

ZMCIS374xC General Quad-Channel Digital Isolators

1. Features

- **Data rate: DC to 40Mbps**
- **Robust isolation barrier**
 - High lifetime: >40 years
 - Up to 5000 V_{RMS} isolation rating (Wide body packages)
 - ±150 kV/μs typical CMTI
- **Wide supply range: 3.0V to 5.5V**
- **Wide operating temperature range: -40°C to 125°C**
- **No start-up initialization required**
- **Default output High (ZMCIS374xCH) and Low (ZMCIS374xCL) Options**
- **High electromagnetic immunity**
- **Low power consumption**
 - 2.0mA per channel at 1Mbps with V_{DD} = 5.0V
 - 3.5mA per channel at 40Mbps with V_{DD} = 5.0V
- **Best in class propagation delay and skew**
 - 22ns typical propagation delay
 - 2.5ns propagation delay skew (chip -to-chip)
 - 1ns pulse width distortion
 - 20ns minimum pulse width
- **CMOS inputs logic**
- **Safety regulatory approvals**
 - VDE 0884-17 isolation certification
 - UL according to UL1577

2. Applications

- Industrial Automation
- Motor Control
- Medical Systems
- Isolated Power Supplies
- Solar Inverters
- Isolated ADC, DAC

3. General Description

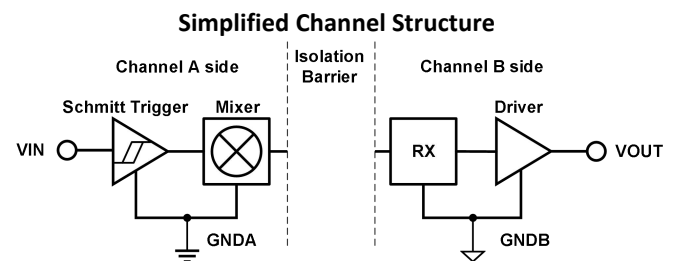
The ZMCIS374xC devices provide high electromagnetic immunity and low emissions at low power consumption, while isolating CMOS digital I/O. Each isolation channel has a logic input and output buffer separated by capacitive silicon dioxide (SiO₂) insulation barrier, and each channel input integrated Schmitt trigger to provide excellent noise immunity.

The ZMCIS3740C features 4 channels transferring digital signals in one direction and output enable for the B side is active-high. The ZMCIS3741C device has three forward and one reverse-direction channels, making it ideal for applications such as isolated SPI, RS-485 communication. The ZMCIS3742C provides further design flexibility with two channels in each direction. When the input is either not powered or is open-circuit, the default output is low for devices with suffix L and high for devices with suffix H.

The ZMCIS374xC family are specified over the -40°C to +125°C operating temperature range and are available in 8-pin SOIC narrow body package, 8-pin SOIC wide body package and 16-pin SOIC wide body package.

Device information

Part number	Package	Package size (NOM)
ZMCIS3740C, ZMCIS3741C, ZMCIS3742C	SOIC16-WB(W)	10.30 mm × 7.50 mm



GND A and GND B are the isolated grounds for A side and B side respectively.

4. Ordering Information

Table 4- 1 Ordering Guide for Valid Ordering Part Number

Part Number	Number of Inputs A Side	Number of Inputs B Side	Default Output	Isolation Rating (kV _{RMS})	Package
ZMCIS3740CLW	4	0	Low	5.0	SOIC16-WB (W)
ZMCIS3740CHW	4	0	High	5.0	SOIC16-WB (W)
ZMCIS3741CLW	3	1	Low	5.0	SOIC16-WB (W)
ZMCIS3741CHW	3	1	High	5.0	SOIC16-WB (W)
ZMCIS3742CLW	2	2	Low	5.0	SOIC16-WB (W)
ZMCIS3742CHW	2	2	High	5.0	SOIC16-WB (W)

Table of Contents

1. Features	1	7.9	Supply Current	10
2. Applications	1	7.9.1	$V_{DDA} = V_{DDB} = 5V \pm 10\%$, $T_A = -40$ to 125°C	10
3. General Description	1	7.9.2	$V_{DDA} = V_{DDB} = 3.3V \pm 10\%$, $T_A = -40$ to 125°C	11
4. Ordering Informatio	1	7.10	Timing Characteristics	12
5. Revision History	3	7.10.1	$V_{DDA} = V_{DDB} = 5V \pm 10\%$, $T_A = -40$ to 125°C	12
6. Pin Descriptions and Functions	4	7.10.2	$V_{DDA} = V_{DDB} = 3.3V \pm 10\%$, $T_A = -40$ to 125°C	12
7. Specifications	5	8	Parameter Measurement Information	13
7.1 Absolute Maximum Ratings ¹	5	9	Detailed Description	15
7.2 ESD Ratings	5	9.1	Overview	15
7.3 Recommended Operating Conditions	5	9.2	Functional Block Diagram	15
7.4 Thermal Information	6	9.3	Device Operation Modes	16
7.5 Power Ratings	6	10	Application and Implementation	17
7.6 Insulation Specifications	7	11	Package Information	18
7.7 Safety-Related Certifications	8	11.1	SOIC16-WB Package	18
7.8 Electrical Characteristics	9	12	Soldering Information	19
7.8.1 $V_{DDA} = V_{DDB} = 5V \pm 10\%$, $T_A = -40$ to 125°C	9	13	Tape and Reel Information	20
7.8.2 $V_{DDA} = V_{DDB} = 3.3V \pm 10\%$, $T_A = -40$ to 125°C	9	14	Important Notice	错误! 未定义书签。

