

Feature

- Fail-safe circuitry
- Low power consumption
- Up to 256 transceivers can be attached to the bus
- Maximum transmission rate: 10Mbps(Vcc=5V)
- ESD: $\geq \pm 15\text{kV}$
- SOP8 Package

Applications

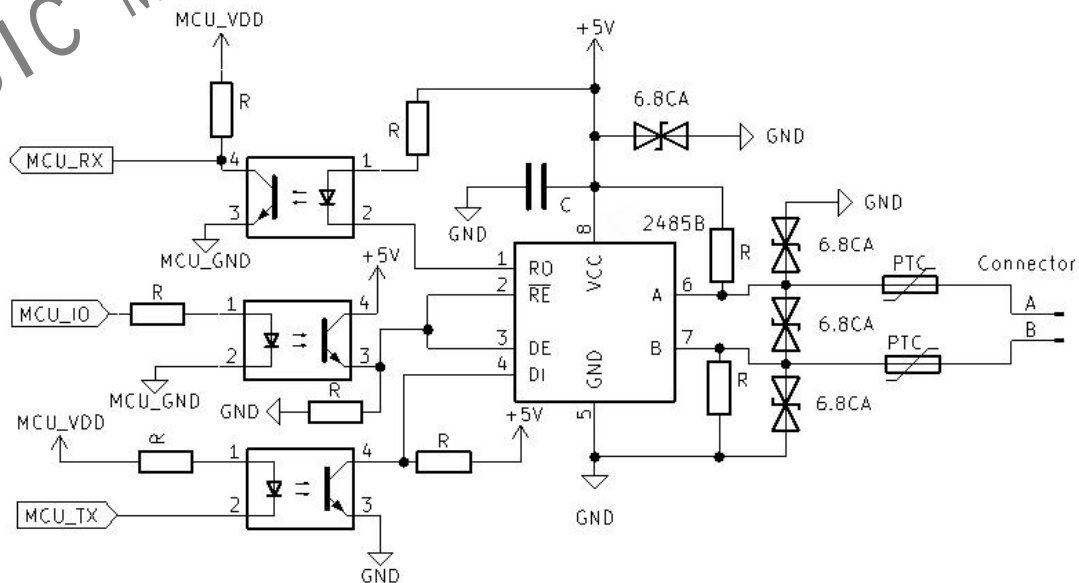
- RS-485 Communications
- Level Translators
- Security Equipment
- Industrial Control Equipment
- Watt-hour meter

General Description

The ACP2485B is high-speed transceivers for RS-485 communication, which contain one driver and one receiver. The ACP2485B feature fail-safe circuitry, which guarantees a logic-high receiver output when the receiver inputs are open or shorted. This means that the receiver output will be a logic high if all transmitters on a

terminated bus are disabled (high impedance). The ACP2485B driver slew rates are not limited, making transmit speeds up to 10Mbps possible. And this device has a 1/8-unit-load receiver input impedance that allows up to 256 transceivers on the bus.

Typical application circuit



Absolute Maximum Ratings (TA=25°C)

Supply Voltage (VCC)	+7V	Receiver Input Voltage (A,B)	±13V
Operating voltage ¹	+3~5.5V	Receiver Output Voltage (RO)	-0.3~Vcc+0.3V
Control Input Voltage (/RE, DE)	-0.3~Vcc+0.3V	Operating Temperature (TOPR)	-40 °C~+105 °C
Driver Input Voltage (DI)	-0.3~Vcc+0.3V	Storage Temperature (TSTG)	-65 °C~+150 °C
Driver Output Voltage (A,B)	±13V		

Note 1: Recommended operating voltage is 5V, but can be compatible with 3V. If using a 3V or 3.3V supply voltage, please reduce the transmission rate.

