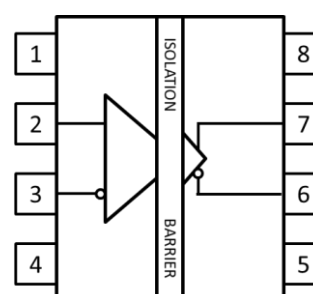


### Isolated Amplifier CEK79-G Series

Schematic



Pin Configuration

1. VDD1
2. INP
3. INN
4. GND1
5. GND2
6. OUTN
7. OUTP
8. VDD2

#### Features:

- Compliance Halogens Free  
(Br < 900 ppm, Cl < 900 ppm, Br+Cl < 1500 ppm)
- $\pm 250\text{mV}$  input voltage range optimized for current measurement using shunt resistors
- Low offset error and drift:  $\pm 0.2\text{mV}$  (max),  $\pm 1.5\mu\text{V}/^\circ\text{C}$  (max)
- Fixed gain: 8.2
- Low gain error and drift:  $\pm 0.3\%$  (max),  $\pm 30\text{ppm}/^\circ\text{C}$  (max)
- Low nonlinearity and drift: 0.03%,  $\pm 1.5\text{ppm}/^\circ\text{C}$  (typical)
- 3.3V to 5V operation on high side
- System-level diagnostic features
- High CMTI: 150 kV/ $\mu\text{s}$  (typical)
- Operating temperature from  $-40$  to  $+125^\circ\text{C}$

#### Description

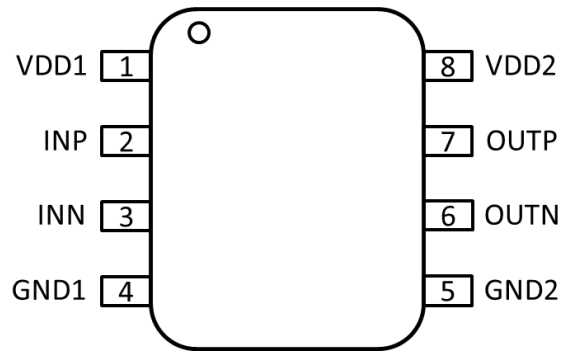
The CEK79 is a precision, isolated amplifier with an output separated from the input circuitry by an isolation barrier that is highly resistant to magnetic interference. This barrier is certified to provide reinforced galvanic isolation of up to 5kVRMS according to VDE V 0884-17 and UL1577. Used in conjunction with isolated power supplies, this isolated amplifier separates parts of the system that operate on different common-mode voltage levels and protects lower-voltage parts from damage.

The input of the CEK79 is optimized for direct connection to shunt resistors or other low voltage level signal sources. The excellent performance of the device supports accurate current control resulting in system-level power savings. The integrated missing high-side supply voltage detection and input common mode overvoltage detection simplify system-level design and diagnostics.

#### Applications

- Shunt-resistor-based current sensing in:
  - Motor drives
  - Frequency inverters
  - Uninterruptible power supplies

## Pin Description



PIN No.	PIN NAME	TYPE	DESCRIPTION
1	VDD1	High-side power	High-side power supply, 3.0 V to 5.5 V relative to GND1.
2	INP	Analog input	Noninverting analog input.
3	INN	Analog input	Inverting analog input.
4	GND1	High-side ground	High-side analog ground.
5	GND2	Low-side ground	Low-side analog ground.
6	OUTN	Analog output	Inverting analog output.
7	OUTP	Analog output	Noninverting analog output.
8	VDD2	Low-side power	Low-side power supply, 3.0V to 5.5V relative to GND2.

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

Parameter	Symbol	Rating	Unit
Supply Voltage	VDD1, VDD2	-0.3 to 6.5	V
Input Voltage	INP, INN	GND1-6 to VDD1+0.5	V
Output Voltage	OUTP, OUTN	GND2-0.5 to VDD2+0.5	V
Input Current	Continuous, any pin except power-supply pins	-10 to 10	mA
Operating Temperature	T <sub>OPR</sub>	-40 ~ +125	°C
Storage Temperature	T <sub>STG</sub>	-65 ~ +150	°C
Isolation Voltage	V <sub>ISO</sub>	5000	V <sub>rms</sub>

Notes:

\* Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

### Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply Voltage	VDD1, VDD2	3.0	5.5	V
Differential input voltage before clipping output	$V_{IN} = V_{INP} - V_{INN}$	-320	320	mV
Specified linear differential input full-scale		-250	250	mV
Absolute common-mode input voltage*	$(V_{INP} + V_{INN}) / 2$ to GND1	-2	VDD1	V
Operating common-mode input voltage		-0.16	VDD1-2.1	V
T <sub>A</sub>	Ambient Temperature	-40	125	°C

Notes:

\* Steady-state voltage supported by the device in case of a system failure. See the specified common-mode input voltage VCM for normal operation. Observe analog input voltage range as specified in the Absolute Maximum Ratings table.

