Features

- Meets the ISO 11898 Standard
- Support CAN FD and data rates up to 5 Mbps
- Typical Loop Delay: 110 ns
- 5V power supply, 3.0V~5.5V IO interface
- Receiver Common Mode Input Voltage: ±30 V
- Bus Fault Protection: ±42 V
- Up to 110 Nodes in CAN network
- Junction Temperatures from –40°C to 150°C
- Latch-Up performance exceeds 500mA
- BUS pin ESD Protection：
  - ±8kV Human-Body Model
  - ±1.5kV Charged-Device Model

Description

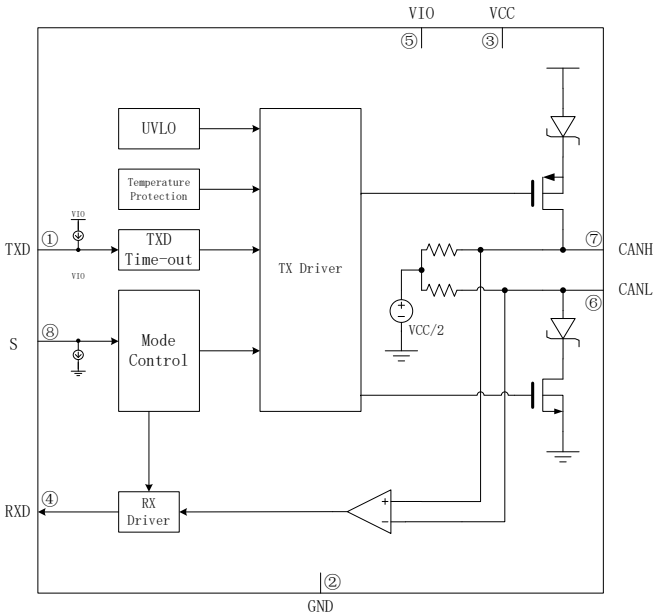
The TPT1051V is a CAN transceiver which meets the ISO11898 High Speed CAN (Controller Area Network) physical layer standard. The device is designed to use in CAN FD networks up to 5 Mbps, and enhanced timing margin and higher data rates in long and highly-loaded networks. As design, the device features cross-wire, overvoltage and loss of ground protection from –42 V to +42 V, overtemperature shutdown, a –30V to +30V common-mode range. TPT1051V have a secondary power supply input for I/O level shifting the input pin thresholds and RXD output level, and the device comes with silent mode which is also commonly referred to as listen-only mode, and it includes many protection features to enhance device and network robustness.

TPT1051V is available in SOP8 and DFN8L package, and is characterized from –40°C to +125°C.

Applications

- All devices support highly loaded CAN networks
- Field Industrial Automation, Sensors and Drive Systems
- Building, Security Control Systems
- Energy Storage systems
- Telecom Base Station Status and Control

Function block



Revision History

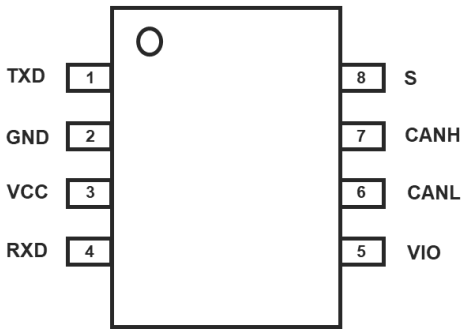
Date	Revision	Notes
2020/2/18	Rev. Pre 0.0	Initial Version
2020/4/24	Rev. Pre 0.1	Update ESD level
2020/5/18	Rev. Pre 0.2	Update electrical parameter
2020/6/17	Rev. Pre 0.3	Add DFN3x3-8L package
2020/6/30	Rev.0	Release Version
2020/12/25	Rev.A.0	Update the notes for Absolute Maximum Ratings