5 Revision History

Revision	Description	Date	Page
Version 1.00	NA	2024.08.12	NA

6 Pin Descriptions and Functions

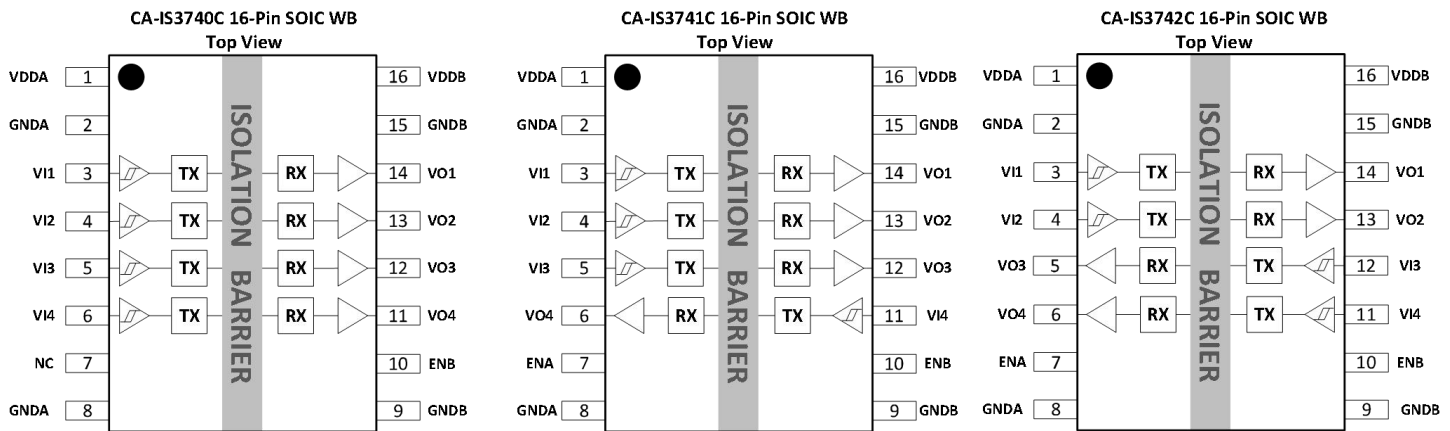


Figure 6- 1. ZMCIS374xC pin configuration

Table 6- 1. Pin description for the ZMCIS374xC 16-Pin Wide body SOIC packages

16-SOIC Pin#			Name	Type	Description
ZMCIS3740C	ZMCIS3741C	ZMCIS3742C			
1	1	1	VDDA	Supply	Power supply for side A.
2, 8	2, 8	2, 8	GNDA	Ground	Ground reference for side A.
3	3	3	VI1	Digital I/O	Digital input 1 on side A, corresponds to logic output 1 on side B.
4	4	4	VI2	Digital I/O	Digital input 2 on side A, corresponds to logic output 2 on side B.
5	5	12	VI3	Digital I/O	Digital input 3 on side A/B, corresponds to logic output 3 on side B/A.
6	11	11	VI4	Digital I/O	Digital input 4 on side A/B, corresponds to logic output 4 on side B/A.
7	-	-	NC ¹	No Connect	Not internally connected. It can be left floating, tied to VDDA or tied to GNDA.
-	7	7	ENA ²	Digital I/O	Output enable A. Output pin on side A is enabled when ENA is high or floating; Output pin on side A is open and in high-impedance state when ENA is low.
9, 15	9, 15	9, 15	GNDB	Ground	Ground reference for side B.
10	10	10	ENB ²	Digital I/O	Output enable B. Output pin on side B is enabled when ENB is high or floating; Output pin on side B is open and in high-impedance state when ENB is low.
11	6	6	VO4	Digital I/O	Digital output 4 on side B/A, VO4 is the logic output for the VI4 input on side A/B.
12	12	5	VO3	Digital I/O	Digital output 3 on side B/A, VO3 is the logic output for the VI3 input on side A/B.
13	13	13	VO2	Digital I/O	Digital output 2 on side B, VO2 is the logic output for the VI2 input on side A.
14	14	14	VO1	Digital I/O	Digital output 1 on side B, VO1 is the logic output for the VI1 input on side A.
16	16	16	VDDB	Supply	Power supply for side B.

Notes:

1. No Connect. This pin is not internally connected. It can be left floating, tied to VDD_ or tied to GND.
2. Enable inputs ENA and ENB can be used to put the respective outputs in high impedance for multi master driving applications, external clock synchronization etc. With internal pull-up resistors, these pins can be connected to logic high or left floating to enable the outputs. If ENA, ENB are unused, it is recommended to connect these pins to a logic level, especially in the noisy environment.

7 Specifications

7.1 Absolute Maximum Ratings¹

PARAMETER		MIN	MAX	UNIT
V _{DDA} , V _{DDB}	Supply voltage ²	-0.5	7.0	V
V _{IN}	Voltage at VIx, ENx	-0.5	V _{DD-} + 0.5 ³	V
I _O	Output current	-20	20	mA
T _J	Junction Temperature	-40	150	°C
T _{STG}	Storage Temperature	-65	150	°C

NOTE:

- 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.
- All voltage values are with respect to the local ground (GNDA or GNDB) and are peak voltage values.
- Maximum voltage must not exceed 7V.

7.2 ESD Ratings

		VALUE	UNIT
V _{ESD} Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, pins at same side	±8	kV
	Charged device model (CDM), per JEDEC specification JESD22-C101, all pins	±2	

7.3 Recommended Operating Conditions

PARAMETER		MIN	NOM	MAX	UNIT
V _{DDA} , V _{DDB}	Supply voltage	3.0	3.3 or 5.0	5.5	V
V _{DD} (UVLO+)	V _{DDX} undervoltage-lockout threshold @ rising edge	2.55	2.7	2.85	V
V _{DD} (UVLO-)	V _{DDX} undervoltage-lockout threshold @ falling edge	2.35	2.5	2.65	V
V _{HYS} (UVLO)	V _{DDX} undervoltage-lockout threshold hysteresis	150	200	250	mV
I _{OH}	High-level output current	V _{DDO} ¹ = 5V		-4	mA
		V _{DDO} ¹ = 3.3V		-2	
I _{OL}	Low-level output current	V _{DDO} ¹ = 5V		4	mA
		V _{DDO} ¹ = 3.3V		2	
V _{IH}	High-level input voltage	0.7 × V _{DDI} ²		V _{DDI} ²	V
V _{IL}	Low-level input voltage	0		0.3 × V _{DDI} ²	V
DR	Data rate	0		40	Mbps
T _A	Ambient temperature	-40	27	125	°C
T _J	Junction temperature	-40		150	°C

NOTE:

- V_{DDO} = output-side supply V_{DD}.
- V_{DDI} = input-side supply V_{DD}.

7.4 Thermal Information

THERMAL METRIC		PACKAGE	UNIT
		SOIC16-WB (W)	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	83.4	°C/W

7.5 Power Ratings

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
ZMCIS3740C						
P_D	Maximum Power Dissipation	$V_{DDA} = V_{DDB} = 5.5V$, $C_L = 15pF$, $T_J = 150^\circ C$,			120	mW
P_{DA}	Maximum Power Dissipation on Side A	Input a 20-MHz 50% duty cycle square			34	mW
P_{DB}	Maximum Power Dissipation on Side B	wave			86	mW
ZMCIS3741C						
P_D	Maximum Power Dissipation	$V_{DDA} = V_{DDB} = 5.5V$, $C_L = 15pF$, $T_J = 150^\circ C$,			120	mW
P_{DA}	Maximum Power Dissipation on Side A	Input a 20-MHz 50% duty cycle square			45	mW
P_{DB}	Maximum Power Dissipation on Side B	wave			75	mW
ZMCIS3742C						
P_D	Maximum Power Dissipation	$V_{DDA} = V_{DDB} = 5.5V$, $C_L = 15pF$, $T_J = 150^\circ C$,			120	mW
P_{DA}	Maximum Power Dissipation on Side A	Input a 20-MHz 50% duty cycle square			56	mW
P_{DB}	Maximum Power Dissipation on Side B	wave			64	mW

7.6 Insulation Specifications

PARAMETR		TEST CONDITIONS	VALUE	UNIT
			W	
CLR	External clearance ¹	Shortest terminal-to-terminal distance through air	8	mm
CPG	External creepage ¹	Shortest terminal-to-terminal distance across the package surface	8	mm
DTI	Distance through the insulation	Minimum internal gap (internal clearance)	28	μm
CTI	Comparative tracking index	DIN EN 60112 (VDE 0303-11); IEC 60112	> 600	V
	Material group	According to IEC 60664-1	I	
	Overvoltage category per IEC 60664-1	Rated mains voltage ≤ 300V _{RMS}	I-IV	
		Rated mains voltage ≤ 600V _{RMS}	I-IV	
		Rated mains voltage ≤ 1000V _{RMS}	I-III	
DIN EN IEC 60747-17 (VDE 0884-17)²				
V _{IORM}	Maximum repetitive peak isolation voltage	AC voltage (bipolar)	1414	V _{PK}
V _{IOWM}	Maximum working isolation voltage	AC voltage; Time dependent dielectric breakdown (TDDB) Test	1000	V _{RMS}
		DC voltage	1414	V _{DC}
V _{IOTM}	Maximum transient isolation voltage	V _{TEST} = V _{IOTM} , t = 60s (qualification); V _{TEST} = 1.2 × V _{IOTM} , t = 1s (100% production)	7070	V _{PK}
V _{IMP}	Maximum impulse voltage	1.2/50-μs waveform per IEC 62368-1	8700	V _{PK}
V _{IOSM}	Maximum surge isolation voltage ³	V _{IOSM} ≥ 1.3 × V _{IMP} ; Tested in air or oil (qualification test), 1.2/50-μs waveform per IEC 62368-1	11312	V _{PK}
Q _{pd}	Apparent charge ⁴	Method a, After input/output safety test subgroup 2/3, V _{ini} = V _{IOTM} , t _{ini} = 60s; V _{pd(m)} = 1.2 × V _{IORM} , t _m = 10s	≤ 5	pC
		Method a, After environmental tests subgroup 1, V _{ini} = V _{IOTM} , t _{ini} = 60s; V _{pd(m)} = 1.6 × V _{IORM} , t _m = 10s	≤ 5	
		Method b1, At routine test (100% production) and preconditioning (type test) V _{ini} = 1.2 × V _{IOTM} , t _{ini} = 1s; V _{pd(m)} = 1.875 × V _{IORM} , t _m = 1s	≤ 5	
C _{IO}	Barrier capacitance, input to output ⁵	V _{IO} = 0.4 × sin(2πft), f = 1MHz	~ 0.5	pF
R _{IO}	Isolation resistance ⁵	V _{IO} = 500V, T _A = 25°C	> 10 ¹²	Ω
		V _{IO} = 500V, 100°C ≤ T _A ≤ 125°C	> 10 ¹¹	
		V _{IO} = 500V at T _S = 150°C	> 10 ⁹	
	Pollution degree		2	
UL 1577				
V _{ISO}	Maximum withstanding isolation voltage	V _{TEST} = V _{ISO} , t = 60s (qualification), V _{TEST} = 1.2 × V _{ISO} , t = 1s (100% production)	5000	V _{RMS}
NOTE:				
<ol style="list-style-type: none"> Creepage and clearance requirements should be applied according to the specific equipment isolation standards of an application. Care should be taken to maintain the creepage and clearance distance of a board design to ensure that the mounting pads of the isolator on the printed-circuit board do not reduce this distance. Creepage and clearance on a printed-circuit board become equal in certain cases. Techniques such as inserting grooves and/or ribs on a printed circuit board are used to help increase these specifications. This coupler is suitable for safe electrical insulation only within the safety ratings. Compliance with the safety ratings shall be ensured by means of suitable protective circuits. Testing is carried out in air or oil to determine the intrinsic surge immunity of the isolation barrier. Apparent charge is electrical discharge caused by a partial discharge (pd). All pins on each side of the barrier tied together creating a two-terminal device. 				