DC ELECTRICAL CHARACTERISTICS (VCC=5.0V, TA=25°C) ¹

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Differential Driver Output (no load)	V _{OD1}	R=27Ω, Figure 1		---	---	VCC	V
Differential Driver Output	V _{OD2}			1.5	---	---	V
Change in Magnitude of Differential Output Voltage	ΔV _{OD}			---	---	0.2	V
Driver Common-Mode Output Voltage	V _{OC}			1.0	---	3.0	V
Change in Magnitude of Common-Mode Voltage ²	ΔV _{OC}			---	---	0.2	V
Input High Voltage	V _{IH}	DE, DI, /RE		2.0	---	---	V
Input Low Voltage	V _{IL}	DE, DI, /RE		---	---	0.8	V
DI Input Hysteresis	V _{HYS}	---		---	100	---	mV
Driver Input Current (A And B)	I _{IN1}	VIN=12V	DE=0V,	---	---	250	uA
		VIN=-7V	Vcc=5.0V	-150	---	---	uA
Driver Short-Circuit Output Current ³	I _{OSD}	A and B Short-Circuit		-100	---	100	mA
Receiver Differential Threshold Voltage	V _{TH}	-7V ≤ V _{CM} ≤ 12V		-200	-125	-20	mV
Receiver Input Hysteresis	ΔV _{TH}	---		---	40	---	mV
Receiver Output High Voltage	V _{OH}	I _O =-8mA		VCC-1	---	---	V
Receiver Output Low Voltage	V _{OL}	I _O =8mA		---	---	0.4	V
Three-State Output Current at Receiver	I _{OZR}	Vo=1V		-1	---	1	μA
Receiver Input Resistance	R _{IN}	-7V ≤ V _{CM} ≤ 12V		96	---	---	K Ω
Receiver Output Short-Circuit Current	I _{OSR}	0V ≤ V _{RO} ≤ VCC		± 7	---	± 100	mA
Supply Current	I _{CC}	DE=VCC	No Load	---	630	1200	μA
		DE=GND	/RE=DI=VCC/GND	---	600	1200	μA
Supply Current in Shutdown Mode	I _{SHDN}	DE=GND, /RE=VCC, DI=VCC/GND		---	---	3	μA

DC ELECTRICAL CHARACTERISTICS (VCC=3.0V, TA=25°C) ¹

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Differential Driver Output (no load)	V _{OD1}	R=27Ω, Figure 1		---	---	VCC	V
Differential Driver Output	V _{OD2}			0.9	---	---	V
Change in Magnitude of Differential Output Voltage	ΔV _{OD}			---	---	0.2	V
Driver Common-Mode Output Voltage	V _{OC}			1.0	---	3.0	V
Change in Magnitude of Common-Mode Voltage ²	ΔV _{OC}			---	---	0.2	V
Input High Voltage	V _{IH}	DE, DI, /RE		1.5	---	---	V
Input Low Voltage	V _{IL}	DE, DI, /RE		---	---	0.6	V
DI Input Hysteresis	V _{HYS}	---		---	100	---	mV
Driver Input Current (A And B)	I _{IN1}	VIN=12V	DE=0V,	---	---	150	uA
		VIN=-7V	VCC=3V	-150	---	---	uA
Driver Short-Circuit Output Current ³	I _{OSD}	A and B Short-Circuit		100	---	100	mA
Receiver Differential Threshold Voltage	V _{TH}	-7V ≤ V _{CM} ≤ 12V		-150	---	150	mV
Receiver Input Hysteresis	ΔV _{TH}	---		---	40	---	mV
Receiver Output High Voltage	V _{OH}	I _O =-8mA		VCC-1	---	---	V
Receiver Output Low Voltage	V _{OL}	I _O =8mA		---	---	0.6	V
Three-State Output Current at Receiver	I _{OZR}	Vo=1V		-1	---	1	μA
Receiver Input Resistance	R _{IN}	-7V ≤ V _{CM} ≤ 12V		96	---	---	K Ω
Receiver Output Short-Circuit Current	I _{OSR}	0V ≤ V _{RO} ≤ VCC		± 7	---	± 100	mA
Supply Current	I _{CC}	DE=VCC	No Load	---	---	1000	μA
		DE=GND	/RE=DI=VCC/GND	---	---	1000	μA
Supply Current in Shutdown Mode	I _{SHDN}	DE=GND, /RE=VCC, DI=VCC/GND		---	---	3	μA