Order Information

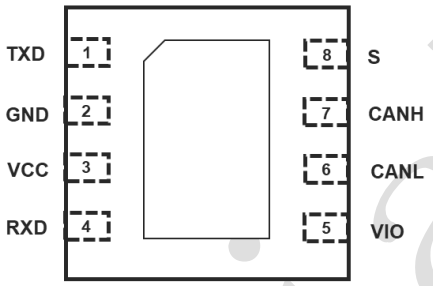
Order Number	Operating Temperature Range	Package	Marking Information	MSL	Transport Media, Quantity
TPT1051V-SO1R	-40 to 125°C	8-Pin SOP	T1051V	MSL3	Tape and Reel, 4000
TPT1051V-DF6R	-40 to 125°C	8-Pin DFN	1051V	MSL3	Tape and Reel, 4000

Pin Configuration and Functions

TPT1051V-SO1R
SOP8



TPT1051VL1-DF6R
DFN3X3-8L



Pin Functions

Pin name	Pin No	I/O	Description
TXD	1	I	CAN transmit data input (LOW for dominant and HIGH for recessive bus states)
GND	2	GND	Ground
VCC	3	POWER	Transceiver 5V supply voltage
RXD	4	O	CAN receive data output (LOW for dominant and HIGH for recessive bus states)
VIO	5	POWER	Transceiver I/O level shifting supply voltage (Devices with "V" suffix only)
CANL	6	BUS I/O	Low level CAN bus input/output line
CANH	7	BUS I/O	High level CAN bus Input/output line
S	8	I	Silent Mode control input (active high)

Absolute Maximum Ratings

Parameter	Description	Min	Max	Unit
VCC	5-V Bus Supply Voltage Range	–0.3	7	V
VIO	I/O Level-Shifting Voltage Range	–0.3	7	V
VBUS	CAN Bus I/O voltage range (CANH, CANL)	–42	42	V
V(Logic_Input)	Logic input terminal voltage range (TXD, S)	–0.3	7	V
V(Logic_Output)	Logic output terminal voltage range (RXD)	–0.3	7	V
IO(RXD)	RXD (Receiver) output current	–8	8	mA
Tj(max)	Maximum junction temperature	-40	150	°C
Tstg	Storage temperature range	–65	150	°C

* Note: Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. Exposure to any Absolute Maximum Rating condition for extended periods may affect device reliability and lifetime.
(1) This data was taken with the JEDEC low effective thermal conductivity test board.
(2) This data was taken with the JEDEC standard multilayer test boards.

ESD, Electrostatic Discharge Protection

Symbol	Parameter	Condition	Minimum Level	Unit
HBM	HBM, per ANSI/ESDA/JEDEC JS-001	Bus Pin	±8	kV
		All Pin Except Bus Pin	±8	kV
CDM	CDM, per ANSI/ESDA/JEDEC JS-002	All Pin	±1.5	kV
LU	LU, per JESD78	All Pin	±500	mA

Thermal Information

Package Type	θ_{JA}	θ_{JC}	Unit
8-Pin SOIC	148	48	°C/W
8-Pin DFN3x3	52	23	°C/W

Recommended Operating Conditions

Symbol	Description	MIN	MAX	UNIT
$V_{I/O}$	Input/output voltage SCL1, SDA1, SCL2, SDA2	3.0	5.5	V
VCC	Power supply	4.5	5.5	V
$I_{OH(RXD)}$	RXD terminal HIGH level output current	-2		mA
$I_{OL(RXD)}$	RXD terminal LOW level output current		2	mA
T_A	Operating ambient temperature	–40	125	°C

Power Consumption

Parameter		Test Condition	Value	Unit
P_D	Average power dissipation	VCC = 5 V, VIO = 3.3 V (if applicable), Ta = 25°C, RL = 60 Ω, S at 0 V, Input to TXD at 250 kHz, CL_RXD = 15 pF. Typical CAN operating conditions at 500 kbps with 25% transmission (dominant) rate	65	mW
		VCC = 5.5 V, VIO = 3.6 V (if applicable), Ta = 125°C, RL = 50 Ω, S at 0 V, Input to TXD at 0.5MHz, CL_RXD = 15 pF. Typical high load CAN operating conditions at 1 Mbps with 50% transmission (dominant) rate and loaded network.	135	mW

Function Description

Driver Function Table

Device	Inputs		Outputs		Driven BUS State
	S	TXD	CANH	CANL	
All Devices	L or open	L	H	L	Dominant
		H or Open	Z	Z	Recessive
	H	X	Z	Z	Recessive

