

GENERAL DESCRIPTION

The HM713 device is an electrically isolated monolithic current sensor based on Hall Effect. The device provides precise and economical solutions for AC or DC current sensing in industrial, commercial and communication equipments. It is provided in a small, surface mount SOP8 package with current sensing range of 5A/10A/20A/30A. Customers can easily complete their PCB design and implementation.

The HM713 device consists of a precise, low-offset, linear Hall circuit with a copper conduction path located near the surface of the die. When current flows through the copper conduction path, a magnetic field generates. Meanwhile the Hall circuit converts this magnetic signal to output voltage signal.

The Hall circuit based on BiCOMS process integrates a high sensitivity Hall element, oscillator, Hall signal pre-amplifier, H&M Semi® patented temperature compensation circuit, dynamic offset cancellation circuit, sensitivity trimming circuit and output amplifier. The temperature compensation circuit ensures good temperature stability of HM713. Chopper stabilization technique is applied to the Hall circuit to minimize offset voltage. High chopping frequency up to 1MHz makes HM713 80kHz band width and ultra-short step input response time down to typical 2 μ s. Because of this chopper stabilization approach, the output voltage from the Hall IC is desensitized to the effects of temperature and mechanical stress.

Internal copper conductor's resistance is typical 1.5m Ω , which provides much less power loss than the universal resistor sampling method.

Zero current output voltage is 50%VCC. When power supply voltage is 5V, the linear output voltage range is 0.2~4.8V, a range of 0.5~4.5V is recommended for better linearity.

Current sensing range of HM713 is programmed to a fixed value after packaging, and the range of 5A/10A/20A/30A is available. It's operating ambient temperature range is -40~125°C.

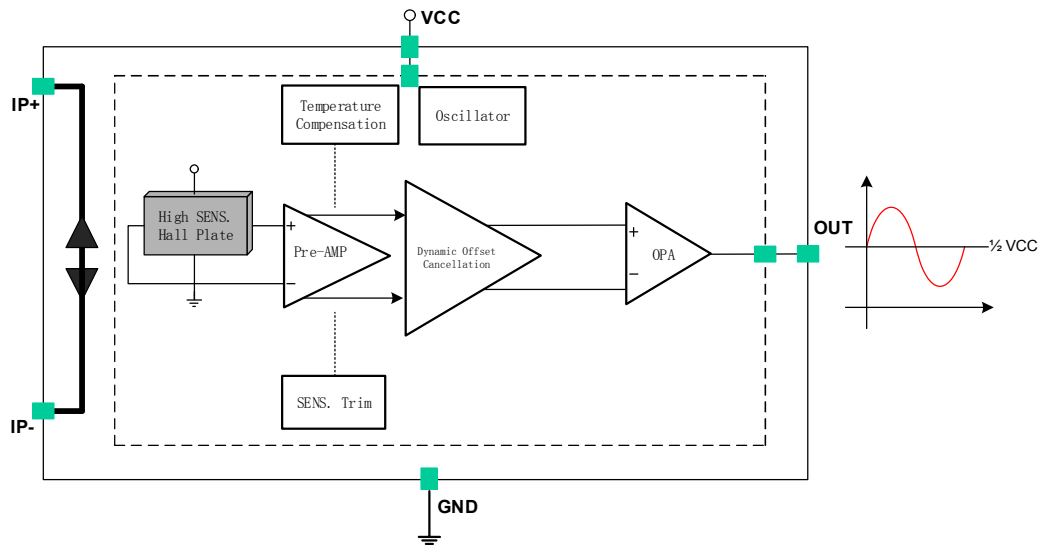
FEATURES

- ◆ Built-in high sensitivity Hall sensor
- ◆ 5V, single supply operation
- ◆ Zero current output voltage is 50%VCC
- ◆ Typical primary conductor's resistance is 1.5m Ω
- ◆ Current sensing range available: 5A/10A/20A/30A
- ◆ 80kHz bandwidth
- ◆ 2 μ s output rise time in response to step input current
- ◆ 2kV_{RMS} isolation voltage between pins 1-4 and 5-8
- ◆ Total output error 1% at T_a=25°C and 3% at T_a= -40~125°C
- ◆ H&M Semi® patented temperature compensation
- ◆ Output is desensitized to mechanical stress
- ◆ ESD (HBM) 6000V
- ◆ Operating ambient temperature: -40~125°C