SWITCHING CHARACTERISTICS (VCC=5.0V, TA=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Rise or Fall Time	t_R, t_F	Figure 3 and 5. $R_{DIFF}=54\Omega$ $C_L=C_L2=100pF$	---	30	---	ns
Driver Input to Output	t_{PLH}, t_{PHL}		---	30	60	ns
Driver Output Skew $ T_{DPLH} - T_{DPLH} $	t_{SKEW}		---	---	20	ns
Driver Enable time	t_{LZ}, t_{HZ}	Figure 4 and 6. $C_L=100pF$ (Receiver enabled)	---	---	70	ns
Driver Enable time	$t_{LZ}(SHDN),$ $t_{HZ}(SHDN)$	Figure 4 and 6. $C_L=100pF$ (Receiver disabled)	---	1400	3000	ns
Driver disable time	t_{LZ}, t_{ZL}	Figure 4 and 6. $C_L=100pF$	---	---	70	ns
Maximum Data Rate	F_{MAX}	---	10	---	---	Mbps
Receiver Rise or Fall Time	t_R, t_F	Figure 7	---	20	---	ns
Receiver propagation delay time	t_{PLH}, t_{PHL}		---	90	250	ns
$ T_{RPLH}-T_{RPHL} $ Differential Receiver Skew	t_{SKD}		---	30	---	ns
Receiver enable time	t_{ZL}, t_{ZH}	Figure 2 and 8. $C_{RL}=15pF$ (Driver enabled)	---	30	70	ns
Receiver enable time	$t_{ZL}(SHDN),$ $t_{ZH}(SHDN)$	Figure 2 and 8. $C_{RL}=15pF$ (Driver disabled)	---	1400	3000	ns
Receiver disable time	t_{LZ}, t_{HZ}	Figure 2 and 8. $C_{RL}=15pF$	---	30	70	ns
Time to Shutdown	t_{SHDN}	---	---	200	600	ns

SWITCHING CHARACTERISTICS (VCC=3.0V, TA=25°C)

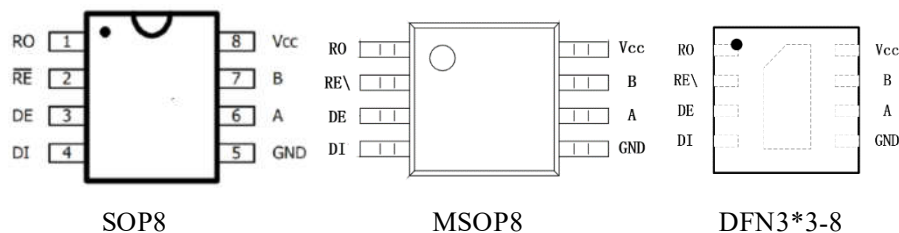
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Rise or Fall Time	t_R, t_F	Figure 3 and 5. $R_{DIFF}=54\Omega$ $C_{L1}=C_{L2}=100pF$	---	30	---	ns
Driver Input to Output	t_{PLH}, t_{PHL}		---	30	60	ns
Driver Output Skew $ T_{DPLH} - T_{DPLH} $	t_{SKEW}		---	---	20	ns
Driver Enable time	t_{LZ}, t_{HZ}	Figure 4 and 6. $C_L=100pF$ (Receiver enabled)	---	---	70	ns
Driver Enable time	$t_{LZ(SHDN)}, t_{HZ(SHDN)}$	Figure 4 and 6. $C_L=100pF$ (Receiver disabled)	---	1600	3000	ns
Driver disable time	t_{LZ}, t_{LZL}	Figure 4 and 6. $C_L=100pF$	---	---	70	ns
Maximum Data Rate	F_{MAX}	---	10	---	---	Mbps
Receiver Rise or Fall Time	t_R, t_F	Figure 7	---	20	---	ns
Receiver propagation delay time	t_{PLH}, t_{PHL}		---	90	250	ns
Receiver Skew $ T_{RPLH} - T_{RPHL} $ Differential Receiver Skew	t_{SKD}		---	30	---	ns
Receiver enable time	t_{LZ}, t_{LZH}	Figure 2 and 8. $C_{RL}=15pF$ (Driver enabled)	---	25	70	ns
Receiver enable time	$t_{LZ(SHDN)}, t_{LZH(SHDN)}$	Figure 2 and 8. $C_{RL}=15pF$ (Driver disabled)	---	1600	3000	ns
Receiver disable time	t_{LZ}, t_{LZH}	Figure 2 and 8. $C_{RL}=15pF$	---	30	70	ns
Time to Shutdown	t_{SHDN}	---	---	230	800	ns