Receiver Function Table

Device Mode	CAN Differential Inputs $V_{ID} = V_{CANH} – V_{CANL}$	BUS State	RXD Terminal
Normal or Silent	$V_{ID} \geq V_{IT+(MAX)}$	Dominant	L
	$V_{IT-(MIN)} < V_{ID} < V_{IT+(MAX)}$	Indeterminate	Indeterminate
	$V_{ID} \leq V_{IT-(MIN)}$	Recessive	H
	Open ($V_{ID} \approx 0$ V)	Open	H

Normal mode

A LOW level on pin S selects Normal mode. In this mode, the transceiver will transmit and receive data via the bus lines CANH and CANL. The differential receiver converts the analog data on the bus lines into digital data which is output to pin RXD. The slopes of the output signals on the bus lines are controlled internally and are optimized in a way that guarantees the lowest possible Electro Magnetic Emission (EME).

Silent mode

A HIGH level on pin S selects Silent mode. In Silent mode the transmitter is disabled, releasing the bus pins to recessive state. All other IC functions, including the receiver, continue to operate as in Normal mode, just like listen-only mode. Silent mode can be used to prevent a faulty CAN controller from disrupting all network communications.

Electrical Characteristics

VCC = 4.5 V to 5.5 V, VIO = 3.0 V to 5.5 V, T_A = –40°C to 125°C

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
ICC	Normal mode (dominant)	TXD = 0 V, R_L = 60 Ω, C_L = open, R_{CM} = open, S = 0V		50	70	mA
		TXD = 0 V, R_L = 50 Ω, C_L = open, R_{CM} = open, S = 0V		52	80	mA
	Normal mode (dominant – bus fault)	TXD = 0 V, S = 0V, CANH = -12V, R_L = open, C_L = open, R_{CM} = open		74	150	mA
	Normal mode (recessive)	TXD = V_{CC}, R_L = 50 Ω, C_L = open, R_{CM} = open, S = 0V		1.3	2.5	mA
	Silent mode	TXD = V_{CC}, R_L = 50 Ω,C_L = open, R_{CM} = open, S = V_{CC}		1.3	2.5	mA
I_{IO}	Normal and Silent modes	RXD Floating, TXD = S = 0 or VIO		73	300	μA
UV_{VCC}	Rising undervoltage detection on VCC for protected mode			4.0	4.4	V
	Falling undervoltage detection on VCC for protected mode		3.6	3.9	4.15	
$V_{HYS(UVVCC)}$	Hysteresis voltage on UVVCC			200		mV
UV_{VIO}	Undervoltage detection on VIO for protected mode		1.3		2.75	V
$V_{HYS(UVVIO)}$	Hysteresis voltage on UVVIO for protected mode			150		mV
Pin- S (mode select input)						
V_{IH}	High-level input voltage		0.7 x V_{IO}			V
V_{IL}	Low-level input voltage				0.3 x V_{IO}	
I_{IH}	High-level input leakage current	S = V_{CC} or V_{IO} = 5.5 V			30	μA
I_{IL}	Low-level input leakage current	S = 0 V, V_{CC} = V_{IO} = 5.5 V	–2	0	2	
$I_{lkg(OFF)}$	Unpowered leakage current	S = 5.5 V, V_{CC} = V_{IO} = 0 V	-1	0	1	
Pin- TXD (CAN transmit data input)						
V_{IH}	High-level input voltage		0.7 x V_{IO}			V
V_{IL}	Low-level input voltage				0.3 x V_{IO}	
I_{IH}	High-level input leakage current	S = V_{CC} or V_{IO} = 5.5 V	–2.5	0	1	μA
I_{IL}	Low-level input leakage current	S = 0 V, V_{CC} = V_{IO} = 5.5 V	–100	-63	–7	
$I_{lkg(OFF)}$	Unpowered leakage current	TXD = 5.5 V, V_{CC} = V_{IO} = 0 V	–1	0	1	
C_I	Input capacitance note1			4.5		pF

Note:

1: Typ data is based on bench test by LRC meter E4980AL

Electrical Characteristics (Continue)

