

## QSOP Quad-Channel Digital Isolators High Speed CEQ8X4XX-XG Series

### Features:

- Compliance Halogens Free  
( Br < 900 ppm, Cl < 900 ppm, Br+Cl < 1500 ppm)
- Data rate: 10M ~ 200Mbps
- High robustness to radiated and conducted noise
- Low propagation delay: 13 ns typical
- Isolation voltages 3000Vrms
- Human body model (HBM)  $\pm 8$ kV
- Wide temperature range: -40°C to 125°C

### Description

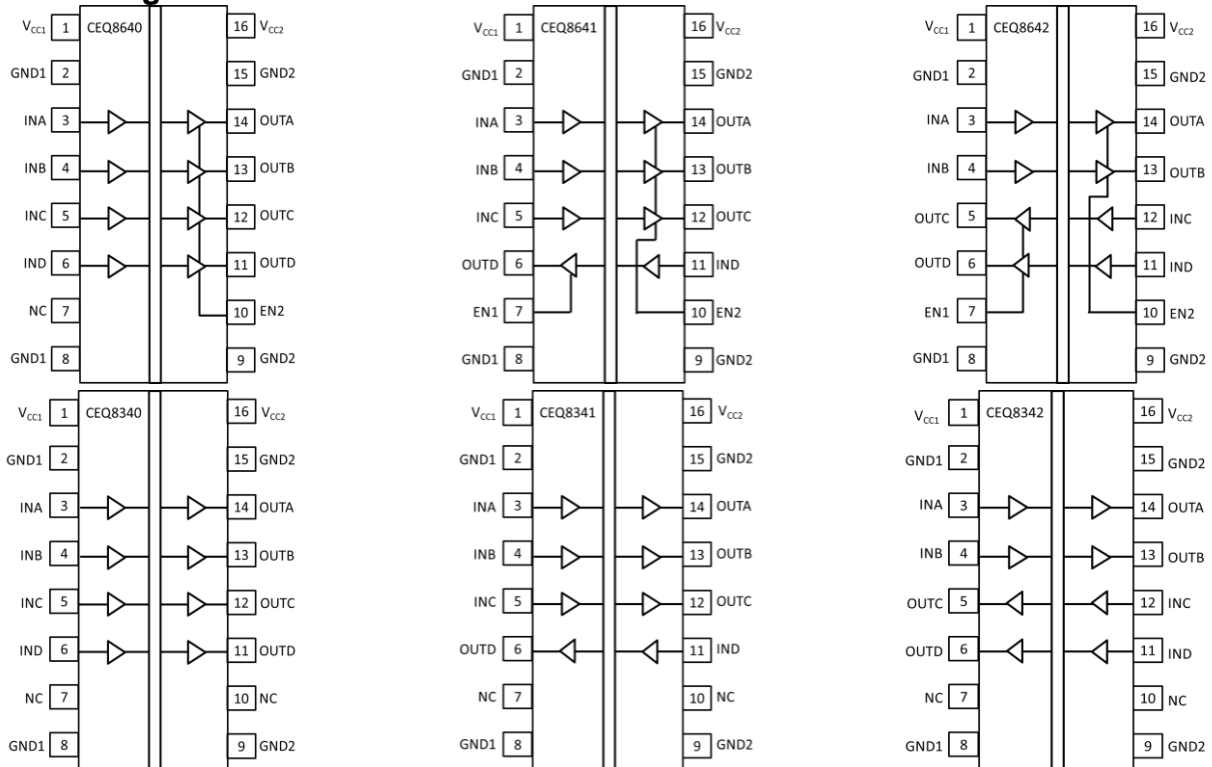
The CEQ8X4XX-XG are quad-channel digital isolators.

The CEQ8X4XX-XG provides digital channel direction configuration and the default output level configuration when the input power is lost. Wide supply voltage of the CEQ8X4XX-XG device supports to connect with most digital interface directly, easy to do the level shift.