7.7 Safety-Related Certifications

VDE	UL (Pending)
Certified according to DIN EN IEC60747-17(VDE 0884-17):2021-10; EN IEC60747-17:2020+AC:2021	Recognized under UL 1577 Component Recognition Program
Reinforced Isolation: V_{IORM} : 1414V _{PK} V_{IOTM} : 7070V _{PK} V_{IOSM} : 11312V _{PK}	Single protection SOIC16-WB: 5000V _{RMS}
Certification Number Reinforced Isolation Certificate: 40057278	Certification Number:

7.8 Electrical Characteristics

7.8.1 $V_{DDA} = V_{DDB} = 5V \pm 10\%$, $T_A = -40$ to $125^\circ C$

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	$I_{OH} = -4mA$; See Figure 8- 3	$V_{DDO}^1 - 0.4$	$V_{DDO}^1 - 0.2$		V
V_{OL}	Low-level output voltage	$I_{OL} = 4mA$; See Figure 8- 3		0.2	0.4	V
$V_{IT+(IN)}$	Logic input high level threshold		$0.7 \times V_{DDI}^1$			V
$V_{IT-(IN)}$	Logic input low level threshold				$0.3 \times V_{DDI}^1$	V
I_{IH}	High-Level input leakage current	$V_{IH} = V_{DDI}^1$ at VIx or ENx			20	μA
I_{IL}	Low-Level input leakage current	$V_{IL} = 0V$ at VIx	-20			μA
Z_o	Output impedance ²			50		Ω
CMTI	Common mode transient immunity	$V_I = V_{DDI}^1$ or 0V, $V_{CM} = 1200V$; See Figure 8- 4	100	150		kV/ μs
C_i	Input capacitance ³	$V_I = V_{DD}/2 + 0.4 \times \sin(2\pi ft)$, $f = 1MHz$, $V_{DD} = 5V$		2		pF

NOTE:

- V_{DDI} = input-side VDD supply voltage, V_{DDO} = output-side VDD supply voltage.
- The nominal output impedance of each isolator driver is $50\Omega \pm 40\%$.
- Measured from pin to Ground.

7.8.2 $V_{DDA} = V_{DDB} = 3.3V \pm 10\%$, $T_A = -40$ to $125^\circ C$

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_{OH}	High-level output voltage	$I_{OH} = -2mA$; See Figure 8- 3	$V_{DDO}^1 - 0.4$	$V_{DDO}^1 - 0.2$		V
V_{OL}	Low-level output voltage	$I_{OL} = 2mA$; See Figure 8- 3		0.2	0.4	V
$V_{IT+(IN)}$	Logic input high level threshold		$0.7 \times V_{DDI}^1$			V
$V_{IT-(IN)}$	Logic input low level threshold				$0.3 \times V_{DDI}^1$	V
I_{IH}	High-Level input leakage current	$V_{IH} = V_{DDI}^1$ at VIx or ENx			20	μA
I_{IL}	Low-Level input leakage current	$V_{IL} = 0V$ at VIx	-20			μA
Z_o	Output impedance ²			50		Ω
CMTI	Common mode transient immunity	$V_I = V_{DDI}^1$ or 0V, $V_{CM} = 1200V$; See Figure 8- 4	100	150		kV/ μs
C_i	Input capacitance ³	$V_I = V_{DD}/2 + 0.4 \times \sin(2\pi ft)$, $f = 1MHz$, $V_{DD} = 3.3V$		2		pF

NOTE:

- V_{DDI} = input-side VDD supply voltage, V_{DDO} = output-side VDD supply voltage.
- The nominal output impedance of each isolator driver is $50\Omega \pm 40\%$.
- Measured from pin to Ground.

7.9 Supply Current

7.9.1 $V_{DDA} = V_{DDB} = 5V \pm 10\%$, $T_A = -40$ to 125°C

Parameters	Test conditions	SUPPLY CURRENT	MIN	TYP	MAX	UNIT	
ZMCIS3740C							
Supply Current – Outputs disabled	ENB = 0V; $V_{IN} = 0V$ (ZMCIS3740CL); $V_{IN} = V_{DDA}$ (ZMCIS3740CH)	I_{DDA}		1.9	3.2	mA	
		I_{DDB}		4.7	7.4		
	ENB = 0V; $V_{IN} = V_{DDA}$ (ZMCIS3740CL); $V_{IN} = 0V$ (ZMCIS3740CH)	I_{DDA}		6.4	9.9		
		I_{DDB}		5.0	7.8		
Supply Current – DC Signal	ENB = V_{DDB} ; $V_{IN} = 0V$ (ZMCIS3740CL); $V_{IN} = V_{DDA}$ (ZMCIS3740CH)	I_{DDA}		1.9	3.2		
		I_{DDB}		4.7	7.4		
	ENB = V_{DDB} ; $V_{IN} = V_{DDA}$ (ZMCIS3740CL); $V_{IN} = 0V$ (ZMCIS3740CH)	I_{DDA}		6.4	9.9		
		I_{DDB}		5.0	7.8		
Supply Current – AC Signal	ENB = V_{DDB} ; All Channels Switching with 50% Duty Cycle Square Wave Clock Input with 5V Amplitude; $C_L = 15$ pF for Each Channel.	1Mbps (500kHz)	I_{DDA}		4.2		6.6
			I_{DDB}		5.0		7.9
		10Mbps (5MHz)	I_{DDA}		5.0		7.9
			I_{DDB}		6.8		10.5
		40Mbps (20MHz)	I_{DDA}		5.4	8.5	
			I_{DDB}		12.8	19.3	
ZMCIS3741C							
Supply Current – Outputs disabled	ENA = ENB = 0V; $V_{IN} = 0V$ (ZMCIS3741CL); $V_{IN} = V_{DDI}^1$ (ZMCIS3741CH)	I_{DDA}		2.1	3.3	mA	
		I_{DDB}		3.9	6.1		
	ENA = ENB = 0V; $V_{IN} = V_{DDI}$ (ZMCIS3741CL); $V_{IN} = 0V$ (ZMCIS3741CH)	I_{DDA}		6.3	9.8		
		I_{DDB}		5.5	8.6		
Supply Current – DC Signal	ENA = ENB = V_{DDI} ; $V_{IN} = 0V$ (ZMCIS3741CL); $V_{IN} = V_{DDI}$ (ZMCIS3741CH)	I_{DDA}		2.1	3.3		
		I_{DDB}		3.8	6.0		
	ENA = ENB = V_{DDI} ; $V_{IN} = V_{DDI}$ (ZMCIS3741CL); $V_{IN} = 0V$ (ZMCIS3741CH)	I_{DDA}		6.3	9.8		
		I_{DDB}		5.5	8.6		
Supply Current – AC Signal	ENA = ENB = V_{DDI} ; All Channels Switching with 50% Duty Cycle Square Wave Clock Input with 5V Amplitude; $C_L = 15$ pF for Each Channel.	1Mbps (500kHz)	I_{DDA}		4.3		6.7
			I_{DDB}		4.7		7.4
		10Mbps (5MHz)	I_{DDA}		5.1		7.9
			I_{DDB}		5.7		9.0
		40Mbps (20MHz)	I_{DDA}		5.9	9.1	
			I_{DDB}		9.8	15.6	
ZMCIS3742C							
Supply Current – Outputs disabled	ENA = ENB = 0V; $V_{IN} = 0V$ (ZMCIS3742CL); $V_{IN} = V_{DDI}^1$ (ZMCIS3742CH)	I_{DDA}		3.0	4.8	mA	
		I_{DDB}		3.0	4.8		
	ENA = ENB = 0V; $V_{IN} = V_{DDI}$ (ZMCIS3742CL); $V_{IN} = 0V$ (ZMCIS3742CH)	I_{DDA}		5.8	9.0		
		I_{DDB}		5.8	9.0		
Supply Current – DC Signal	ENA = ENB = V_{DDI} ; $V_{IN} = 0V$ (ZMCIS3742CL); $V_{IN} = V_{DDI}$ (ZMCIS3742CH)	I_{DDA}		3.0	4.8		
		I_{DDB}		3.0	4.8		
	ENA = ENB = V_{DDI} ; $V_{IN} = V_{DDI}$ (ZMCIS3742CL); $V_{IN} = 0V$ (ZMCIS3742CH)	I_{DDA}		5.8	9.0		
		I_{DDB}		5.8	9.0		
Supply Current – AC Signal	ENA = ENB = V_{DDI} ; All Channels Switching with 50% Duty Cycle Square Wave Clock Input with 5V Amplitude; $C_L = 15$ pF for Each Channel.	1Mbps (500kHz)	I_{DDA}		4.3		6.7
			I_{DDB}		4.7		7.3
		10Mbps (5MHz)	I_{DDA}		5.6		8.7
			I_{DDB}		6.0		9.3
		40Mbps (20MHz)	I_{DDA}		8.7	13.4	
			I_{DDB}		9.4	14.4	
Note:							
1. V_{DDI} = Input-side supply V_{DD} .							