## Electrical Characteristics

Minimum and maximum specifications of the CEK79 apply from  $T_A = -40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ ,  $V_{DD1} = 3.0\text{V}$  to  $5.5\text{V}$ ,  $V_{DD2} = 3.0\text{V}$  to  $5.5\text{V}$ ,  $I_{NP} = -250\text{mV}$  to  $+250\text{mV}$ , and  $I_{NN} = \text{GND1} = 0\text{V}$ ; typical specifications are at  $T_A = 25^{\circ}\text{C}$ ,  $V_{DD1} = 5\text{V}$ , and  $V_{DD2} = 3.3\text{V}$  (unless otherwise noted).

### Input and Output

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Common-mode overvoltage detection level	$V_{CMov}$	$V_{DD1} - 2$			V	
Hysteresis of common-mode overvoltage detection level		100			mV	
Input offset voltage*	$V_{OS}$	-0.2	$\pm 0.01$	0.2	mV	initial, at $T_A = 25^{\circ}\text{C}$ , $V_{INP} = V_{INN} = \text{GND1}$
Input offset drift*	$TCV_{OS}$	-1.5	$\pm 0.1$	1.5	$\mu\text{V}/^{\circ}\text{C}$	
Common-mode rejection ratio	CMRR	-85			dB	$f_{IN} = 0\text{Hz}$ , $V_{CM\ min} \leq V_{CM} \leq V_{CM\ max}$
		-85			dB	$f_{IN} = 10\text{kHz}$ , $V_{CM\ min} \leq V_{CM} \leq V_{CM\ max}$
Single-ended input capacitance	$C_{IN}$	25			pF	$I_{NN} = \text{GND1}$ , $f_{IN} = 275\text{kHz}$
Differential input capacitance	$C_{IND}$	20			pF	$f_{IN} = 275\text{kHz}$
Single-ended input resistance	$R_{IN}$	30			$\text{k}\Omega$	$I_{NN} = \text{GND1}$
Differential input resistance	$R_{IND}$	35			$\text{k}\Omega$	
Input bias current	$I_{IB}$	-13	-10	-7	$\mu\text{A}$	$I_{NP} = I_{NN} = \text{GND1}$ , $I_{IB} = (I_{IBP} + I_{IBN}) / 2$
Input offset current	$I_{IO}$	$\pm 5$			nA	$I_{IO} = I_{IBP} - I_{IBN}$
Normal gain	GAIN	8.2			V/V	
Gain error*	$E_G$	-0.3%	$\pm 0.05\%$	0.3%		Initial, at $T_A = 25^{\circ}\text{C}$
Gain error drift*	$TCE_G$	-30	$\pm 5$	30	ppm/ $^{\circ}\text{C}$	
Nonlinearity*	NL	-0.03%	$\pm 0.01\%$	0.03%		
Nonlinearity drift	$TC_{NL}$	$\pm 1.5$			ppm/ $^{\circ}\text{C}$	
Total harmonic distortion	THD	-88			dB	$V_{IN} = 0.5\text{V}$ , $f_{IN} = 10\text{kHz}$ , $\text{BW} = 100\text{kHz}$
Output noise	$\text{NOISE}_{OUT}$	280			$\mu\text{V}_{RMS}$	$V_{INP} = V_{INN} = \text{GND1}$ , $\text{BW} = 100\text{kHz}$
Signal-to-noise ratio	SNR	86			dB	$V_{IN} = 0.5\text{V}$ , $f_{IN} = 1\text{kHz}$ , $\text{BW} = 10\text{kHz}$
		77			dB	$V_{IN} = 0.5\text{V}$ , $f_{IN} = 10\text{kHz}$ , $\text{BW} = 100\text{kHz}$
Power-supply rejection ratio	PSRR	-100			dB	PSRR vs $V_{DD1}$ , at DC
		-100				PSRR vs $V_{DD1}$ , 100mV and 10kHz ripple
		-110				PSRR vs $V_{DD2}$ , at DC
		-100				PSRR vs $V_{DD2}$ , 100mV and 10kHz ripple

