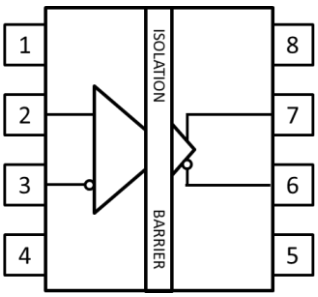
DATASHEET

Isolated Amplifier
CEK87-G Series

Schematic



Pin Configuration
1. VDD1
2. IN
3. SHTDN
4. GND1
5. GND2
6. OUTN
7. OUTP
8. VDD2

Features:

- Compliance Halogens Free
  (Br < 900 ppm, Cl < 900 ppm, Br+Cl < 1500 ppm)
- -0.1V to 2V, high-impedance input voltage range optimized for voltage measurement
- Low offset error and drift: ±2.5mV (max), ±10μV/°C (max)
- Fixed gain: 1
- Low gain error and drift: ±0.3% (max), ±30ppm/°C (max)
- Low nonlinearity and drift: 0.04%, ±1ppm/°C (typical)
- 3.3V to 5V operation on high side
- Missing high-side supply indication
- High CMTI: 150 kV/μs (typical)
- Operating temperature from -40 to 125°C

Description

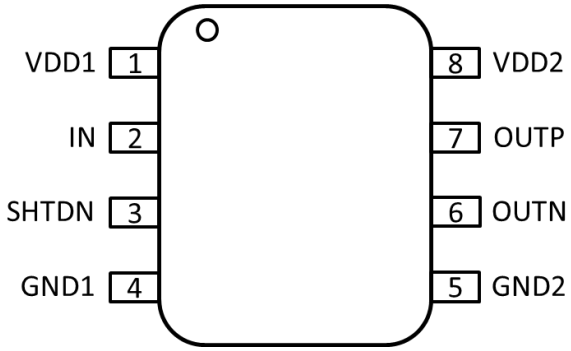
The CEK87 is a precision, isolated amplifier with an output separated from the input circuitry by a capacitive isolation barrier that is highly resistant to magnetic interference. This barrier is certified to provide reinforced galvanic isolation of up to 5 kV_{RMS} according to DIN EN IEC 60747-17 (VDE 0884-17) and UL1577.

The high-impedance input of the CEK87 is optimized for connection to high-impedance resistive dividers or any other high-impedance voltage signal source. The excellent DC accuracy and low temperature drift support accurate, isolated voltage sensing and control in closed-loop systems. The integrated missing high-side supply voltage detection feature simplifies system-level design and diagnostics.

Applications

- Isolated voltage 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	IN	Analog input	Analog input.
3	SHTDN	Digital input	Shutdown input, active high, with internal pullup resistor.
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	V
Input Voltage	IN	GND1-6 to VDD1+0.5	V
	SHTDN	GND1-0.5 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_{OPR}	-40 ~ +125	°C
Storage Temperature	T_{STG}	-65 ~ +150	°C
Isolation Voltage	V_{ISO}	5000	Vrms

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
Specified linear full-scale voltage	IN-GND1	-0.1	2.0	V
Capacitive load	On OUTP or OUTN to GND2	-	200	pF
	OUTP to OUTN	-	500	
Resistive load	On OUTP or OUTN to GND2	-	1	kΩ
Input voltage	SHTDN to GND1	0	VDD1	V
T_A	Ambient Temperature	-40	125	°C

Electrical Characteristics

Minimum and maximum specifications of the CEK87 apply from T_A=-40°C to +125°C, VDD1=3.0V to 5.5V, VDD2 =3.0V to 5.5V, IN=0V to 2V, and SHTDN=GND1=0V, typical specifications are at T_A=25°C, VDD1=5V, and VDD2=3.3V (unless otherwise noted).