### Applications

- General-purpose multichannel isolation
- Industrial field bus isolation
- Isolation Industrial automation systems
- Isolated switch mode supplies
- Isolated ADC, DAC
- Motor control

## Functional Diagram



## Pin Description

NAME	PIN						DESCRIPTION
	CEQ 8640	CEQ 8340	CEQ 8641	CEQ 8341	CEQ 8642	CEQ 8342	
V <sub>CC1</sub>	1	1	1	1	1	1	Power supply, side 1
V <sub>CC2</sub>	16	16	16	16	16	16	Power supply, side 2
GND1	2,8	2,8	2,8	2,8	2,8	2,8	Ground , side 1
GND2	9,15	9,15	9,15	9,15	9,15	9,15	Ground , side 2
INA	3	3	3	3	3	3	Input, channel A
INB	4	4	4	4	4	4	Input, channel B
INC	5	5	5	5	12	12	Input, channel C
IND	6	6	11	11	11	11	Input, channel D
OUTA	14	14	14	14	14	14	Output, channel A
OUTB	13	13	13	13	13	13	Output, channel B
OUTC	12	12	12	12	5	5	Output, channel C
OUTD	11	11	6	6	6	6	Output, channel D
EN1	--	--	7	--	7	--	Output pins on side 1 are enabled when EN1 is high or open and in high-impedance state when EN1 is low.
EN2	10	--	10	--	10	--	Output pins on side 2 are enabled when EN2 is high or open and in high-impedance state when EN2 is low.
NC	7	7,10	--	7,10	--	7,10	Not connected

**Truth Table**

**CEQ834XX**

V <sub>IX</sub> Input	V <sub>DDI</sub> State	V <sub>DDO</sub> State	Default Low V <sub>OX</sub> Output	Default High V <sub>OX</sub> Output	Test Conditions /Comments
H	P	P	H	H	Normal operation
L	P	P	L	L	Normal operation
NC	P	P	L	H	Default output
X <sup>*2</sup>	UP	P	L	H	Default output <sup>*3</sup>
X <sup>*2</sup>	P	UP	Z	Z	

**CEQ864XX**

V <sub>IX</sub> Input	EN1/2 State	V <sub>DDI</sub> State	V <sub>DDO</sub> State	Default Low V <sub>OX</sub> Output	Default High V <sub>OX</sub> Output	Test Conditions /Comments
H	H or NC	P	P	H	H	Normal operation
L	H or NC	P	P	L	L	Normal operation
X <sup>*2</sup>	L	P	P	Z	Z	Disabled
NC	H or NC	P	P	L	H	Default output
X <sup>*2</sup>	H or NC	UP	P	L	H	Default output <sup>*3</sup>
X <sup>*2</sup>	L	UP	P	Z	Z	
X <sup>*2</sup>	X <sup>*2</sup>	P	UP	Z	Z	

**Notes:**

1. V<sub>IX</sub>/V<sub>OX</sub> are the input/output signals of a given channel. V<sub>DDI</sub>/V<sub>DDO</sub> are the supply voltages on the input/output signal sides of this given channel.
2. Input signal (V<sub>IX</sub>) must be in a low state to avoid powering the given V<sub>DDI</sub> through its ESD protection circuitry.
3. If the V<sub>DDI</sub> goes into unpowered status, the channel outputs the default logic signal after around 1us. If the V<sub>DDI</sub> goes into powered status, the channel outputs the input status logic signal after around 5us.

### Absolute Maximum Ratings (Ta=25°C)

Parameter	Symbol	Rating	Unit
Supply Voltage	V <sub>DDX</sub>	6.5	V
Maximum Input Voltage	V <sub>IN</sub>	V <sub>DD</sub> +0.5	V
Maximum Output Voltage	V <sub>OUT</sub>	V <sub>DD</sub> +0.5	V
Output Current	I <sub>O</sub>	10	mA
Isolation Voltage *1	V <sub>ISO</sub>	3000	V rms
Operating Temperature	T <sub>OPR</sub>	-40 ~ +125	°C
Storage Temperature	T <sub>STG</sub>	-55 ~ +150	°C
Soldering Temperature *2	T <sub>SOL</sub>	260	°C

Notes:

\*1 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1 to 8 are shorted together, and pins 9 to 16 are shorted together.

\*2 For 10 seconds.

### Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V <sub>DDX</sub>	3	5.5	V
High Level Input Voltage	V <sub>IH</sub>	V <sub>DDX</sub> *0.7	V <sub>DDX</sub>	V
Low Level Input Voltage	V <sub>IL</sub>	0	V <sub>DDX</sub> *0.3	V

**Electro-Optical Characteristics** $V_{DD1} - V_{GND1} = V_{DD2} - V_{GND2} = 3.3V$  or  $5V$ ,  $T_A = 25^\circ C$ , unless otherwise noted.