Note 1: All currents into the device are positive; all currents out of the device are negative. All voltages are referred to device ground unless otherwise noted.

Note 2: ΔV_{OD} and ΔV_{OC} are the changes in V_{OD} and V_{OC} , respectively, when the DI input changes state.

Note 3: Maximum current level applies to peak current just prior to foldback-current limiting; minimum current level applies during current limiting.

Pin Assignment



Product Information

Product	Package	MPQ
ACP2485BAT0	SOP-8	3500PCS
ACP2485BBT0	MSOP-8	3500PCS
ACP2485BCT0	DFN3*3-8	3000PCS

Pin Description

PIN	NAME	FUNCTION
1	RO	Receiver Output, When RE is low and if $A - B \geq -50mV$, RO will be high; if $A - B \leq -200mV$, RO will be low.
2	/RE	Receiver Output Enable. Drive RE low to enable RO; RO is high impedance when RE is high. Drive RE high and DE low to enter low-power shutdown mode.
3	DE	Driver Output Enable. Drive DE high to enable driver outputs. These outputs are high impedance when DE is low. Drive RE high and DE low to enter low-power shutdown mode.
4	DI	Driver Input. With DE high, a low on DI forces noninverting output low and inverting output high.
5	GND	Ground
6	A	Noninverting Receiver Input and Noninverting Driver Output
7	B	Inverting Receiver Input and Inverting Driver Output
8	VCC	Positive Supply

Function Tables

TRANSMITTING

INPUTS			OUTPUTS	
/RE	DE	DI	A	B
X	1	1	1	0
X	1	0	0	1
0	0	X	High-Z	High-Z
1	0	X	Shutdown	

RECEIVING

INPUTS			OUTPUT
/RE	DE	A-B	RO
0	X	$\geq -0.05V$	1
0	X	$\leq -0.2V$	0
0	X	Open/shorted	1
1	1	X	High-Z
1	0	X	Shutdown