APPLICATIONS

- ◆ Motor controller
- ◆ Load detection and management
- ◆ Switch-mode power supplies
- ◆ Over-current fault protection

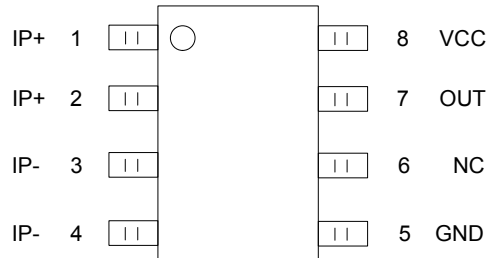
FUNCTION BLOCK DIAGRAM



ORDERING INFORMATION

Part No.	SENS. (mV/A)	Package	Packing Form
HM713-05A	400	SOP8	tapereel,3000pcs/reel
HM713-10A	200	SOP8	tapereel,3000pcs/reel
HM713-20A	100	SOP8	tapereel,3000pcs/reel
HM713-30A	67	SOP8	tapereel,3000pcs/reel

PINOUT DIAGRAM



SOP8 Package

Name	Number	Description	Name	Number	Description
IP+	1	Current Sampled +	GND	5	Ground
IP+	2	Current Sampled +	NC	6	Must be floated
IP-	3	Current Sampled -	OUT	7	Analog Voltage Output
IP-	4	Current Sampled -	VCC	8	Power Supply

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Power Supply	V_{CC}	7	V
Output Voltage	V_{OUT}	-0.3~ $V_{CC}+0.3$	V
Output Source Current	$I_{OUT(SOURCE)}$	400	uA
Output Sink Current	$I_{OUT(SINK)}$	30	mA
Isolation Voltage	V_{ISO}	2000	VAC
Operating Ambient Temperature	T_a	-40~125	°C
Junction Temperature	T_J	165	°C
Storage Temperature	T_S	-55~150	°C
Magnetic Flux Density	B	Not Limited	mT
Electrostatic Discharge Voltage(HBM)	ESD(HBM)	6000	V
Overcurrent Transient Tolerance	I_P	1pulse, 100ms	100A

Note: Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Max.	Unit
Power Supply	V_{CC}	4.5	5.5	V
Operation Temperature	T_a	-40	125	°C
Sense Current Capability	I_P	-30	30	A

Note: The actual maximum continuous sensing current through IC must be calculated according to actual ambient temperature(T_a), IC's thermal resistance(θ_{JA}) and maximum junction temperature(T_J).

ELECTRICAL PARAMETERS

$T_a=25^\circ\text{C}$ and $V_{CC}=5\text{V}$, unless otherwise specified

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power Supply	V_{CC}	-	4.5	-	5.5	V
Supply Current	I_{CC}	OUT pin floated	-	5	8	mA
Output Capacitance Load	C_L		-	-	1	nF
Output Resistive Load	R_L		20	-	-	k Ω
Propagation Time	t_D			1	1.2	us
Rise Time	t_r		-	2	3.6	us
Bandwidth	BW	-3dB, $T_a=25^\circ\text{C}$	-	80	-	kHz
Nonlinearity	Lin_{ERR}		-	0.4	1	%
Symmetry	Sym_{ERR}		-	0.8	1.5	%
Zero Current Output Voltage	$V_{OUT(Q)}$		2.48	2.5	2.52	V
Power-on Time	T_{POR}	Output rising from 0 to 90% of steady-state	-	10	-	us
Res. of Primary Conductor	R_P		-	1.5	1.8	m Ω
Junction-to-Ambient Thermal Resistance	θ_{JA}	1500 mm ² of 2 oz. copper on 1、2 and 3、4 pin	-	25	-	°C/W