Input and Output

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Input offset voltage*	V_{OS}	-2.5	±0.5	2.5	mV	T_A = 25°C
Input offset drift*	TCV_{OS}	-10	±3	10	µV/°C	
Input resistance	R_{IN}		1		GΩ	
Input bias current	I_{IB}	-15		15	nA	T_A = 25°C
Input capacitance	C_{IN}		25		pF	f_{IN} = 275 kHz
Normal gain	GAIN		1		V/V	
Gain error*	E_G	-0.3%	±0.05%	0.3%		T_A = 25°C
Gain error drift*	TCE_G	-30	±5	30	ppm/°C	
Nonlinearity*	NL	-0.04%	±0.01%	0.04%		
Nonlinearity drift	TC_{NL}		±1		ppm/°C	
Total harmonic distortion	THD		-83		dB	V_{IN} = 2V, f_{IN} = 10 kHz, BW = 100 kHz
Signal to noise ratio	SNR		81		dB	V_{IN} = 2V, f_{IN} = 1 kHz, BW = 10 kHz
			71		dB	V_{IN} = 2V, f_{IN} = 10 kHz, BW = 100 kHz
Output noise	$NOISE_{OUT}$		250		uV_{RMS}	V_{IN}= GND1, BW =100kHz
Power-supply rejection ratio	PSRR		-95		dB	PSRR vs VDD1, at DC
			-85			PSRR vs VDD1, 100mV and 10kHz ripple
			-95			PSRR vs VDD2, at DC
			-85			PSRR vs VDD2, 100mV and 10kHz ripple
Common-mode output voltage	V_{CMout}	1.39	1.44	1.49	V	
Input Voltage before clipping output	$V_{Clipping}$		2.516		V	IN to GND1
Clipping differential output voltage	$V_{CLIPout}$		2.5		V	V_{IN} > $V_{Clipping}$
Failsafe differential output voltage	$V_{FAILSAFE}$		-2.6	-2.5	V	
Output bandwidth	BW	250	310		kHz	
Output resistance	R_{OUT}		0.2		Ω	OUTP or OUTN
Output short-circuit current	I_{SC}		±13		mA	VDD2 or GND2
Common-mode transient immunity	CMTI	100	150		kV/us	|GND1 – GND2| = 1 kV

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
SHTDN pin, GND1 ≤ SHTDN ≤ VDD1	I_{IN}	-70		1	uA	
High level of input voltage	V_{IH}	0.77* VDD1			V	
Low level of input volage	V_{IL}			0.28* VDD1	V	

Power Supply

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

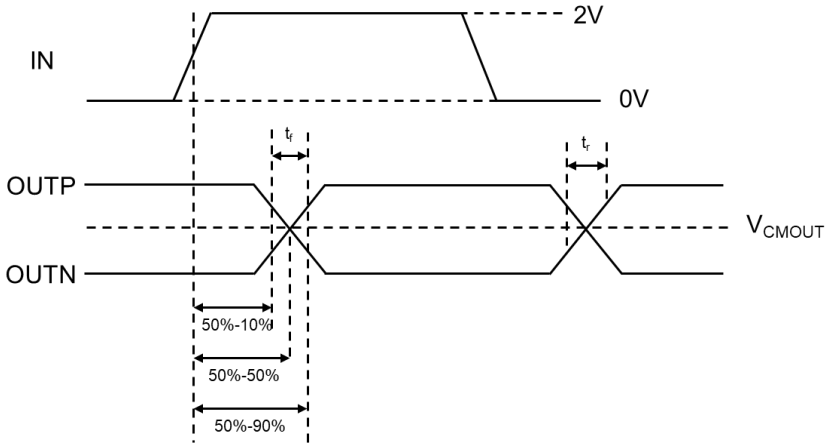
Notes:
* The typical value includes one sigma statistical variation.

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	
Fall time of OUTP, OUTN	t_f		1.0		us	
IN to OUTP, OUTN (50% – 10%)	t_{PD}		0.7	1	us	Unfiltered output, see Fig.1
IN to OUTP, OUTN (50% – 50%)			1.2	1.5	us	Unfiltered output, see Fig.1
IN to OUTP, OUTN (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 ≥ 3.0V, to OUTP, OUTN valid, 0.1% settling
Device enable time	t_{EN}		350		us	SHTDN high to low
Device shut down time	t_{SHTDN}		3	10	us	SHTDN low to high

