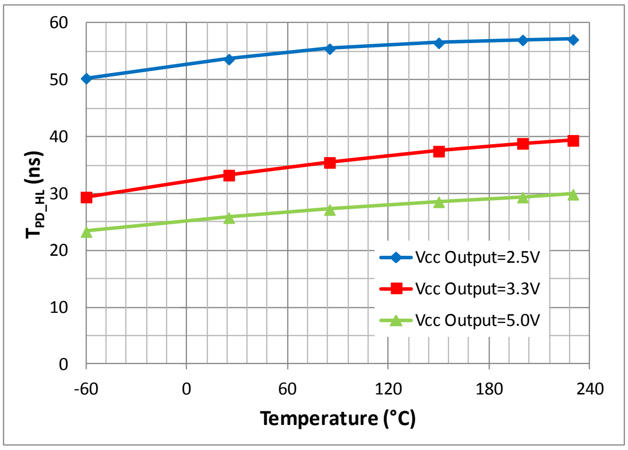


Figure 32. Propagation Delay (t_{PD_HL}) vs. Case Temperature for different Supply Voltages.
VCC_{INPUT}=2.5V; falling Input to falling Output.

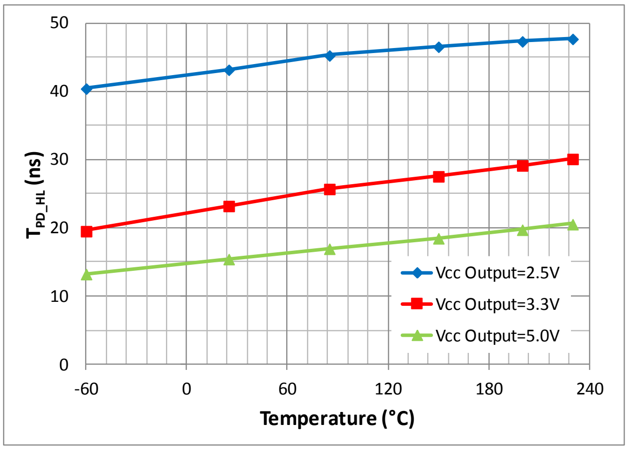


Figure 33. Propagation Delay (t_{PD_HL}) vs. Case Temperature for different Supply Voltages.
VCC_{INPUT}=5V; falling Input to falling Output.

XTR50014/XTR50015 TYPICAL PERFORMANCE (CONTINUED)

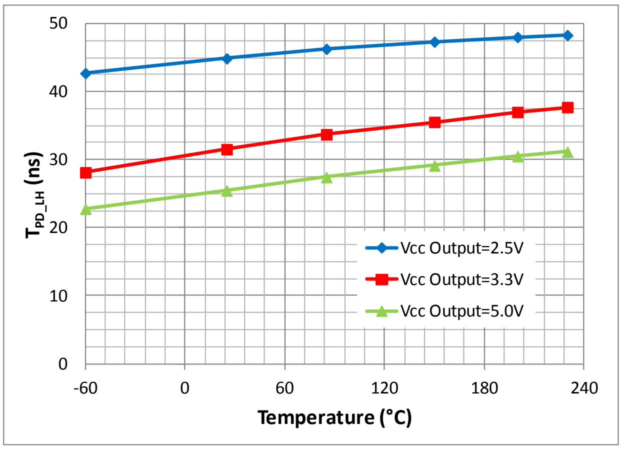


Figure 34. Propagation Delay (t_{PD_LH}) vs. Case Temperature for different Supply Voltages.
VCC_{INPUT}=2.5V; rising Input to rising Output.

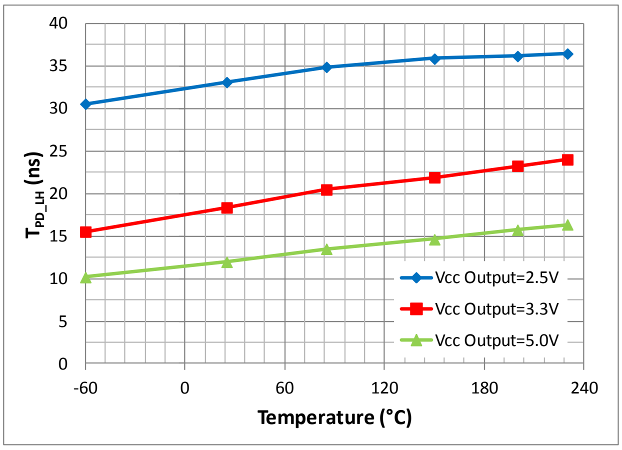


Figure 35. Propagation Delay (t_{PD_LH}) vs. Case Temperature for different Supply Voltages.
VCC_{INPUT}=5V; rising Input to rising Output.