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
High Level Input Voltage	$V_{IH}$		$0.6 \cdot V_{DDX}$	$0.7 \cdot V_{DDX}$	V	
Low Level Input Voltage	$V_{IL}$	$0.3 \cdot V_{DDX}$	$0.4 \cdot V_{DDX}$		V	
High Level Output Voltage	$V_{OH}$	$V_{DDX} - 0.1$	$V_{DDX}$		V	$I_o = -20\mu A$
		$V_{DDX} - 0.2$	$V_{DDX} - 0.1$			$I_o = -2mA$
Low Level Output Voltage	$V_{OL}$		0	0.1	V	$I_o = 20\mu A$
			0.1	0.2		$I_o = 2mA$
Input Current per Signal Channel	$I_{IN}$	-10	0.5	10	$\mu A$	$0V \leq \text{Signal voltage} \leq V_{DD}$
$V_{DDX}$ Undervoltage Rising Threshold	$V_{DDXUV+}$	2.45	2.75	2.95	V	
$V_{DDX}$ Undervoltage Falling Threshold	$V_{DDXUV-}$	2.30	2.60	2.75	V	
$V_{DDX}$ Hysteresis	$V_{DDXUVH}$		0.15		V	
Common Mode Transient Immunity	CMTI		75	-	$kV/\mu S$	$V_{CM} = 1000V$

**Switching Characteristics - 5V Supply**

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
Minimum Pulse Width	PW			5	ns	for CEQ8X4XE
				100	nS	for CEQ8X4XM
Propagation Delay	$t_{PLH}$ 、 $t_{PLH}$			16.5	nS	
Pulse Width Distortion	PWD			5	nS	
Part to Part Propagation Delay Skew	$t_{PSK}$			3	nS	
Channel-to-Channel Delay Skew	$t_{CSK}$			3	nS	
Rising Time	$T_r$		1.5		nS	
Falling Time	$T_f$		1.5		nS	
Disable high to Tri-State	$t_{PHZ}$		20	41	nS	for CEQ864XX
Disable low to Tri-State	$t_{PLZ}$		20	41	nS	for CEQ864XX
Enable to Data high	$t_{PZH}$		12	25	nS	for CEQ864XX-H

Valid			1.7	5.7	uS	for CEQ864XX-L
Enable to Data high Valid	t <sub>PZL</sub>		1.7	5.7	uS	for CEQ864XX-H
			12	25	nS	for CEQ864XX-L

**Switching Characteristics – 3.3V Supply**

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
Minimum Pulse Width	PW			5	ns	for CEQ8X4XE
				100	nS	for CEQ8X4XM
Propagation Delay	t <sub>PLH</sub> 、t <sub>PLH</sub>			19	nS	
Pulse Width Distortion	PWD			5	nS	
Part to Part Propagation Delay Skew	t <sub>PSK</sub>			2	nS	
Channel-to-Channel Delay Skew	t <sub>CSK</sub>			2	nS	
Rising Time	T <sub>r</sub>		1.5		nS	
Falling Time	T <sub>f</sub>		1.5		nS	
Disable high to Tri-State	t <sub>PHZ</sub>		24	50	nS	for CEQ864XX
Disable low to Tri-State	t <sub>PLZ</sub>		24	50	ns	for CEQ864XX
Enable to Data high Valid	t <sub>PZH</sub>		16	33	ns	for CEQ864XX-H
			1.1	4.4	us	for CEQ864XX-L
Enable to Data high Valid	t <sub>PZL</sub>		1.1	4.4	us	for CEQ864XX-H
			16	33	ns	for CEQ864XX-L

