

Isolated, Digital Output, Power Monitoring IC with Zero-Crossing Detection, Overcurrent and Overvoltage Flagging

FEATURES AND BENEFITS

- Accurate power monitoring for AC and DC applications
- UL 60950-1 (ed. 2) and UL 62368-1 (ed. 1) certified for reinforced isolation up to 517 V_{RMS} in a single package
- Accurate measurements of active, reactive, and apparent power, as well as power factor
- Separate RMS and instantaneous measurements for both voltage and current channels
- Two programmable averaging blocks
- 0.85 mΩ primary conductor resistance for low power loss and high inrush current withstand capability
- Compatible with floating and non-floating GND
- Dedicated voltage or current zero crossing pin
- Fast, user-programmable overcurrent fault pin (5 μs typ.)
- User-programmable undervoltage and overvoltage RMS thresholds
- 1 kHz bandwidth
- Current sensing range up to 90 A
- Options for I²C or SPI digital interface protocols

DESCRIPTION

The Allegro ACS37800 power monitoring IC greatly simplifies the addition of power monitoring to many AC or DC powered systems. The sensor may be powered from the same supply as the system's MCU, eliminating the need for multiple power supplies. The device's construction includes a copper conduction path that generates a magnetic field proportional to applied current. The magnetic field is sensed differentially to reject errors introduced by common mode fields.

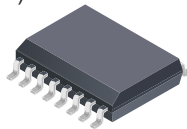
Allegro's Hall-effect-based, galvanically isolated current sensing technology achieves reinforced isolation ratings (4800 V_{RMS}) in a small PCB footprint. These features enable isolated current sensing without expensive Rogowski coils, oversized current transformers, isolated operational amplifiers, or the power loss of shunt resistors.

The ACS37800 power monitoring IC offers key power measurement parameters that can easily be accessed through its SPI or I²C digital protocol interfaces. Dedicated and configurable I/O pins for voltage/current zero crossing, undervoltage and overvoltage reporting, and fast overcurrent fault detection are available in I²C mode. User configuration of the IC is available through on-chip EEPROM.

The ACS37800 is provided in a small low-profile surface mount SOIC16 wide-body package, is lead (Pb) free, and is fully calibrated prior to shipment from the Allegro factory. Customer calibration can further increase accuracy in application.

PACKAGE

16-pin SOICW (suffix MA)