VCC = 4.5 V to 5.5 V, VIO = 3.0 V to 5.5 V, T_A = –40°C to 125°C

Symbol	Parameter		Test Conditions	Min	Typ	Max	Unit
Pin- RXD (CAN Receive data output)							
V_{OH}	High-level output voltage		Devices with the "V" suffix (I/O levelshifting), I_O = –2 mA	0.8 × V_{IO}			V
V_{OL}	Low-level output voltage		Devices with the "V" suffix (I/O levelshifting), I_O = +2 mA			0.2 x V_{IO}	
$I_{lkg(OFF)}$	Unpowered leakage current		RXD = 5.5 V, V_{CC} = 0 V, V_{IO} = 0 V	–1	0	1	µA
Driver electrical characteristics							
$V_{O(DOM)}$	Bus output voltage (dominant	CANH	TXD = 0 V, S = 0 V, 50 Ω≤ R_L ≤ 65 Ω, C_L = open, R_{CM} = open	2.75		4.5	V
		CANL		0.5		2.25	V
$V_{O(REC)}$	Bus output voltage (recessive)	CANH CANL	TXD = V_{CC}, V_{IO} = V_{CC}, S = V_{CC} or 0 V (2), R_L = open (no load), R_{CM} = open	2	0.5xVCC	3	V
$V_{OD(DOM)}$	Differential output voltage (dominant)	CANH CANL	TXD = 0 V, S = 0 V, 45 Ω≤ R_L < 50 Ω, C_L = open, R_{CM} = open	1.4		3	V
			TXD = 0 V, S = 0 V, 50 Ω≤ R_L ≤ 65 Ω, C_L = open, R_{CM} = open	1.5		3	V
			TXD = 0 V, S =0 V, R_L = 2240 Ω, C_L = open, R_{CM} = open	1.5		5	V
$V_{OD(REC)}$	$V_{OD(REC)}$	$V_{OD(REC)}$	TXD = VCC, S = 0 V, RL = 60 Ω, CL = open, RCM = open	-120		12	mV
			TXD = VCC, S = 0 V, RL = open (no load), CL = open, RCM = open	-50		50	mV
V_{SYM}	Transient symmetry (dominant or recessive) ($V_{O(CANH)}$ + $V_{O(CANL)}$) / V_{CC} Note1		S at 0 V, R_{term}= 60 Ω, C_{split} = 4.7 nF, C_L = open, R_{CM} = open, T_{XD} = 250 kHz, 1 MHz		1.0		V/V
V_{SYM_DC}	DC Output symmetry (dominant or recessive) (V_{CC} – $V_{O(CANH)}$ – $V_{O(CANL)}$) Note1		S = 0 V,R_L = 60 Ω, C_L = open, R_{CM} = open	-1	0.2	1	V
$I_{OS(SS\_DOM)}$	Short-circuit steady-state output current, dominant		S at 0 V, V_{CANH} = -5 V to 40 V, CANH = open, TXD = 0 V	–100			mA
			S at 0 V, V_{CANL} = -5 V to 40 V, CANH = open, TXD = 0 V			100	
$I_{OS(SS\_REC)}$	Short-circuit steady-state output current, recessive		–27 V ≤ VBUS ≤ 32 V, Where VBUS = CANH = CANL, TXD = VCC, all modes	-5		5	mA

Note1: Test data based on bench test and design simulation

Electrical Characteristics (Continue)