Supply Current

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
CEQ8340X	I <sub>DD1</sub>	0.13	0.16	0.21	mA	V <sub>DD</sub> = 5V VI=0V for CEQ8340X-L VI=5V for CEQ8340X-H
	I <sub>DD2</sub>	1.56	1.95	2.54	mA	
	I <sub>DD1</sub>	0.32	0.39	0.51	mA	V <sub>DD</sub> = 5V VI=5V for CEQ8340X-L VI=0V for CEQ8340X-H
	I <sub>DD2</sub>	1.48	1.85	2.40	mA	
	I <sub>DD1</sub>	0.13	0.16	0.21	mA	V <sub>DD</sub> = 3.3V VI=0V for CEQ8340X-L VI=3.3V for CEQ8340X-H
	I <sub>DD2</sub>	1.54	1.93	2.51	mA	
	I <sub>DD1</sub>	0.23	0.29	0.38	mA	V <sub>DD</sub> = 3.3V VI=3.3V for CEQ8340X-L VI=0V for CEQ8340X-H
	I <sub>DD2</sub>	1.42	1.77	2.30	mA	
CEQ8341X	I <sub>DD1</sub>	0.48	0.60	0.79	mA	V <sub>DD</sub> = 5V VI=0V for CEQ8341X-L VI=5V for CEQ8341X-H
	I <sub>DD2</sub>	1.20	1.50	1.95	mA	
	I <sub>DD1</sub>	0.59	0.74	0.97	mA	V <sub>DD</sub> = 5V VI=5V for CEQ8341X-L VI=0V for CEQ8341X-H
	I <sub>DD2</sub>	1.17	1.47	1.91	mA	
	I <sub>DD1</sub>	0.48	0.60	0.78	mA	V <sub>DD</sub> = 3.3V VI=0V for CEQ8341X-L VI=3.3V for CEQ8341X-H
	I <sub>DD2</sub>	1.19	1.48	1.93	mA	
	I <sub>DD1</sub>	0.52	0.66	0.85	mA	V <sub>DD</sub> = 3.3V VI=3.3V for CEQ8341X-L VI=0V for CEQ8341X-H
	I <sub>DD2</sub>	1.12	1.40	1.82	mA	
CEQ8342X	I <sub>DD1</sub>	0.84	1.05	1.36	mA	V <sub>DD</sub> = 5V VI=0V for CEQ8342X-L VI=5V for CEQ8342X-H
	I <sub>DD2</sub>	0.84	1.05	1.36	mA	
	I <sub>DD1</sub>	0.87	1.09	1.42	mA	V <sub>DD</sub> = 5V VI=5V for CEQ8342X-L VI=0V for CEQ8342X-H
	I <sub>DD2</sub>	0.87	1.09	1.42	mA	
	I <sub>DD1</sub>	0.83	1.04	1.35	mA	V <sub>DD</sub> = 3.3V VI=0V for CEQ8342X-L VI=3.3V for CEQ8342X-H
	I <sub>DD2</sub>	0.83	1.04	1.35	mA	
	I <sub>DD1</sub>	0.82	1.02	1.33	mA	V <sub>DD</sub> = 3.3V VI=3.3V for CEQ8342X-L VI=0V for CEQ8342X-H
	I <sub>DD2</sub>	0.82	1.02	1.33	mA	