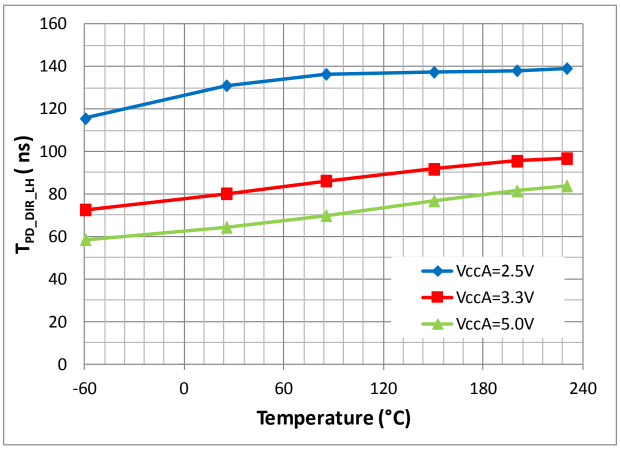


Figure 36. Propagation Delay ($t_{PD\_DIR\_LH}$) vs Case Temperature for different Supply Voltages.
VccB=2.5V; rising DIR to rising Output.

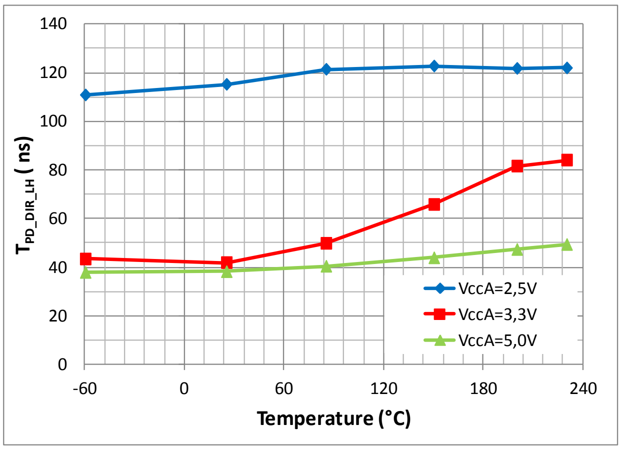


Figure 37. Propagation Delay ($t_{PD\_DIR\_LH}$) vs Case Temperature for different Supply Voltages.
VccB=5V; rising DIR to rising Output.

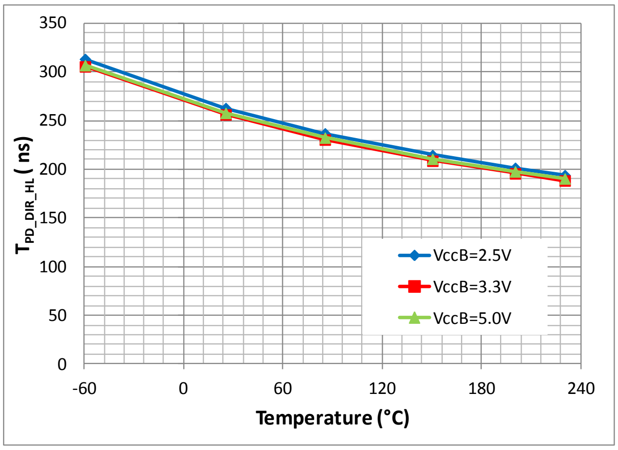


Figure 38. Propagation Delay ($t_{PD\_DIR\_HL}$) vs Case Temperature for different Supply Voltages. VccA=2.5V , falling DIR to falling Output.

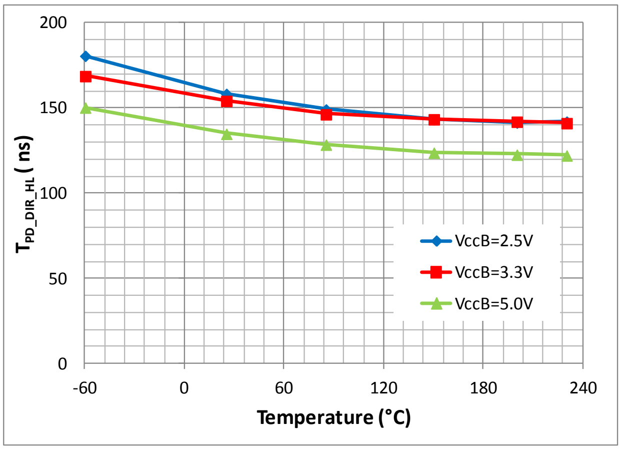


Figure 39. Propagation Delay ($t_{PD\_DIR\_HL}$) vs Case Temperature for different Supply Voltages. VccA =5V , falling DIR to falling Output.

