LAMPIRAN - A

Instruksi Pengontrol Mikro

```
/*****************************************************
This program was produced by the
CodeWizardAVR V1.25.3 Professional
Automatic Program Generator
© Copyright 1998-2007 Pavel Haiduc, HP InfoTech s.r.l.
http://www.hpinfotech.com

Chip type               : ATmega16
Program type            : Application
Clock frequency         : 11.059000 MHz
Memory model            : Small
External SRAM size      : 0
Data Stack size         : 256
*****************************************************/

#include <mega16.h>
#include <stdio.h>
#include <delay.h>
int count; count2; nilai;
bit segmen;
unsigned char bil[10]={0xc0,0xf9,0xa4,0xb0,0x99,0x92,0x82,0xf8,0x80,0x90};
char kiri,kanan,blkng,i,high,low;sw;
float ACS,MID,RH,KTY;


// External Interrupt 0 service routine
interrupt [EXT_INT0] void ext_int0_isr(void)
{
// Place your code here
count++;
}

// Timer 0 output compare interrupt service routine
interrupt [TIM0_COMP] void timer0_comp_isr(void)
{
// Place your code here
if(segmen==1)
{
PORTD.7=0;
PORTD.6=1;
PORTC=bil[kiri];
}

if(segmen==0)
{
PORTD.7=1;
```

```
PORTD.6=0;
PORTC=bil[kanan];
}
segmen=!segmen;
}

// Standard Input/Output functions
#include <stdio.h>

// Timer 1 output compare A interrupt service routine
interrupt [TIM1_COMPA] void timer1_compa_isr(void)
{
// Place your code here
count2 = count;

low=count;
count=0;

switch(i)
{
case 0: putchar('x');break;
//hall efek
case 1: printf(" %d",kiri);break;
case 2: printf("%d",kanan);break;
case 3: printf("%d ",blkng);break;
//arus
case 4: printf("%4.2f ",ACS);break;
//freq
case 5: printf(" %d",low);break;

case 6: putchar('y');break;
//klmbabn
case 7:printf(" %4.2f",RH);break;
//KTY
case 8:printf(" %4.2f ",KTY);break;
//MID
case 9:printf(" %4.2f ",MID);break;
}

i++;
if(i==10)
i=0;
}

#define ADC_VREF_TYPE 0x40
```

```
// Read the AD conversion result
unsigned int read_adc(unsigned char adc_input)
{
ADMUX=adc_input | (ADC_VREF_TYPE & 0xff);
// Start the AD conversion
ADCSRA|=0x40;
// Wait for the AD conversion to complete
while ((ADCSRA & 0x10)==0);
ADCSRA|=0x10;
return ADCW;
}

// Declare your global variables here

void main(void)
{
// Declare your local variables here

// Input/Output Ports initialization
// Port A initialization
// Func7=In Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In Func0=In
// State7=T State6=T State5=T State4=T State3=T State2=T State1=T State0=T
PORTA=0x00;
DDRA=0x00;

// Port B initialization
// Func7=In Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In Func0=In
// State7=T State6=T State5=T State4=T State3=T State2=T State1=T State0=T
PORTB=0x00;
DDRB=0x00;

// Port C initialization
// Func7=In Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In Func0=In
// State7=T State6=T State5=T State4=T State3=T State2=T State1=T State0=T
PORTC=0x00;
DDRC=0x00;

// Port D initialization
// Func7=In Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In Func0=In
// State7=T State6=T State5=T State4=T State3=T State2=T State1=T State0=T
PORTD=0x00;
DDRD=0x00;


// Timer/Counter 0 initialization
// Clock source: System Clock
```

```