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
CEQ8640X	I <sub>DD1</sub>	0.11	0.13	0.21	mA	V <sub>DD</sub> = 5V VI=0V for CEQ8640X-L VI=5V for CEQ8640X-H
	I <sub>DD2</sub>	1.56	2.18	2.93	mA	
	I <sub>DD1</sub>	0.32	0.56	0.79	mA	V <sub>DD</sub> = 5V VI=5V for CEQ8640X-L VI=0V for CEQ8640X-H
	I <sub>DD2</sub>	1.48	2.00	2.72	mA	
	I <sub>DD1</sub>	0.10	0.12	0.21	mA	V <sub>DD</sub> = 3.3V VI=0V for CEQ8640X-L VI=3.3V for CEQ8640X-H
	I <sub>DD2</sub>	1.54	2.11	2.85	mA	
	I <sub>DD1</sub>	0.23	0.35	0.49	mA	V <sub>DD</sub> = 3.3V VI=3.3V for CEQ8640X-L VI=0V for CEQ8640X-H
	I <sub>DD2</sub>	1.42	1.94	2.62	mA	
CEQ8641X	I <sub>DD1</sub>	0.50	0.63	0.82	mA	V <sub>DD</sub> = 5V VI=0V for CEQ8641X-L VI=5V for CEQ8641X-H
	I <sub>DD2</sub>	1.28	1.60	2.07	mA	
	I <sub>DD1</sub>	0.75	0.94	1.22	mA	V <sub>DD</sub> = 5V VI=5V for CEQ8641X-L VI=0V for CEQ8641X-H
	I <sub>DD2</sub>	1.17	1.47	1.91	mA	
	I <sub>DD1</sub>	0.48	0.60	0.78	mA	V <sub>DD</sub> = 3.3V VI=0V for CEQ8641X-L VI=3.3V for CEQ8641X-H
	I <sub>DD2</sub>	1.24	1.55	2.01	mA	
	I <sub>DD1</sub>	0.61	0.77	1.00	mA	V <sub>DD</sub> = 3.3V VI=3.3V for CEQ8641X-L VI=0V for CEQ8641X-H
	I <sub>DD2</sub>	1.13	1.42	1.84	mA	
CEQ8642X	I <sub>DD1</sub>	0.89	1.12	1.46	mA	V <sub>DD</sub> = 5V VI=0V for CEQ8641X-L VI=5V for CEQ8641X-H
	I <sub>DD2</sub>	0.89	1.12	1.46	mA	
	I <sub>DD1</sub>	1.00	1.25	1.63	mA	V <sub>DD</sub> = 5V VI=5V for CEQ8641X-L VI=0V for CEQ8641X-H
	I <sub>DD2</sub>	1.00	1.25	1.63	mA	
	I <sub>DD1</sub>	0.86	1.08	1.41	mA	V <sub>DD</sub> = 3.3V VI=0V for CEQ8641X-L VI=3.3V for CEQ8641X-H
	I <sub>DD2</sub>	0.86	1.08	1.41	mA	
	I <sub>DD1</sub>	0.89	1.12	1.45	mA	V <sub>DD</sub> = 3.3V VI=3.3V for CEQ8641X-L VI=0V for CEQ8641X-H
	I <sub>DD2</sub>	0.89	1.12	1.45	mA	

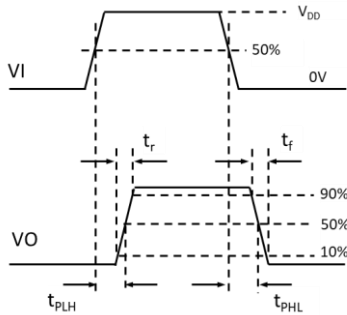


**Supply Current- AC signal**

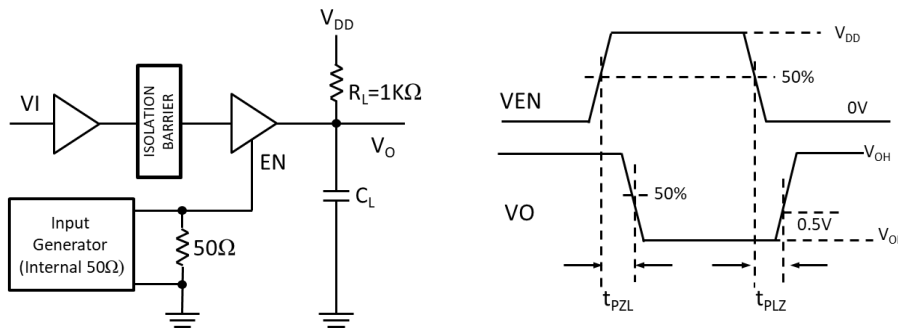
Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
CEQ8340M	I <sub>DD1</sub> (10M)		0.48	0.72	mA	V <sub>DD</sub> = 5V
	I <sub>DD2</sub> (10M)		3.52	5.28	mA	
	I <sub>DD1</sub> (10M)		0.36	0.54	mA	V <sub>DD</sub> = 3.3V
	I <sub>DD2</sub> (10M)		2.86	4.29	mA	
CEQ8341M	I <sub>DD1</sub> (10M)		1.21	1.82	mA	V <sub>DD</sub> = 5V
	I <sub>DD2</sub> (10M)		2.73	4.10	mA	
	I <sub>DD1</sub> (10M)		0.95	1.43	mA	V <sub>DD</sub> = 3.3V
	I <sub>DD2</sub> (10M)		2.20	3.30	mA	
CEQ8342M	I <sub>DD1</sub> (10M)		1.94	2.91	mA	V <sub>DD</sub> = 5V
	I <sub>DD2</sub> (10M)		1.94	2.91	mA	
	I <sub>DD1</sub> (10M)		1.54	2.31	mA	V <sub>DD</sub> = 3.3V
	I <sub>DD2</sub> (10M)		1.54	2.31	mA	
CEQ8640M	I <sub>DD1</sub> (10M)		1.00	1.49	mA	V <sub>DD</sub> = 5V
	I <sub>DD2</sub> (10M)		3.83	5.74	mA	
	I <sub>DD1</sub> (10M)		0.61	0.91	mA	V <sub>DD</sub> = 3.3V
	I <sub>DD2</sub> (10M)		3.12	4.68	mA	
CEQ8641M	I <sub>DD1</sub> (10M)		1.78	2.67	mA	V <sub>DD</sub> = 5V
	I <sub>DD2</sub> (10M)		3.03	4.55	mA	
	I <sub>DD1</sub> (10M)		1.30	1.95	mA	V <sub>DD</sub> = 3.3V
	I <sub>DD2</sub> (10M)		2.45	3.67	mA	
CEQ8642M	I <sub>DD1</sub> (10M)		2.46	3.69	mA	V <sub>DD</sub> = 5V
	I <sub>DD2</sub> (10M)		2.46	3.69	mA	
	I <sub>DD1</sub> (10M)		1.90	2.85	mA	V <sub>DD</sub> = 3.3V
	I <sub>DD2</sub> (10M)		1.90	2.85	mA	

