FEATURES

- Compatible with the ISO 11898-2:2024, SAE J2284-1~ SAE J2284-5 and SAE J1939-14 standard
- AEC-Q100 Grade 1 qualified
- Thermally protected
- ±42V Bus Protection
- Transmit Data (TXD) dominant time-out function
- SIT1057GQT/3 and SIT1057GQTK/3 I/O pins support 1.8V, 3.3V and 5V MCU
- Undervoltage protection on pins VCC and VIO
- Timing guaranteed for data rates up to 5 Mbps in the CAN FD fast phase
- High ElectroMagnetic Immunity
- Unpowered state disengages from the bus
- Available in SOP8 and DFN3*3-8 packages. DFN3*3-8 with improved Automated Optical Inspection (AOI) capability.

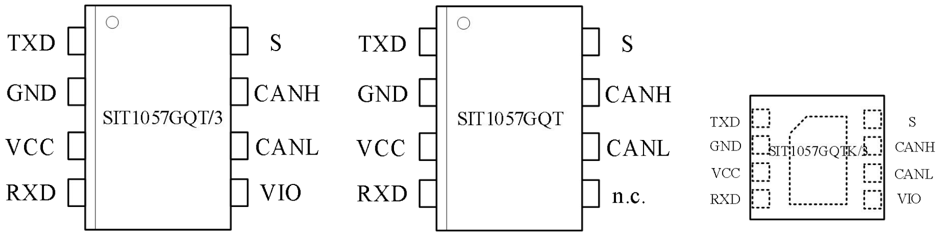
DESCRIPTION

SIT1057GQ is an interface chip used between the CAN protocol controller and the physical bus. It can be used for in-vehicle, industrial control and other fields. It supports 5Mbps (CAN FD), and has the ability to perform differential signal transmission between bus and the CAN protocol controller.

The SIT1057GQ further improves bus signal symmetry, featuring lower electromagnetic radiation performance.

PARAMETER	SYMBOL	MIN.	MAX.	UNIT
Supply voltage	VCC	4.5	5.5	V
VIO voltage	VIO	1.7	5.5	V
CANH/CANL input or output voltage	V_{can}	-42	+42	V
Bus differential voltage	V_{diff}	1.5	3.0	V
Virtual junction temperature	T_j	-40	150	℃

PIN CONFIGURATION



PIN DESCRIPTION

PIN	SYMBOL	DESCRIPTION
1	TXD	transmit data input
2	GND	ground
3	VCC	5V supply voltage
4	RXD	receive data output; reads out data from the bus lines
5	VIO	transceiver I/O level conversion power supply voltage (SIT1057GQT/3, SIT1057GQTK/3)
	n.c.	not connected (SIT1057GQT)
6	CANL	LOW-level CAN bus line
7	CANH	HIGH-level CAN bus line
8	S	Normal mode and silent mode selection, low level is normal mode

Note: The metal pad on the back of the DFN3*3-8 package is recommended to be grounded.

LIMITING VALUES

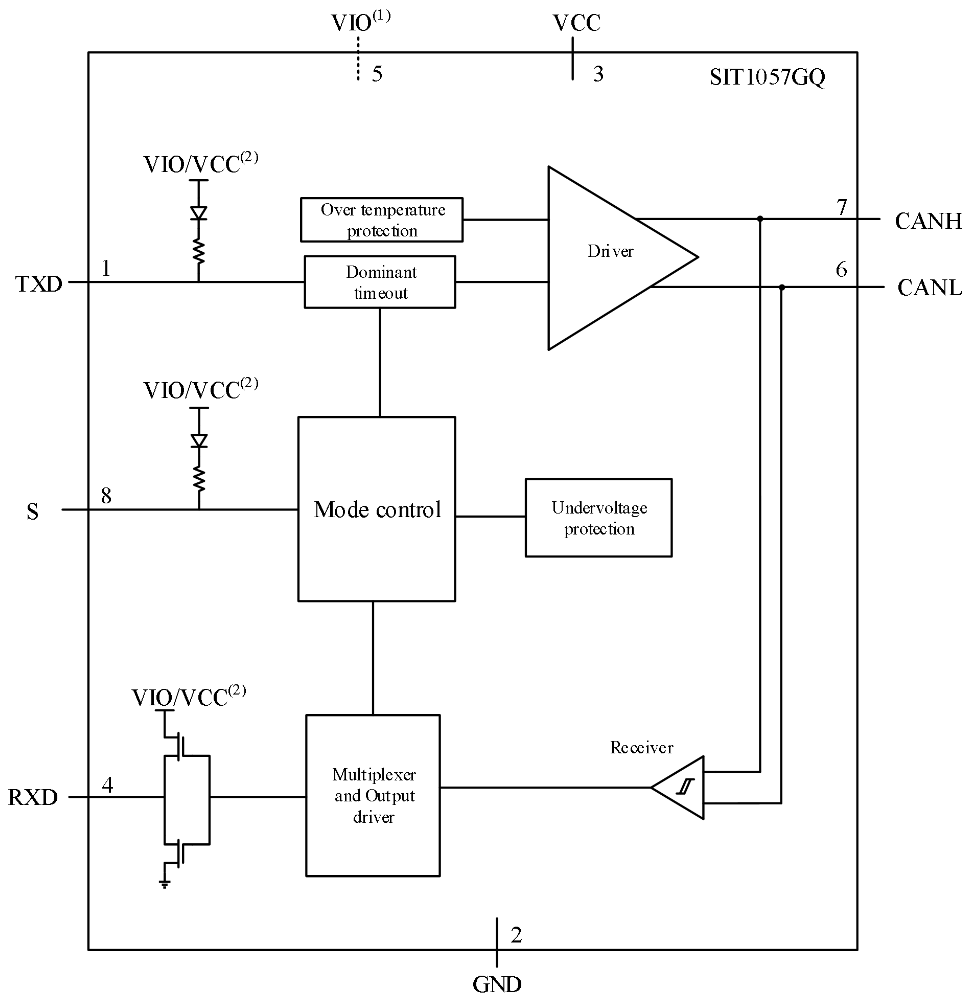
PARAMETER	SYMBOL	CONDITIONS	VALUE	UNIT
Supply voltage	VCC, VIO	Pin VCC, VIO	-0.3~+7	V
MCU side port	V_{TXD}, V_{RXD}, V_S	Pin TXD, RXD, S	-0.3~+7	V
Bus side input voltage	V_{CANL}, V_{CANH}	Pin CANH, CANL	-42~+42	V
Bus differential breakdown voltage	$V_{CANH-CANL}$		-42~+42	V
Contact discharge model (IEC) (2)	VESD_IEC	pins CANH, CANL	-8~+8	kV
Human body model (HBM) (3)	VESD_HBM	All pins	-4~+4	kV
		pins CANH and CANL	-8~+8	kV
Charged device model (CDM) (4)	VESD_CDM	All pins	-2000~+2000	V
Transient voltage (5)	V_{trt}	Pulse 1	-100	V
		Pulse 2a	75	V
		Pulse 3a	-150	V
		Pulse 3b	100	V
Storage temperature	T_{stg}		-55~150	℃
Virtual junction temperature	T_j		-40~150	℃