// Clock value: 10.800 kHz
// Mode: Normal top=FFh
// OC0 output: Disconnected
TCCR0=0x05;
TCNT0=0x00;
OCR0=0x6C;

// Timer/Counter 1 initialization
// Clock source: System Clock
// Clock value: 10.800 kHz
// Mode: CTC top=OCR1A
// OC1A output: Discon.
// OC1B output: Discon.
// Noise Canceler: Off
// Input Capture on Falling Edge
// Timer 1 Overflow Interrupt: Off
// Input Capture Interrupt: Off
// Compare A Match Interrupt: On
// Compare B Match Interrupt: Off
TCCR1A=0x00;
TCCR1B=0x0D;
TCNT1H=0x00;
TCNT1L=0x00;
ICR1H=0x00;
ICR1L=0x00;
OCR1AH=0x15;
OCR1AL=0x18;
OCR1BH=0x00;
OCR1BL=0x00;

// Timer/Counter 2 initialization
// Clock source: System Clock
// Clock value: Timer 2 Stopped
// Mode: Normal top=FFh
// OC2 output: Disconnected
ASSR=0x00;
TCCR2=0x00;
TCNT2=0x00;
OCR2=0x00;

// External Interrupt(s) initialization
// INT0: On
// INT0 Mode: Falling Edge
// INT1: Off
// INT2: Off
GICR|=0x40;
```

```
MCUCR=0x02;
MCUCSR=0x00;
GIFR=0x40;

// Timer(s)/Counter(s) Interrupt(s) initialization
TIMSK=0x12;

// USART initialization
// Communication Parameters: 8 Data, 1 Stop, No Parity
// USART Receiver: On
// USART Transmitter: On
// USART Mode: Asynchronous
// USART Baud rate: 9600
UCSRA=0x00;
UCSRB=0x18;
UCSRC=0x86;
UBRRH=0x00;
UBRRL=0x47;

// Analog Comparator initialization
// Analog Comparator: Off
// Analog Comparator Input Capture by Timer/Counter 1: Off
ACSR=0x80;
SFIOR=0x00;

// ADC initialization
// ADC Clock frequency: 691.188 kHz
// ADC Voltage Reference: AVCC pin
// ADC Auto Trigger Source: None
ADMUX=ADC_VREF_TYPE & 0xff;
ADCSRA=0x84;

// Watchdog Timer initialization
// Watchdog Timer Prescaler: OSC/2048k
#pragma optsize-
WDTCR=0x1F;
WDTCR=0x0F;
#ifdef _OPTIMIZE_SIZE_
#pragma optsize+
#endif

// Global enable interrupts
#asm("sei")

while (1)
    {
```

```
    // Place your code here
delay_ms(50);

//sens hall efek
nilai=read_adc(0);
//VVV=range teg yg mncakup "teg OP" (dlm Volt)
//AAA=range nile ADC
//tidak ada pengaruh magnet
//teg OP=2,59V    N adc=530,43     V=0-2,61V        NA =0-535
if(nilai>0 && nilai <=535)      {kiri=0;kanan=0;blkng=0;}
//magnet bagian A
//teg OP=2,64V    N adc=540,64     V=2,61-2,68V    NA =535-549
if(nilai>535 && nilai <=549)    {kiri=0;kanan=3;blkng=9;}
//magnet bagian B
//teg OP=2,72V    N adc=557,06     V=2,68-2,79V    NA =549-571
if(nilai>549 && nilai <=571)    {kiri=1;kanan=0;blkng=0;}
//mgnet bagian C
//teg OP=2,85V    N adc=583,68     V=2,79-2,87V    NA =571-588
if(nilai>571 && nilai <=588)    {kiri=2;kanan=0;blkng=0;}
//mgnet bagian D
//teg OP=2,90V    N adc=593,92     V=2,87-3,10V    NA =588-635
if(nilai>588 && nilai <=635)    {kiri=2;kanan=3;blkng=8;}
//mgnet bagian E
//teg OP=3,20V    N adc=655,36     V=3,10-3,80V    NA=635-778
if(nilai>635 && nilai <=778)    {kiri=4;kanan=7;blkng=0;}

//sens arus
//ud mndekati benar yg  ini ma
nilai=read_adc(1);
ACS=(float)((3*nilai)-1530)/150;

//sens suhu MID
nilai=read_adc(2);
MID=(float)(nilai/2.1153)+0.47;

//sens RH
nilai=read_adc(3);
RH=(float)((30*nilai)+6110)/104;
//RH=(float)(((24*nilai)+15702)/258)-42.4;

//sens KTY
nilai=read_adc(4);
KTY=(float)((5/4)*nilai)+20;
    };

}
```

