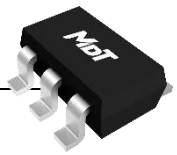
MULTI DIMENSION™
Sensing the Future

TMR2108/2109/2110/2111



TMR Linear Sensor

RoHS COMPLIANT

DESCRIPTION

TMR2108/2109/2110/2111 series TMR linear sensor adopts a unique push-pull Wheatstone full bridge structure utilizing four TMR sensor elements. This Wheatstone full bridge provides differential voltage output when the applied magnetic field changes parallel to the sensor's sensitive direction. This TMR2108/2109/2110/2111 series magnetic linear sensor are available in SOT23-5 package with compact size and easy to weld.

FEATURES AND BENEFITS

- Tunneling magnetoresistance (TMR) technology
- Non-Linearity ±0.5%
- Large dynamic range
  - TMR2108: ±500Gs
  - TMR2109: ±250Gs
  - TMR2110: ±100Gs
  - TMR2111: ±40Gs
- Wide range supply voltages: 0.5 V~7 V
- Low hysteresis
- High frequency response: >500 kHz
- Compact package size: SOT23-5
- Operating ambient temperature: -40°C~125°C

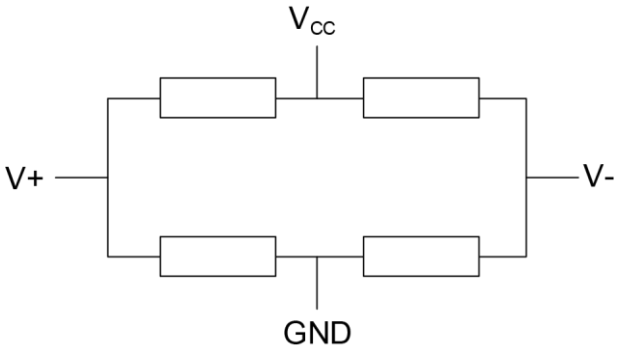
APPLICATIONS

- Magnetometer
- Current sensor
- Position sensor
- Rotation sensor
- Magnetic navigation

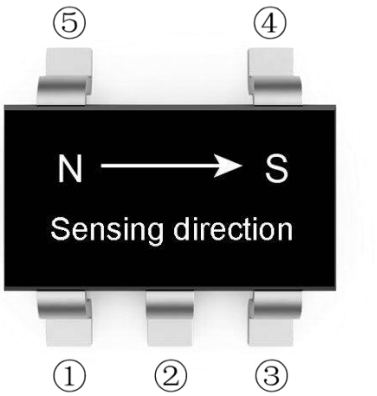
SELECTION GUIDE

Part Number	Dynamic Range (Gs)	Typical Sensitivity (mV/V/Gs)	Chip Package Type	Packaging Form
TMR2108	±500	0.08	SOT23-5	Tape & Reel
TMR2109	±250	0.14	SOT23-5	Tape & Reel
TMR2110	±100	0.25	SOT23-5	Tape & Reel
TMR2111	±40	0.65	SOT23-5	Tape & Reel

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION AND SENSING DIRECTION



Number	Name	Function
1	V_{CC}	Power supply
2	GND	Ground
3	N/A	Not internally connected
4	V_-	Analog differential output 2
5	V_+	Analog differential output 1

ABSOLUTE MAXIMUM RATINGS

Parameters	Symbol	Min.	Max.	Unit
Supply voltage	V_{CC}	-7	7	V
External magnetic field	H_{MAX}	-	4000	Gs
ESD performance (HBM)	V_{ESD}	-	4000	V
Operating ambient temperature	T_A	-40	125	°C
Storage ambient temperature	T_{STG}	-50	150	°C

SPECIFICATIONS of TMR2108

T_A = 25 °C, V_{CC} = 3.0 V, unless otherwise specified

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	operating	0.5	-	7	V
Resistance (1)	R_B	H=0 Gs	800	-	4000	Ω
Sensitivity	S	H in ±500 Gs	-	0.08	-	mV/V/Gs
Saturation magnetic field	H_{SAT}		-	±1600	-	Gs
Nonlinearity	NONL	H in ±500 Gs	-	0.5	-	%FS
Offset	V_{OFFSET}		-8	-	8	mV/V
Hysteresis (2)	Hys	H in ±500 Gs	-	1	-	Gs
Response frequency max. (3)	F_{MAX}		500	-	-	kHz
Bridge ohmic temperature coefficient (4)	TCR_B	H=0 Gs	-	-0.035	-	%/°C
Sensitivity temperature coefficient (5)	TCS		-	0.47	-	%/°C
Bridge offset temperature coefficient (6)	TCV_{OFFSET}		-	2	-	μV/V/°C

(1) Bridge resistance: resistance between V_{CC} and GND, or resistance between V+ and V-.