Not to scale

UL
CB Certificate Number:
 US-32210-M1-UL
 US-36315-UL

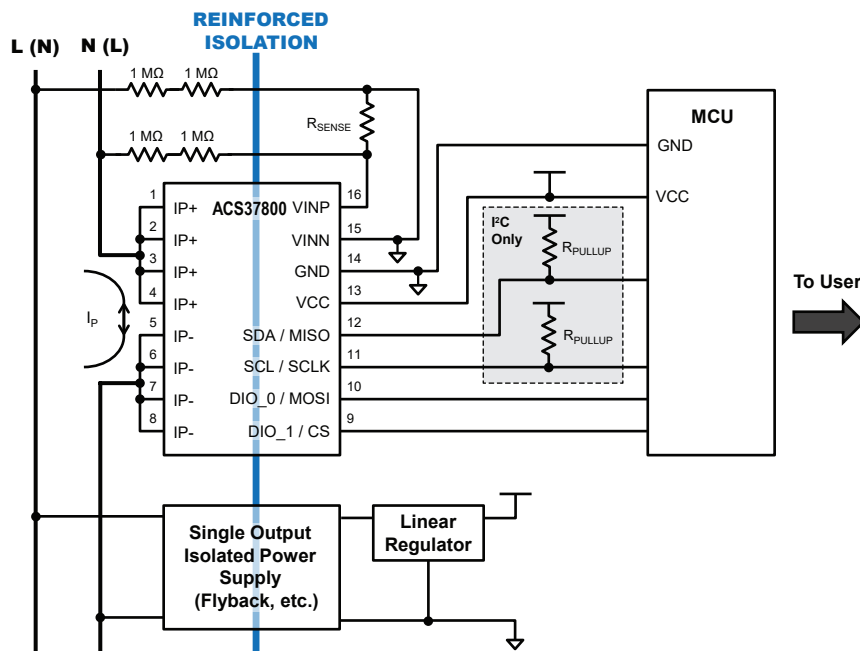


Figure 1: Typical Application

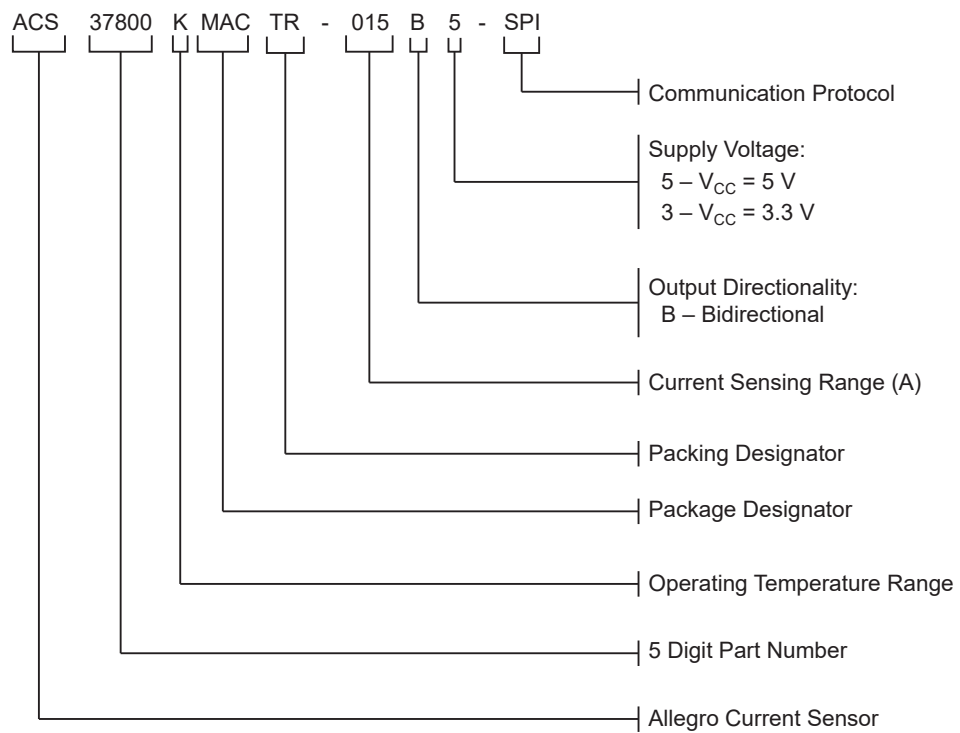
ACS37800

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SELECTION GUIDE

Part Number	V _{CC(typ)} (V)	I _{PR} (A)	Communication Protocol	T _A (°C)	Packing [1]
ACS37800KMACTR-015B5-SPI	5	±15	SPI	-40 to 125	Tape and reel, 1000 pieces per reel, 3000 pieces per box
ACS37800KMACTR-030B3-SPI	3.3	±30			
ACS37800KMACTR-030B3-I2C	3.3	±30	I2C		
ACS37800KMACTR-090B3-I2C	3.3	±90			

[1] Contact Allegro for additional packing options.



ABSOLUTE MAXIMUM RATINGS

Characteristic	Symbol	Notes	Rating	Units
Supply Voltage	V_{CC}		6.5	V
Reverse Supply Voltage	V_{RCC}		-0.5	V
Input Voltage	V_{INP}, V_{INN}		$V_{CC} + 0.5$	V
Reverse Input Voltage	V_{RNP}, V_{RNN}		-0.5	V
Digital I/O Voltage	V_{DIO}	SPI, I ² C, and general purpose I/O	6	V
Reverse Digital I/O Voltage	V_{RDIO}		-0.5	V
Maximum Continuous Current	I_{CMAX}	$T_A = 25^{\circ}C$	60	A
Operating Ambient Temperature	T_A	Range K	-40 to 125	$^{\circ}C$
Junction Temperature	$T_{J(max)}$		165	$^{\circ}C$
Storage Temperature	T_{stg}		-65 to 170	$^{\circ}C$

ISOLATION CHARACTERISTICS

Characteristic	Symbol	Notes	Rating	Unit
Dielectric Strength Test Voltage	V_{ISO}	Agency type-tested for 60 seconds per UL 60950-1 (edition 2) and UL 62368-1 (edition 1); Production tested at 3000 V_{RMS} for 1 second, in accordance with UL 60950-1 (edition 2) and UL 62368-1 (edition 1)	4800	V_{RMS}
Working Voltage for Basic Isolation	V_{WVBI}	Maximum approved working voltage for basic (single) isolation according to UL 60950-1 (edition 2) and UL 62368-1 (edition 1)	1480	V_{PK} or VDC
			1047	V_{RMS}
Working Voltage for Reinforced Isolation	V_{WVRI}	Maximum approved working voltage for reinforced isolation according to UL 60950-1 (edition 2) and UL 62368-1 (edition 1)	730	V_{PK} or VDC
			517	V_{RMS}
Clearance	D_{cl}	Minimum distance through air from IP leads to signal leads	7.5	mm
Creepage	D_{cr}	Minimum distance along package body from IP leads to signal leads	7.9	mm
Distance Through Insulation	DTI	Minimum internal distance through insulation	90	μm
Comparative Tracking Index	CTI	Material Group II	400 to 599	V

ESD RATINGS

Characteristic	Symbol	Notes	Value	Unit
Human Body Model	V_{HBM}	Per JEDEC JS-001	± 5	kV
Charged Device Model	V_{CDM}	Per JEDEC JS-002	± 1	kV

THERMAL CHARACTERISTICS

Characteristic	Symbol	Test Conditions [1]	Value	Units
Package Thermal Resistance (Junction to Ambient)	$R_{\theta JA}$	Mounted on the Allegro ASEK37800 evaluation board with 750 mm ² of 4 oz. copper on each side, connected to pins 1 and 2, and to pins 3 and 4, with thermal vias connecting the layers. Performance values include the power consumed by the PCB.	23	$^{\circ}C/W$
Package Thermal Resistance (Junction to Lead)	$R_{\theta JL}$	Mounted on the Allegro ACS37800 evaluation board.	5	$^{\circ}C/W$

[1] Refer to the Thermal Performance section below.