LAMPIRAN - B

Instruksi Program Visual Basic

```
Dim x1, x2, x3, x4, x5, x6, x50, x51, x52, x53, x54, x55, x56, x57
Private Sub Command1_Click()
Timer2.Enabled = True
End Sub
Private Sub Command2_Click()
End
End Sub
Private Sub Form_Load()
MSComm1.PortOpen = True
End Sub
Private Sub Timer1_Timer()
x1 = x2
x2 = x3
x3 = x4
x4 = x5
x5 = x6
x6 = MSComm1.Input
Label1.Caption = x1
Label2.Caption = x2
Label3.Caption = x3
Label4.Caption = x4
Label5.Caption = x5
Label6.Caption = x6
If x1 = "x" Then
x50 = x2
x51 = x3
x52 = x4
x53 = x5
x54 = x6
ElseIf x1 = "y" Then
x55 = x2
x56 = x3
x57 = x4
End If
End Sub

'aktif setelah command button ("ambil") di klik
Private Sub Timer2_Timer()
'hall efek
Label8.Caption = CStr(x50) + CStr(x51) + CStr(x52)
'arus
Label10.Caption = CStr(x53)
'freq
Label9.Caption = 2 * (x54)
'RH
Label12.Caption = CStr(x55)
'KTY
Label13.Caption = CStr(x56)
'MID
Label11.Caption = CStr(x57)
End Sub
```

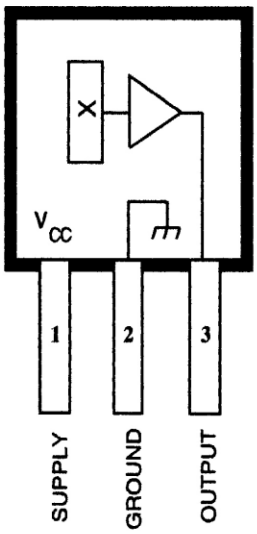
LAMPIRAN - C

Datasheet UGN3503

3503

Data Sheet 27501B*

RATIOMETRIC, LINEAR HALL-EFFECT SENSORS



Dwg. PH-006

Pinning is shown viewed from branded side.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage, V_{CC} ..... **8 V**

Magnetic Flux Density, B ..... **Unlimited**

Operating Temperature Range,

T_A ..... **-20°C to +85°C**

Storage Temperature Range,

T_S ..... **-65°C to +150°C**

The UGN3503LT, UGN3503U, and UGN3503UA Hall-effect sensors accurately track extremely small changes in magnetic flux density—changes generally too small to operate Hall-effect switches.

As motion detectors, gear tooth sensors, and proximity detectors, they are magnetically driven mirrors of mechanical events. As sensitive monitors of electromagnets, they can effectively measure a system's performance with negligible system loading while providing isolation from contaminated and electrically noisy environments.

Each Hall-effect integrated circuit includes a Hall sensing element, linear amplifier, and emitter-follower output stage. Problems associated with handling tiny analog signals are minimized by having the Hall cell and amplifier on a single chip.

Three package styles provide a magnetically optimized package for most applications. Package suffix 'LT' is a miniature SOT-89/TO-243AA transistor package for surface-mount applications; suffix 'U' is a miniature three-lead plastic SIP, while 'UA' is a three-lead ultra-mini-SIP. All devices are rated for continuous operation over the temperature range of -20°C to +85°C.