(2) Hysteresis is ascertained by the maximum difference in magnetic field corresponding to the same output voltage in the interval when magnetic field ramped from -500 Gs to +500 Gs and back to -500 Gs.

(3) Minimum response frequency is DC (0 Hz).

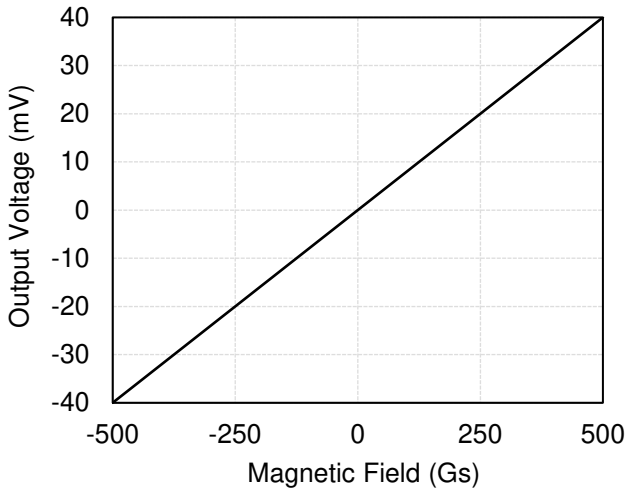
(4) $TCR_B = 100 \times \frac{R_{B\,(T2)} - R_{B\,(T1)}}{R_{B\,(T1)} \times (T2-T1)}$, T1= -25°C, T2=125°C

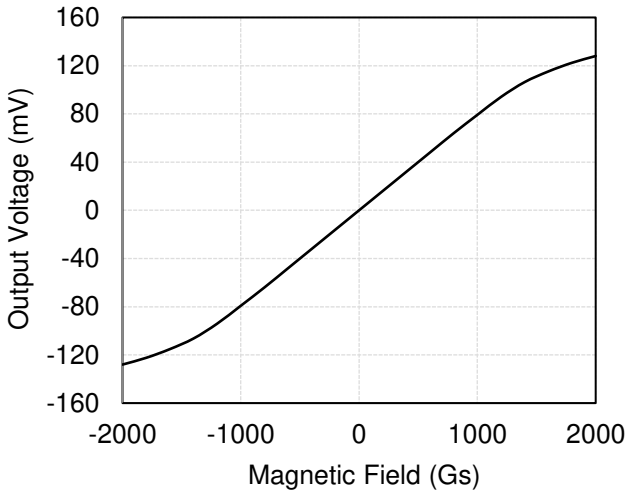
(5) $TCS = 100 \times \frac{S_{(T2)} - S_{(T1)}}{S_{(T1)} \times (T2-T1)}$, T1= -25°C, T2=125°C

(6) $TCV_{OFFSET} = \frac{V_{OFFSET\,(T2)} - V_{OFFSET\,(T1)}}{T2-T1}$, T1= -25°C, T2=125°C

TYPICAL TRANSFER CURVE of TMR2108

T_A = 25 °C, V_{CC} = 1.0 V





SPECIFICATIONS of TMR2109

T_A = 25 °C, V_{CC} = 3.0 V, unless otherwise specified

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	operating	0.5	-	7	V
Resistance (1)	R_B	H=0 Gs	800	-	4000	Ω
Sensitivity	S	H in ±250 Gs	-	0.14	-	mV/V/Gs
Saturation magnetic field	H_{SAT}		-	±1000	-	Gs
Nonlinearity	NONL	H in ±250 Gs	-	0.5	-	%FS
Offset	V_{OFFSET}		-8	-	8	mV/V
Hysteresis (2)	Hys	H in ±250 Gs	-	0.5	-	Gs
Response frequency max. (3)	F_{MAX}		500	-	-	kHz
Bridge ohmic temperature coefficient (4)	TCR_B	H=0 Gs	-	-0.007	-	%/°C
Sensitivity temperature coefficient (5)	TCS		-	0.15	-	%/°C
Bridge offset temperature coefficient (6)	TCV_{OFFSET}		-	6	-	μV/V/°C

(1) Bridge resistance: resistance between V_{CC} and GND, or resistance between V+ and V-.