VCC = 4.5 V to 5.5 V, VIO = 3.0 V to 5.5 V, T_A = –40°C to 125°C

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Receiver electrical characteristics						
V_{CM}	Common mode range, normal mode	S = 0 or V_{CC} or V_{IO}	-30		+30	V
V_{IT+}	Positive-going input threshold voltage, all modes	S = 0 or V_{CC} or V_{IO}, -20 V ≤ V_{CM} ≤ +20 V			900	mV
V_{IT-}	Negative-going input threshold voltage, all modes		400			
V_{IT+}	Positive-going input threshold voltage, all modes	S = 0 or V_{CC} or V_{IO}, -30 V ≤ V_{CM} ≤ +30 V			1000	mV
V_{IT-}	Negative-going input threshold voltage, all modes		400			
V_{HYS}	Hysteresis voltage (V_{IT+} - V_{IT-}) Note1	S = 0 or V_{CC} or V_{IO}		115		mV
$I_{lkg(IOFF)}$	Power-off (unpowered) bus input leakage current	CANH = CANL = 5 V, V_{CC} = V_{IO} = 0 V			4.8	μA
C_I	Input capacitance to ground (CANH or CANL) Note2			35		pF
C_{ID}	Differential input capacitance Note3			20		pF
R_{ID}	Differential input resistance	TXD = V_{CC} = V_{IO} = 5 V, S = 0 V, -30 V ≤ V_{CM} ≤ +30 V	30		80	kΩ
R_{IN}	Input resistance (CANH or CANL)		15		40	kΩ
$R_{IN(M)}$	Input resistance matching: [1 – $R_{IN(CANH)}$ / $R_{IN(CANL)}$] × 100%	V_{CANH} = V_{CANL} = 5 V	–2%		+2%	

Note1: Test data based on bench test and design simulation
Note2: Typ data is based on bench test by LRC meter E4980AL
Note3: Typ data is based on bench test by LRC meter E4980AL