XTR50014/XTR50015 TYPICAL PERFORMANCE (CONTINUED)

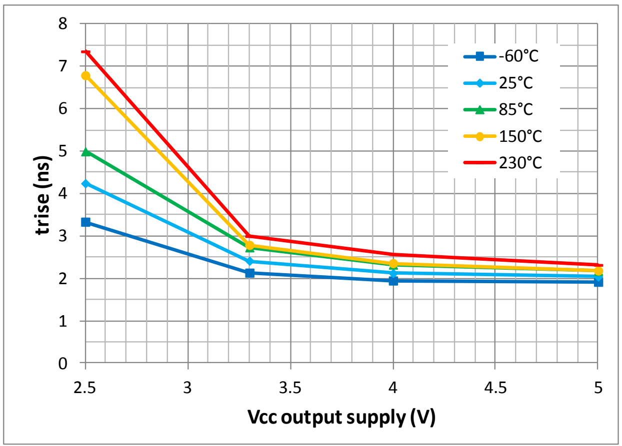


Figure 40. Rising time (t_{RISE}) vs. Output Supply Voltage for different temperatures. VCC input=5V ; Cout=50pF.

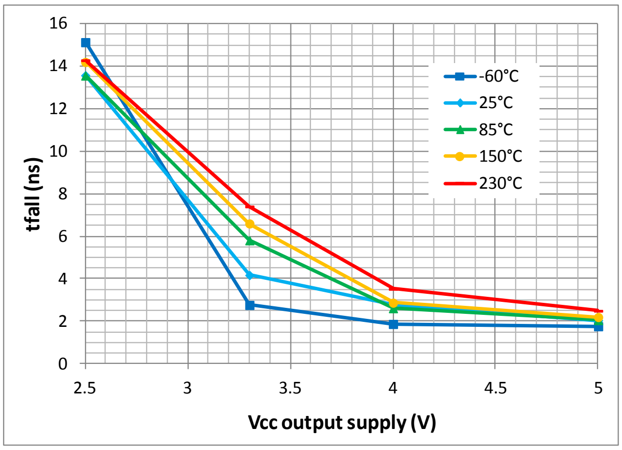


Figure 41. Falling time (t_{FALL}) vs. Output Supply Voltage for different temperatures. VCC input=5V ; Cout=50pF.

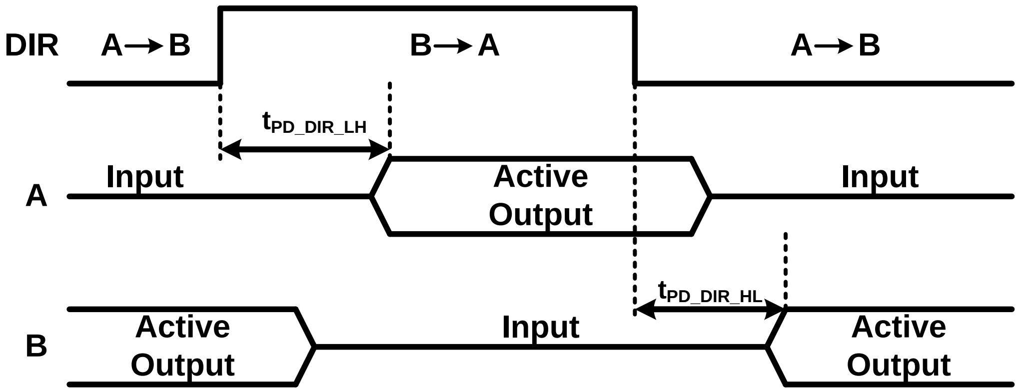


Figure 42. Timing diagram for DIR operation

THEORY OF OPERATION

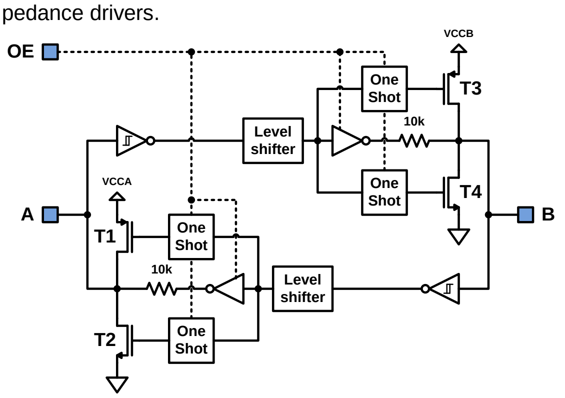
Introduction

The XTR50010 is a family of bidirectional level translators that can be used for data communication between devices or systems operating at different supply voltages.
XTR50010 parts are able to operate from -60°C to +230°C, with supply voltages from 2.5V to 5.5V.

