International

IMPORTANT NOTICE:

Data Sheet No. PD60192 revG IR2171/IR2172 (S)

For new designs we recommend IR's new products IR2175, IR2177, IR21771, IR2277 or IR22771.

LINEAR CURRENT SENSING IC

Features

- Floating channel up to +600V
- Monolithic integration
- · Linear current feedback through shunt resistor
- · Direct digital PWM output for easy interface
- · Low IQBS allows the boot strap power supply
- Independent fast overcurrent trip signal
- High common mode noise immunity
- Input overvoltage protection for IGBT short circuit condition
- Open Drain outputs

Description

IR2171/IR2172 are monolithic current sensing IC designed for motor drive applications. It senses the motor phase current through an external shunt resistor, converts from analog to digital signal, and transfers the signal to the low side. IR's proprietary high voltage isolation technology is implemented to enable the high bandwidth signal processing. The output format is discrete PWM to eliminate need for the A/D input interface for the IR2172. The dedicated overcurrent trip (OC) signal facilitates IGBT short circuit protection. The opendrain outputs make easy for any interface from 3.3V to 15V.

Product Summary

VOFFSET	600Vmax
IQBS	1mA
Vin	+/-260mVmax
Gain temp.drift	20ppm/ ⁰ C (typ.)
fo	40kHz (typ.)
Overcurrent trip signal delay (IR2172)	1.5usec (typ)
Overcurrent trip level	+/-260mV (typ.)

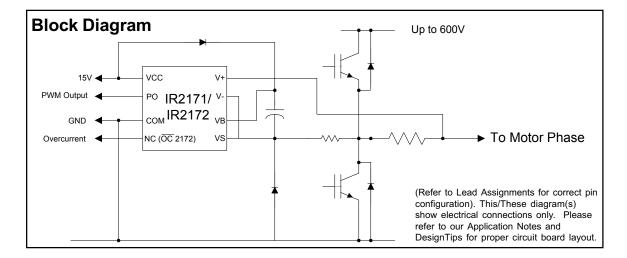
Packages





8-Lead SOIC

8-Lead PDIF



Absolute Maximum Ratings

Absolute maximum ratings indicate sustained limits beyond which damage to the device may occur. All voltage parameters are absolute voltages referenced to COM, all currents are defined positive into any lead. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions.

Symbol	Definition		Min.	Max.	Units
VS	High side offset voltage		-0.3	600	
V _{BS}	High side floating supply voltage		-0.3	25	
V _{CC}	Low side and logic fixed supply voltage		-0.3	25	
V _{IN}	Maximum input voltage between VIN+ and VI	N-	-5	5	V
V _{PO}	Digital PWM output voltage		COM -0.3	VCC +0.3	
V _{OC}	Overcurrent output voltage (IR2172)		COM -0.3	VCC +0.3	
V _{IN-}	V _{IN-} input voltage (note 1)		V _S -5	V _{B+0.3}	
dV/dt	Allowable offset voltage slew rate		—	50	V/ns
PD	Package power dissipation @ $T_A \le +25^{\circ}C$	8 lead SOIC	—	.625	
		8 lead PDIP	—	1.0	W
Rth _{JA}	Thermal resistance, junction to ambient	8 lead SOIC	—	200	°C/M
		8 lead PDIP	—	125	°C/W
TJ	Junction temperature		_	150	
Τ _S	Storage temperature		-55	150	°C
ΤL	Lead temperature (soldering, 10 seconds)		_	300	

Note 1: Capacitors are required between VB and Vin-, and between VB and Vs pins when bootstrap power is used. The external power supply, when used, is required between Vs and Vin-, and between VB and Vs pins.

Recommended Operating Conditions

The output logic timing diagram is shown in figure 1. For proper operation the device should be used within the recommended conditions.

Symbol	Definition	Min.	Max.	Units
VB	High side floating supply voltage	V _S +13.0	V _S +20	
VS	High side floating supply offset voltage	0.3	600	
V _{PO}	Digital PWM output voltage	COM	VCC	v
V _{OC}	Overcurrent output voltage	COM	VCC	
V _{CC}	Low side and logic fixed supply voltage	9.5	20	
VIN	Input voltage between VIN+ and VIN-	-260	+260	mV
TA	Ambient temperature	-40	125	°C

DC Electrical Characteristics

 V_{CC} = V_{BS} = 15V, and T_A = 25°C unless otherwise specified.