Parameter	Symbol	Min	Typ.	Max.	Unit	Condition
CEQ8340E	I <sub>DD1</sub> (200M)		7.44	11.90	mA	V <sub>DD</sub> = 5V
	I <sub>DD2</sub> (200M)		34.40	55.04	mA	
	I <sub>DD1</sub> (200M)		4.32	6.91	mA	V <sub>DD</sub> = 3.3V
	I <sub>DD2</sub> (200M)		22.28	35.65	mA	
CEQ8341E	I <sub>DD1</sub> (200M)		14.12	22.59	mA	V <sub>DD</sub> = 5V
	I <sub>DD2</sub> (200M)		27.60	44.16	mA	
	I <sub>DD1</sub> (200M)		8.74	13.98	mA	V <sub>DD</sub> = 3.3V
	I <sub>DD2</sub> (200M)		17.72	28.35	mA	
CEQ8342E	I <sub>DD1</sub> (200M)		20.80	33.28	mA	V <sub>DD</sub> = 5V
	I <sub>DD2</sub> (200M)		20.80	33.28	mA	
	I <sub>DD1</sub> (200M)		13.16	21.06	mA	V <sub>DD</sub> = 3.3V
	I <sub>DD2</sub> (200M)		13.16	21.06	mA	
CEQ8640E	I <sub>DD1</sub> (200M)		17.40	27.84	mA	V <sub>DD</sub> = 5V
	I <sub>DD2</sub> (200M)		38.94	62.30	mA	
	I <sub>DD1</sub> (200M)		10.16	16.26	mA	V <sub>DD</sub> = 3.3V
	I <sub>DD2</sub> (200M)		26.40	42.24	mA	
CEQ8641E	I <sub>DD1</sub> (200M)		23.62	37.79	mA	V <sub>DD</sub> = 5V
	I <sub>DD2</sub> (200M)		31.54	50.46	mA	
	I <sub>DD1</sub> (200M)		14.46	23.14	mA	V <sub>DD</sub> = 3.3V
	I <sub>DD2</sub> (200M)		21.12	33.79	mA	
CEQ8642E	I <sub>DD1</sub> (200M)		29.68	47.49	mA	V <sub>DD</sub> = 5V
	I <sub>DD2</sub> (200M)		29.68	47.49	mA	
	I <sub>DD1</sub> (200M)		19.62	31.39	mA	V <sub>DD</sub> = 3.3V
	I <sub>DD2</sub> (200M)		19.62	31.39	mA	