(1) The maximum limit parameters mean that exceeding these values may cause irreversible damage to the device. Under these conditions, it is not conducive to the normal operation of the device. The continuous operation of the device at the maximum allowable rating may affect the reliability of the device. The reference point for all voltages is ground.
(2) According to IEC 61000-4-2.
(3) According to AEC-Q100-002.
(4) According to AEC-Q100-011.
(5) Verified by an external test house according to IEC 62228-3; parameters for standard pulses defined in ISO7637.

THERMAL INFORMATION

PARAMETER	SYMBOL	CONDITIONS	VALUE	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance	SOP8	95	℃/W
		DFN3*3-8	65	℃/W
$R_{\theta JC}$	Junction-to-case thermal resistance	SOP8	46	℃/W
		DFN3*3-8	35	℃/W

FUNCTIONAL BLOCK DIAGRAM



(1) VIO is only available in SIT1057GQT/3 and SIT1057GQTK/3 version, pin 5 is not connected in SIT1057GQT.

(2) VIO is in SIT1057GQT/3 and SIT1057GQTK/3 version and VCC is in SIT1057GQT.

STATIC CHARACTERISTICS

Unless specified otherwise; all values are tested in recommended operating conditions: T_j=-40℃ to 150℃, VCC=4.5V to 5.5V, VIO=1.7V to 5.5V (SIT1057GQT/3 和 SIT1057GQTK/3），R_L=60Ω。

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply: pin VCC						
Supply voltage	VCC		4.5	-	5.5	V
Standby undervoltage detection voltage	$V_{uvd(stb)}$		3.4	-	4.5	V
Standby undervoltage hysteresis voltage	$V_{uvhys(stb)}$		50	-	-	mV
Switch-off undervoltage detection voltage	$V_{uvd(swoff)}$	SIT1057GQT/3 SIT1057GQTK/3	1.2	-	1.7	V
VCC supply current	I_{CC}	Normal mode; dominant; $t<t_{to(dom)TXD}$; V_{TXD}=0V	-	40	70	mA
		Normal mode; dominant; short circuit on bus lines; V_{TXD}=0V; -3V< (V_{CANH}=V_{CANL}) <+40V	-	-	125	mA
		Normal mode; recessive; V_{TXD}=VIO [1]	-	5	10	mA
		Silent mode; SIT1057GQT/3 SIT1057GQTK/3	-	3	6	mA
		Silent mode; SIT1057GQT	-	3.01	6.1	mA
I/O level adapter supply; pin VIO (SIT1057GQT/3 and SIT1057GQTK/3)						
Supply voltage	VIO		1.7	-	5.5	V
Switch-off undervoltage detection voltage	$V_{uvd(swoff)}$		1.2	-	1.7	V
VIO supply current	I_{IO}	Normal mode; dominant; S=0, V_{TXD}=0V	-	220	760	μA
		Normal mode; recessive; S=0, V_{TXD}=VIO [1]	-	110	460	μA
		Silent mode; S=VIO; V_{TXD}=VIO	-	8	30	μA
Pin TXD characteristics						
HIGH-level input voltage	V_{IH}	SIT1057GQT/3 SIT1057GQTK/3	0.7VIO [1]	-	-	V
		SIT1057GQT	2	-	-	V
LOW-level input voltage	V_{IL}	SIT1057GQT/3 SIT1057GQTK/3	-	-	0.3VIO [1]	V
		SIT1057GQT	-	-	0.8	V
Pull-up resistance	R_{pu}	2.8V<VIO<5.5V	20	-	80	kΩ
Unpowered leakage current on pin TXD	I_O(off)	VCC=VIO=0V V_{TXD}=5V	-1	-	1	μA