Symbol	Definition	Min.	Тур.	Max.	Units	Test Conditions
VIN	Nominal input voltage range before saturation	-260	_	260		
	V _{IN+} _ V _{IN-}					
V _{OC+}	Overcurrent trip positive input voltage	—	260		mV	
V _{OC} -	Overcurrent trip negative input voltage	—	-260	—		
Vos	Input offset voltage	-10	0	10		V _{IN} = 0V (Note 1)
$\Delta V_{OS}/\Delta TA$	Input offset voltage temperature drift	—	25		μV/ºC	
G	Gain (duty cycle % per V _{IN})	157	162	167	%/V	max gain error=5%
						(Note 2)
ΔG/ΔΤΑ	Gain temperature drift	_	20	—	ppm/ ^o C	
I _{LK}	Offset supply leakage current	—	—	50	μA	$V_{\rm B} = V_{\rm S} = 600 V$
IQBS	Quiescent VBS supply current	—	1	2	mA	V _S = 0V
IQCC	Quiescent V _{CC} supply current	_	—	0.5	mA	
LIN	Linearity (duty cycle deviation from ideal linearity	_	0.5	1	%	
	curve)					
$\Delta V_{LIN} / \Delta TA$	Linearity temperature drift	_	.005	_	%/°C	
IOPO	Digital PWM output sink current	20	—	—		V _O = 1V
		2	_	_	mA	V _O = 0.1V
locc	OC output sink current (IR2172)	10	—	_	· IIIA	V _O = 1V
		1	_	_		V _O = 0.1V

Note 1: ± 10 mV offset represents $\pm 1.5\%$ duty cycle fluctuation

Note 2: Gain = (full range of duty cycle in %) / (full input voltage range).

AC Electrical Characteristics

 $V_{CC} = V_{BS} = 15V$, and $T_A = 25^{\circ}C$ unless otherwise specified.

Symbol	Definition	Min.	Тур.	Max.	Units	Test Conditions	
Propaga	tion delay characteristics						
fo	Carrier frequency output	35	41	47	kHz	figure 1	
$\Delta f / \Delta T A$	Temperature drift of carrier frequency	_	500	—	ppm/ ^o C	V _{IN} = 0 & 5V	
Dmin	Minimum duty	-	7	-	%	VIN+=-260mV,VIN-=0V	
Dmax	Maximum duty	_	93	—	%	VIN+=+260mV,VIN-=0V	
BW	fo bandwidth		15		kHz	V _{IN} + = 100mVpk -pk sine wave, gain=-3dB	
PHS	Phase shift at 1kHz		-10		0	V _{IN} + =100mVpk-pk sine wave	
tdoc	Propagation delay time of OC (IR2172)	1	1.5	_	μsec		
twoc	Low true pulse width of OC (IR2172)	-	1	—	μοσο		

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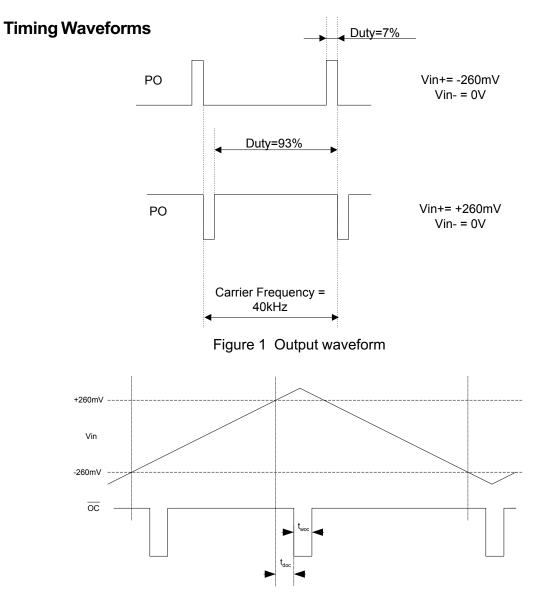


Figure 2. OC Waveform (2172 only)

Application Hint:

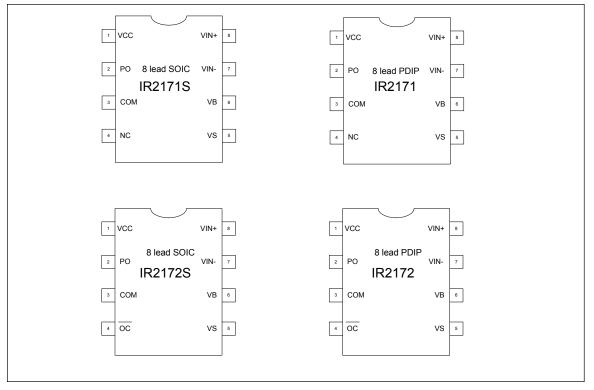
Temperature drift of the output carrier frequency can be cancelled by measuring both a PWM period and the on-time of PWM (Duty) at the same time. Since both periods vary in the same direction, computing the ratio between these values at each PWM period gives consistent measurement of the current feedback over the temperature drift.

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Lead Definitions

Symbol	Description
Vcc	Low side and logic supply voltage
COM	Low side logic ground
V _{IN+}	Positive sense input
V _{IN-}	Negative sense input
VB	High side supply
VS	High side return
PO	Digital PWM output
	Overcurrent output (negative logic) (IR2172 only)
N.C.	No connection

Lead Assignment



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International **TOR** Rectifier

Case outlines