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Common-mode output voltage	$V_{CMout}$	1.40	1.44	1.49	V	
Failsafe differential output voltage	$V_{FAILSAFE}$		-2.6	-2.5	V	
Output bandwidth	BW	250	310		kHz	
Output resistance	$R_{OUT}$		0.2		$\Omega$	On OUTP or OUTN
Output short current	$I_{SC}$		$\pm 13$		mA	VDD2 or GND2
Common-mode transient immunity	CMTI	100	150		kV/us	$ GND1 - GND2  = 1kV$

## Power Supply

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
VDD1 undervoltage detection threshold voltage	$VDD1_{UVLO}$	2.3	2.5	2.7	V	VDD1 Rising
VDD1 undervoltage hysteresis			0.15		V	Hysteresis
VDD2 undervoltage detection threshold voltage	$VDD2_{UVLO}$	2.2	2.4	2.6	V	VDD2 Rising
VDD2 undervoltage hysteresis				0.35		V
High-side supply current	IDD1		4	6	mA	$3.0V \leq VDD1 \leq 5.5V$
Low-side supply current	IDD2		3	5	mA	$3.0V \leq VDD2 \leq 5.5V$

Notes:

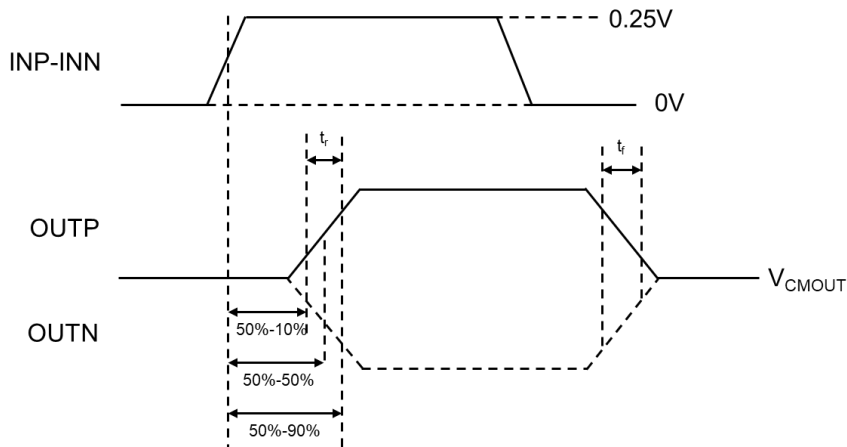
\* The typical value includes one sigma statistical variation.

## Switching Characteristics

Over operating ambient temperature range (unless otherwise noted)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Rise time of OUTP, OUTN	$t_r$		1.0		us	See Fig.1
Fall time of OUTP, OUTN	$t_f$		1.0		us	See Fig.1
INP, INN to OUTP, OUTN signal delay (50% – 50%)	$t_{PD}$		1.2	1.5	us	Unfiltered output, see Fig.1
INP, INN to OUTP, OUTN signal delay (50% – 10%)			0.7	1	us	Unfiltered output, see Fig.1
INP, INN to OUTP, OUTN signal delay (50% – 90%)			1.7	2	us	Unfiltered output, see Fig.1
Analog settling time	$t_{AS}$		350		us	VDD1 step to 3.0 V with VDD2 $\geq 3.0V$ , to OUTP, OUTN valid, 0.1% settling

