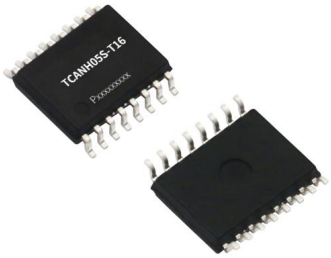
Descriptions

SOIC-16 package isolated CAN Transceiver



RoHS

Features

- Ultra-small, ultra-thin, chip scale SOIC package
- Compliant with ISO11898-2 standard
- Integrated efficient Isolated power supply
- I/O power supply range supports 4.5V to 5.5V
- High isolation up to 5000 Vrms
- Bus-Pin ESD protection up to 8kV(HBM)
- Baud rate up to 5Mbps
- -58V to 58V bus fault protection
- High CMTI: 180 kV/μs (typical)
- TXD dominant time-out function
- Nanosecond level communication delay
- The bus supports maximum 110 nodes
- Industrial operating ambient temperature range: -40℃ to +125℃

Applications

- Industrial automation, control, sensors and drive systems
- Building and greenhouse environmental control(HVAC) automation
- Security systems
- Transport
- Medical treatment
- Telecommunications
- CAN Bus standard such as CAN open, Device Net, NMEA2000, ARNIC825, ISO11783, CAN Kingdom, CAN aerospace

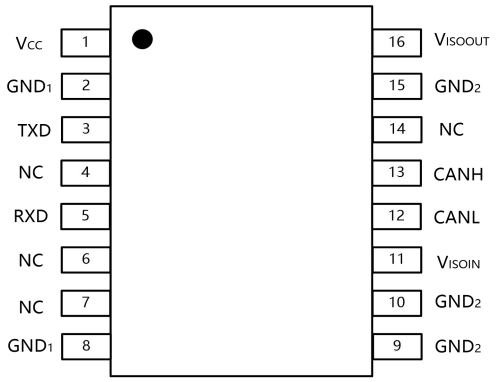
Functional Description

TCANH05S-T16 is an isolated CAN bus transceiver compliant with ISO 11898-2. It integrates a built-in 5V isolated power supply. The device provides differential transmit & receive functions between CAN protocol controller and physical bus interface, supporting data rates up to 5 Mbps. Equipped with -58 V ~ +58 V overvoltage protection and thermal shutdown protection, it is well-suited for applications in harsh environments.

Contents

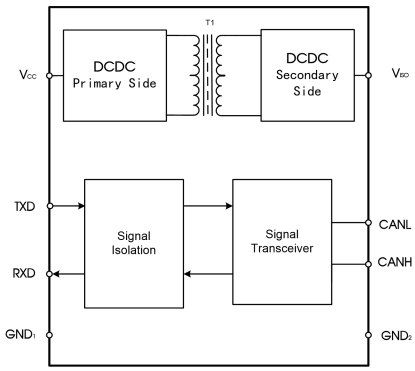
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Pin Connection



Note: Pin2 and Pin8 GND1 are internally connected;
Pin15 and Pin9&10 GND2 are internally connected;

Internal Block Diagram



Function Table

Letter	Description
H	High-Level
L	Low-Level
X	Unrelated
Z	High Impedance

Table 1. Driver Function table

Input	Output		Bus State
TXD	CANH	CANL	
L	H	L	Dominant
H（Or No Connection）	Z	Z	Recessive

Table 2. Receiver Function table

V_{ID}=CANH-CANL	RXD	Bus State
V_{ID}≥0.9V	L	Dominant
0.5< V_{ID}<0.9V	Uncertainty	Uncertainty
V_{ID}≤0.5V	H	Recessive
Open	H	Recessive

Pin Descriptions

Pin Number	Pin Name	Pin Functions
1	V_{CC}	Place 0.1 μF & 10 μF ceramic capacitors close to this pin and connect to GND_1.
2	GND_1	Ground(Logic side)
3	TXD	Driver input pin
4	NC	No connect
5	RXD	Receiver output pin.
6	NC	No connect
7	NC	No connect
8	GND_1	Ground(Logic side). The pin needs to be connected to pin2 in application.
9	GND_2	Ground (Bus side). The pin needs to be connected to pin15 in application.
10	GND_2	Ground (Bus side). The pin needs to be connected to pin15 in application.
11	V_{ISOIN}	Isolated power input. The pin needs to be connected to pin16 in application.
12	CANL	CANL pin
13	CANH	CANH pin
14	NC	No connect
15	GND_2	Ground (Bus side)
16	V_{ISOOUT}	Isolated power output.Place 0.1 μF & 10 μF ceramic capacitors close to this pin and connect to GND_2. The pin needs to be connected to pin11 in application.