7.9.2 $V_{DDA} = V_{ddb} = 3.3V \pm 10\%$, $T_A = -40$ to $125^\circ C$

Parameters	Test conditions	SUPPLY CURRENT	MIN	TYP	MAX	UNIT	
ZMCIS3740C							
Supply Current – Outputs disabled	ENB = 0V; $V_{IN} = 0V$ (ZMCIS3740CL); $V_{IN} = V_{DDA}$ (ZMCIS3740CH)	I_{DDA}		1.7	2.9	mA	
		I_{ddb}		4.5	7.0		
	ENB = 0V; $V_{IN} = V_{DDA}$ (ZMCIS3740CL); $V_{IN} = 0V$ (ZMCIS3740CH)	I_{DDA}		6.3	9.7		
		I_{ddb}		4.8	7.5		
Supply Current – DC Signal	ENB = V_{ddb} ; $V_{IN} = 0V$ (ZMCIS3740CL); $V_{IN} = V_{DDA}$ (ZMCIS3740CH)	I_{DDA}		1.7	2.9		
		I_{ddb}		4.5	7.0		
	ENB = V_{ddb} ; $V_{IN} = V_{DDA}$ (ZMCIS3740CL); $V_{IN} = 0V$ (ZMCIS3740CH)	I_{DDA}		6.3	9.7		
		I_{ddb}		4.8	7.5		
Supply Current – AC Signal	ENB = V_{ddb} ; All Channels Switching with 50% Duty Cycle Square Wave Clock Input with 5V Amplitude; $C_L = 15$ pF for Each Channel.	1Mbps (500kHz)	I_{DDA}		4.0		6.3
			I_{ddb}		4.8		7.5
		10Mbps (5MHz)	I_{DDA}		4.9		7.6
			I_{ddb}		5.9		9.1
		40Mbps (20MHz)	I_{DDA}		5.6	8.8	
			I_{ddb}		9.5	14.7	
ZMCIS3741C							
Supply Current – Outputs disabled	ENA = ENB = 0V; $V_{IN} = 0V$ (ZMCIS3741CL); $V_{IN} = V_{DD1}^1$ (ZMCIS3741CH)	I_{DDA}		2.0	3.1	mA	
		I_{ddb}		3.7	5.8		
	ENA = ENB = 0V; $V_{IN} = V_{DD1}$ (ZMCIS3741CL); $V_{IN} = 0V$ (ZMCIS3741CH)	I_{DDA}		6.2	9.6		
		I_{ddb}		5.4	8.5		
Supply Current – DC Signal	ENA = ENB = V_{DD1} ; $V_{IN} = 0V$ (ZMCIS3741CL); $V_{IN} = V_{DD1}$ (ZMCIS3741CH)	I_{DDA}		2.0	3.1		
		I_{ddb}		3.7	5.8		
	ENA = ENB = V_{DD1} ; $V_{IN} = V_{DD1}$ (ZMCIS3741CL); $V_{IN} = 0V$ (ZMCIS3741CH)	I_{DDA}		6.3	9.7		
		I_{ddb}		5.4	8.5		
Supply Current – AC Signal	ENA = ENB = V_{DD1} ; All Channels Switching with 50% Duty Cycle Square Wave Clock Input with 5V Amplitude; $C_L = 15$ pF for Each Channel.	1Mbps (500kHz)	I_{DDA}		4.1		6.4
			I_{ddb}		4.6		7.2
		10Mbps (5MHz)	I_{DDA}		5.0		7.8
			I_{ddb}		5.3		8.3
		40Mbps (20MHz)	I_{DDA}		5.2	8.3	
			I_{ddb}		7.2	11.5	
ZMCIS3742C							
Supply Current – Outputs disabled	ENA = ENB = 0V; $V_{IN} = 0V$ (ZMCIS3742CL); $V_{IN} = V_{DD1}^1$ (ZMCIS3742CH)	I_{DDA}		2.9	4.7	mA	
		I_{ddb}		2.9	4.7		
	ENA = ENB = 0V; $V_{IN} = V_{DD1}$ (ZMCIS3742CL); $V_{IN} = 0V$ (ZMCIS3742CH)	I_{DDA}		5.8	8.9		
		I_{ddb}		5.8	8.9		
Supply Current – DC Signal	ENA = ENB = V_{DD1} ; $V_{IN} = 0V$ (ZMCIS3742CL); $V_{IN} = V_{DD1}$ (ZMCIS3742CH)	I_{DDA}		2.9	4.7		
		I_{ddb}		2.9	4.7		
	ENA = ENB = V_{DD1} ; $V_{IN} = V_{DD1}$ (ZMCIS3742CL); $V_{IN} = 0V$ (ZMCIS3742CH)	I_{DDA}		5.8	8.9		
		I_{ddb}		5.8	8.9		
Supply Current – AC Signal	ENA = ENB = V_{DD1} ; All Channels Switching with 50% Duty Cycle Square Wave Clock Input with 5V Amplitude; $C_L = 15$ pF for Each Channel.	1Mbps (500kHz)	I_{DDA}		4.2		6.6
			I_{ddb}		4.3		6.8
		10Mbps (5MHz)	I_{DDA}		5.1		8.0
			I_{ddb}		5.2		8.1
		40Mbps (20MHz)	I_{DDA}		6.0	9.4	
			I_{ddb}		6.4	10.0	
Note:							
2. V_{DD1} = Input-side supply V_{DD} .							

7.10 Timing Characteristics

7.10.1 $V_{DDA} = V_{DDB} = 5V \pm 10\%$, $T_A = -40$ to 125°C

Parameters		Test conditions	MIN	TYP	MAX	UNIT	
DR	Data Rate		0		40	Mbps	
PW_{min}	Minimum Pulse Width				20.0	ns	
t_{PLH} , t_{PHL}	Propagation Delay Time	See Figure 8- 1		22.0	35	ns	
PWD	Pulse Width Distortion $ t_{PLH} - t_{PHL} $			2.5	10	ns	
$t_{sk(o)}$	Channel-to-Channel Output Skew Time ¹	Same-direction channels		1	3	ns	
$t_{sk(pp)}$	Part-to-Part Output Skew Time ²			1	7	ns	
t_r	Output Signal Rise Time	See Figure 8- 1		2.5	4.8	ns	
t_f	Output Signal Fall Time	See Figure 8- 1		2.5	4.8	ns	
t_{PHZ}	Disable Propagation Delay, High to High Impedance Output	See Figure 8- 2		8	12	ns	
t_{PLZ}	Disable Propagation Delay, Low to High Impedance Output			8	12	ns	
t_{PZH}	Enable Propagation Delay, High Impedance to High Output		ZMCIS374xCL		10	15	ns
			ZMCIS374xCH		15	22	ns
t_{PZL}	Enable Propagation Delay, High Impedance to Low Output		ZMCIS374xCL		10	15	ns
			ZMCIS374xCH		15	22	ns
t_{DO}	Default Output Delay Time from Input Power Loss	See Figure 8- 3		10	15	ns	
t_{SU}	Start-up Time			25	37	μs	

Notes:

1. $t_{sk(o)}$ is the skew between outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical loads.
2. $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any terminals of different devices switching in the same direction while operating at identical supply voltages, temperature, input signals and loads.