(2) Hysteresis is ascertained by the maximum difference in magnetic field corresponding to the same output voltage in the interval when magnetic field ramped from -250 Gs to +250 Gs and back to -250 Gs.

(3) Minimum response frequency is DC (0 Hz).

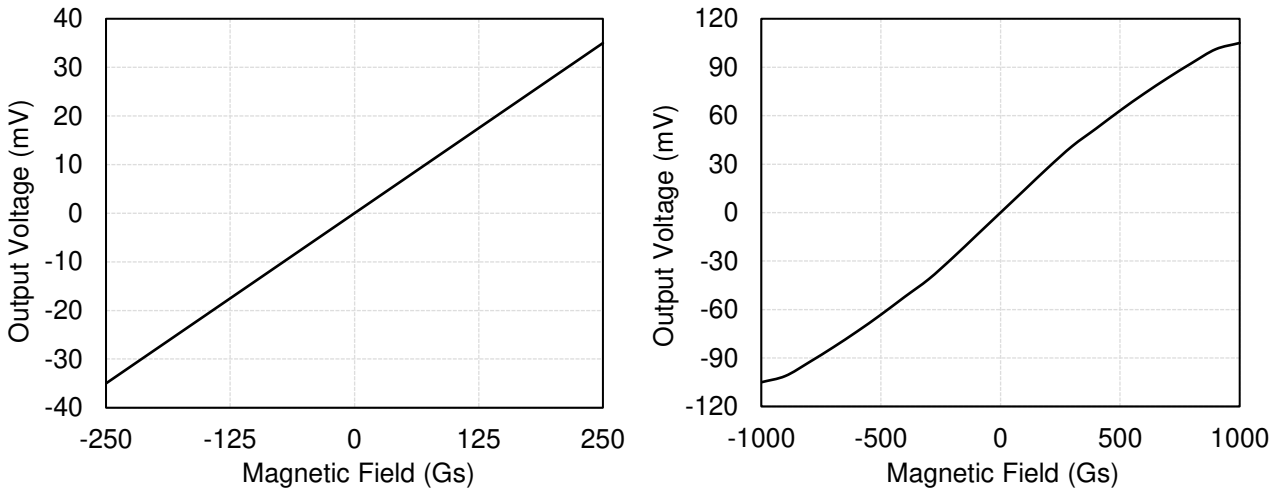
(4) $TCR_B = 100 \times \frac{R_{B\,(T2)} - R_{B\,(T1)}}{R_{B\,(T1)} \times (T2-T1)}$, T1= -25°C, T2=125°C

(5) $TCS = 100 \times \frac{S_{(T2)} - S_{(T1)}}{S_{(T1)} \times (T2-T1)}$, T1= -25°C, T2=125°C

(6) $TCV_{OFFSET} = \frac{V_{OFFSET\,(T2)} - V_{OFFSET\,(T1)}}{T2-T1}$, T1= -25°C, T2=125°C

TYPICAL TRANSFER CURVE of TMR2109

T_A = 25 °C, V_{CC} = 1.0 V



SPECIFICATIONS of TMR2110

T_A = 25 °C, V_{CC} = 3.0 V, unless otherwise specified

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	operating	0.5	-	7	V
Resistance (1)	R_B	H=0 Gs	800	-	4000	Ω
Sensitivity	S	H in ±100 Gs	-	0.25	-	mV/V/Gs
Saturation magnetic field	H_{SAT}		-	±500	-	Gs
Nonlinearity	NONL	H in ±100 Gs	-	0.5	-	%FS
Offset	V_{OFFSET}		-8	-	8	mV/V
Hysteresis (2)	Hys	H in ±100 Gs	-	0.1	-	Gs
Response frequency max. (3)	F_{MAX}		500	-	-	kHz
Bridge ohmic temperature coefficient (4)	TCR_B	H=0 Gs	-	-0.0056	-	%/°C
Sensitivity temperature coefficient (5)	TCS		-	0.3	-	%/°C
Bridge offset temperature coefficient (6)	TCV_{OFFSET}		-	4	-	μV/V/°C

(1) Bridge resistance: resistance between V_{CC} and GND, or resistance between V+ and V-.