Absolute Maximum Ratings

Parameters	Unit
Supply voltage, Vcc	-0.5V to +6V
Logic-side input voltage Vin	-0.5V to V_{CC}+0.5V
Bus-side voltage (CANH, CANL)	-58 to 58V
Output current I_O	-10mA to +10mA
Junction temperature T_J	< 150℃
Operating temperature range	-40℃ to +125℃
Storage temperature range	-65℃ to +150℃

Important:

①General test conditions: Free-air, normal operating temperature range (Unless otherwise specified);

②Exposure to absolute maximum rated conditions for an extended period may severely affect the device reliability, and stress levels exceeding the "Absolute Maximum Ratings"

may result in permanent damage. All voltage values are based on the reference ground(GND) maximum voltage not exceeding 6V.

Recommended Operating Conditions

Parameters		Min.	Typ.	Max.	Unit
V_{CC}	Power supply	4.5	5	5.5	V
V_I or V_{IC}	Bus input pin withstand voltage (differential mode)	-30	--	30	
V_{IH}	TXD High level input voltage	2	--	Vcc+0.3	
V_{IL}	TXD low level input voltage	-0.3	--	0.8	
T_A	Operating temperature range	-40	--	125	℃
T_J	Junction temperature T_J	--	--	150	
$T_{J(shutdown)}$	Thermal shutdown temperature	--	165	--	
	Signaling rate	--	--	5	Mbps

Electrical Characteristics

Parameters		Conditions	Min.	Typ.	Max.	Unit
Driver						
$\|V_{O(D)}\|$	Dominant CANH output voltage	Figure 1, V_{TXD} = 0 V, RL = 60 Ω	2.75	3.5	4.5	V
	Dominant CANL output voltage		0.5	--	2	
$V_{O(R)}$	Recessive bus voltage	V_{TXD} = 2 V, No load	2	2.5	3	
$V_{OD(D)}$	Differential output voltage	Figure 1, V_{TXD} = 0 V, R_L = 60Ω	1.5	--	3	
$V_{OD(R)}$	Recessive differential output voltage	R_L=60Ω	-0.05	--	0.05	
I_{IH}	TXD High-level input current	V_{TXD} =2 V	--	--	20	uA
I_{IL}	TXD Low-level input current	V_{TXD} =0.8 V	-20	--	--	
CMTI	Common Mode Transient Immunity	V_I = 0V or V_I =V_{CC}	--	180	--	kV/us
Receiver						
V_{IT+}	Positive input threshold voltage		--	--	900	mV
V_{IT-}	Negative input threshold voltage		500	--	--	
V_{hys}	Hysteresis voltage (V_{IT+} - V_{IT-})		--	120	--	
V_{OH}	High-level output voltage	Figure 2; I_{OH} = -4 mA	V_{CC} - 0.4	4.8	--	V
V_{OL}	Low-level output voltage	Figure 2; I_{OL} = 4 mA	0	0.2	0.4	
R_{IN}	Input resistance (CANH or CANL)	V_{TXD} = 3 V	50	--	80	kΩ
Supply and Protection						
V_{ISO}	Isolated power output voltage	No load, I_{ISO}=0mA	4.8	5.06	5.3	V
I_{VCC}	Supply Current(Logic side)	V_I = 0 V,R_L = 60 Ω, enter active mode protection	--	75	120	mA
		V_I = V_{CC}, passive mode	--	23	30	
ESD	HBM Mode	CANH, CANL pin to GND	--	--	±8	kV
	Contact discharge Mode	CANH, CANL	--	--	±4	
Insulation characteristics						
V_{I-O}	Isolated voltage	Input-Output, Leakage current<1mA	--	--	5000	Vrms

		Rise time 3s, Fall time 1s $V_{TEST}=V_{ISO}$, t=60s, $V_{TEST}=1.2 \times V_{ISO}$, t=1s(100% production test)				
R_{I-O}	Insulation resistance		1	--	--	GΩ
Note: General test conditions and VCC=VISO= 5V, Ta = 25℃ (unless otherwise specified).						