05A PERFORMANCE CHARACTERISTICS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Accuracy Range	I_P	-	-5	-	5	A
Sensitivity	Sens	full range of I_P	390	400	410	mV/A
Noise	$V_{NOISE(PP)}$		-	50	-	mV
Zero Current Output Slope	$\Delta V_{OUT(Q)}$		-	0.26	-	mV/°C
Sensitivity Slope	$\Delta Sens$		-	0.054	-	mV/A/°C
Total Output Error	E_{TOT}		-3.0	-	3.0	%

10A PERFORMANCE CHARACTERISTICS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Accuracy Range	I_P	-	-10	-	10	A
Sensitivity	Sens	full range of I_P	195	200	205	mV/A
Noise	$V_{NOISE(PP)}$		-	30	-	mV
Zero Current Output Slope	$\Delta V_{OUT(Q)}$		-	0.30	-	mV/°C
Sensitivity Slope	$\Delta Sens$		-	0.027	-	mV/A/°C
Total Output Error	E_{TOT}		-3.0	-	3.0	%

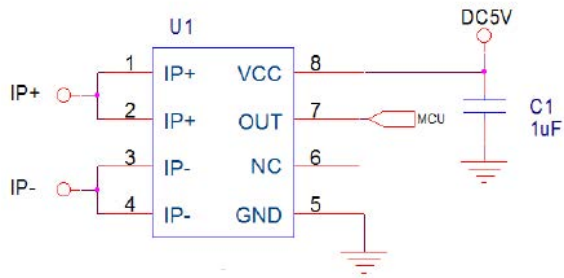
20A PERFORMANCE CHARACTERISTICS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Accuracy Range	I_P	-	-20	-	20	A
Sensitivity	Sens	full range of I_P	95	100	105	mV/A
Noise	$V_{NOISE(PP)}$		-	20	-	mV
Zero Current Output Slope	$\Delta V_{OUT(Q)}$		-	0.34	-	mV/°C
Sensitivity Slope	$\Delta Sens$		-	0.017	-	mV/A/°C
Total Output Error	E_{TOT}		-3.0	-	3.0	%

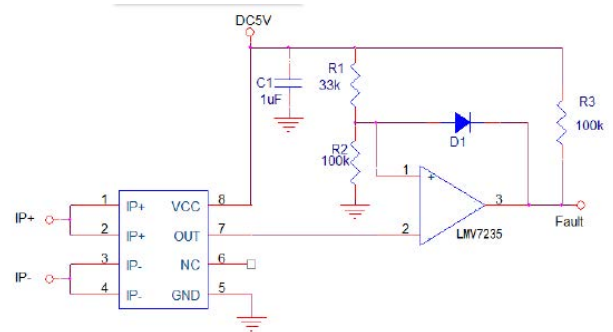
30A PERFORMANCE CHARACTERISTICS

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Current Accuracy Range	I_P	-	-30	-	30	A
Sensitivity	Sens	full range of I_P	64	67	70	mV/A
Noise	$V_{NOISE(PP)}$		-	20	-	mV
Zero Current Output Slope	$\Delta V_{OUT(Q)}$		-	0.35	-	mV/°C
Sensitivity Slope	$\Delta Sens$		-	0.010	-	mV/A/°C
Total Output Error	E_{TOT}		-3.0	-	3.0	%