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Input capacitance	C_i	(2)	-	-	10	pF
Pin RXD characteristics						
HIGH-level output current	$I_{OH(RXD)}$	V_{RXD}=VIO-0.4V (1)	-10	-	-1	mA
LOW-level output current	$I_{OL(RXD)}$	Bus dominant; V_{RXD}=0.4V	1	-	10	mA
Pin S characteristics						
HIGH-level input voltage	V_{IH}	SIT1057GQT/3 SIT1057GQTK/3	0.7VIO (1)	-	-	V
		SIT1057GQT	2	-	-	V
LOW-level input voltage	V_{IL}	SIT1057GQT/3 SIT1057GQTK/3	-	-	0.3VIO (1)	V
		SIT1057GQT	-	-	0.8	V
Pull-up resistance	R_{pu}	2.8V<VIO<5.5V	20	-	80	kΩ
Unpowered leakage current on pin S	I_O(off)	VCC=VIO=0V S=5V	-1		1	μA
Input capacitance	C_i	(2)	-	-	10	pF
Overtemperature protection						
Shutdown junction temperature	$T_{j(sd)}$		-	190	-	℃
Release shutdown junction temperature	T_{hys}		-	20	-	℃
Bus lines; pins CANH and CANL						
Dominant output voltage on pin CANH	$V_{O(dom)}$	t<$t_{to(dom)TXD}$; V_{TXD}=0V; R_L=50Ω至 65Ω	2.89	3.55	4.26	V
Dominant output voltage on pin CANL			0.77	1.45	2.13	V
Transmitter voltage symmetry	V_{TXsym}	V_{TXsym}=V_{CANH}+V_{CANL}; C_{SPLIT}=4.7nF; f_{TXD}=250kHz, 1MHz or 2.5MHz	0.9VCC	-	1.1VCC	V
Common mode voltage step	$V_{cm(step)}$	(2)	-150	-	150	mV
Peak-to-peak common mode voltage	$V_{cm(p-p)}$	(2)	-300	-	300	mV
Differential output voltage	$V_{O(diff)}$	Normal mode; t<$t_{to(dom)TXD}$; V_{TXD}=0V; R_L=50Ω to 65Ω	1.5	-	3	V
		Normal mode; t<$t_{to(dom)TXD}$; V_{TXD}=0V; R_L=45Ω to 70Ω	1.4	-	3.3	V
		Normal mode; dominant; t<$t_{to(dom)TXD}$; V_{TXD}=0V; R_L=2240Ω	1.5	-	5	V
		Normal mode; recessive; V_{TXD}=VIO (1); No load;	-50	-	+50	mV
		Normal mode; recessive; V_{TXD}=VIO (1); R_L =60Ω	-50	-	+50	mV
		Silent mode; no load	-0.2	-	+0.2	V

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Output voltage	$V_{O(rec)}$	Normal mode; V_{TXD}=VIO (1); no load	2	0.5VCC	3	V
		Normal mode; V_{TXD}=VIO (1); R_L =60Ω	2.2	0.5VCC	2.8	V
		Silent mode; no load	2	-	3	V
Differential receiver threshold voltage	$V_{th(RX)diff}$	Normal/Silent mode; $-12V \leq V_{CANH} \leq 12V$ $-12V \leq V_{CANL} \leq 12V$	0.5	-	0.9	V
Receiver recessive voltage	$V_{rec(RX)}$	Normal/Silent mode; $-12V \leq V_{CANH} \leq 12V$ $-12V \leq V_{CANL} \leq 12V$	-4	-	0.5	V
Receiver dominant voltage	$V_{dom(RX)}$	Normal/Silent mode; $-12V \leq V_{CANH} \leq 12V$ $-12V \leq V_{CANL} \leq 12V$	0.9	-	9	V
Differential receiver hysteresis voltage	$V_{hys(RX)dif}$	Normal mode; $-12V \leq V_{CANH} \leq 12V$ $-12V \leq V_{CANL} \leq 12V$	-	70	-	mV
Short-circuit output current	$I_{O(SC)}$	V_{CANH}=-15V to 40V; V_{CANL}=-15V to 40V	-115	-	115	mA
Recessive short-circuit output current	$I_{O(SC)rec}$	V_{CANH}=-27V to 32V; V_{CANL}=-27V to 32V; V_{TXD}=VIO for $t > t_{d(TXD-busrec)end}$	-5	-	5	mA
Leakage current	I_L	VCC=VIO= 0Vor pins shorted to GND via 47kΩ; T_j<105°C $V_{CANH}=V_{CANL}$=5V	-10	-	10	μA
Input resistance	R_i	$-2V \leq V_{CANH} \leq 7V$ $-2V \leq V_{CANL} \leq 7V$	25	40	50	kΩ
Input resistance deviation	$\triangle R_i$	$0V \leq V_{CANH} \leq 5V$ $0V \leq V_{CANL} \leq 5V$	-3		3	%
Differential input resistance	R_{ID}	$-2V \leq V_{CANH} \leq 7V$ $-2V \leq V_{CANL} \leq 7V$	50	80	100	kΩ
Common-mode input capacitance	$C_{i(cm)}$	(2)	-	-	24	pF
Differential input capacitance	$C_{i(diff)}$	(2)	-	-	12	PF
Slew Rate (2)	SR	R_L=60Ω, C_L=100pF			70	V/μs