FEATURES

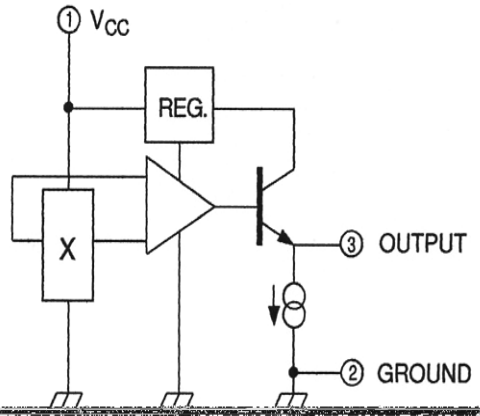
- Extremely Sensitive
- Flat Response to 23 kHz
- Low-Noise Output
- 4.5 V to 6 V Operation
- Magnetically Optimized Package

Always order by complete part number, e.g., **UGN3503UA**.

Allegro MicroSystems, Inc.

3503
RATIOMETRIC,
LINEAR
HALL-EFFECT SENSORS

FUNCTIONAL BLOCK DIAGRAM



LAMPIRAN - D

Datasheet MID232

Raytek Compact Series

MI

Datasheet

Highlights

- Small sensing head fits where other sensors can't
- Ambient head temperatures up to 180°C without cooling
- Industrial rugged head cable: Silicone and Halogen free, resistant against oil, bases, and acids (MID/MIC)
- 1% accuracy across broad temperature range
- 0/4 – 20 mA, 0 – 5 V, J or K thermocouple output
- Interchangeable sensing heads
- Adjustable emissivity, transmissivity, peak hold, valley hold and averaging
- 5-digit backlit LCD user interface
- Accessories for mounting and air purging
- Interface: RS232 (standard) or RS485 (optional)
- Multidrop Network (max. 32 sensors with RS485)

Electrical Specifications

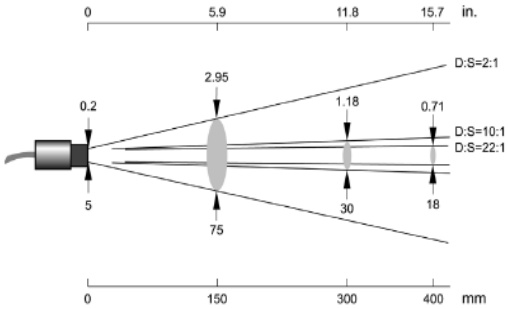
Outputs	4 – 20 mA, 0 – 20 mA, 0 – 5 V (scaleable) J or K thermocouple, 10 mV / °C head ambient signal, Alarm (software enabled)
Inputs	Emissivity setting, background radiation compensation, trigger (software enabled)
Cable Length	1 m standard
Output Impedance (T/C)	20 Ω
Minimum Load Impedance (mV)	100 kΩ
Maximum Loop Impedance (mA)	500 Ω with 24 VDC power supply
Current Draw	100 mA
Power Supply	12 – 26 VDC

Sensor Specifications

Environmental Rating	IP65 (NEMA-4)[1]
Ambient Temperature	
MIH sensing head	0 to 180°C
MIC sensing head	0 to 125°C
MID sensing head	0 to 85°C
with air cooling	up to 200°C
Electronics housing	0 to 65°C
Storage Temperature	-10 to 85°C
Relative Humidity	10 to 95%, non-condensing
EMC	IEC 61326-1 (max. cable length 3 m)
Weight Sensing head	50 g (with 1 m cable), Stainless steel
Electronics housing	270 g, Zinc, die-cast

