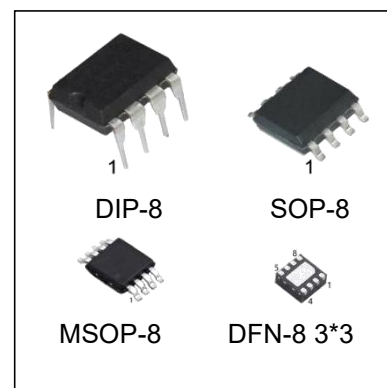# RS485 Transceivers

Feature

- Fail-safe circuitry

- Low power consumption

- Up to 256 transceivers can be attached to the bus

- Maximum transmission rate：10Mbps(Vcc=5V)

- ESD：≥ ±15kV

- Available in DIP-8、SOP-8、MSOP-8 and DFN-8 packages

DIP-8   SOP-8

MSOP-8   DFN-8 3*3

Ordering Information

| DEVICE	Package Type	MARKING	Packing	Packing Qty
HGSP3485EIN	DIP-8	SP3485	TUBE	2000pcs/box
HGSP3485EIM/TR	SOP-8	SP3485	REEL	2500pcs/reel
HGSP3485EIMM/TR	MSOP-8	3485	REEL	3000pcs/reel
HGSP3485EIDQ3/TR	DFN-8 3*3	3485	REEL	5000pcs/reel

General Description

The HGSP3485 is high-speed transceivers for RS-485 communication, which contain one driver and one receiver. The HGSP3485 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 HGSP3485 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.
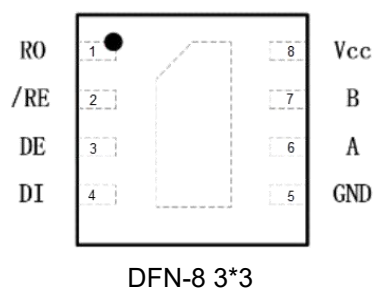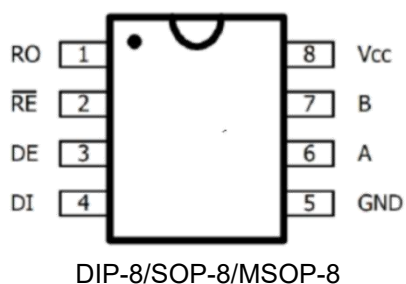
Applications

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

Typical application circuit

Pin Assignment

DIP-8/SOP-8/MSOP-8

DFN-8 3*3
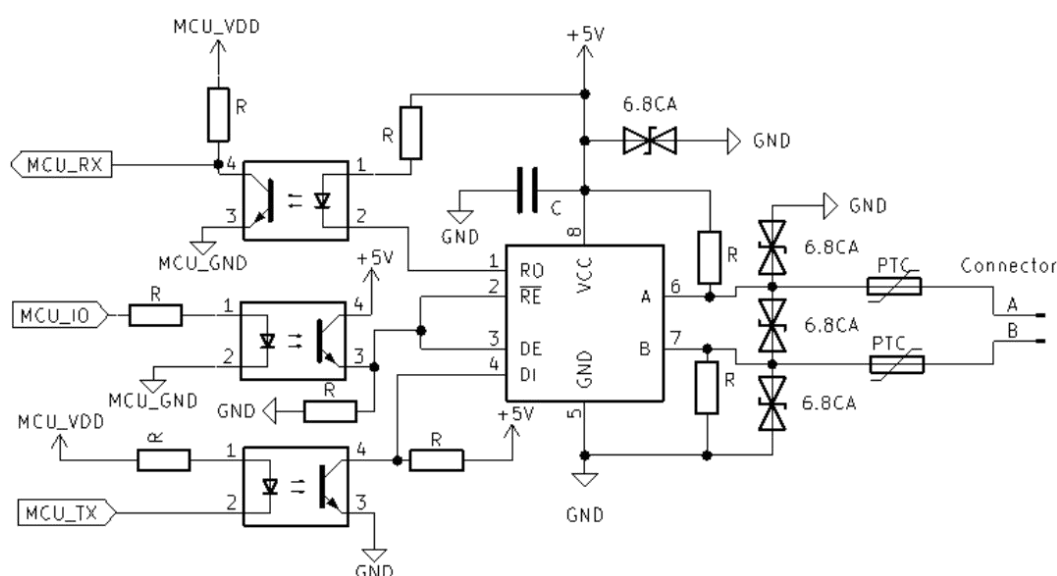
Pin Description

PIN	NAME	FUNCTION
1	RO	Receiver Output, When RE is low and if A - B ≥ -50mV, RO will be high; if A - B ≤ -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	≥-0.05V	1
0	X	≤-0.2V	0
0	X	Open/shorted	1
1	1	X	High-Z
1	0	X	Shutdown

Absolute Maximum Ratings

（TA=25℃）

CONDITION	SYMBOL	VALUE	UNITS
Supply Voltage	V_{CC}	+7	V
Operating voltage [1]		+3 ~ +5.5	V
Control Input Voltage	/RE, DE	-0.3 ~ Vcc+0.3	V
Driver Input Voltage	DI	-0.3 ~ Vcc+0.3	V
Driver Output Voltage	A,B	±13	V
Receiver Input Voltage	A,B	±13	V
Receiver Output Voltage	RO	-0.3 ~ Vcc+0.3	V
Operating Temperature[2]	T_{OPR}	-40 ~ +105	℃
Storage Temperature	T_{STG}	-65 ~ +150	℃
Lead Temperature (10s)	T_L	+260	℃

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.