Transmission Characteristics

Parameters		Conditions	Min.	Typ.	Max.	Unit
t_{onTxD}	Propagation delay, TXD On to bus active	Figure 3 R_L = 60 Ω, C_L = 100 pF	--	75	100	ns
t_{offTxD}	Propagation delay ,TXD Off to bus inactive		--	100	120	
t_r	Differential output signal rise time		--	70	--	
t_f	Differential output signal fall time		--	70	--	
t_{onRxD}	Propagation delay,RXD On to receiver active		--	70	100	
t_{offRxD}	Propagation delay, RXD Off to receiver inactive		--	75	140	
t_r	Output signal rise time		--	3	6	
t_f	Output signal fall time		--	3	6	
T_{loop}	loop delay		--	120	200	
t_{TXD_DTO}	Dominant time-out	C_L=100 pF	0.3	--	3	ms
Note: General test conditions and VCC=VISO= 5V, Ta = 25℃ (unless otherwise specified).						

Physical Specifications

Parameters	Value	Unit
Weight	0.4(Typ.)	g

Test Circuits

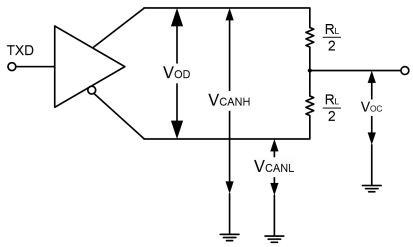


Figure 1. Driver test circuit

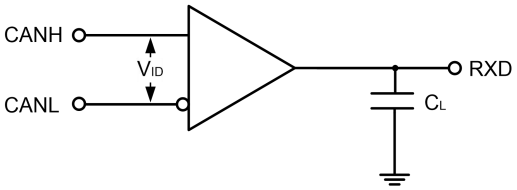


Figure 2. Receiver test circuit

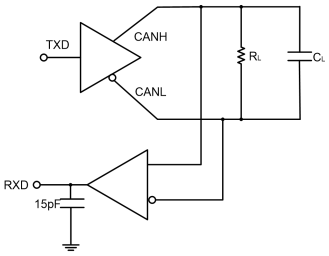


Figure 3. Switching characteristics test circuit

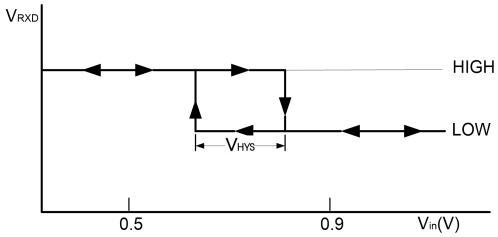


Figure 4. Receiver input hysteresis

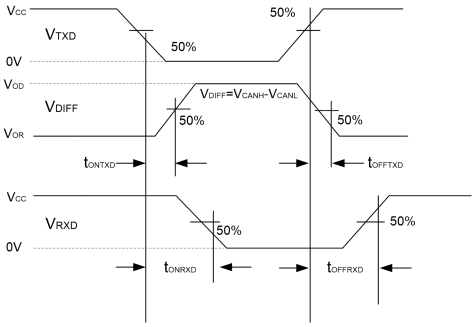


Figure 5. Drive and receiver propagation delay

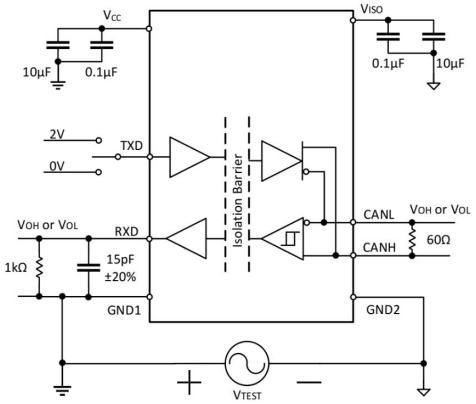


Figure 6.CMTI Test Circuit

Detailed Description

TCANH05S-T16 is an isolated CAN bus transceiver compliant with ISO 11898-2. It integrates a built-in 5V isolated power supply.

Short-circuit protection: TCANH05S-T16 has current-limiting protection to prevent the drive circuit from short-circuiting to positive and negative supply voltages. The power dissipation increases when a short circuit occurs. The short-circuit protection function protects the driver stage from damage.