Test circuit

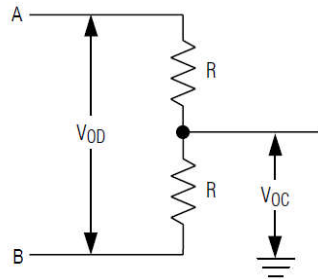


Figure 1. Driver DC Test Load

Load

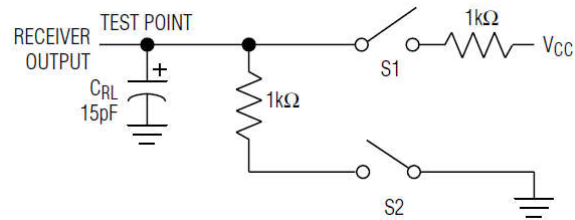


Figure 2. Receiver Enable/Disable Timing Test

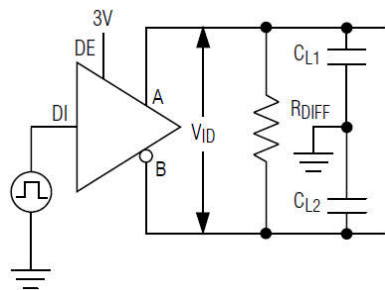


Figure 3. Driver Timing Test Circuit

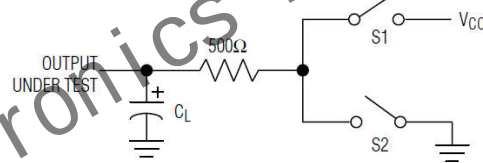


Figure 4. Driver Enable/Disable Timing Test Load

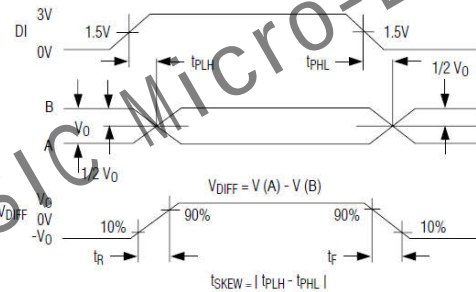


Figure 5. Driver Propagation Delays

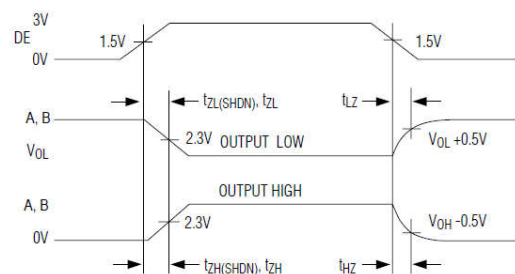


Figure 6. Driver Enable and Disable Times

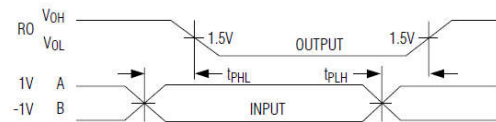


Figure 7. Receiver Propagation Delays

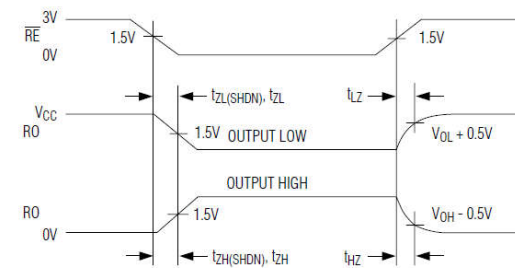
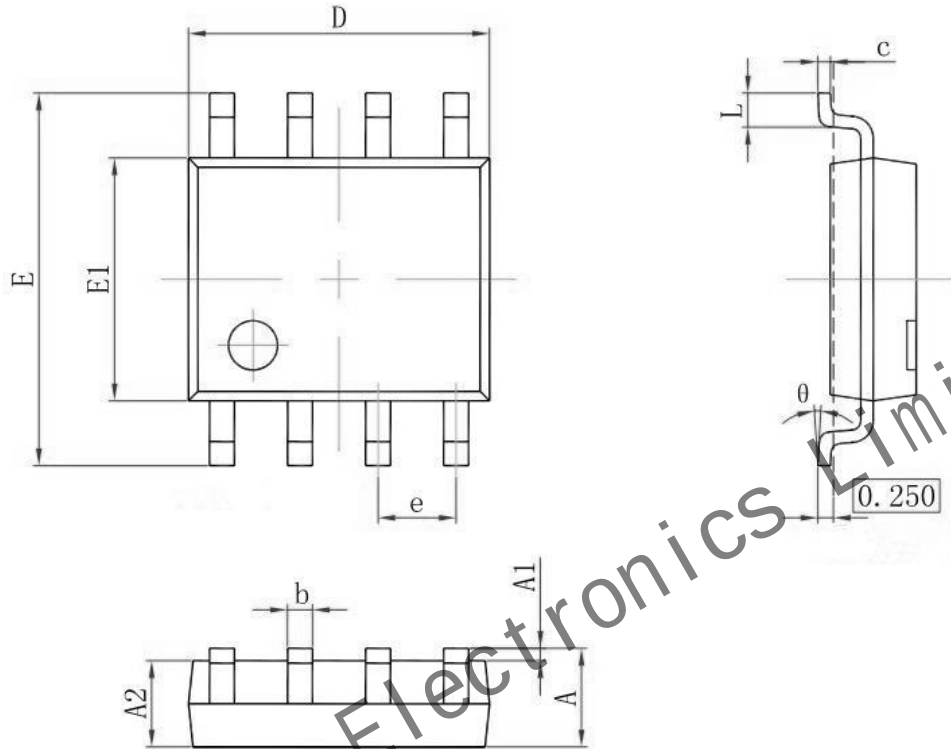