(2) Hysteresis is ascertained by the maximum difference in magnetic field corresponding to the same output voltage in the interval when magnetic field ramped from -100 Gs to +100 Gs and back to -100 Gs.

(3) Minimum response frequency is DC (0 Hz).

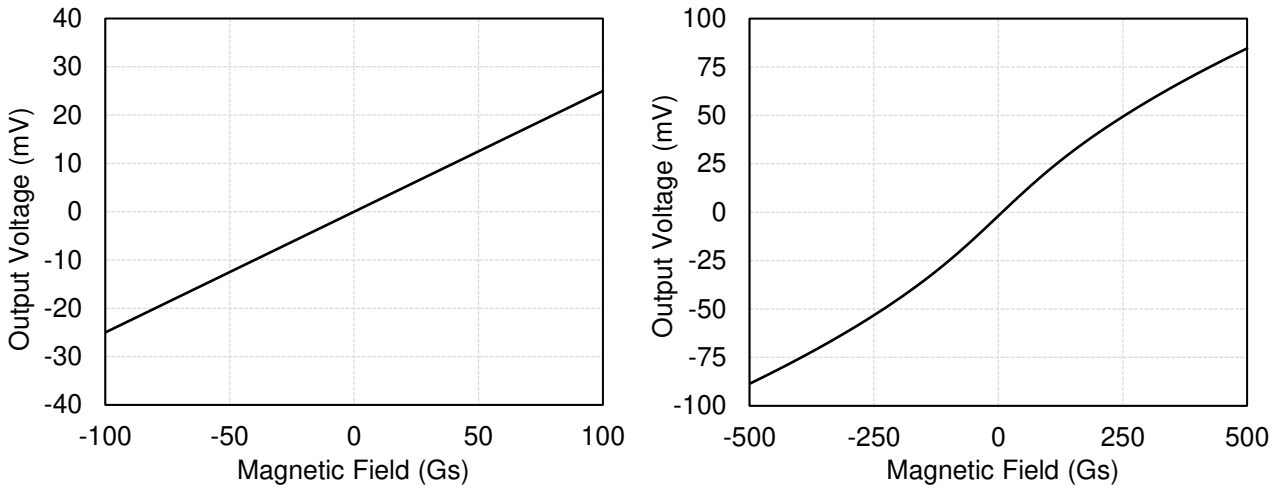
(4) $TCR_B = 100 \times \frac{R_{B\,(T2)} - R_{B\,(T1)}}{R_{B\,(T1)} \times (T2-T1)}$, T1= -25°C, T2=125°C

(5) $TCS = 100 \times \frac{S_{(T2)} - S_{(T1)}}{S_{(T1)} \times (T2-T1)}$, T1= -25°C, T2=125°C

(6) $TCV_{OFFSET} = \frac{V_{OFFSET\,(T2)} - V_{OFFSET\,(T1)}}{T2-T1}$, T1= -25°C, T2=125°C

TYPICAL TRANSFER CURVE of TMR2110

T_A = 25 °C, V_{CC} = 1.0 V



SPECIFICATIONS of TMR2111

T_A = 25 °C, V_{CC} = 3.0 V, unless otherwise specified

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply voltage	V_{CC}	operating	0.5	-	7	V
Resistance (1)	R_B	H=0 Gs	800	-	4000	Ω
Sensitivity	S	H in ±40 Gs	-	0.65	-	mV/V/Gs
Saturation magnetic field	H_{SAT}		-	±200	-	Gs
Nonlinearity	NONL	H in ±40 Gs	-	0.5	-	%FS
Offset	V_{OFFSET}		-8	-	8	mV/V
Hysteresis (2)	Hys	H in ±40 Gs	-	0.2	-	Gs
Response frequency Max. (3)	F_{MAX}		500	-	-	kHz
Bridge ohmic temperature coefficient (4)	TCR_B	H=0 Gs	-	-0.015	-	%/°C
Sensitivity temperature coefficient (5)	TCS		-	0.67	-	%/°C
Bridge offset temperature coefficient (6)	TCV_{OFFSET}		-	5	-	μV/V/°C

(1) Bridge resistance: resistance between V_{CC} and GND, or resistance between V+ and V-.