Over-temperature protection: TCANH05S-T16 has over-temperature protection. When the junction temperature exceeds 150°C, the current in the driver stage will decrease. Because the drive tube is the primary energy consuming component, current reduction can reduce power consumption and reduce chip temperature. At the same time, the rest of the chip remains functional.

Dominant time-out function: TCANH05S-T16 has dominant time-out function to prevent if the pin TXD is forced to a permanent low level due to a hardware or software application failure, the built-in TXD dominant timeout timer circuit prevents the bus line from being driven to a permanent dominant state (blocking all network traffic). The timer is triggered by the negative edge on pin TXD.

If the low level on pin TXD lasts longer than the internal timer value (t_{TXD_OTD}), the transmitter will be disabled and the drive bus will enter a recessive state. The timer is reset by the positive edge on pin TXD.

Application Circuit

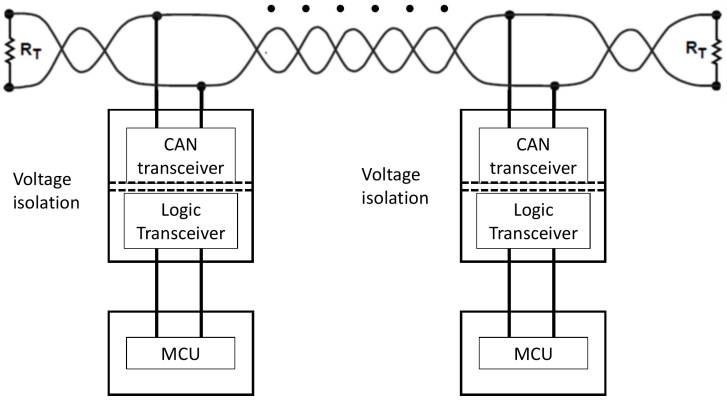


Figure 7. Typical application circuit

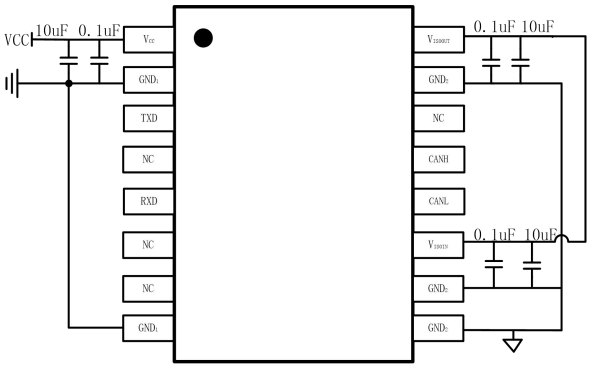


Figure 8. Typical Application of PCB layout

PCB Design Instructions

1. The decoupling capacitors (0.1uF)and energy storage capacitor(10uF) of VCC and GND_1, V_{ISO} and GND_2 should be placed as close as possible to the chip pins to reduce loop area and parasitic inductance of PCB traces. General control should be 2mm. The decoupling capacitor is placed close the chip, and the energy storage capacitor is placed outside. As shown in Figure 8-1.



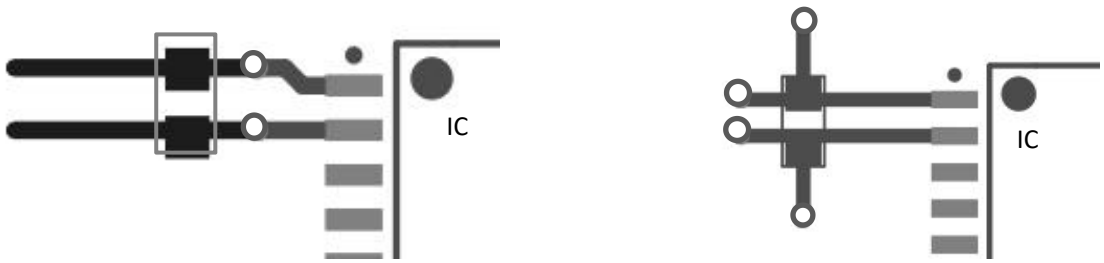
Not Recommended

Recommended

Figure 8-1

2. The power line width should be designed at least 0.5mm when wiring.

3. When it is necessary to place vias in the power supply line and the ground wire, the position of the vias should be placed on the outside of the capacitor relative to the chip pins, rather than between the capacitor and the chip,as shown in figure 8-2 to avoid the effect of parasitic inductance brought by vias.