DYNAMIC CHARACTERISTICS

Unless specified otherwise; all values are tested in recommended operating conditions: T_j=-40℃ to 150℃, VCC=4.5V to 5.5V, VIO=1.7V to 5.5V (SIT1057GQT/3 and SIT1057GQTK/3), R_L=60Ω.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
CAN timing characteristics; Figure 1, Figure 3, Figure 4.						
Delay time from TXD to bus dominant	$t_{d(TXD\text{-}busdom)}$	Normal mode	-	-	80	ns
Delay time from TXD to bus recessive	$t_{d(TXD\text{-}busrec)}$	Normal mode	-	-	80	ns
Delay time from bus dominant to RXD	$t_{d(busdom\text{-}RXD)}$	Normal mode	-	-	110	ns
Delay time from bus recessive to RXD	$t_{d(busrec\text{-}RXD)}$	Normal mode	-	-	110	ns
Delay time from TXD LOW to RXD LOW	$t_{d(TXDL\text{-}RXDL)}$	Normal mode	40	-	190	ns
Delay time from TXD HIGH to RXD HIGH	$t_{d(TXDH\text{-}RXDH)}$	Normal mode	40	-	190	ns
CAN FD timing characteristics; Figure 1 & Figure 4.						
Transmitted recessive bit width	$t_{bit(bus)}$	2Mbit/s （$t_{bit(TXD)}$=500ns）	455	-	510	ns
		5Mbit/s （$t_{bit(TXD)}$=200ns）	155	-	210	ns
Bit time on pin RXD	$t_{bit(RXD)}$	2Mbit/s （$t_{bit(TXD)}$=500ns）	420	-	520	ns
		5Mbit/s （$t_{bit(TXD)}$=200ns）	120	-	220	ns
Transmitted recessive bit width deviation	$\Delta t_{bit(BUS)}$	$\Delta t_{bit(BUS)}=t_{bit(bus)}- t_{bit(TXD)}$	-45	-	10	ns
Receiver timing symmetry	Δt_{rec}	$\Delta t_{rec}=t_{bit(RXD)}- t_{bit(bus)}$	-45	-	15	ns
Received recessive bit width deviation	$\Delta t_{bit(RXD)}$	$\Delta t_{bit(RXD)}=t_{bit(RXD)}- t_{bit(TXD)}$	-80	-	20	ns
TXD dominant time-out time						
TXD dominant time-out time	$t_{to(dom)TXD}$	V_{TXD}=0V; Normal mode	0.8	-	9	ms

(1) VIO only in SIT1057GQT/3 and SIT1057GQTK/3 version.

(2) Guaranteed by design, not tested in production.

FUNCTION TABLE

Table1. CAN TRANSCEIVER TRUTH TABLE

TXD (1)	S (1)	CANH (1)	CANL (1)	BUS STATE	RXD (1)
L	L	H	L	Dominate	L
H or Open	L	0.5VCC	0.5VCC	Recessive	H
X	H or Open	0.5VCC	0.5VCC	Recessive	H
X	H or Open	H	L	Dominate	L

（1）H=high level；L=low level；X=irrelevant。

Table 2. RECEIVER FUNCTION TABLE

V_{ID}=CANH-CANL	RXD (1)	BUS STATE (1)
$V_{ID}\geq 0.9V$	L	Dominate
$0.5<V_{ID}<0.9V$	?	?
$V_{ID}\leq 0.5V$	H	Recessive
Open	H	Recessive

（1）H=high-level；L=L=low-level；？=uncertain。

Table 3. Under-voltage protection status table

VCC	VIO (1)	BUS STATE	BUS OUT (2)	RXD (2)
$VCC>V_{uvd(stb)}$	$VIO>V_{uvd(swoff)}$	normal	According to STB and TXD	Follow the bus
$VCC<V_{uvd(stb)}$	$VIO>V_{uvd(swoff)}$	Protected state	Z	H
$VCC>V_{uvd(stb)}$	$VIO<V_{uvd(swoff)}$	Protected state	Z	H
$VCC<V_{uvd(stb)}$	$VIO<V_{uvd(swoff)}$	Protected state	Z	H

(1) Only SIT1057QT/3 and SIT1057QTK/3 version;

(2) H=high level; Z=high impedance state.