[1] not for sensing heads with optical resolution of 2:1

Optical Specifications



Measurement Specifications

Temperature Range	
LT	-40 to 600°C -25 to 600°C for J-thermocouple output
Spectral Response	
LT	8 to 14 µm
Optical Resolution[1]	
MID, MIC, MIH	22:1 (typ.), 21:1 (guaranteed)
MID, MIC, MIH	10:1
MID, MIC	2:1
System Accuracy[2]	
LT	±1% or ±1°C [3,5]
Thermocouple output	-±1% or ±2,5°C [3]
Repeatability	±0,5% or ±0,5°C [3]
Temperature Coefficient	
MIH sensing head[4]	±0,05°C / °C or ±0,05% / °C [3] (ambient temperature: 23 – 180°C)
MIC sensing head[4]	±0,05°C / °C or ±0,05% / °C [3] (ambient temperature: 23 – 125°C)
MIC, MIH sensing head[4]	±0,1°C / °C or ±0,1% / °C [3] (ambient temperature: 0 – 23°C)
MID sensing head	±0,15°C / °C or ±0,15% / °C [3] (ambient temperature: 0 – 85°C)
Electronics housing	±0,1°C / °C or ±0,1% / °C [3]
Temperature Resolution	
LT	0,1°C
System Response Time	150 ms (95%)
Emissivity	0,100 to 1,100 digitally adjustable increments of 0,001
Transmission	0,100 to 1,000 digitally adjustable increments of 0,001
Signal Processing	Peak hold, valley hold, variable averaging filter, adjustable up to 998 s

[1] 90% energy
[2] at ambient temperature 23°C ± 5°C
[3] whichever is greater
[4] with ISO Calibration Certificate, based on NIST/DKD certified probes
[5] ± 2°C for target temperatures < 20°C

Raytek®
A Fluke Company

LAMPIRAN - E

Datasheet HS15PF

HUMIDITY SENSOR HS15-SERIES

HS15P
HS15PF

The HS15 series features much higher woter resistance than the HS12P has. It can be used for long-in the conditions liable to dew condensation. Two types of HS15 series are available: A lead pin type HS15P, and a flexible lead type HS15PF with sensor mounting flexibility.

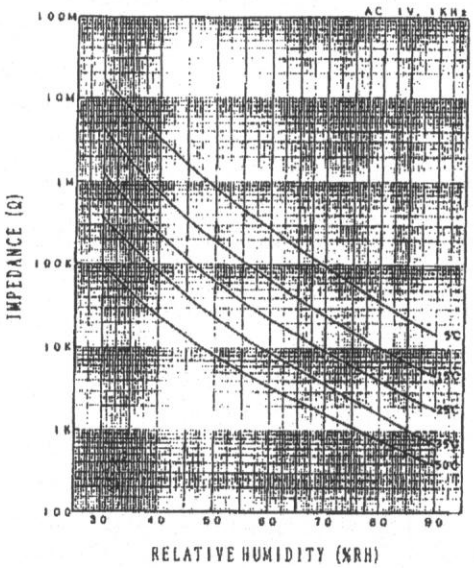
□ Features

- Superior water resistance for use in the conditions liable to dew condensation
- Superior long-term reliability
- Low price

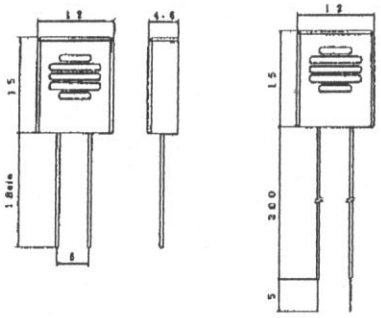
□ Applications

Humidifiers, Dehumidifiers, Humidity monitors, Air conditioners, Humidity control in agricultural hothouses

□ Humidity sensing performance



□ Specifications

Type	HS15P	HS15PF
Measurement range	20%RH to 100%RH	
Measurement accuracy	±5%RH	
Impedance	60±30KΩ (25℃, 50%RH)	
Drive voltage	AC 1V	
Measuring freq.	50Hz to 1KHz	
Rated power	0.3mW	
Case color	Light blue	
Shape		

LAMPIRAN - F

Datasheet ACS712T

ACS712

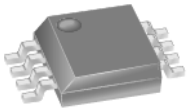
Fully Integrated, Hall Effect-Based Linear Current Sensor with 2.1 kVRMS Voltage Isolation and a Low-Resistance Current Conductor

Features and Benefits

- Low-noise analog signal path
- Device bandwidth is set via the new FILTER pin
- 5 µs output rise time in response to step input current
- 80 kHz bandwidth
- Total output error 1.5% at T_A = 25°C
- Small footprint, low-profile SOIC8 package
- 1.2 mΩ internal conductor resistance
- 2.1 kV_{RMS} minimum isolation voltage from pins 1-4 to pins 5-8
- 5.0 V, single supply operation
- 66 to 185 mV/A output sensitivity
- Output voltage proportional to AC or DC currents
- Factory-trimmed for accuracy
- Extremely stable output offset voltage
- Nearly zero magnetic hysteresis
- Ratiometric output from supply voltage