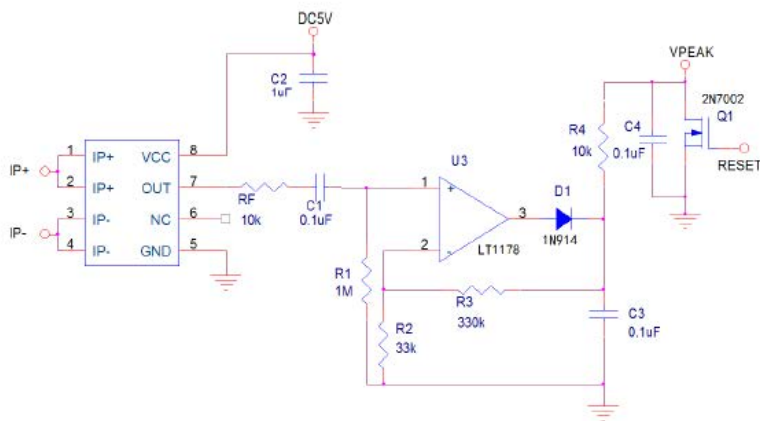
TYPICAL APPLICATION CIRCUITS



Typical Output Application



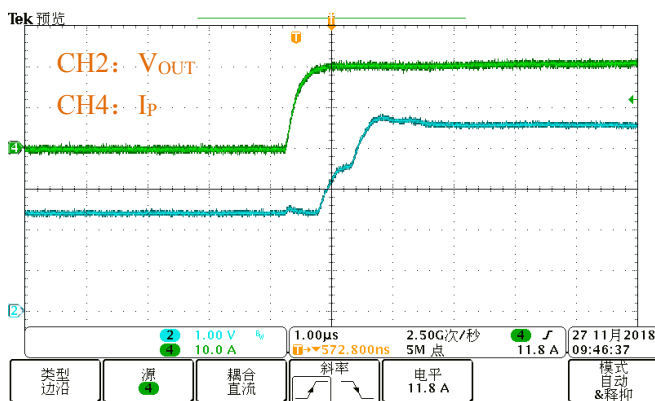
Over Current Fault Latch



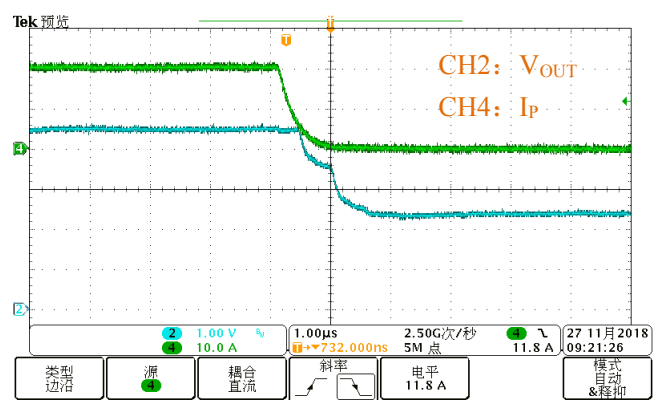
Peak Current Detection

OUTPUT WAVEFORMS AND CURVES

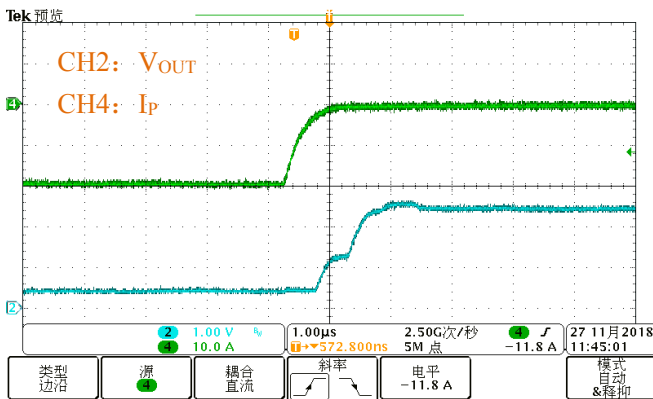
$T_a=25^\circ\text{C}$ and $V_{CC}=5\text{V}$, unless otherwise specified



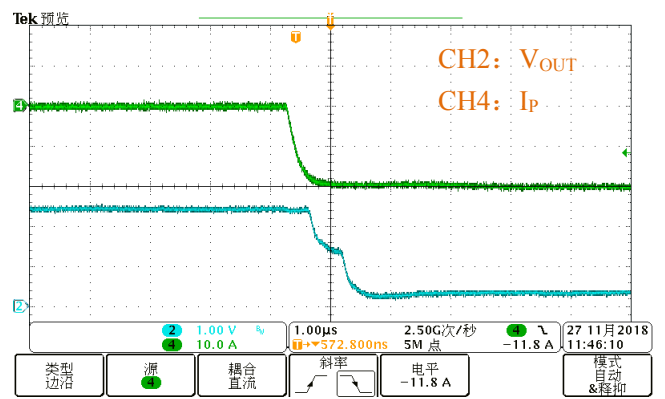
V_{OUT} vs. I_P (Positive Current Rising Edge Response) (20A)