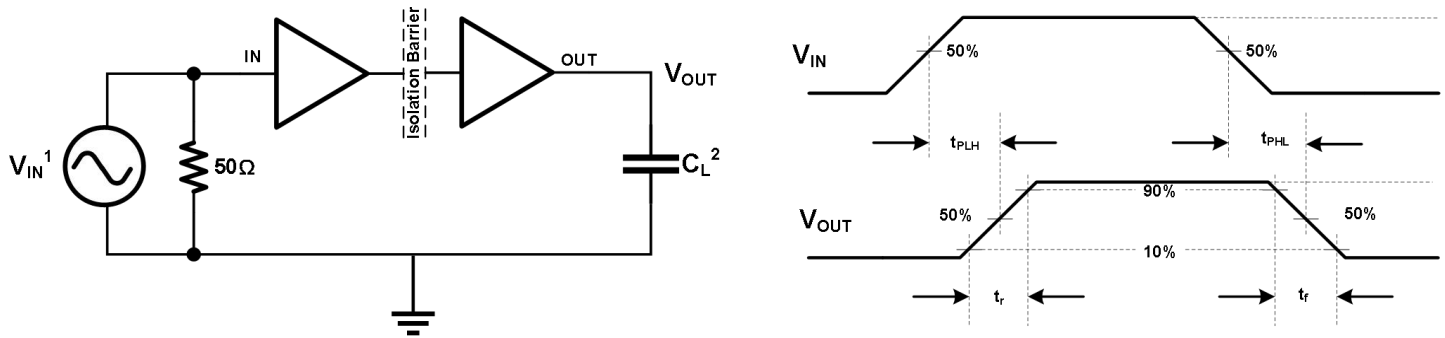
7.10.2 $V_{DDA} = V_{DDB} = 3.3V \pm 10\%$, $T_A = -40$ to 125°C

Parameters		Test conditions	MIN	TYP	MAX	UNIT	
DR	Data Rate		0		40	Mbps	
PW_{min}	Minimum Pulse Width				20.0	ns	
t_{PLH} , t_{PHL}	Propagation Delay Time	See Figure 8- 1		22.0	35	ns	
PWD	Pulse Width Distortion $ t_{PLH} - t_{PHL} $			2.5	10	ns	
$t_{sk(o)}$	Channel-to-Channel Output Skew Time ¹	Same-direction channels		1	3	ns	
$t_{sk(pp)}$	Part-to-Part Output Skew Time ²			1	7	ns	
t_r	Output Signal Rise Time	See Figure 8- 1		2.5	4.8	ns	
t_f	Output Signal Fall Time	See Figure 8- 1		2.5	4.8	ns	
t_{PHZ}	Disable Propagation Delay, High to High Impedance Output	See Figure 8- 2		8	12	ns	
t_{PLZ}	Disable Propagation Delay, Low to High Impedance Output			8	12	ns	
t_{PZH}	Enable Propagation Delay, High Impedance to High Output		ZMCIS374xCL		10	15	ns
			ZMCIS374xCH		15	22	ns
t_{PZL}	Enable Propagation Delay, High Impedance to Low Output		ZMCIS374xCL		10	15	ns
			ZMCIS374xCH		15	22	ns
t_{DO}	Default Output Delay Time from Input Power Loss	See Figure 8- 3		10	15	ns	
t_{SU}	Start-up Time			25	37	μs	

Notes:

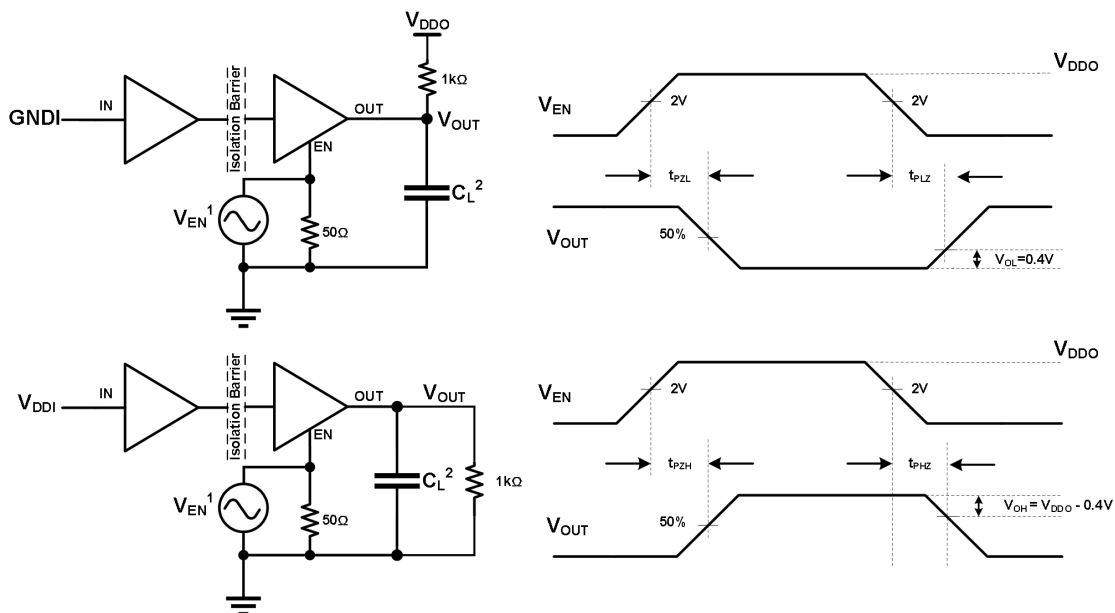
3. $t_{sk(o)}$ is the skew between outputs of a single device with all driving inputs connected together and the outputs switching in the same direction while driving identical loads.
4. $t_{sk(pp)}$ is the magnitude of the difference in propagation delay times between any terminals of different devices switching in the same direction while operating at identical supply voltages, temperature, input signals and loads.

8 Parameter Measurement Information



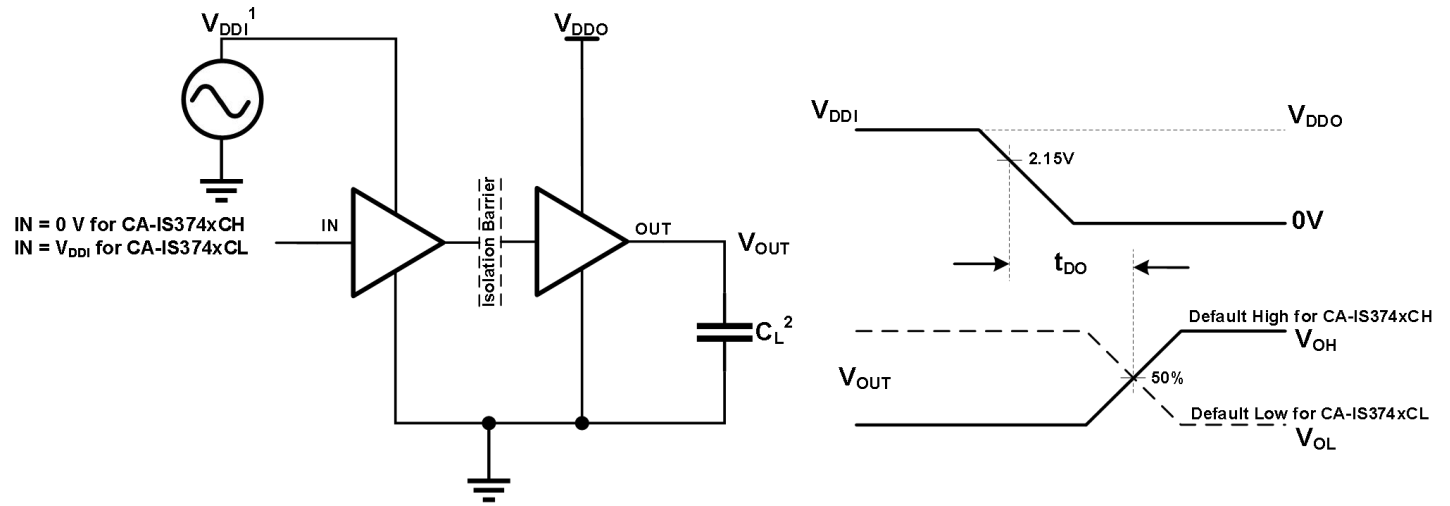
- Note:**
1. A square wave generator provides V_{IN} input signal with characteristics: frequency $\leq 100\text{kHz}$, 50% duty cycle, $t_r \leq 3\text{ns}$, $t_f \leq 3\text{ns}$, $Z_{out} = 50\Omega$. At the input, 50Ω resistor is required to terminate input generator signal. It is not needed in actual application.
 2. $C_L = 15\text{pF}$ and includes external circuit (instrumentation and fixture etc.) capacitance. Since the load capacitance influences the output rising/falling time, it's a key factor in the timing characteristic measurement.