TÜV America
Certificate Number:
U8V 06 05 54214 010

Package: 8 Lead SOIC (suffix LC)



Approximate Scale 1:1

Description

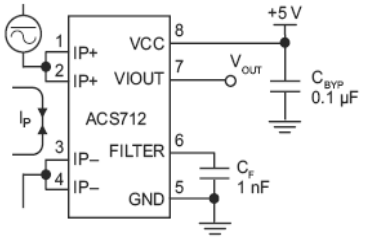
The Allegro® ACS712 provides economical and precise solutions for AC or DC current sensing in industrial, commercial, and communications systems. The device package allows for easy implementation by the customer. Typical applications include motor control, load detection and management, switched-mode power supplies, and overcurrent fault protection.

The device consists of a precise, low-offset, linear Hall sensor circuit with a copper conduction path located near the surface of the die. Applied current flowing through this copper conduction path generates a magnetic field which is sensed by the integrated Hall IC and converted into a proportional voltage. Device accuracy is optimized through the close proximity of the magnetic signal to the Hall transducer. A precise, proportional voltage is provided by the low-offset, chopper-stabilized BiCMOS Hall IC, which is programmed for accuracy after packaging.

The output of the device has a positive slope (>$V_{IOUT(Q)}$) when an increasing current flows through the primary copper conduction path (from pins 1 and 2, to pins 3 and 4), which is the path used for current sensing. The internal resistance of this conductive path is 1.2 mΩ typical, providing low power

Continued on the next page…

Typical Application



Application 1. The ACS712 outputs an analog signal, V_{OUT}, that varies linearly with the uni- or bi-directional AC or DC primary sensed current, I_P, within the range specified. C_F is recommended for noise management, with values that depend on the application.

Description (continued)

loss. The thickness of the copper conductor allows survival of the device at up to 5× overcurrent conditions. The terminals of the conductive path are electrically isolated from the sensor leads (pins 5 through 8). This allows the ACS712 current sensor to be used in applications requiring electrical isolation without the use of opto-isolators or other costly isolation techniques.

The ACS712 is provided in a small, surface mount SOIC8 package. The leadframe is plated with 100% matte tin, which is compatible with standard lead (Pb) free printed circuit board assembly processes. Internally, the device is Pb-free, except for flip-chip high-temperature Pb-based solder balls, currently exempt from RoHS. The device is fully calibrated prior to shipment from the factory.

Selection Guide

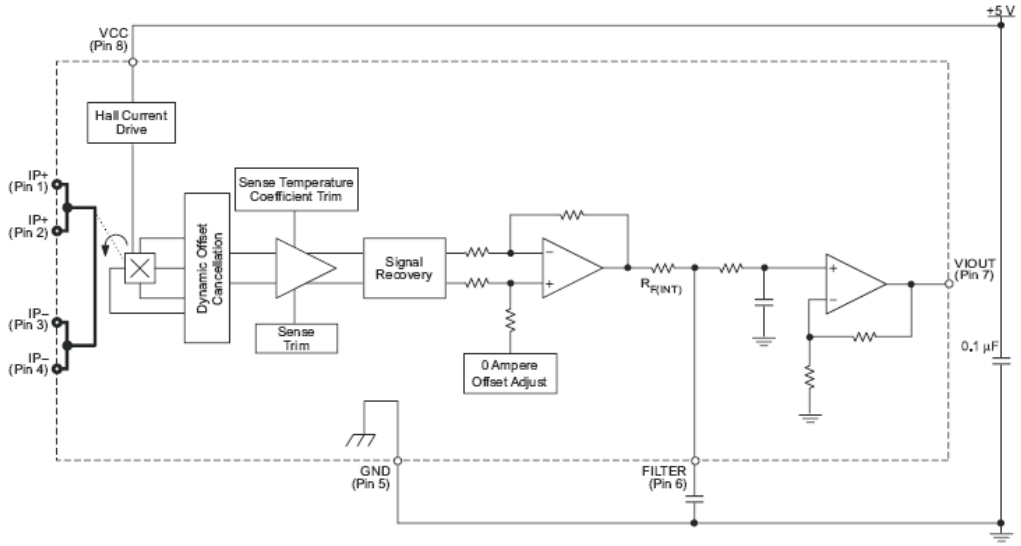
Part Number	Packing*	T_A (°C)	Optimized Range, I_P (A)	Sensitivity, Sens (Typ) (mV/A)
ACS712ELCTR-05B-T	Tape and reel, 3000 pieces/reel	–40 to 85	±5	185
ACS712ELCTR-20A-T	Tape and reel, 3000 pieces/reel	–40 to 85	±20	100
ACS712ELCTR-30A-T	Tape and reel, 3000 pieces/reel	–40 to 85	±30	66