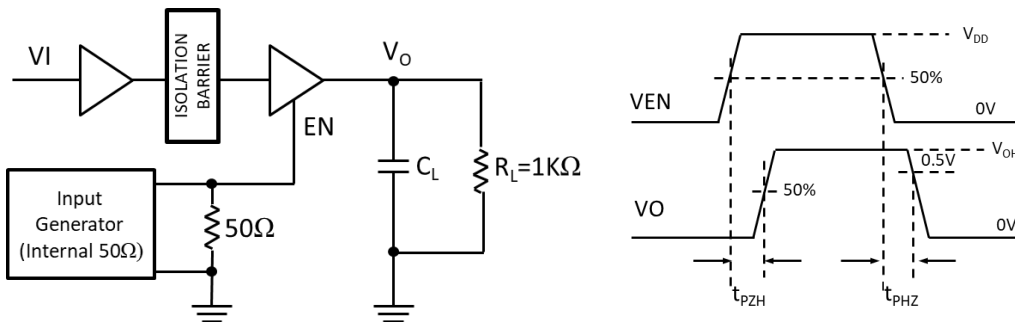
**Fig. 1 Switching Time waveform measurement**



**Fig. 2  $t_{pZL}/t_{pLZ}$  test circuit and waveform measurement**

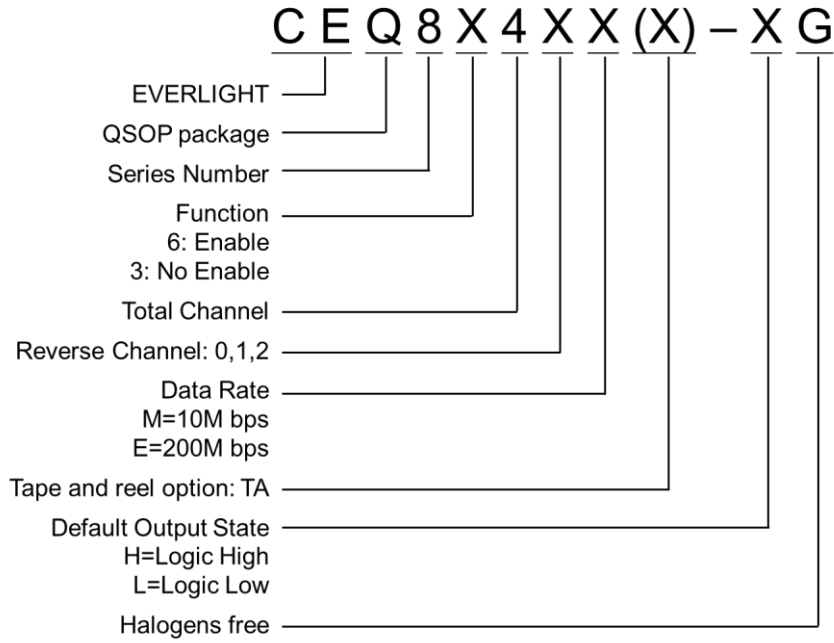


**Fig. 3  $t_{pZH}/t_{pHZ}$  test circuit and waveform measurement**



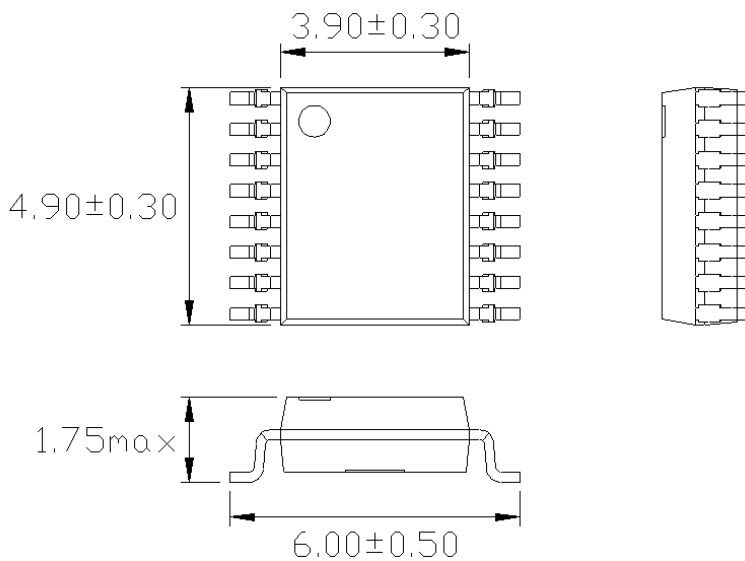
**Order Information**

**Part Number**

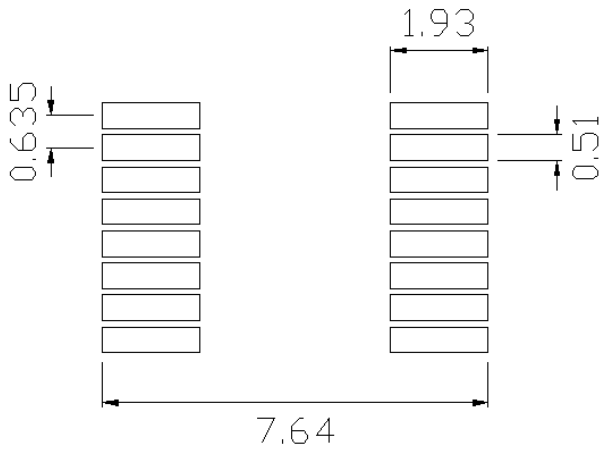


Option	Description	Packing quantity
(TA)	Surface mount lead form + TA tape & reel option	4000 units per reel

**Package Dimension**  
 (Dimensions in mm)



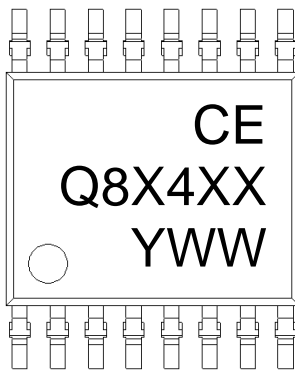
**Recommended pad layout for surface mount leadform**



**Notes.**

Suggested pad dimension is just for reference only.  
Please modify the pad dimension based on individual need.

**Device Marking**



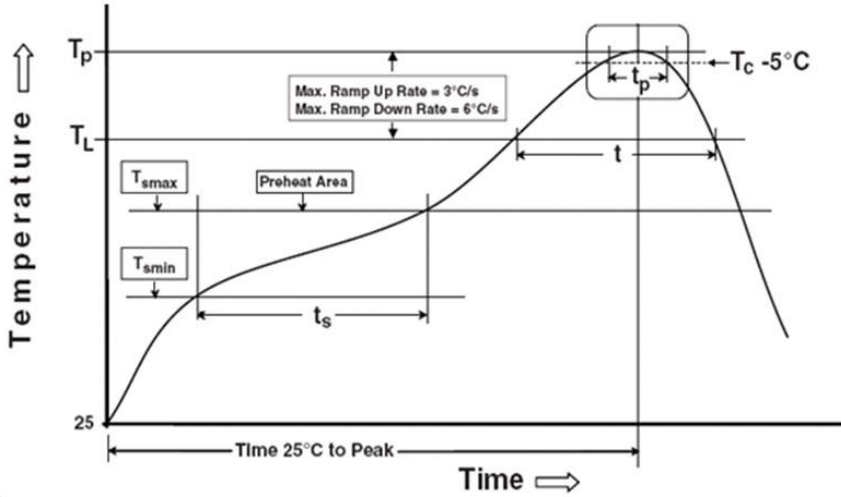
**Notes**

- CE denotes EVERLIGHT
- Q8X4XX denotes Device Number
- Y denotes 1 digit Year code
- WW denotes 2 digit Week code

**Precautions for Use**

1. Soldering Condition

1.1 (A) Maximum Body Case Temperature Profile for evaluation of Reflow Profile



Note:

Reference: IPC/JEDEC J-STD-020D

**Preheat**

Temperature min ( $T_{smin}$ )	150 °C
Temperature max ( $T_{smax}$ )	200°C
Time ( $T_{smin}$ to $T_{smax}$ ) ( $t_s$ )	60-120 seconds
Average ramp-up rate ( $T_{smax}$ to $T_p$ )	3 °C/second max

**Other**

Liquidus Temperature ( $T_L$ )	217 °C
Time above Liquidus Temperature ( $t_L$ )	60-100 sec
Peak Temperature ( $T_p$ )	260°C
Time within 5 °C of Actual Peak Temperature: $T_p - 5°C$	30 s
Ramp- Down Rate from Peak Temperature	6°C /second max.
Time 25°C to peak temperature	8 minutes max.
Reflow times	3 times

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