Not Recommended　　Recommended

Figure 8-2

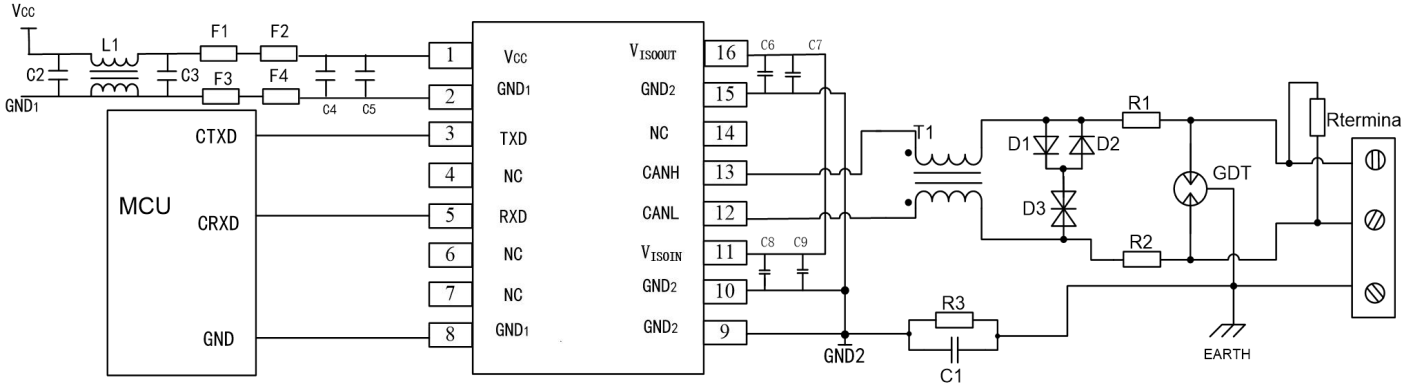


Figure 9. Port protection circuit for harsh environments

Recommended components and values:

Component	Recommended part, value	Component	Recommended part, value
R3	1MΩ	D1、D2	1N4007
C1	1nF, 2kV	D3	SMBJ30CA
T1	ACM2520-301-2P	$R_{terminal}$	120Ω
GDT	B3D090L	R1、R2	2.7Ω/2W
C2,C3	10uF/16V (SMD ceramic capacitor)	C5.C6	0.1uF/16V
C4,C7（Must add）	10uF/16V (SMD ceramic capacitor)	L1	EFL2D-0.5-080
F1,F2,F3,F4	BA0805-102T		

To improve the system's EMI performance, you can add common-mode inductors and beads at the VCC-GND front end of the module.

When the module is used in applications with harsh environment, it can be susceptible to large energy like lightning strike, etc. in which case, it is essential to add an adequate protection circuit to the CAN signal ports to protect the system from failure and maintain a reliable bus communication. Figure 9 provides a recommended protection circuit design for high-energy lightning surges, with a degree of protection related to the selected protection device. Parameter description lists a set of recommended circuit parameters, which can be adjusted according to the actual application situation. Also, when using the shielded cable, the reliable single-point grounding of the shield must be achieved.

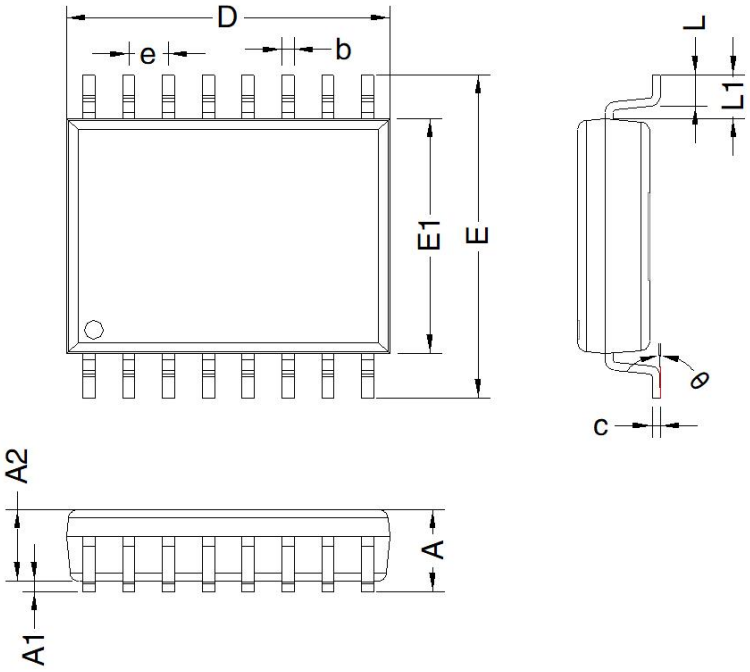
Note: The recommended components and values are for reference only and must be verified per the user's actual application. We recommend using PTCs for R1 and R2, and fast recovery diodes for D1 and D2.