Operation Modes

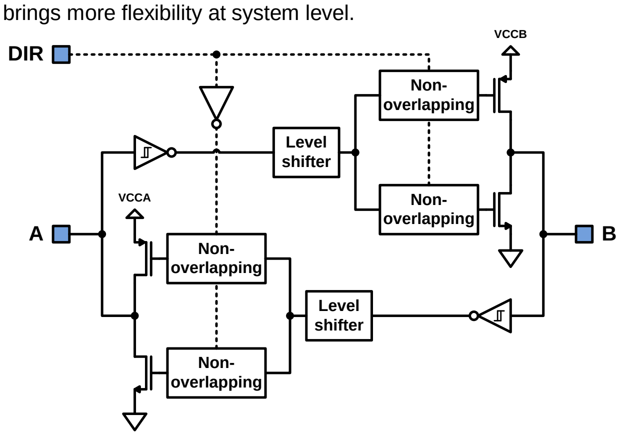
XTR50011/XTR50012 operation (bidirectional)

The block architecture for one I/O channel of XTR50011 or XTR50012 devices is shown in the figure below. These devices do not require a direction-control signal to control the direction of data flow from A to B or from B to A. In a static state, the output drivers of the XTR50011 or XTR50012 can maintain a high or low, but are designed to present a weak output (10kΩ output impedance), so that they can be overdriven by an external, low-impedance driver when data on the bus starts flowing in the opposite direction. However, load capacitors of up to 50pF can be connected at the output as theses capacitors will be charged and discharged during transitions by strong drivers controlled by the "One-Shot" blocks of the figure below.
The One-Shot blocks driving the output transistors T1-T4 detect rising or falling edges of input signal on the A or B ports. During a rising edge, the One-Shot blocks turn on the PMOS transistors T1 and T3 for a short duration, which speeds up the low-to-high transition. Similarly, during a falling edge, the One-Shot blocks turn on the NMOS transistors T2 and T4 for a short duration, which speeds up the high-to-low transition. After the rising or falling transition, the state is maintained with 10kΩ output impedance drivers.



XTR50014/XTR50015 operation (directional)

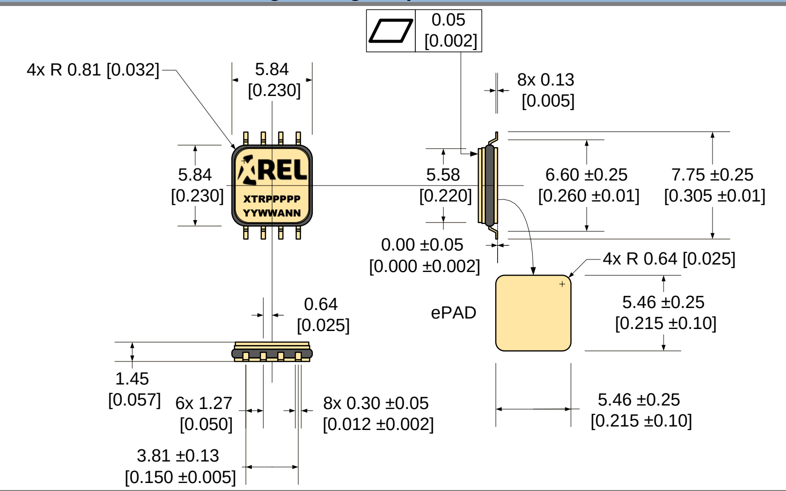
The block architecture for one I/O channel of XTR50014 or XTR50015 is shown in the figure below. These devices are designed for asynchronous communication between two data buses. The logic levels of the direction-control (DIR) input activate either the B-port outputs or the A-port outputs. The device transmits data from the A bus to the B bus when the B-port outputs are activated and from the B bus to the A bus when the A-port outputs are activated. The input circuitry on both A and B ports is always active and must have a logic HIGH or LOW level applied to prevent excess short-circuit current on the power supplies.
The DIR input can be powered either by VCCA or VCCB. This brings more flexibility at system level.



