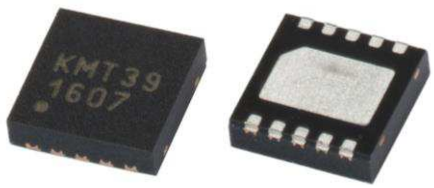


TDFN 10L 3.0 x 3.0

KMT39

Magnetic Angle Sensor

The KMT39 is a magnetic field sensor based on the anisotropic magneto resistance effect, i.e. it is sensing the **magnetic field direction** independently on the magnetic field strength for applied field strengths H>25 kA/m. The sensor contains two parallel supplied Wheatstone bridges, which enclose a sensitive angle of 45 degrees.

With reduced accuracy, the sensor KMT39 may be used with a field strength of H0 ≥ 15 kA/m (at room temperature). Most magnets show a decreasing field strength with temperature while the magnetic field direction is unchanged.

FEATURES

- Contactless angular position, ideal for harsh environments
- Design optimized for linearity
- Very high resolution
- High accuracy
- Low power consumption
- Self diagnosis feature
- Attractive small form factor
- User has complete control over signal evaluation
- Extended operating temperature range (-40 °C to +150 °C)
- REACH & RoHS compliant (lead free)

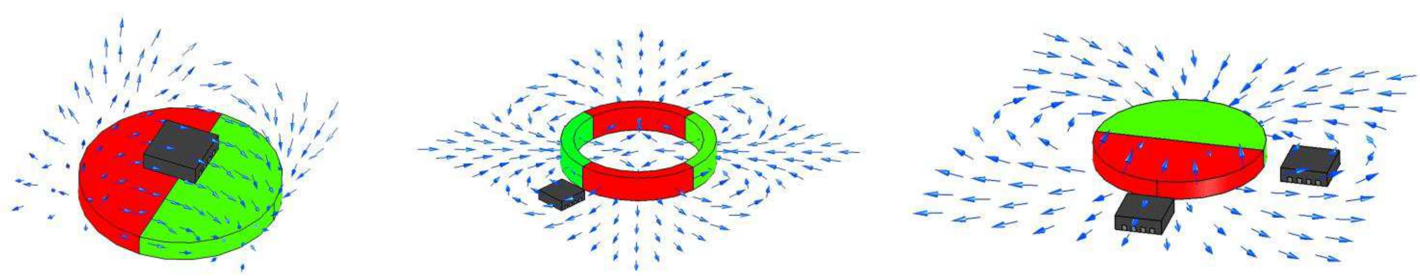
APPLICATIONS

- Absolute and incremental angle measurement in harsh environments
- Automotive applications (steering angle, steering torque, throttle, wiper, …)
- Position feedback in robotics
- Camera positioning
- Potentiometer replacement
- Position measurement in medical applications
- Motor motion control

SPECIFICATIONS

- **AMR sensor with 180° signal period**
- **high accuracy**
- **very high resolution**
- **for the use at moderate field strengths**
- **small TDFN package with wetable flanks**
- **ROHS & REACH compliant**

A rotating magnetic field in the surface parallel to the chip plane will therefore deliver two independent sinusoidal output signals, one following a cos(2α) and the second following a sin(2α) function, α being the angle between sensor and the magnetic field direction (see Figure 2).



CHARACTERISTIC VALUES

Parameter	Symbol	Condition	Min	Typ	Max	Unit
A. Operating Limits						
Max. supply voltage	$V_{CC,max}$				**10**	V
Max. current (single bridge)	$I_{CC,max}$				**6**	mA
Operating temperature	T_{op}		**-40**		**+150**	°C
Storage temperature	T_{st}		**-40**		**+150**	°C
B. Sensor Specifications (T=25 °C)						
Supply voltage	V_{CC}			**5**		V
Resistance (single bridge)	R_b	Condition A	**2500**	**3200**	**3800**	Ω
Output signal amplitude	V_{PEAK}	Condition A, B	**10**	**11.5**	**12.5**	mV/V
Offset voltage	V_{OFF}	Condition A, B	**-1**	**0**	**+1**	mV/V
Angular inaccuracy	$\Delta\alpha$	Condition A, B			**0.2**	deg
Angular hysteresis	$\Delta\alpha H$	Condition A, B			**0.15**	deg
C. Sensor Specifications						
TC of amplitude	TCSV	Condition A, C	**-0.40**	**-0.35**	**-0.30**	%/K
TC of resistance	TCBR	Condition A, C	**+0.3**	**+0.4**	**+0.5**	%/K
TC of offset	TCVoff	Condition A, C	**-2**	**0**	**+2**	µV/V/K

Stress above one or more of the limiting values may cause permanent damage to the device. Exposure to limiting values for extended periods may affect device reliability.