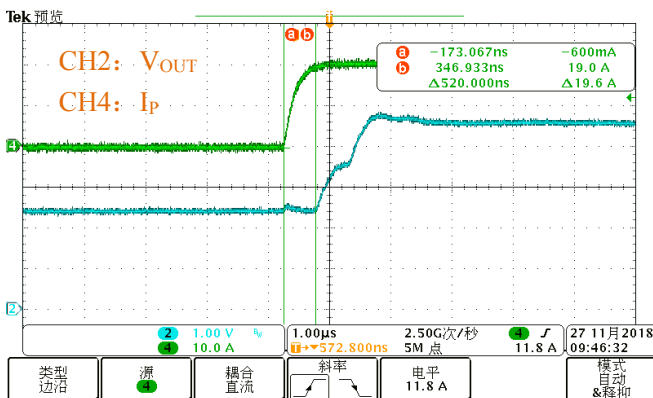
V_{OUT} vs. I_P (Positive Current Falling Edge Response) (20A)



V_{OUT} vs. I_P (Negative Current Rising Edge Response) (20A)



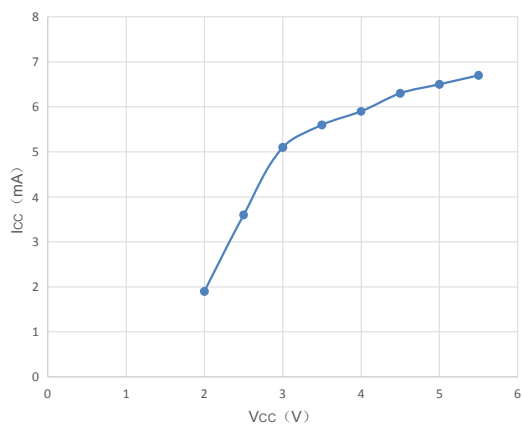
V_{OUT} vs. I_P (Negative Current Falling Edge Response) (20A)



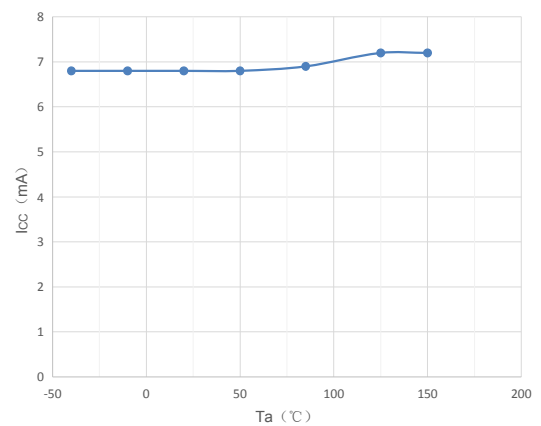
Propagation Time (20A)

All of these pictures use the same oscilloscope settings as follows:

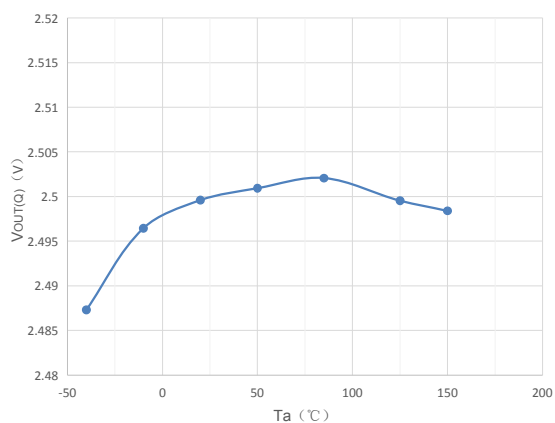
1. I_P Current Channel: 10A/div, 1us/div, DC coupling, non-inverting
2. V_{OUT} Voltage Channel: 1V/div, 1us/div, DC coupling, non-inverting
3. Trigger Mode: I_P Current Channel, Edge, Trigger Level: 11.8A