(2) Hysteresis is ascertained by the maximum difference in magnetic field corresponding to the same output voltage in the interval when magnetic field ramped from -40 Gs to +40 Gs and back to -40 Gs.

(3) Minimum response frequency is DC (0 Hz).

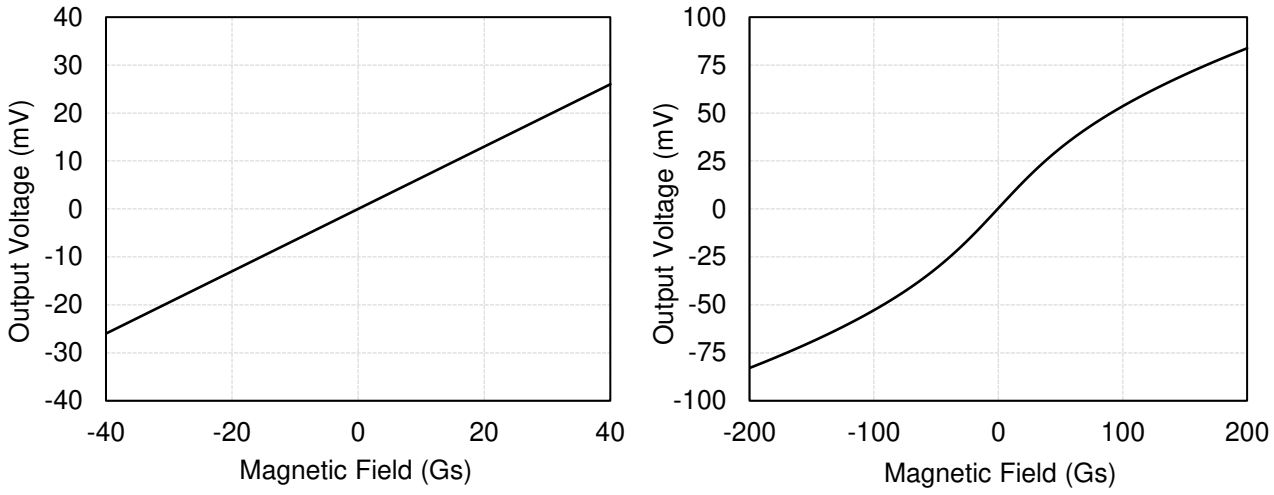
(4) $TCR_B = 100 \times \frac{R_{B\,(T2)} - R_{B\,(T1)}}{R_{B\,(T1)} \times (T2\text{-}T1)}$, T1= -25°C, T2=125°C

(5) $TCS = 100 \times \frac{S_{(T2)} - S_{(T1)}}{S_{(T1)} \times (T2\text{-}T1)}$, T1= -25°C, T2=125°C