*Contact Allegro for additional packing options.

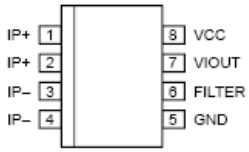
Absolute Maximum Ratings

Characteristic	Symbol	Notes	Rating	Units
Supply Voltage	V_{CC}		8	V
Reverse Supply Voltage	V_{RCC}		–0.1	V
Output Voltage	V_{IOUT}		8	V
Reverse Output Voltage	V_{RIOUT}		–0.1	V
Reinforced Isolation Voltage	V_{ISO}	Pins 1-4 and 5-8; 60 Hz, 1 minute, T_A=25°C	2100	V
		Voltage applied to leadframe (Ip+ pins), based on IEC 60950	184	V_{peak}
Basic Isolation Voltage	$V_{ISO(bsc)}$	Pins 1-4 and 5-8; 60 Hz, 1 minute, T_A=25°C	1500	V
		Voltage applied to leadframe (Ip+ pins), based on IEC 60950	354	V_{peak}
Output Current Source	$I_{IOUT(Source)}$		3	mA
Output Current Sink	$I_{IOUT(Sink)}$		10	mA
Overcurrent Transient Tolerance	I_P	1 pulse, 100 ms	100	A
Nominal Operating Ambient Temperature	T_A	Range E	–40 to 85	ºC
Maximum Junction Temperature	T_J(max)		165	ºC
Storage Temperature	T_{stg}		–65 to 170	ºC

Functional Block Diagram



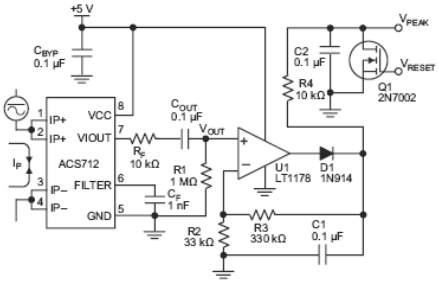
Pin-out Diagram



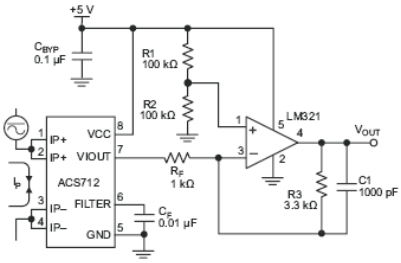
Terminal List Table

Number	Name	Description
1 and 2	IP+	Terminals for current being sensed; fused internally
3 and 4	IP–	Terminals for current being sensed; fused internally
5	GND	Signal ground terminal
6	FILTER	Terminal for external capacitor that sets bandwidth
7	VIOUT	Analog output signal
8	VCC	Device power supply terminal