MEASUREMENT CONDITIONS

Parameter	Symbol	Unit	Condition
Condition A: Set Up Conditions			
Ambient temperature	T	°C	T = 25 °C (unless otherwise noted)
Supply voltage	V_{cc}	V	Vcc=5 V , Vcc1= Vcc2
Applied magnetic field	H	kA/m	H=25±1.25 kA/m, homogenous in chip plane

Condition B: Sensor Specifications (360° turn , Vo_{max}>0, Vo_{min}<0)			
Output signal amplitude	Vn/Vcc	mV/V	Vn/Vcc = (Vomax - Vomin)/2/Vcc; n=1, 2 The difference between maximum and minimum output signals is output signal range, or double signal amplitude. Alternatively, the amplitude can be obtained through circle regression (V1, V2)
Offset voltage	Voffn/Vcc	mV/V	Voff/Vcc =(Vomax + Vomin)/2/Vcc ; n=1, 2 Both offset values can be obtained through circle regression of both signals (V1, V2)
Angular inaccuracy	Δ□	deg	Δα=MAX|α0-α| The angular inaccuracy (unit: degrees) is defined as the maximum deviation from ideal sinusoidal characteristics, calculated from the third and fifth harmonics of the spectrum Vn/Vcc; offset voltage error contributions not included
Angular hysteresis	Δ□H	deg	ΔαH = MAX|αleft turn -αright turn| Hysteresis (unit: degrees) is defined as the average phase difference between the characteristic curve measured in a clockwise rotating field and the characteristic curve measured in a counterclockwise rotating field. In order to determine the average phase difference, sinusoidal curves are fitted to the characteristic voltage curves for both rotating directions, i.e. 4 curves in total. The maximum phase difference between the fitted curves of both bridges will be the hysteresis. To avoid disturbing effects due to the rotation reversal the field must be turned at least one revolution in the new direction before starting measurements.

MEASUREMENT CONDITIONS

Parameter	Symbol	Unit	Condition
Condition C: Sensor Specifications (-25°C, +125°C)			
Ambient temperatures	T	°C	T_1 = -25 °C, T_0 = +25 °C, T_2 = +125 °C
TC of amplitude	*TCSV*	%/K	The temperature coefficient of the amplitude is defined as the percentage change of the amplitude per K referred to the value at T_1 = -25°C: $TCV = \frac{1}{(T_2 - T_1)} \cdot \frac{\frac{V_n}{V_{cc}}(T_2) - \frac{V_n}{V_{cc}}(T_1)}{\frac{V_n}{V_{cc}}(T_1)} \cdot 100\%$
TC of resistance	*TCBR*	%/K	The temperature coefficient of resistance is defined as the percentage change of the resistance per K referred to the value at T_1 = -25 °C: $TCR = \frac{1}{(T_2 - T_1)} \cdot \frac{R(T_2) - R(T_1)}{R(T_1)} \cdot 100\%$
TC of offset	*TCVoff*	(µV/V)/K	The temperature coefficient of the offset voltage is defined as the voltage change per K expressed in µV/V: $TCVoff = \frac{Voff_n(T_2) - Voff_n(T_1)}{(T_2 - T_1)}$