Fig.1 Rise, Fall, and Delay Time Waveforms



## Order Information

### Part Number

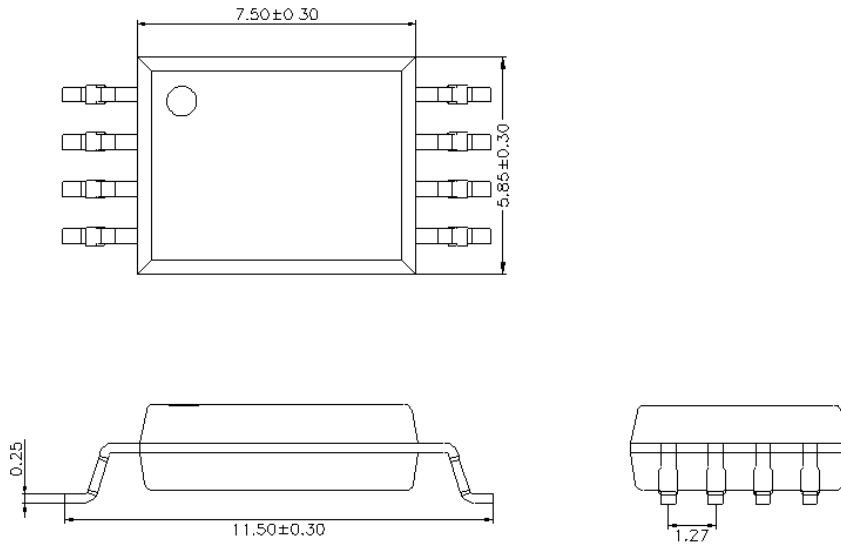
**CEK79(TA)-G**

### Note

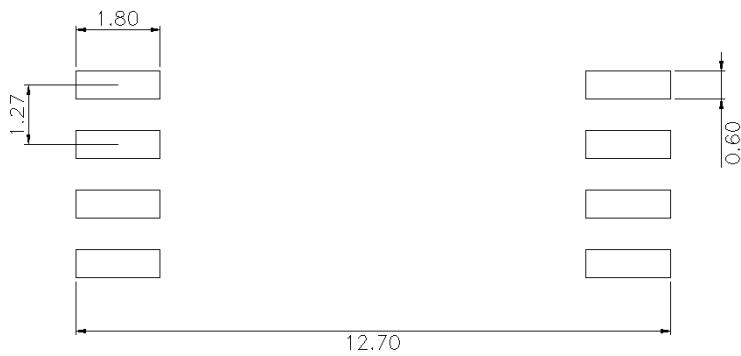
CE = denotes EVERLIGHT  
K79 = part no.  
G = Halogens free

Option	Description	Packing quantity
(TA)	Surface mount lead form + TA tape & reel option	1000 units per reel

**Package Dimension**  
(Dimensions in mm)

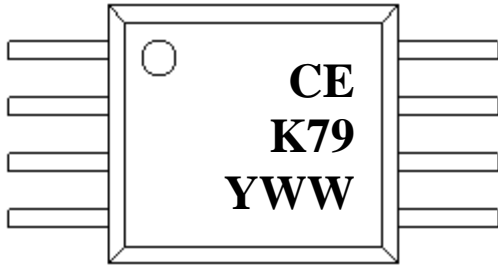


**Recommended pad layout for surface mount leadform**



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

## Device Marking



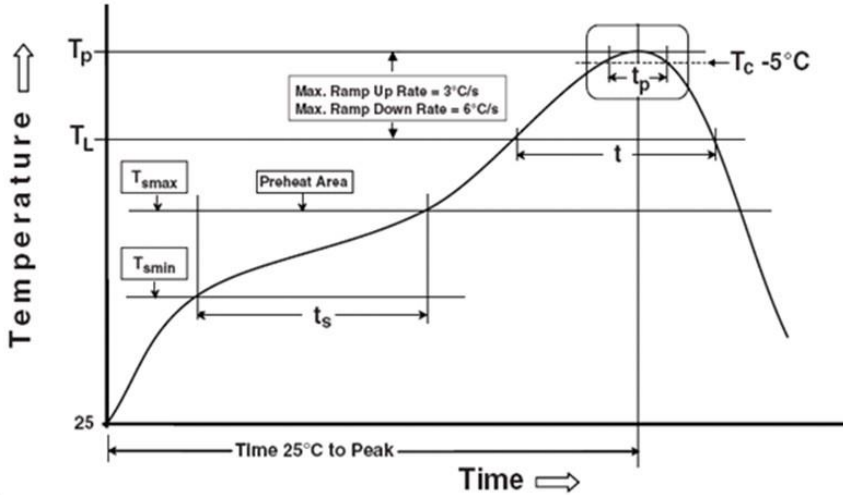
### Notes

CE	denotes EVERLIGHT
K79	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: $T_p - 5^\circ\text{C}$	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

## DISCLAIMER

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2. The graphs shown in this datasheet are representing typical data only and do not show guaranteed values.
3. When using this product, please observe the absolute maximum ratings and the instructions for use outlined in these specification sheets. EVERLIGHT assumes no responsibility for any damage resulting from use of the product which does not comply with the absolute maximum ratings and the instructions included in these specification sheets.
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