Ordering Information

Part number	Package	Number of pins	Product marking	Tape & Reel
TCANH05S-T16	SOIC	16	TCANH05S-T16	340/REEL

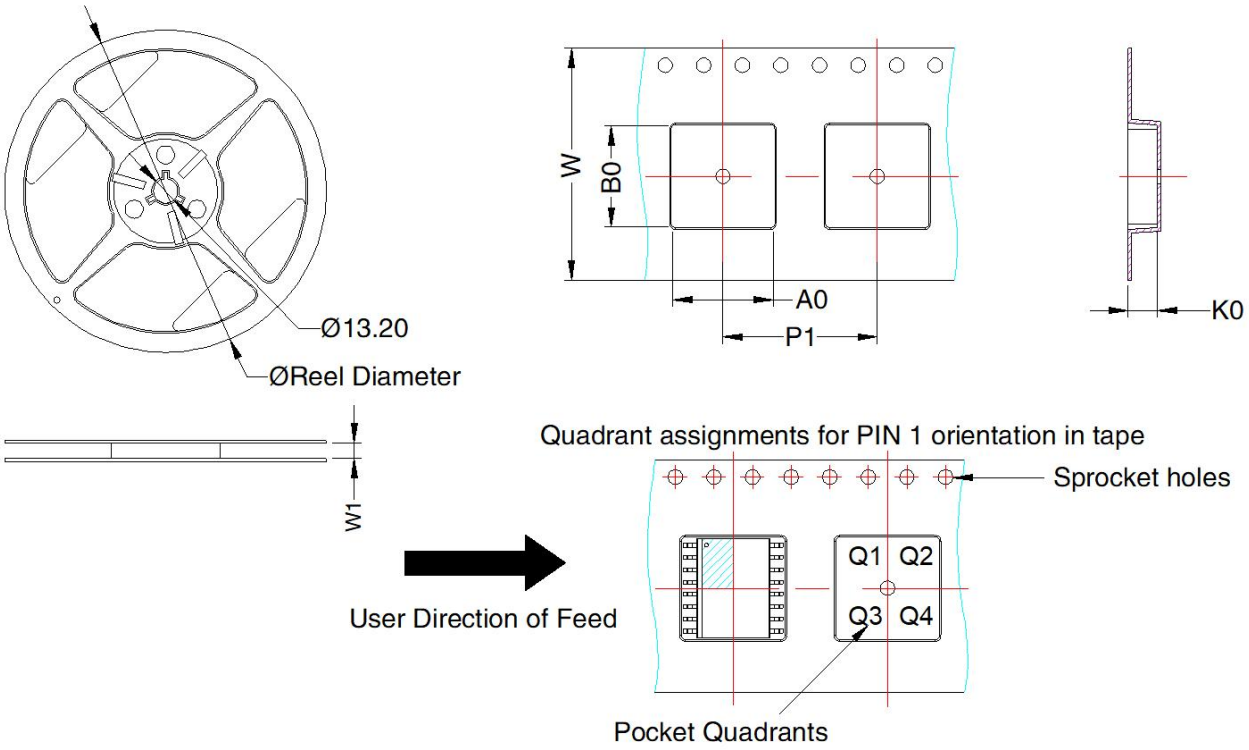
Package Information

THIRD ANGLE PROJECTION



Mark	Dimension(mm)	
	Min	Max
A	-	2.65
A1	0.10	0.30
A2	2.25	2.35
b	0.35	0.43
c	0.24	0.29
D	10.20	10.40
e	1.27 BSC	
E	10.10	10.50
E1	7.40	7.60
L	0.55	0.85
L1	1.40 BSC	
θ	0°	8°

Tape & Reel Information



Package Type	Pin	MPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SOIC–16	16	340	180.0	16.4	10.74	10.65	3.05	16.0	16.0	Q1