Figure 8- 1 Switching Characteristics Test Circuit and Voltage Waveforms



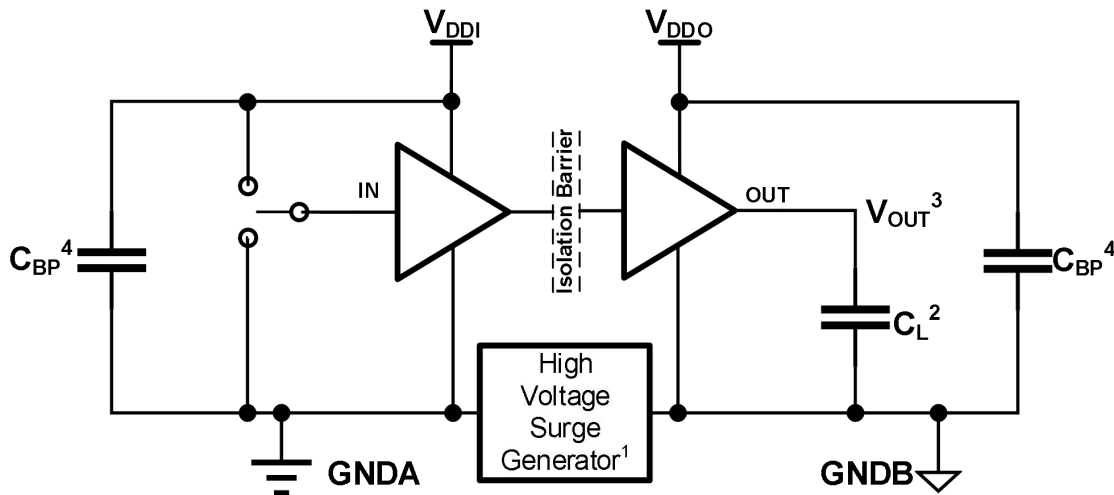
- Note:**
1. A square wave generator provide V_{IN} input signal with characteristics: frequency $\leq 10\text{kHz}$, 50% duty cycle, $t_r \leq 3\text{ns}$, $t_f \leq 3\text{ns}$, $Z_{out} = 50\Omega$. At the input, 50Ω resistor is required to terminate input generator signal. It is not needed in actual application.
 2. $C_L = 15\text{pF}$ and includes external circuit (instrumentation and fixture etc.) capacitance. Since the load capacitance influence the output rising time, it's a key factor in the timing characteristic measurement.

Figure 8-2. Enable/Disable Propagation Delay Time Test Circuit and Waveform



- Note:**
1. Power supply ramp rate = 10mV/ns.
 2. $C_L = 15\text{pF}$ and includes external circuit (instrumentation and fixture etc.) capacitance. Since the load capacitance influences the output rising/falling time, it's a key factor in the timing characteristic measurement.

Figure 8-3. Default Output Delay Time Test Circuit and Voltage Waveforms



- Note:**
1. The High Voltage Surge Generator generates repetitive surges with $> 1\text{kV}$, $< 10\text{ns}$ rise time and fall time to reach common-mode transient noise with $> 100\text{kV}/\mu\text{s}$ slew rate.
 2. $C_L = 15\text{pF}$ and includes external circuit (instrumentation and fixture etc.) capacitance.
 3. Pass-fail criteria: the output must remain stable whenever the high voltage surges occur.
 4. C_{BP} is bypass capacitor, $0.1\mu\text{F} \sim 1\mu\text{F}$.

Figure 8-4. Common-Mode Transient Immunity Test Circuit

9 Detailed Description

9.1 Overview

The ZMCIS374xC devices are a family of 4-channel digital galvanic isolators using Chipanalog's full differential capacitive isolation technology. These devices have an ON-OFF keying (OOK) modulation scheme to transfer digital signals across the SiO₂ based isolation barrier between circuits with different power domains. The transmitter sends a high frequency carrier across the barrier to represent one digital state and sends no signal to represent the other digital state. The receiver demodulates the signal and recovery input signal at output through a buffer stage. With this OOK architecture, the ZMCIS374xC family of devices build a robust data transmission path between different power domains, without any special start-up initialization requirements.

These devices also incorporate advanced full differential techniques to maximize the CMTI performance and minimize the radiated emissions due the high frequency carrier and IO buffer switching. The conceptual block diagram of a digital capacitive isolator, [Figure 9-1](#), shows a functional block diagram of a typical channel; [Figure 9-2](#) shows the operating waveform of a typical channel.

9.2 Functional Block Diagram

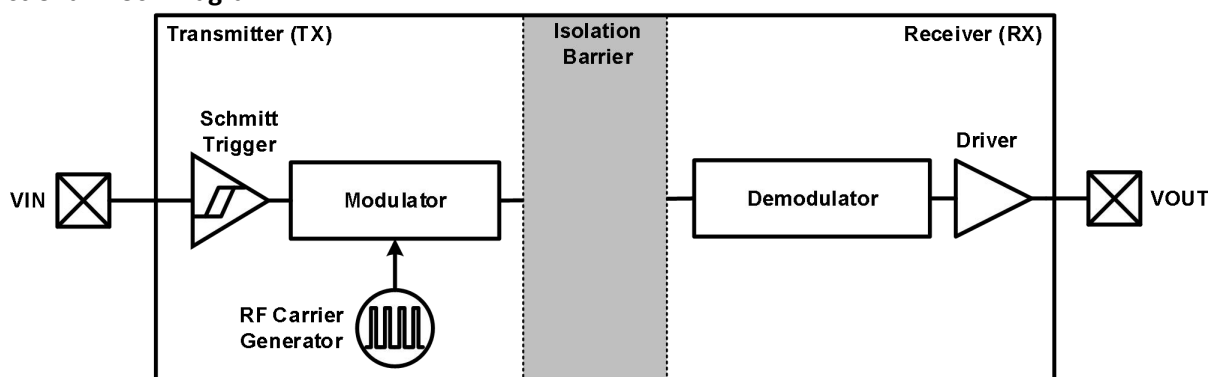


Figure 9- 1 Functional Block Diagram of a Single Channel

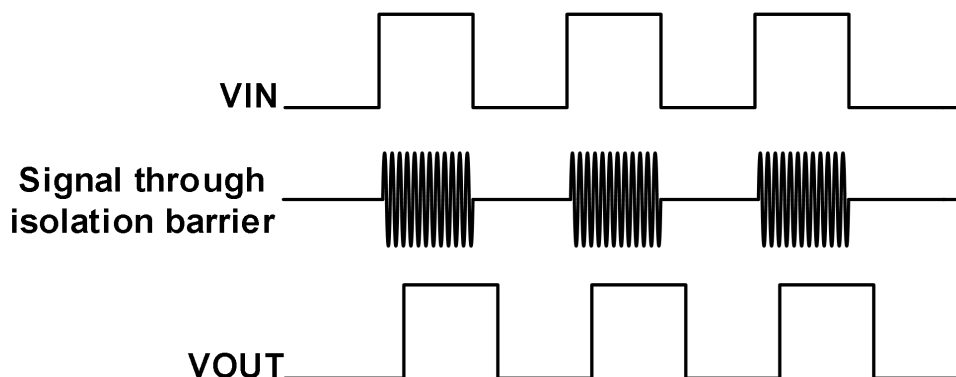


Figure 9- 2 Conceptual Operation Waveform of a Single Channel

9.3 Device Operation Modes

Table 9-1 lists the operation modes for the ZMCIS374xC devices.