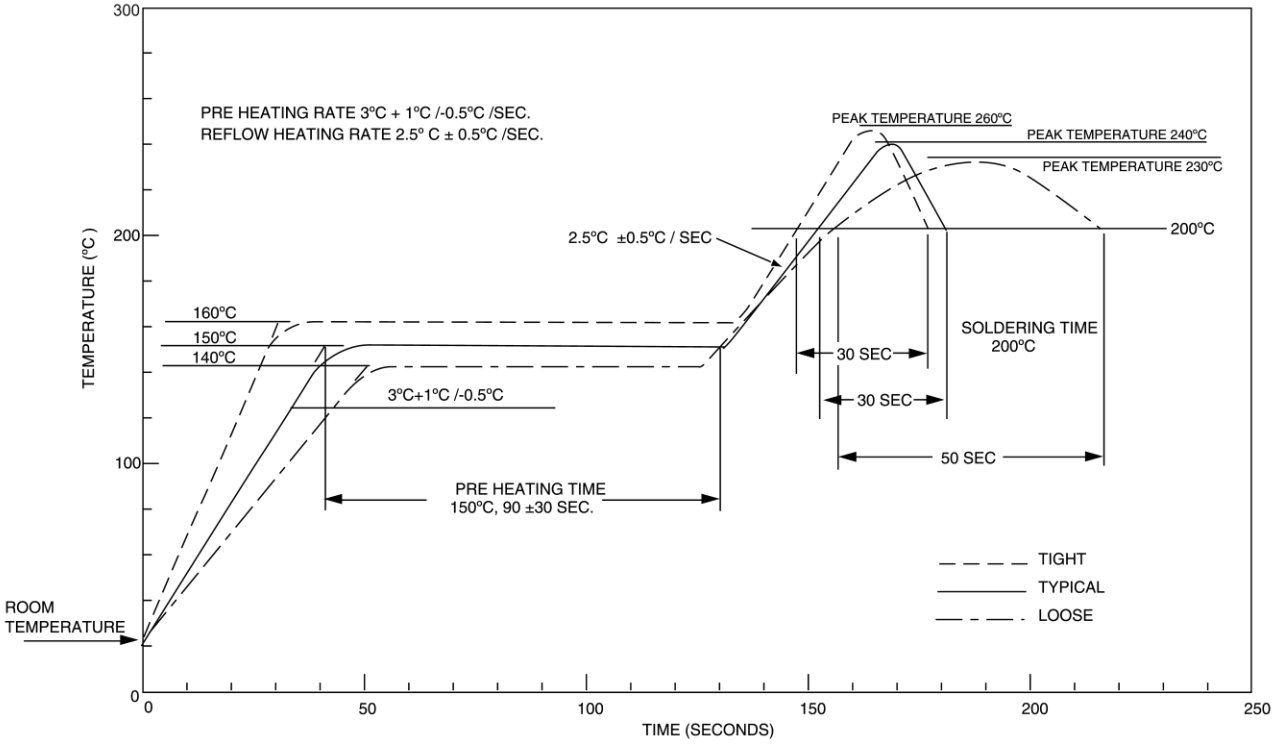
(6) $TCV_{OFFSET} = \frac{V_{OFFSET\,(T2)} - V_{OFFSET\,(T1)}}{T2\text{-}T1}$, T1= -25°C, T2=125°C

TYPICAL TRANSFER CURVE of TMR2111

T_A = 25 °C, V_{CC} = 1.0 V



SOLDERING INFORMATION



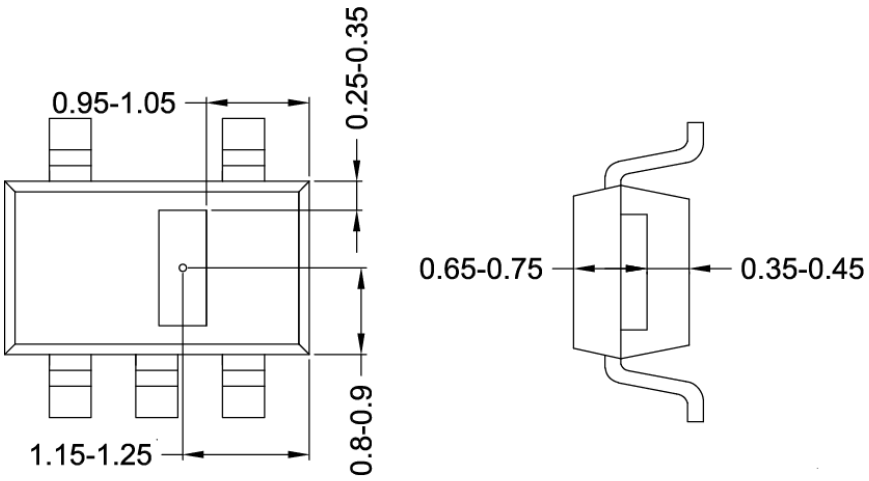
Reflow Soldering Curve

Lead-free soldering is recommended. The peak temperature in the figure of reflow soldering curve can be reduced to 230 °C for leaded soldering. It can cause sensor performance decay or permanent damage, if the peak temperature exceeds 265°C or exceeds the time defined by the reflow curve in the figure above.

RECYCLING

The product(s) in this document need to be handed over to a qualified solid waste management services company for recycling in accordance with relevant regulations on waste classification after the end of the product(s) life.