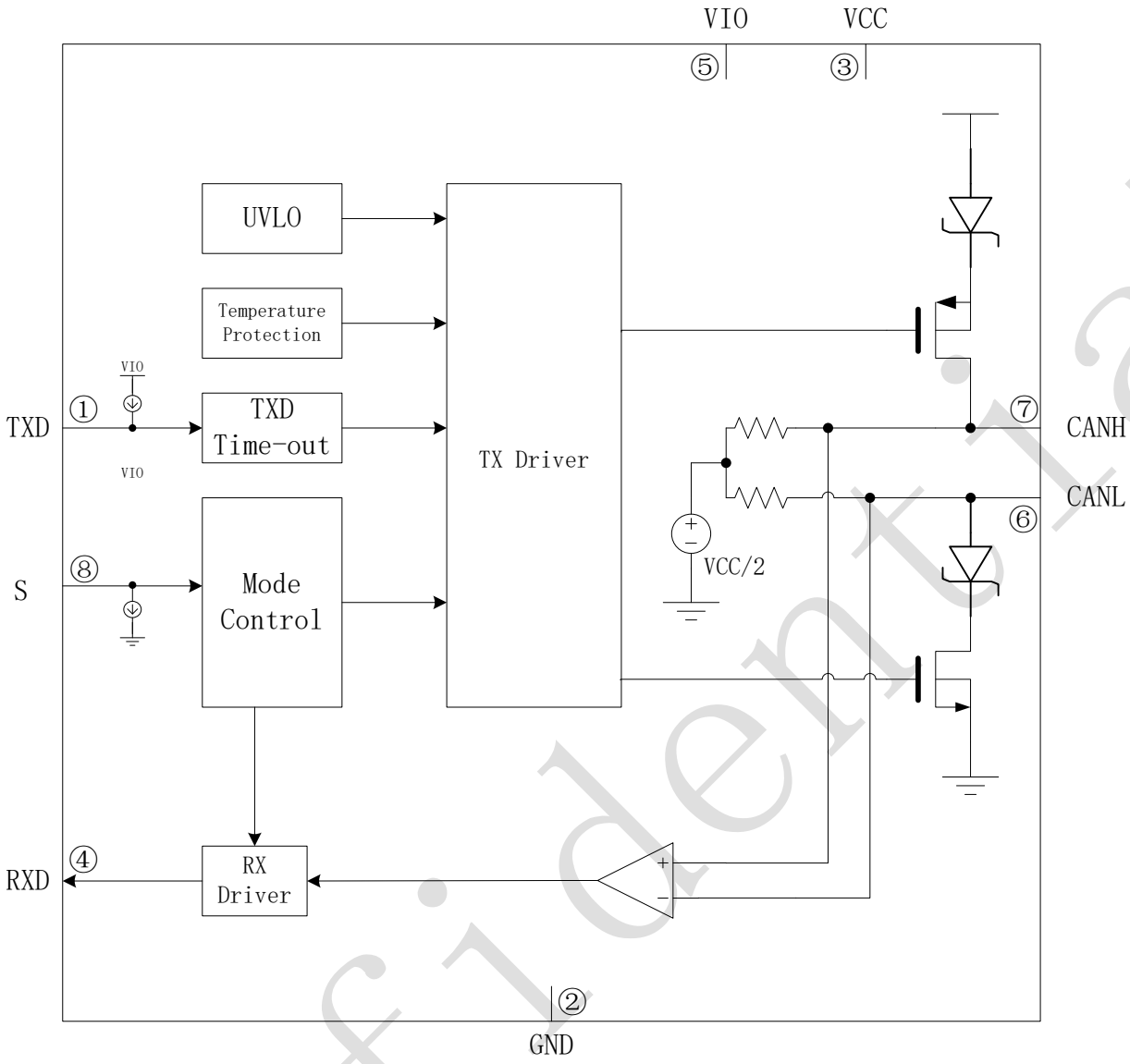
AC Timing Requirements

VCC = 4.5 V to 5.5 V, VIO = 3.0 V to 5.5 V, T_A = –40°C to 125°C

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
DEVICE SWITCHING CHARACTERISTICS						
$t_{PROP(LOOP1)}$	Total loop delay, driver input (TXD) to receiver output (RXD), recessive to dominant	S = 0 V, RL = 60 Ω, CL = 100 pF, CL(RXD) = 15 pF		100	160	ns
$t_{PROP(LOOP2)}$	Total loop delay, driver input (TXD) to receiver output (RXD), dominant to recessive			110	175	
t_{MODE}	Mode change time, from Normal to Silent or from Silent to Normal			0.15	10	µs
DRIVER SWITCHING CHARACTERISTICS						
t_{pHR}	Propagation delay time, high TXD to driver recessive (dominant to recessive) Note1	S = 0 V, R_L = 60 Ω, C_L = 100 pF, R_{CM} = open		70		ns
t_{pLD}	Propagation delay time, low TXD to driver dominant (recessive to dominant) Note1			42		
$t_{sk(p)}$	Pulse skew ($\lvert t_{pHR} - t_{pLD} \rvert$) Note1			20		
t_R	Differential output signal rise time Note1			45		
t_F	Differential output signal fall time Note1			45		
t_{TXD_DTO}	Dominant timeout	S = 0 V, R_L = 60 Ω, C_L = open	1.2		3.8	ms
RECEIVER SWITCHING CHARACTERISTICS						
t_{pRH}	Propagation delay time, bus recessive input to high output (Dominant to Recessive) Note1	S = 0 V, $C_{L(RXD)}$ = 15 pF		76		ns
t_{pDL}	Propagation delay time, bus dominant input to low output (Recessive to Dominant) Note1			59		
t_R	RXD Output signal rise time Note1			10		
t_F	RXD Output signal fall time Note1			10		
FD Timing Parameters						
$t_{BIT(BUS)}$	Bit time on CAN bus output pins with $t_{BIT(TXD)}$ = 500 ns, all devices	S = 0 V, R_L = 60 Ω, C_L = 100 pF, $C_{L(RXD)}$ = 15 pF, $\Delta t_{REC} = t_{BIT(RXD)} - t_{BIT(BUS)}$	435		530	ns
	Bit time on CAN bus output pins with $t_{BIT(TXD)}$ = 200 ns, G device variants only		155		210	
$t_{BIT(RXD)}$	Bit time on RXD output pins with $t_{BIT(TXD)}$ = 500 ns, all devices		400		550	
	Bit time on RXD output pins with $t_{BIT(TXD)}$ = 200 ns, G device variants only		120		220	
Δt_{REC}	Receiver timing symmetry with $t_{BIT(TXD)}$ = 500 ns, all devices		-65		40	
	Receiver timing symmetry with $t_{BIT(TXD)}$ = 200 ns, G device variants only		-45		15	