Table 9-1 Operation Mode Table¹

V_{DDI}^1	V_{DDO}^1	INPUT (V_{IX}) ²	OUTPUT (V_{OX})	OPERATION
PU	PU	H	H	Normal operation mode: A channel output follows the logic state of the input.
		L	L	
		Open	Default	Default output, fail-safe mode: If a channel input is open, the corresponding channel output goes to the default logic state (Low for ZMCIS374xCL and High for ZMCIS374xCH)
PD	PU	X	Default	Default output, fail-safe mode: When V_{DDI}^1 is unpowered, the corresponding channel output goes to the default logic state (Low for ZMCIS374xCL and High for ZMCIS374xCH)
X	PD	X	Undetermined	When V_{DDO}^2 is unpowered, the output states are undetermined. ³

NOTE:

- V_{DDI} = Input-side Supply V_{DD} ; V_{DDO} = Output-side Supply V_{DD} ; PU = Powered up ($V_{DD_} \geq V_{DD(UVLO+)}$); PD = Powered down ($V_{DD_} \leq V_{DD(UVLO-)}$); X = Irrelevant; H = High level; L = Low level.
- A strongly driven input signal can weakly power the floating V_{DDI} through an internal protection diode and cause undetermined output.
- The outputs are in undetermined state when $V_{DDI} > V_{DD(UVLO+)}$, $V_{DDO} < V_{DD(UVLO-)}$.

Table 9-2 is the truth table with Enable input for the ZMCIS374x-Q1 devices.

Table 9-2. Enable Control

PART NUMBER	ENA ^{1,2}	ENB ^{1,2}	STATUS
ZMCIS3740C	—	H	B-side outputs VO1, VO2, VO3, VO4 are enabled and each output follows the logic state of its input.
	—	L	B-side outputs VO1, VO2, VO3, VO4 are disabled, and go to high impedance state.
ZMCIS3741C	H	X	A-side output VO4 is enabled and follows the logic state of its input.
	L	X	A-side output VO4 is disabled and goes to high impedance state.
	X	H	B-side outputs VO1, VO2, VO3 are enabled and each output follows the logic state of its input.
	X	L	B-side outputs VO1, VO2, VO3 are disabled and go to high impedance state.
ZMCIS3742C	H	X	A-side output VO3, VO4 are enabled and follows the logic state of its input.
	L	X	A-side output VO3, VO4 are disabled and goes to high impedance state.
	X	H	B-side outputs VO1, VO2 are enabled and each output follows the logic state of its input.
	X	L	B-side outputs VO1, VO2 are disabled and go to high impedance state.

Notes:

- Enable inputs ENA and ENB can be used to put the respective outputs in high impedance for multi master driving applications, external clock synchronization etc. With internal pull-up resistors, these pins can be connected to logic high or left floating to enable the outputs. If ENA, ENB are unused, it is recommended to connect these pins to a logic level, especially in the noisy environment.
- X = Irrelevant; H = High level; L = Low level.

10 Application and Implementation

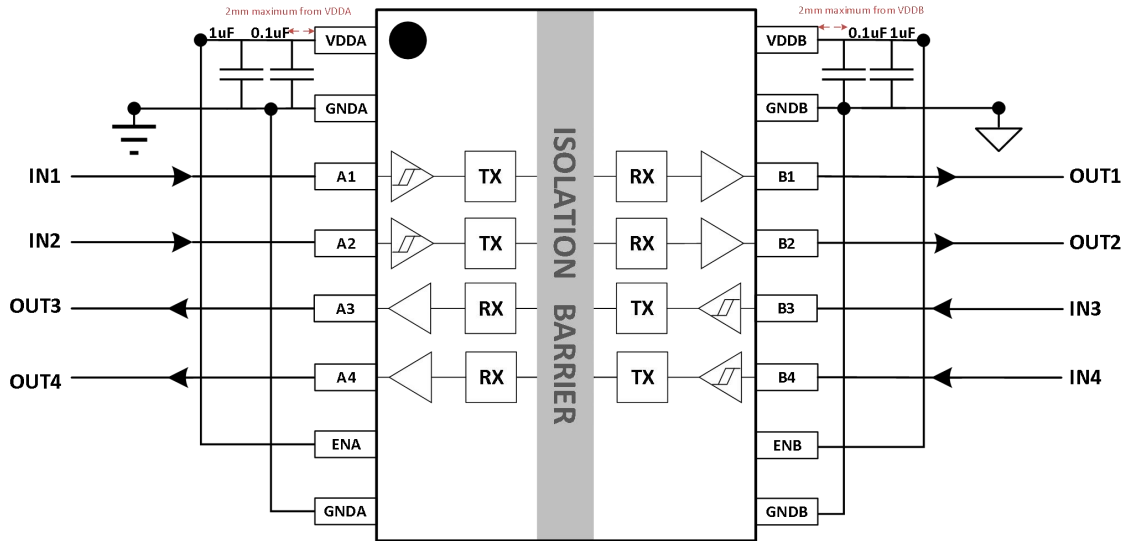


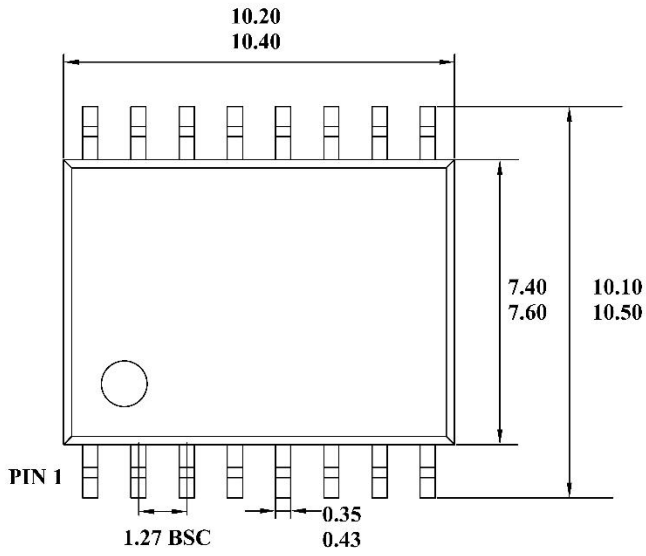
Figure 10- 1 Typical Application Circuit of ZMCIS3742Cx

Unlike optocouplers, which require external components to improve performance, provide bias, or limit current, the ZMCIS374xC devices only require several external bypass capacitors to operate. To reduce ripple and the chance of introducing data errors, bypass VDDA and VDDB pins with 0.1µF to 1µF low-ESR ceramic capacitors to GNDA and GNDB, respectively. Place the bypass capacitors as close to the power supply input pins as possible. [Figure 10- 1](#) shows typical operating circuit of the ZMCIS374xC devices.

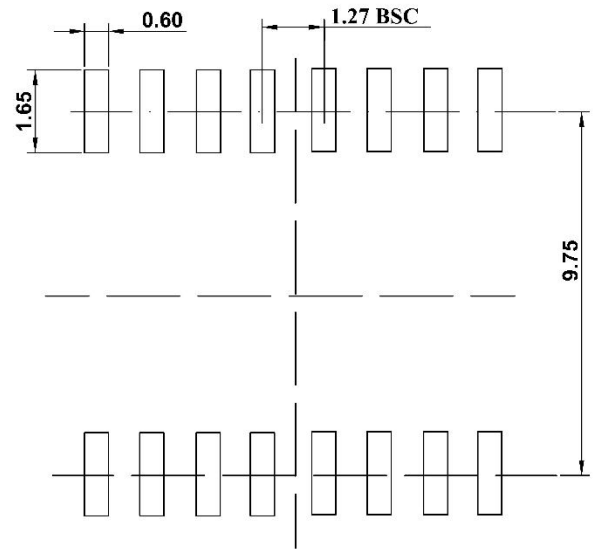
11 Package Information

11.1 SOIC16-WB Package

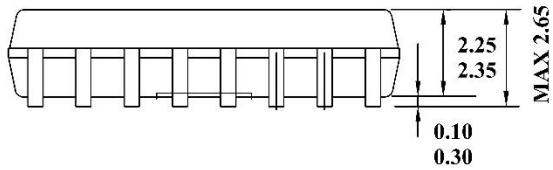
The values for the dimensions are shown in millimeters.