TEST CIRCUIT

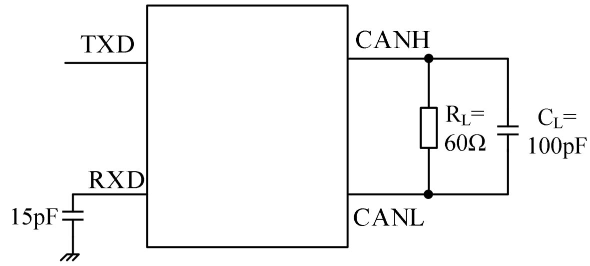


Figure 1 CAN transceiver timing test circuit

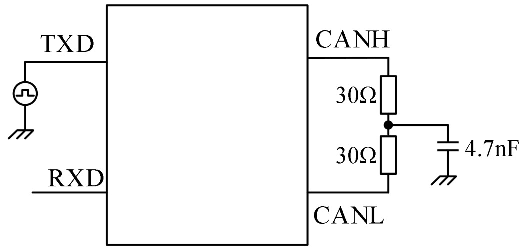


Figure 2 Test circuit for measuring transceiver driver symmetry

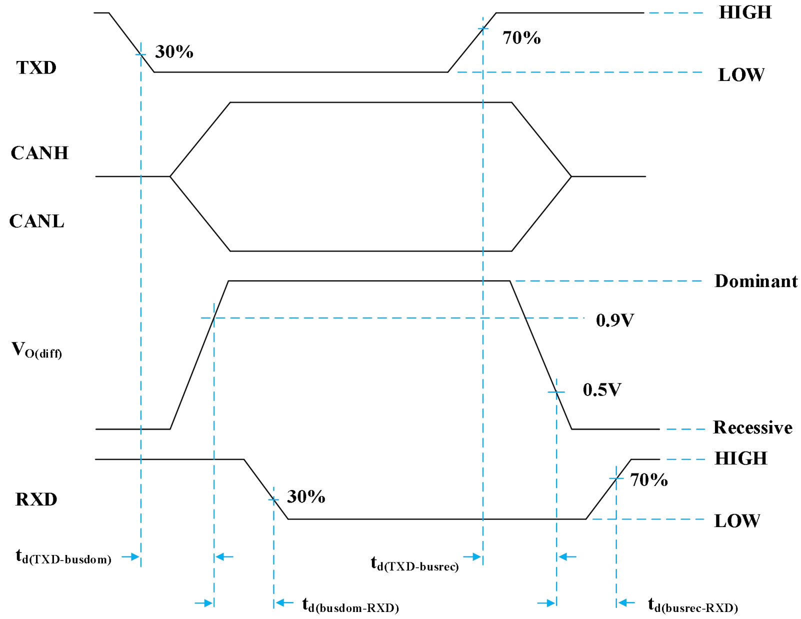


Figure 3 CAN transceiver timing diagram

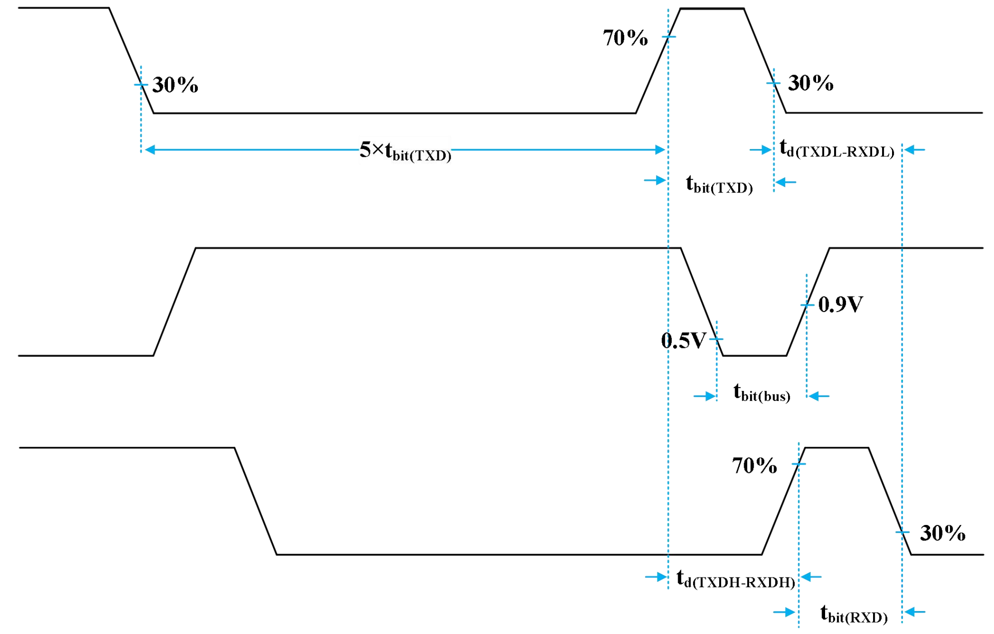
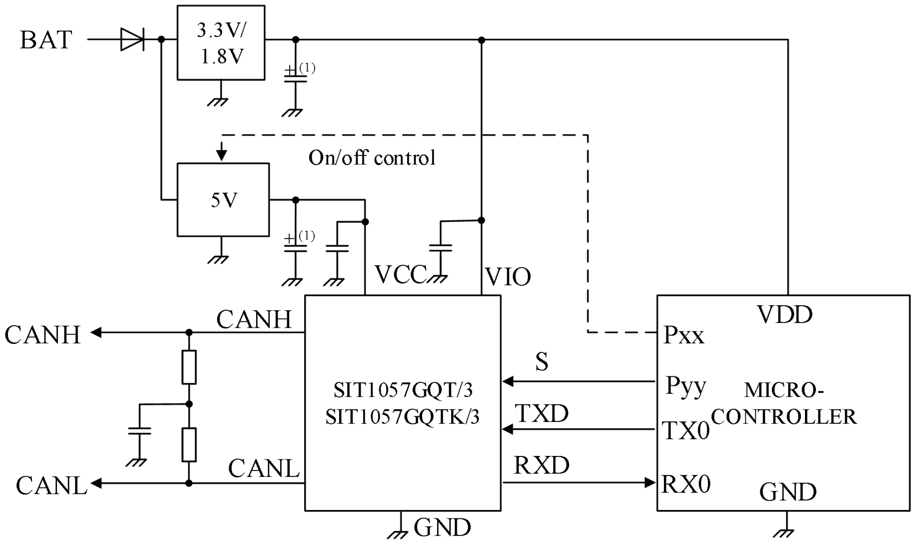