Fig.1 Rise, Fall, and Delay Time Waveforms



Order Information

Part Number

CEK87(TA)-G

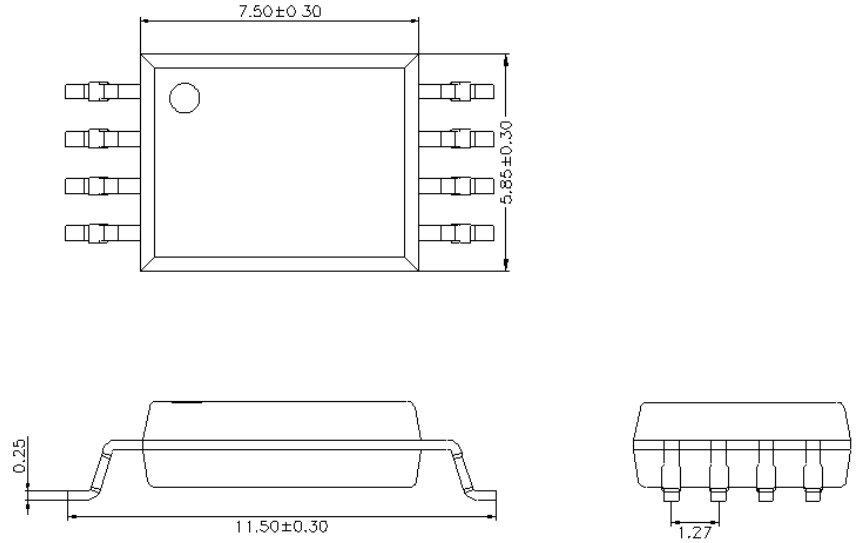
Note

CE	=	denotes EVERLIGHT
K87	=	part no.
G	=	Halogens free

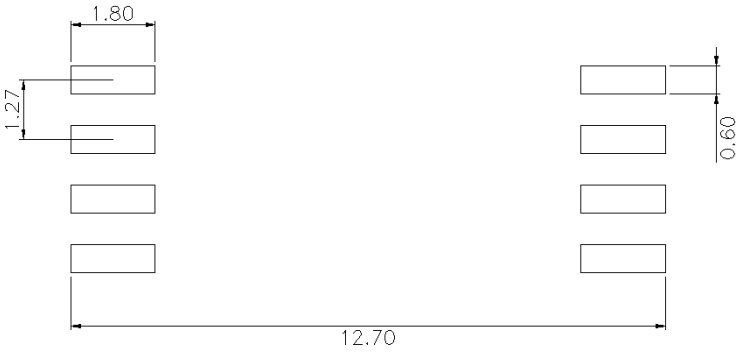
Option	Description	Packing quantity
(TA)	Surface mount lead form + TA tape & reel option	1000 units per reel

Package Dimension

(Dimensions in mm)

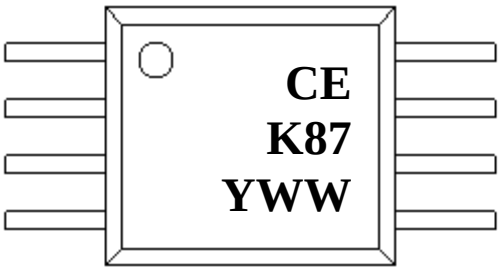


Recommended pad layout for surface mount leadform



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

Device Marking



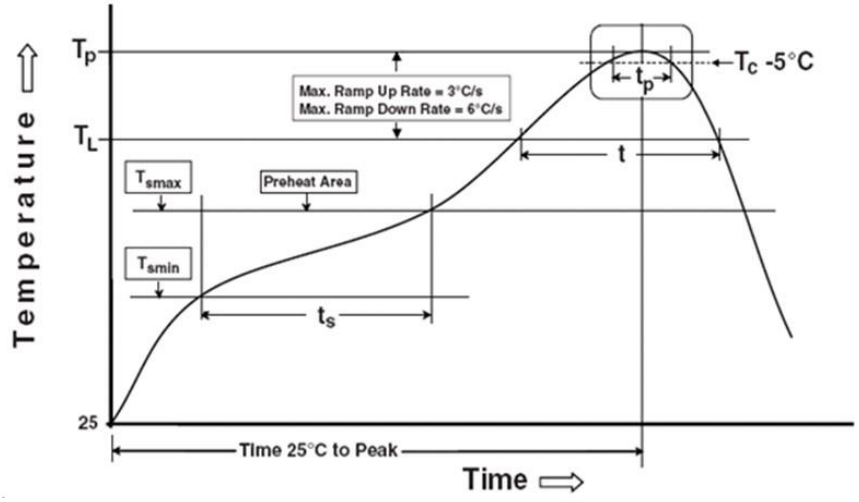
Notes

CE	denotes EVERLIGHT
K87	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

DISCLAIMER

1. Above specification may be changed without notice. EVERLIGHT will reserve authority on material change for above specification.
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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