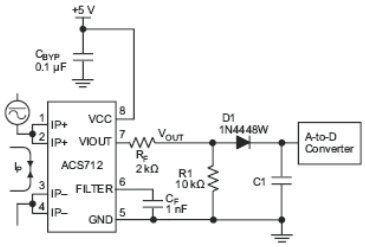
Typical Applications



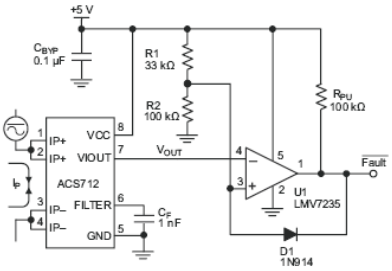
Application 2. Peak Detecting Circuit



Application 3. This configuration increases gain to 610 mV/A (tested using the ACS712ELC-05A).



Application 4. Rectified Output. 3.3 V scaling and rectification application for A-to-D converters. Replaces current transformer solutions with simpler ACS circuit. C1 is a function of the load resistance and filtering desired. R1 can be omitted if the full range is desired.



Application 5. 10 A Overcurrent Fault Latch. Fault threshold set by R1 and R2. This circuit latches an overcurrent fault and holds it until the 5 V rail is powered down.

LAMPIRAN - G

Datasheet KTY-10

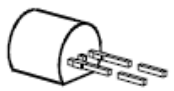
SIEMENS

Silicon Spreading Resistance Temperature Sensor in Leaded Plastic Package

KT 100
KTY 10

Features

- Temperature dependent Resistor with Positive Temperature Coefficient
- Small plastic package
- Fast response
- High reliability due to multilayer gold contacts
- n-conducting silicon crystal
- Polarity independent due to symmetrical construction
- Available selected in ± 1% tolerance groups



Modified TO-92

Electrical Characteristics

at T_A = 25 °C unless otherwise specified

Parameter	Symbol	Limit Values			Unit
		min.	typ.	max.	
Temperature sensor resistance IB = 1 mA	R_{25}				Ω
KT 100		1940	–	2060	
KTY 10-5		1950	–	1990	
KTY 10-6		1980	–	2020	
KTY 10-62		1990	–	2010	
KT 10-7		2010	–	2050	
Thermal time constant (63% of ΔT_A)					s
in still air	τ_{air}	–	40	–	
in still oil (Freon FC40/PP7)	τ_{oil}	–	4	–	

Type	Marking	Ordering Code	Pin Configuration		Package
			1	2	
KT 100	KT 100	Q62705-K331	electrical contact	electrical contact	Modified TO-92
KTY 10-5	KTY 10-5	Q62705-K110			
KTY 10-6	KTY 10-6	Q62705-K132			
KTY 10-62	KTY 10-62	Q62705-K71			
KTY 10-7	KTY 10-7	Q62705-K111			

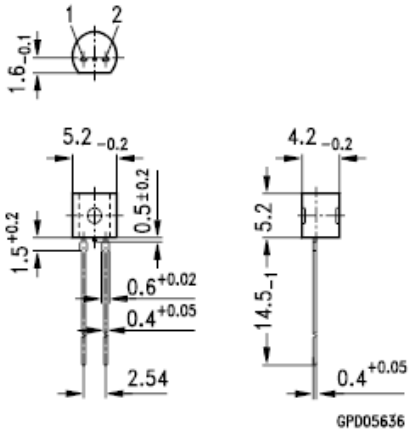
Absolute Maximum Ratings

Parameter	Symbol	Limit Values	Unit
Maximum operating voltage [1)] $T_A \leq 25$ °C, $t \leq 10$ ms	V_{opmax}	25	V
Maximum operating current	I_{opmax}	7	mA
Peak operating current $T_A \leq 25$ °C, $t \leq 10$ ms	I_{opp}	10	mA
Operating temperature range	T_{op}	– 50 … + 150	°C
Storage temperature range	T_{stg}	– 50 … + 150	°C

[1)] ESD Class 1. When the temperature sensor is operated with long supply leads, it should be protected through the parallel connection of a > 10 nF capacitor to prevent damage to the sensor through induced voltage peaks.

Package Outline

Modified TO-92



Weight approx. 0.25 g

Dimensions in mm