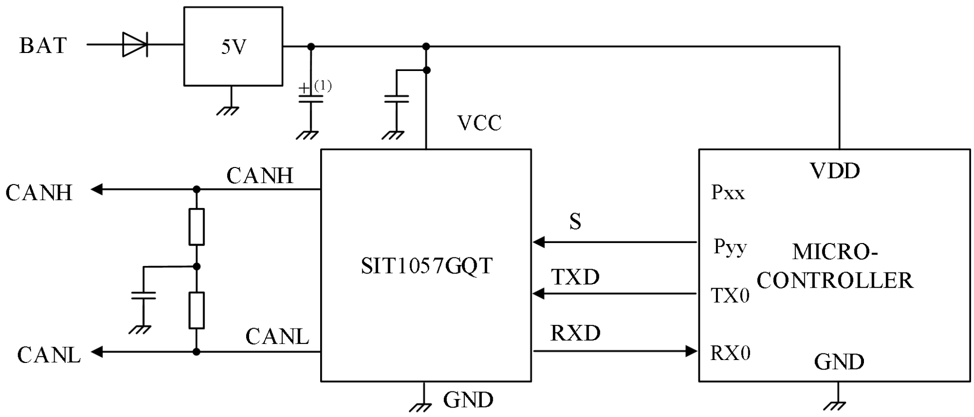
Figure 4 CAN FD timing definitions according to ISO 11898-2:2024

APPLICATION INFORMATION



（1）Optional, depends on regulator.

Figure 5 Typical SIT1057GQT/3 and SIT1057GQTK/3 application with a 3.3V/1.8V microcontroller



（1）Optional, depends on regulator.

Figure 6 Typical SIT1057GQ application with a 5V microcontroller

ADDITIONAL DESCRIPTION

1 Sketch

The SIT1057GQ is an interface chip designed for use between CAN protocol controllers and the physical bus, applicable in automotive and industrial control fields. It supports Flexible Data-Rate of up to 5Mbps and features differential signal transmission capability between the bus and the CAN protocol controller.

2 Overtemperature protection

SIT1057GQ has an over-temperature protection function. After the over-temperature protection is triggered, the drive tube will be turned off, because the drive tube is the main energy-consuming component. Turning off the drive tube can reduce power consumption and thus reduce the chip temperature. At the same time, other parts of the chip are still working normally.

3 Undervoltage protection

The SIT1057GQ power supply pin has an under-voltage detection function, which can put the device in a protected mode. This protects the bus when VCC is lower than $V_{uvd(stb)}$ or VIO is lower than $V_{uvd(swoff)}$ (if applicable).

4 Operating modes

The control pin S allows two working modes to be selected: normal mode and silent mode.

4.1 Normal mode

When pin S is set to 0, normal mode is selected, provided that the supply voltage on the VCC pin exceeds the undervoltage detection threshold $V_{uvd(stb)}$, or the supply voltage on the VIO pin exceeds the undervoltage detection threshold $V_{uvd(swoff)}$ (if applicable). In this mode, the transceiver can transmit and receive data via the CANH and CANL bus lines. The differential receiver converts analog data from the bus lines into digital data and outputs it through the RXD pin. The slope of the output signals on the bus lines is internally controlled to ensure minimized electromagnetic emissions (EME) in an optimized manner. To support high bit rates, especially in CAN FD systems, signal improvement features largely eliminate topology-related reflections and impedance mismatches. In the recessive state, the output voltage on the bus pins is VCC/2.

4.2 Silent mode

If S=1, the SIT1057GQ enters silent mode. In this mode, the transmitter is disabled while the receiver operates normally, which helps prevent network signal blocking caused by a malfunctioning CAN controller.

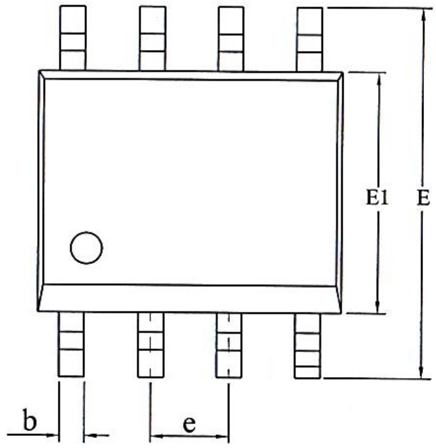
5 Dominant timeout function

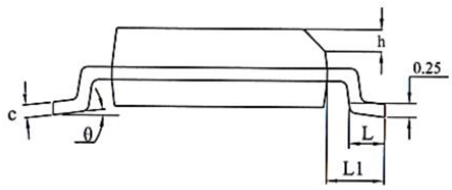
The "TXD dominant timeout" timer is enabled when the TXD pin is set to low. If the low-level duration on pin TXD exceeds the internal timer value ($t_{to(dom)TXD}$), the transmitter will be disabled and drive the bus into a recessive state. It can prevent the pin TXD from being forced to a permanent low level due to a hardware or software application failure, causing the bus line to be driven to a permanent dominant state (blocking all network communications). A rising edge signal on pin TXD can be reset.