FUNCTIONAL BLOCK DIAGRAM

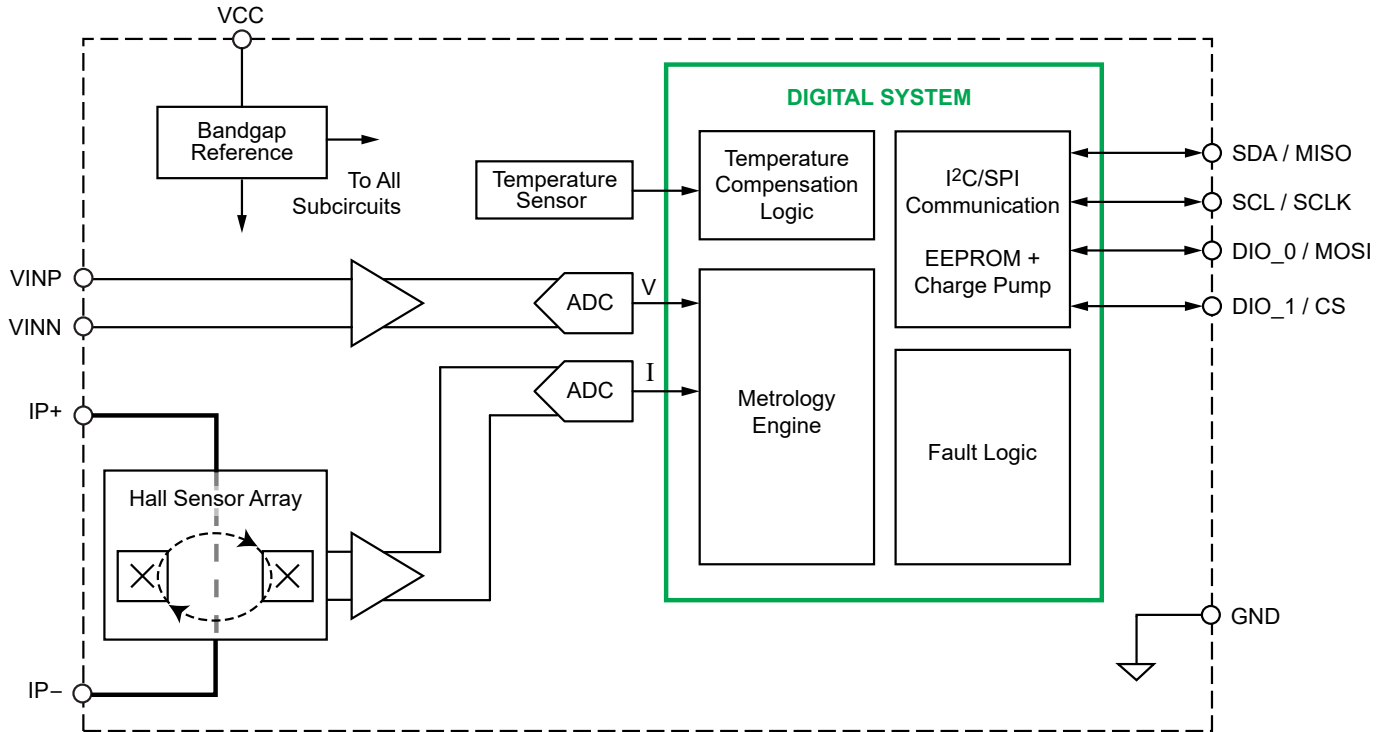
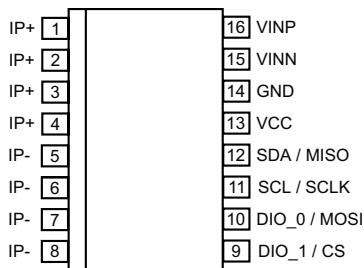


Figure 2: Functional Block Diagram

PINOUT DIAGRAM AND TERMINAL LIST



Pinout Diagram

Terminal List Table

Number	Name	Description	
		I2C	SPI
1, 2, 3, 4	IP+	Terminals for current being sensed; fused internally	
5, 6, 7, 8	IP-	Terminals for current being sensed; fused internally	
9	DIO_1/CS	Digital I/O 1	Chip Select (CS)
10	DIO_0/MOSI	Digital I/O 0	MOSI
11	SCL/SCLK	SCL	SCLK
12	SDA/MISO	SDA	MISO
13	VCC	Device power supply terminal	
14	GND	Device ground terminal	
15	VINN	Negative input voltage (always connect to GND)	
16	VINP	Positive input voltage	

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