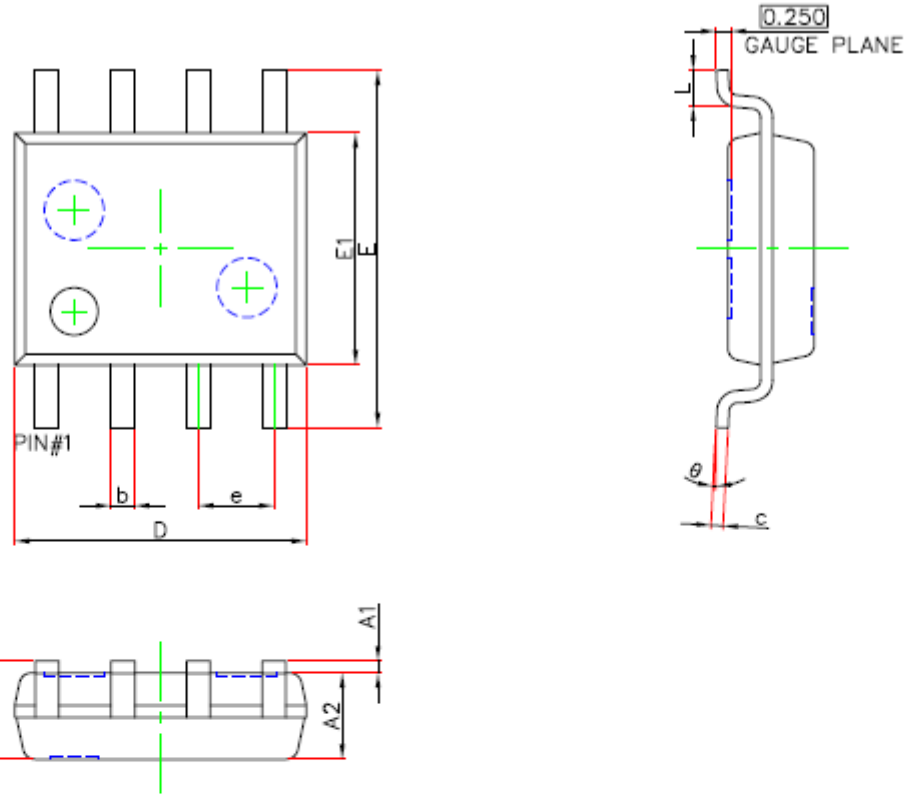
Note1: Test data based on bench test and design simulation

Function Block diagram:



Package Outline Dimensions

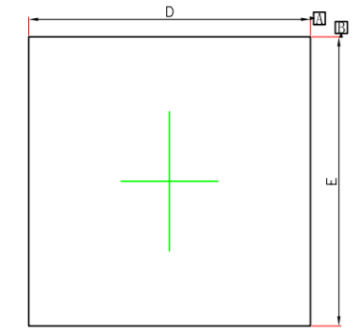
SO1R (SOP8)



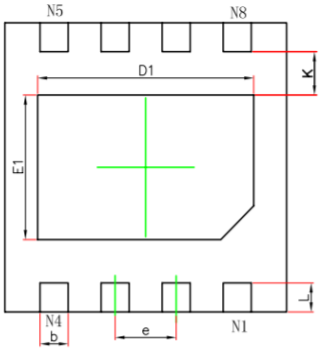
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.450	1.750	0.057	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.700	5.100	0.185	0.201
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
e	1.270(BSC)		0.050(BSC)	
L	0.400	0.800	0.016	0.031
θ	0°	8°	0°	8°

Package Outline Dimensions

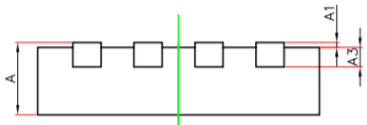
DF6R (DFN3x3-8L)



TOP VIEW



BOTTOM VIEW



SIDE VIEW

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	NOM.	Min.	NOM.
A	0.700/0.800	0.800/0.900	0.028/0.031	0.031/0.035
A1	0.000	0.050	0.000	0.002
A3	0.203REF.		0.008REF.	
D	3.000BSC.		0.118BSC.	
E	3.000BSC.		0.118BSC.	
D1	2.200	2.400	0.087	0.094
E1	1.400	1.600	0.055	0.063
k	0.250MIN.		0.010MIN.	
b	0.250	0.350	0.010	0.014
e	0.650TYP.		0.026TYP.	
L	0.224	0.376	0.009	0.015

单击下面可查看定价，库存，交付和生命周期等信息

>>3PEAK(思瑞浦)