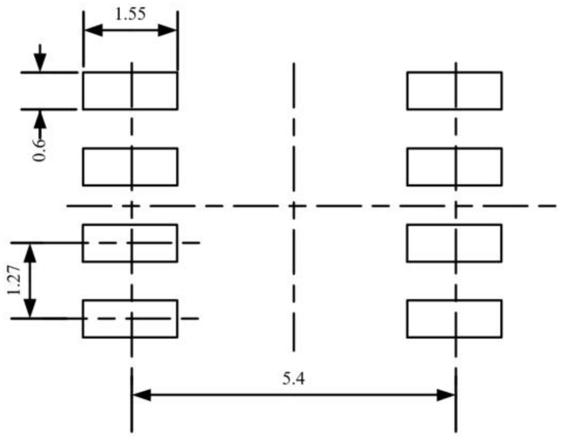
SOP8 DIMENSIONS

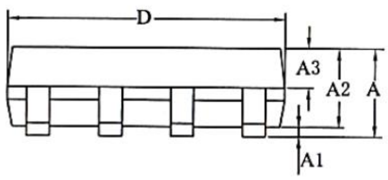
PACKAGE SIZE

SYMBOL	MIN./mm	TYP./mm	MAX./mm
A	-	-	1.75
A1	0.10	-	0.225
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	-	0.47
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
e	1.27BSC		
L	0.50	-	0.80
L1	1.05REF		
c	0.20	-	0.24
θ	0°	-	8°







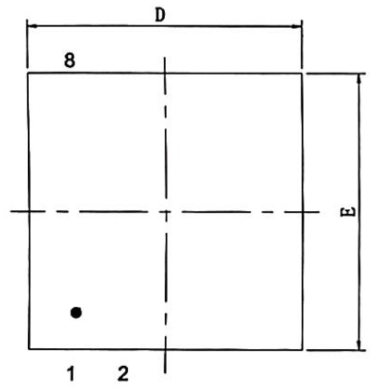


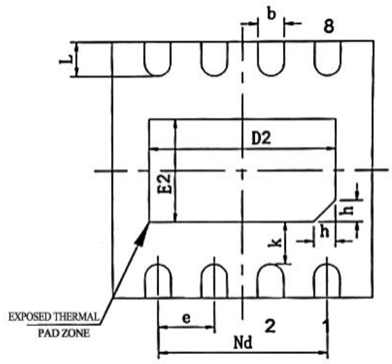
LAND PATTERN EXAMPLE (Unit: mm)

DFN3*3-8 DIMENSIONS

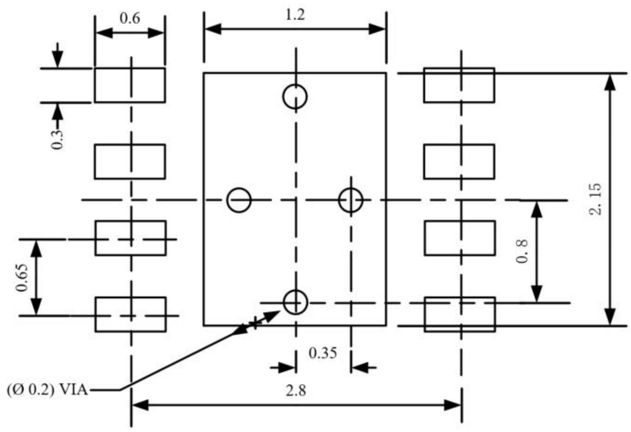
PACKAGE SIZE

SYMBOL	MIN/mm	TYP /mm	MAX/mm
A	0.70	0.75	0.80
A1	0	0.02	0.05
A3	0.203 REF		
D	2.90	3.00	3.10
E	2.90	3.00	3.10
D2	2.05	2.15	2.25
Nd	1.95BSC		
E2	1.10	1.20	1.30
b	0.25	0.30	0.35
e	0.65BSC		
k	0.50REF		
L	0.35	0.40	0.45
h	0.20	0.25	0.30

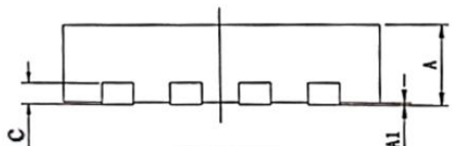




BOTTOM VIEW

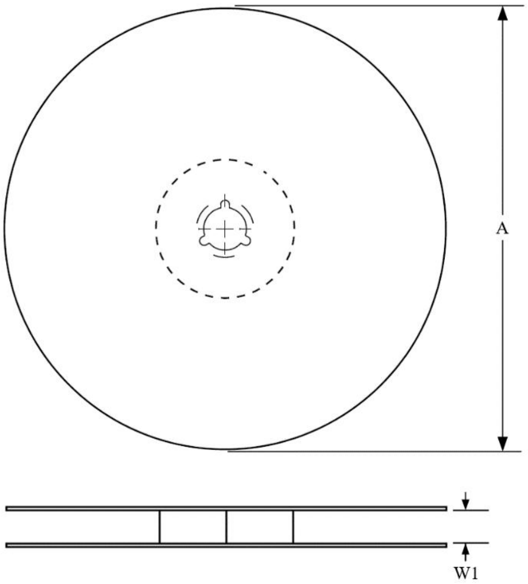


LAND PATTERN EXAMPLE (Unit: mm)