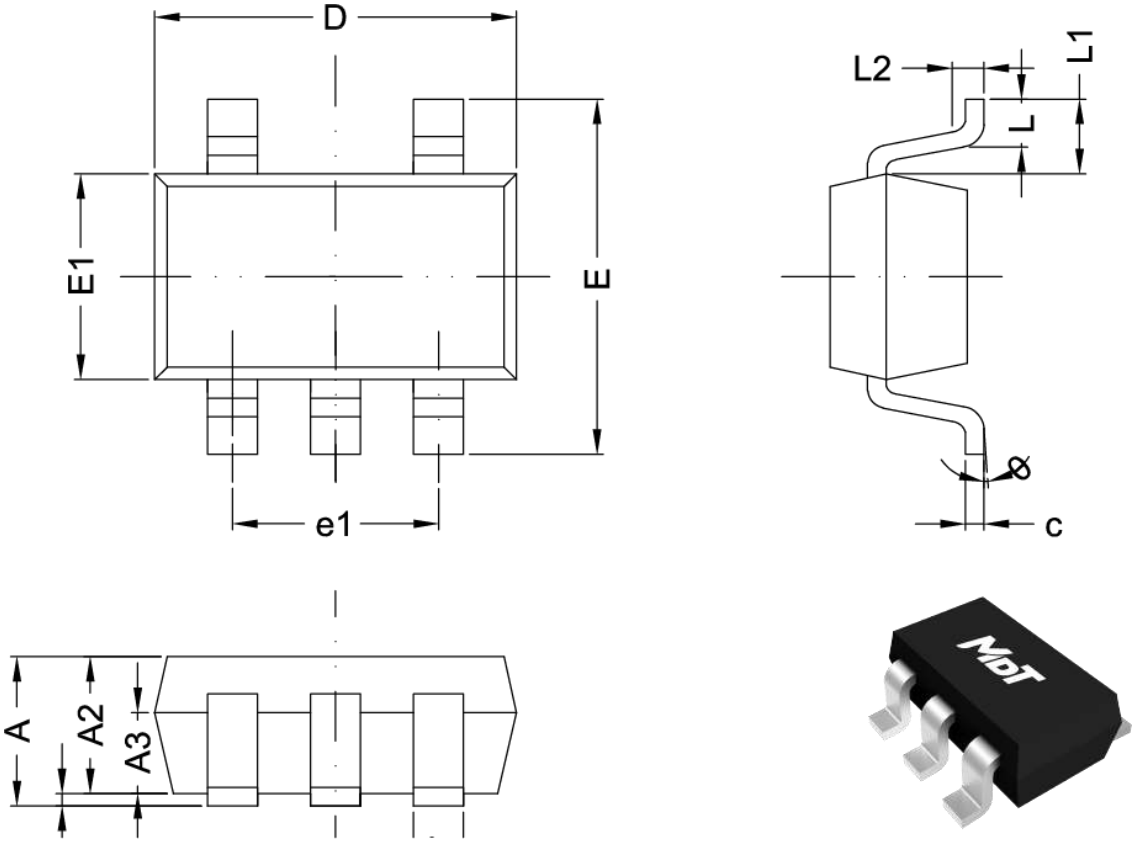
ACTIVE AREA POSITIONING



Top and side view of SOT23-5L (unit: mm)

DIMENSIONS

SOT23-5 package drawing



Symbol	Dimension (mm)			Dimension (inch)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	-	-	1.45	-	-	0.057
A1	0.00	-	0.15	0.000	-	0.006
A2	0.90	1.10	1.30	0.035	0.043	0.051
A3	0.60	0.65	0.70	0.024	0.026	0.028
b	0.35	-	0.49	0.014	-	0.019
c	0.12	-	0.19	0.005	-	0.007
D	2.85	2.95	3.05	0.112	0.116	0.120
E	2.60	2.80	3.00	0.102	0.110	0.118
E1	1.55	1.65	1.75	0.061	0.065	0.069
e	0.85	0.95	1.05	0.033	0.037	0.041
e1	1.80	1.90	2.00	0.071	0.075	0.079
L	0.35	0.45	0.60	0.014	0.018	0.024
L1	0.59 REF			0.023 REF		
L2	0.25 BSC			0.010 BSC		
θ	0°	-	8°	0°	-	8°

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MultiDimension Technology Co., Ltd.
No.2 Guangdong Road, Zhangjiagang Free Trade Zone
Jiangsu, 215634, China
www.dowaytech.com/en
info@dowaytech.com