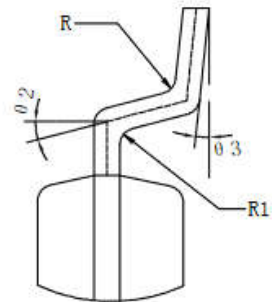
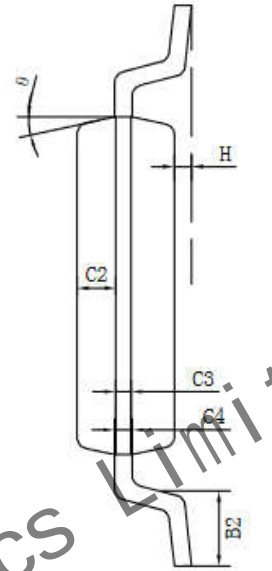
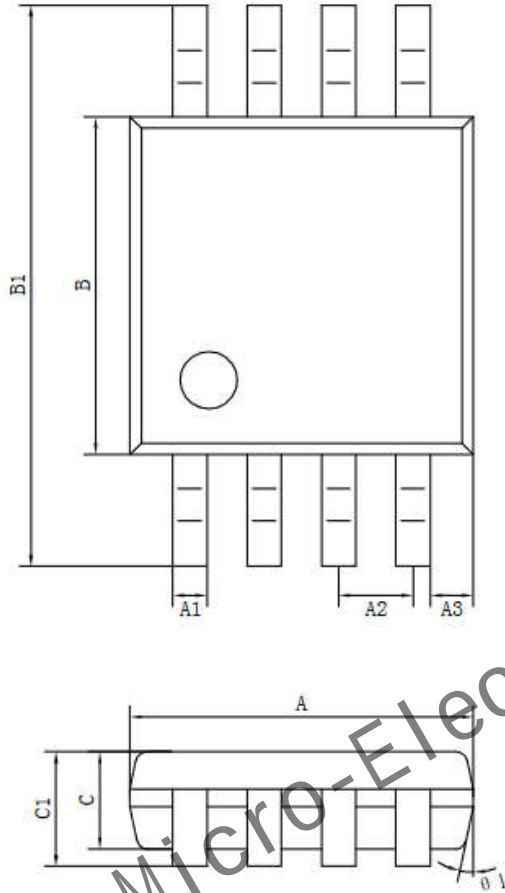
Figure 8. Receiver Enable and Disable Times