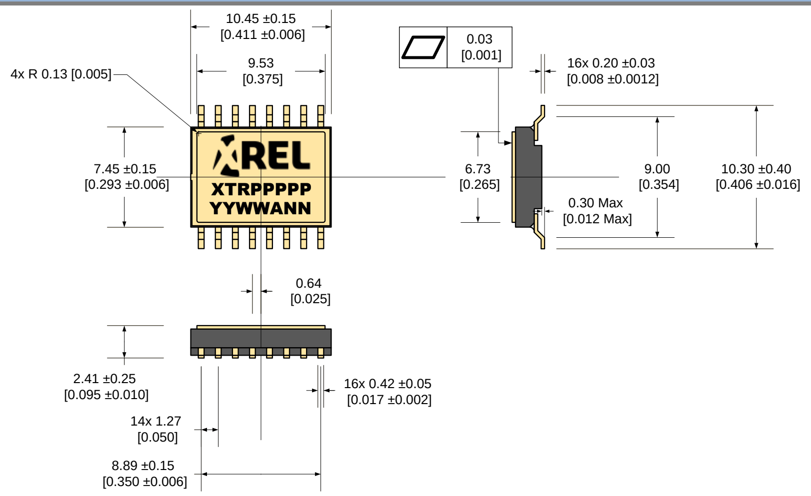
PACKAGE OUTLINES

Dimensions shown in mm [inches].

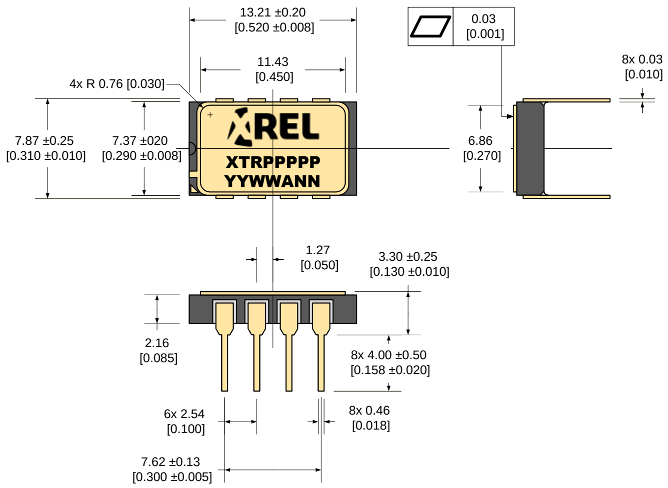
Ceramic gull-wing flat pack with ePad DFP8



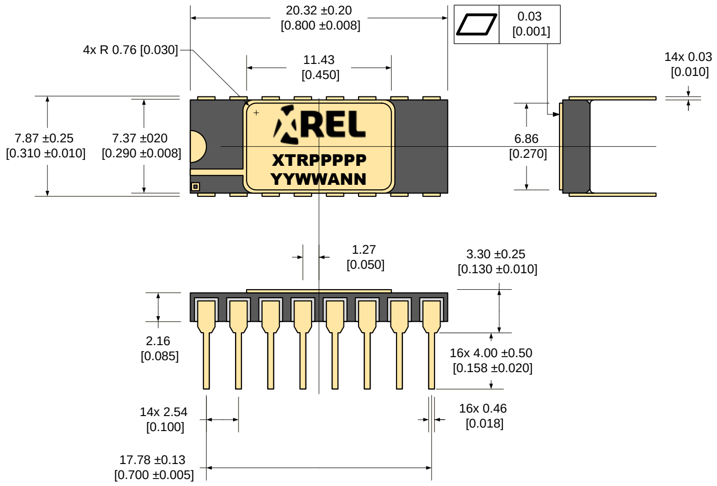
Ceramic Small Outline IC SOIC16



Ceramic Side Braze Dual In-line DIP8



Ceramic Side Braze Dual In-line DIP16



Part Marking Convention	
Part Reference: XTRPPPPPP	
XTR	X-REL Semiconductor, high-temperature, high-reliability product (XTRM Series).
PPPPP	Part number (0-9, A-Z).
Unique Lot Assembly Code: YYWWANN	
YY	Two last digits of assembly year (e.g. 11 = 2011).
WW	Assembly week (01 to 52).
A	Assembly location code.
NN	Assembly lot code (01 to 99).

IMPORTANT NOTICE & DISCLAIMER

CONTACT US

For more information on X-REL Semiconductor's products, technical support or ordering:

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