BLOCK DIAGRAM

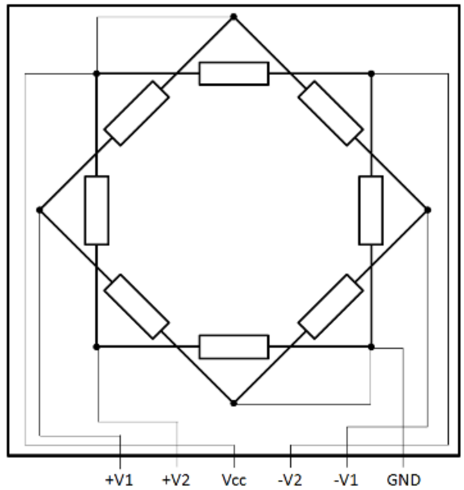
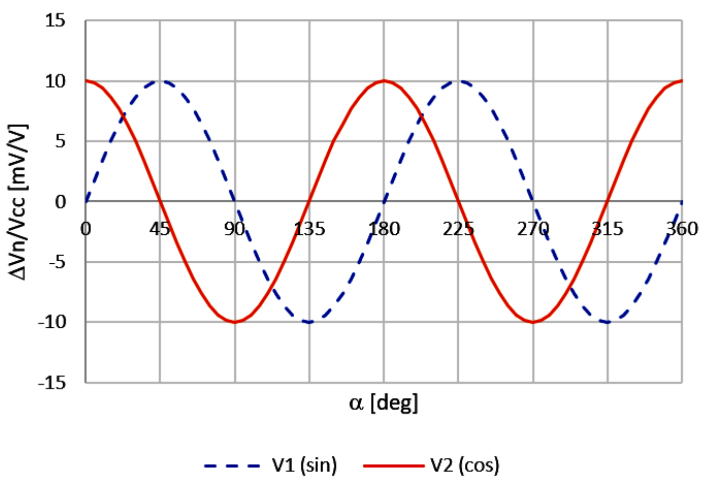


Figure 1: Circuit Diagram

TYPICAL PERFORMANCE CURVES



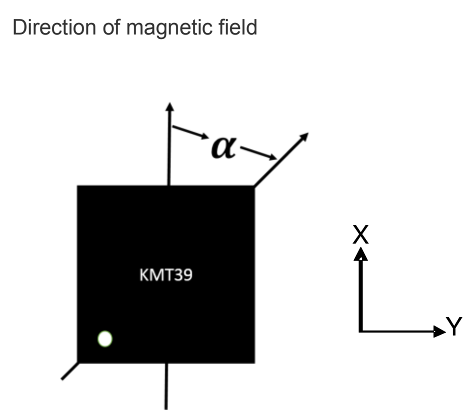
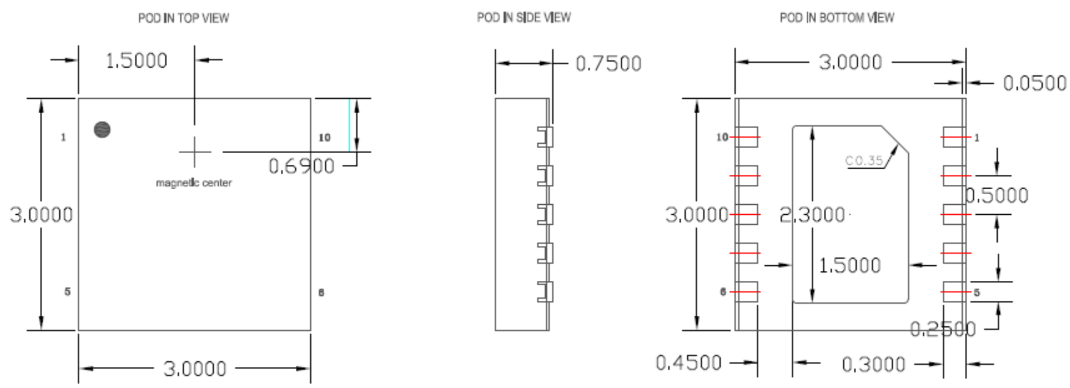


Figure 2: Characteristic curves for KMT39 (TDFN)

PACKAGES

TDFN 3.0 X 3.0 X 0.75 MM³



unit: mm

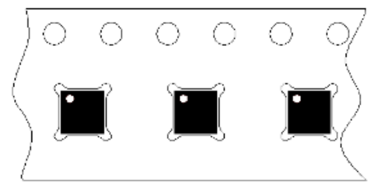
PIN ASSIGNMENT (TDFN)

Pin (TDFN)	Symbol	Function
1	V_{cc}	positive supply voltage
2	$+V_{o1}$	positive output bridge 1
3	$+V_{o2}$	positive output bridge 2
4	N/C	
5	N/C	
6	N/C	
7	N/C	
8	$-V_{o2}$	negative output bridge 2
9	GND	negative supply voltage
10	$-V_{o1}$	negative output bridge 1

SOLDER PROFILE

Recommended solder reflow process according to IPC/JEDEC J-STD-020D (Pb-Free Process)

TAPE AND REEL PACKAGING INFORMATION

Description	Reel size	Units/reel	Pin 1 orientation	Note
KMT39	13”	3,000	Top-left of sprocket hole side	

ORDERING INFORMATION

Device	Package	MOQ	Part Number
KMT39	TDFN 10L 3.0 x 3.0 x 0.75	1 reel	**G-MRCO-048**

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