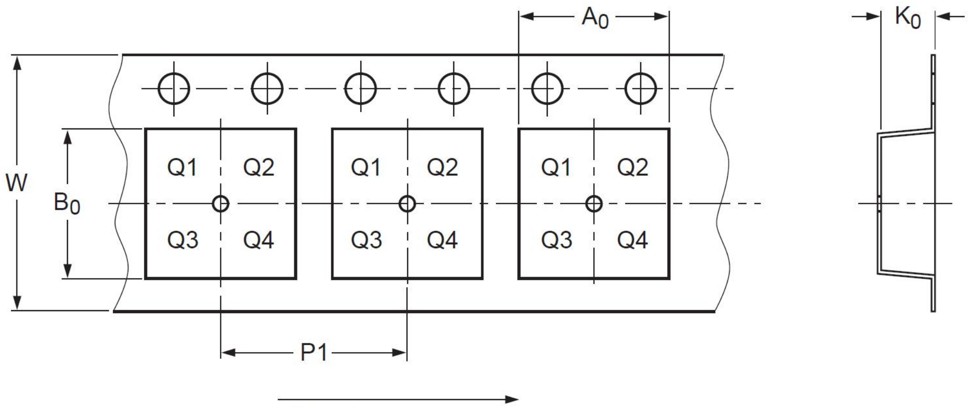


SIDE VIEW

TAPE AND REEL INFORMATION



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers



Direction of Feed

PIN1 is in quadrant 1

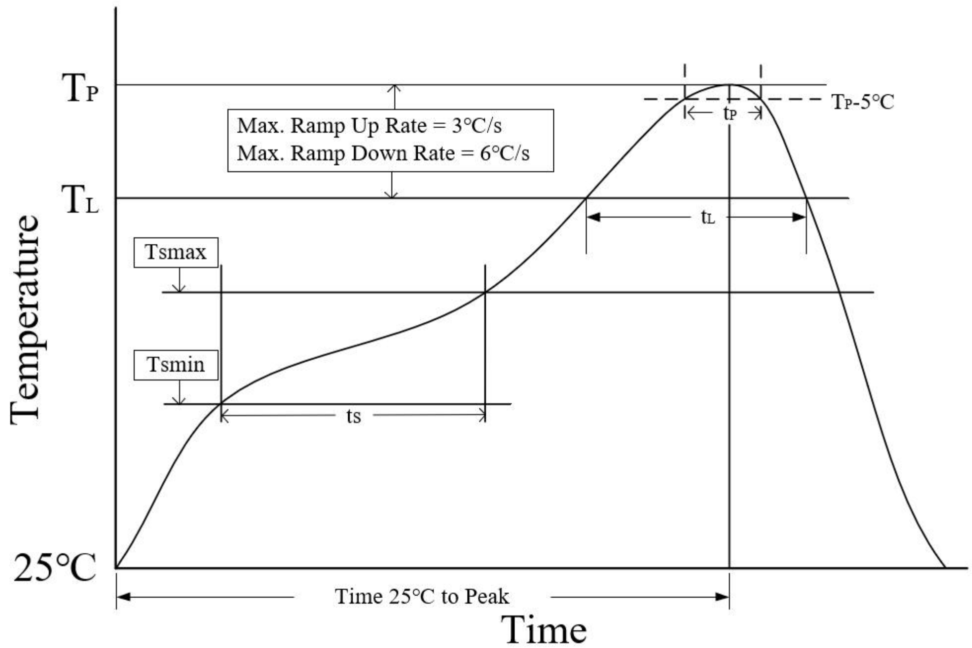
Package Type	Reel Diameter A (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)
SOP8	330±1	12.4	6.60±0.1	5.30±0.10	1.90±0.1	8.00±0.1	12.00±0.1
DFN3*3-8	329±1	12.4	3.30±0.1	3.30±0.1	1.10±0.1	8.00±0.1	12.00±0.3

ORDERING INFORMATION

TYPE NUMBER	PACKAGE	MSL	PACKING
SIT1057GQT/3	SOP8	MSL3	Tape and reel
SIT1057GQT	SOP8	MSL3	Tape and reel
SIT1057GQTK/3	DFN3*3-8, Small shape, no leads	MSL1	Tape and reel

SOP8 is packed with 2500 pieces/disc in braided packaging. Leadless DFN3*3-8 is packed with 6000 pieces/disc in braided packaging.

REFLOW SOLDERING



Parameter	Lead-free soldering conditions
Ave ramp up rate (T_L to T_P)	3 ℃/second max
Preheat time ts (T_{smin}=150 ℃ to T_{smax}=200 ℃)	60-120 seconds
Melting time t_L (T_L=217 ℃)	60-150 seconds
Peak temp T_P	260-265 ℃
5°C below peak temperature t_P	30 seconds
Ave cooling rate (T_P to T_L)	6 ℃/second max
Normal temperature 25°C to peak temperature T_P time	8 minutes max

Important statement

SIT reserves the right to change the above-mentioned information without prior notice.

REVISION HISTORY

Version number	Datasheet status	Revision date
V1.0	Initial version	April 2026