SOP8 Package Information



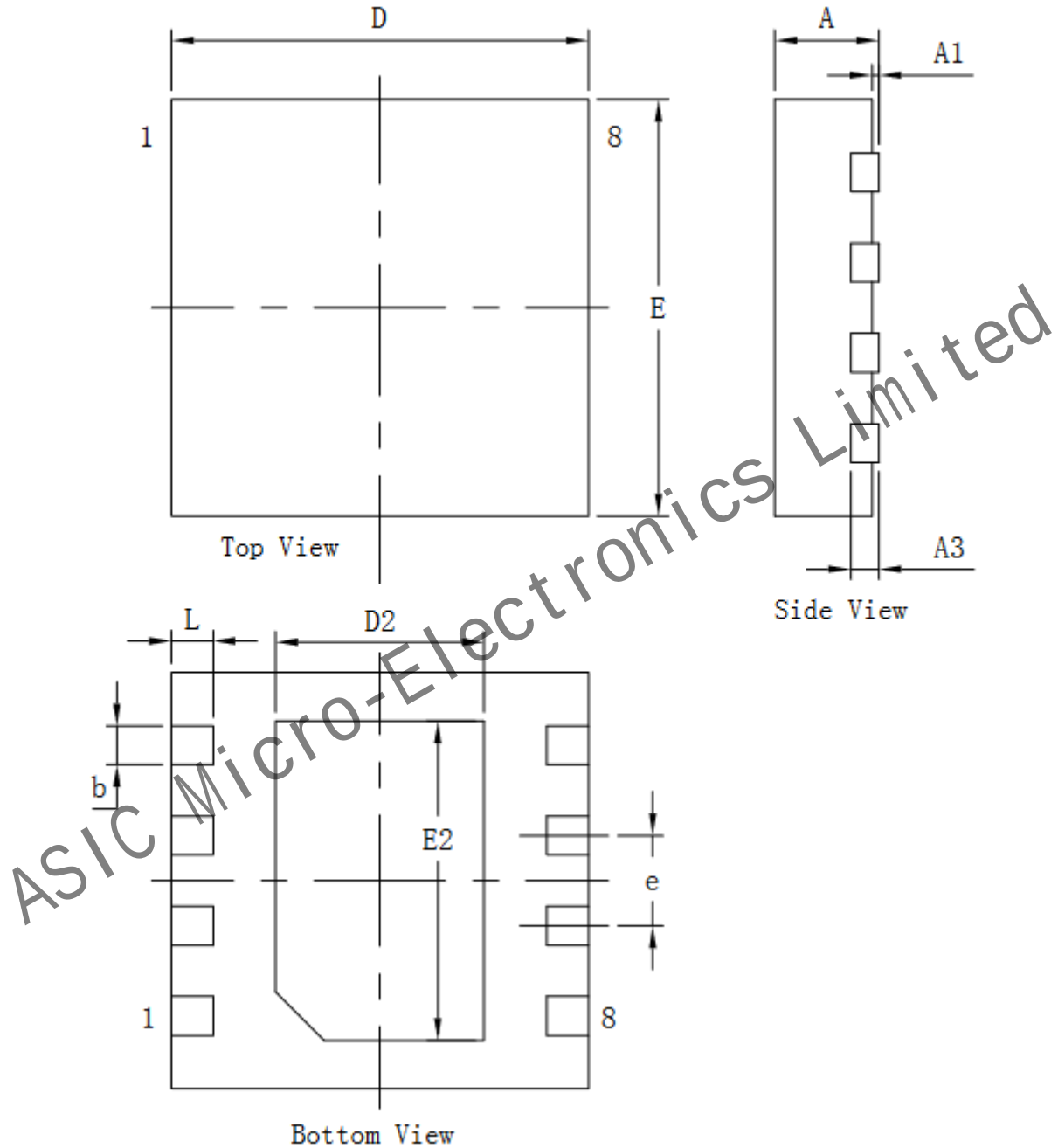
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270 (BSC)		0.050 (BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.031
θ	0°	8°	0°	8°

MSOP8 Package Information



标注	尺寸	最小 (mm)	最大 (mm)	标注	尺寸	最小 (mm)	最大 (mm)
A		2.90	3.10	C3		0.152	
A1		0.28	0.35	C4		0.15	0.23
A2		0.65TYP		H		0.00	0.09
A3		0.375TYP		θ		12° TYP4	
B		2.90	3.10	0.1		12° TYP4	
B1		4.70	5.10	0.2		14° TYP	
B2		0.45	0.75	0.3		0° ~ 6°	
C		0.75	0.95	R		0.15TYP	
C1		--	1.10	R1		0.15TYP	
C2		0.328TYP					

DFN3*3-8 Package Information



标注	尺寸	最小 (mm)	标准 (mm)	最大 (mm)	标注	尺寸	最小 (mm)	标准 (mm)	最大 (mm)
A		0.70	0.75	0.80	E		2.90	3.00	3.10
A1		-	-	0.05	D2		1.40	1.50	1.60
A3		0.203 REF			E2		2.20	2.30	2.40
b		0.23	0.28	0.33	e		0.65 TYP		
D		2.90	3.00	3.10	L		0.25	0.30	0.35

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