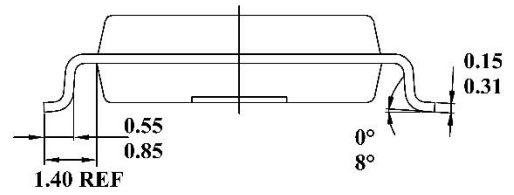
TOP VIEW



RECOMMENDED LAND PATTERN



FRONT VIEW



LEFT SIDE VIEW

12 Soldering Information

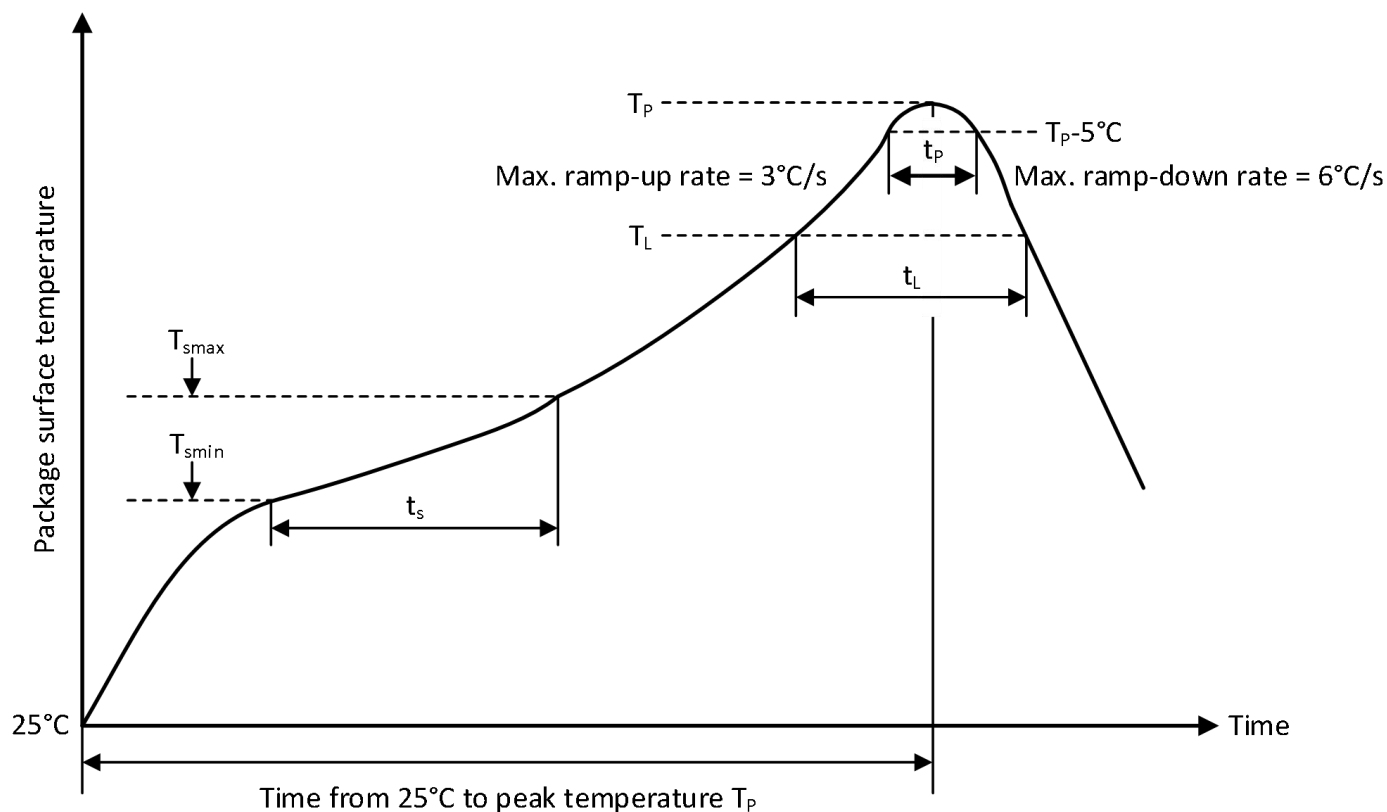


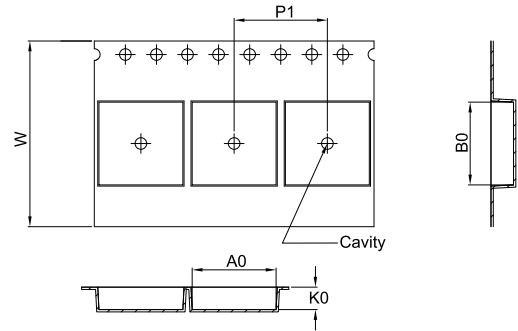
Figure 12- 1 Soldering Temperature Curve

Table 12- 1 Soldering Temperature Parameters

Profile Feature	Pb-Free Soldering
Ramp-up rate ($T_L = 217^\circ\text{C}$ to peak T_P)	3°C/s max
Time t_s of preheat temp ($T_{smin} = 150^\circ\text{C}$ to $T_{smax} = 200^\circ\text{C}$)	60~120 seconds
Time t_L to be maintained above 217°C	60~150 seconds
Peak temperature T_P	260°C
Time t_p within 5°C of actual peak temp	30 seconds max
Ramp-down rate (peak T_P to $T_L = 217^\circ\text{C}$)	6°C/s max
Time from 25°C to peak temperature T_P	8 minutes max

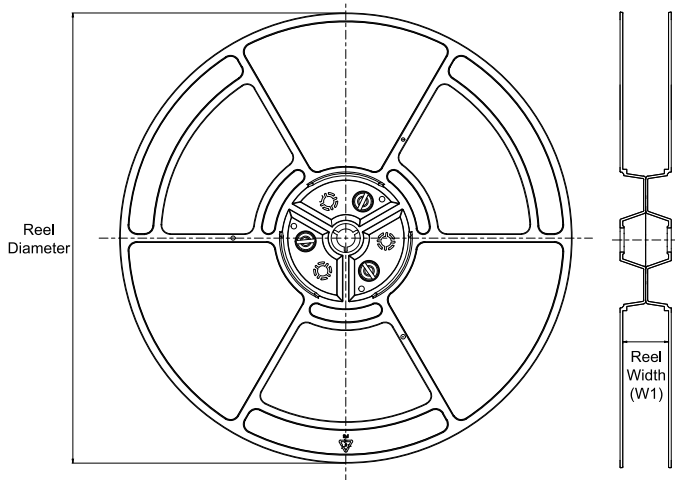
REEL DIMENSIONS

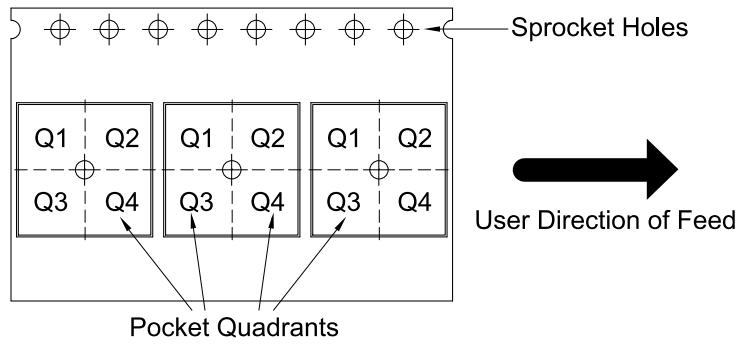
TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE





*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
ZMCIS3740CLW	SOIC	W	16	1000	330	16.4	10.90	10.70	3.20	12.00	16.00	Q1
ZMCIS3740CHW	SOIC	W	16	1000	330	16.4	10.90	10.70	3.20	12.00	16.00	Q1
ZMCIS3741CLW	SOIC	W	16	1000	330	16.4	10.90	10.70	3.20	12.00	16.00	Q1
ZMCIS3741CHW	SOIC	W	16	1000	330	16.4	10.90	10.70	3.20	12.00	16.00	Q1
ZMCIS3742CLW	SOIC	W	16	1000	330	16.4	10.90	10.70	3.20	12.00	16.00	Q1
ZMCIS3742CHW	SOIC	W	16	1000	330	16.4	10.90	10.70	3.20	12.00	16.00	Q1