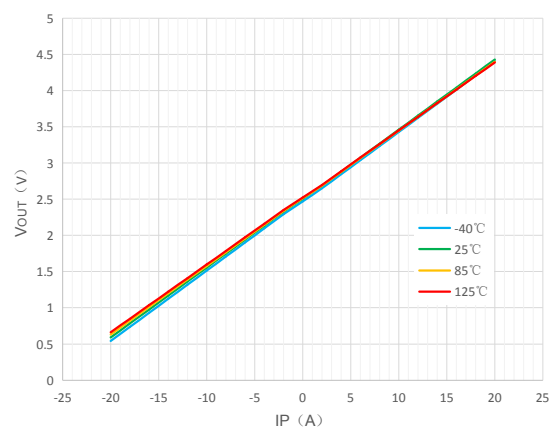
I_{CC} vs. V_{CC}



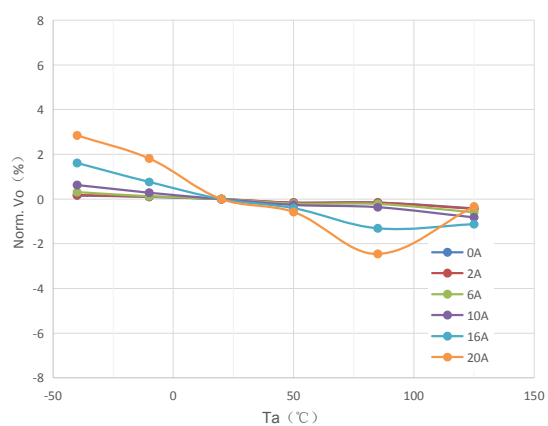
I_{CC} vs. T_a



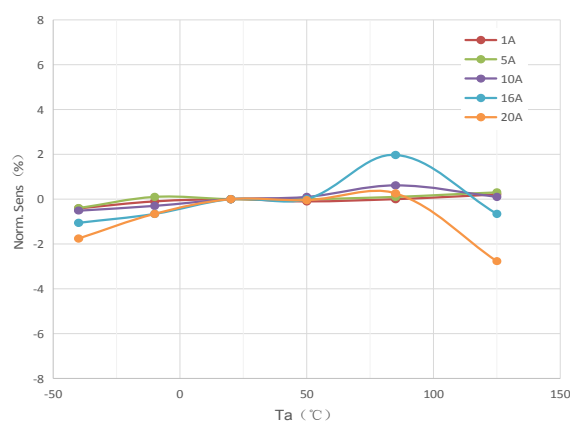
$V_{out(Q)}$ vs. T_a



V_{out} vs. I_P (20A)



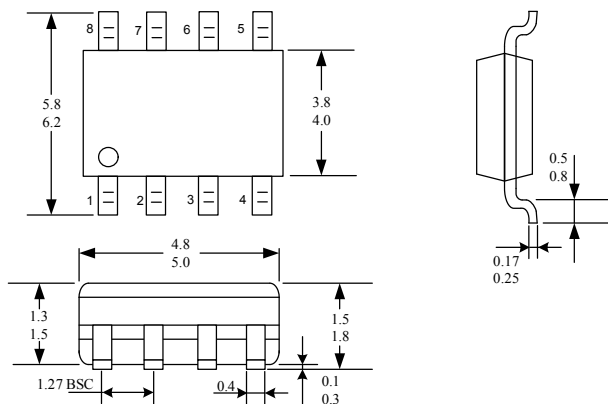
V_{out} error vs. T_a



Sens error vs. T_a

PACKAGE INFORMATION

SOP8 PACKAGE



Note:

1. All dimensions are in millimeters.

Marking:

1st Line: HM713 – Device Name

2nd Line: XX A – I_P Range XX A

3rd Line: YYWW

YY – assembly year (last 2 digits)

WW – assembly week number