Note1: 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.

Note2:Operating temperature range: -40°C to +125°C. This product is designed for industrial grade applications. For automotive grade versions compliant with AEC-Q100, please conduct internal screening per the standard or contact our sales team for availability.

DC Electrical Characteristics

V_{CC}=5.0V，TA=25℃

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Differential Driver Output（no load）	V_{OD1}	R=27Ω, Figure 1		-	-	V_{CC}	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, Vcc=5.0V	-	-	250	uA
		VIN=-7V		-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	$\triangle V_{TH}$			-	40	-	mV
Receiver Output High Voltage	V_{OH}	IO=-8mA		V_{CC}-1	-	-	V
Receiver Output Low Voltage	V_{OL}	IO=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	-	-	KΩ
Receiver Output Short-Circuit Current	I_{OSR}	0V≤V_{RO}≤V_{CC}		±7	-	±100	mA
Supply Current	I_{CC}	DE=V_{CC}	No Load	-	630	1200	μA
		DE=GND	/RE=DI=V_{CC}/GND	-	600	1200	μA
Supply Current in Shutdown Mode	I_{SHDN}	DE=GND, /RE=V_{CC}, DI=V_{CC}/GND		-	-	3	μA

DC Electrical Characteristics

V_{CC}=3.0V，TA=25℃

PARAMETER	SYMBOL	CONDITIONS		MIN	TYP	MAX	UNITS
Differential Driver Output（no load）	V_{OD1}	R=27Ω, Figure 1		-	-	V_{CC}	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, Vcc=3V	-	-	150	uA
		VIN=-7V		-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	$\triangle V_{TH}$			-	40	-	mV
Receiver Output High Voltage	V_{OH}	IO=-8mA		V_{CC}-1	-	-	V
Receiver Output Low Voltage	V_{OL}	IO=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	-	-	KΩ
Receiver Output Short-Circuit Current	I_{OSR}	0V≤V_{RO}≤V_{CC}		±7	-	±100	mA
Supply Current	I_{CC}	DE=V_{CC}	No Load /RE=DI=V_{CC}/GND	-	-	1000	μA
		DE=GND		-	-	1000	μA
Supply Current in Shutdown Mode	I_{SHDN}	DE=GND, /RE=V_{cc}, DI=V_{CC}/GND		-	-	3	μA

Switching Characteristics

V_{CC}=5.0V，TA=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Rise or Fall Time	t_R, t_F	Figure 3 and 5，R_{DIFF}=54Ω C_{L1}=C_{L2}=100pF	-	30	-	ns
Driver Input to Output	t_{PLH}，t_{PHL}		-	30	60	ns
Driver Output Skew|T_{DPLH} − T_{DPHL}|	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

V_{CC}=3.0V，TA=25℃

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Driver Rise or Fall Time	t_R, t_F	Figure 3 and 5，R_{DIFF}=54Ω C_{L1}=C_{L2}=100pF	-	30	-	ns
Driver Input to Output	t_{PLH}，t_{PHL}		-	30	60	ns
Driver Output Skew $|T_{DPLH} - T_{DPHL}|$	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_{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)	-	25	70	ns
Receiver enable time	$t_{ZL(SHDN)}$, $t_{ZH(SHDN)}$	Figure 2 and 8，C_{RL}=15pF (Driver disabled)	-	1600	3000	ns
Receiver disable time	t_{LZ}, t_{HZ}	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.
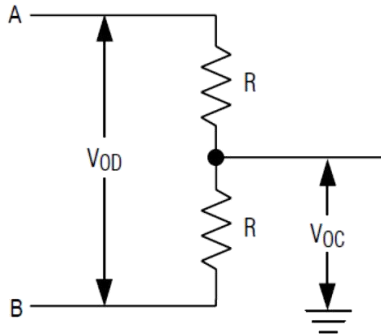
Test circuit

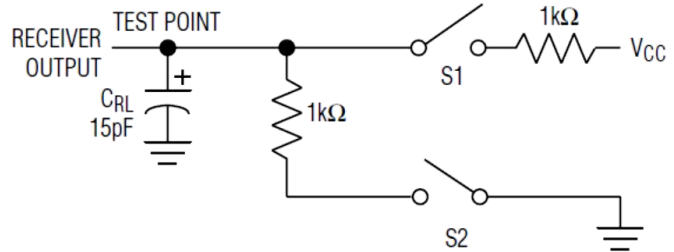Figure 1. Driver DC Test Load

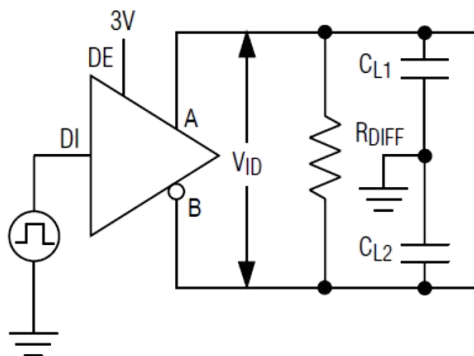Figure 2. Receiver Enable/Disable Timing Test load

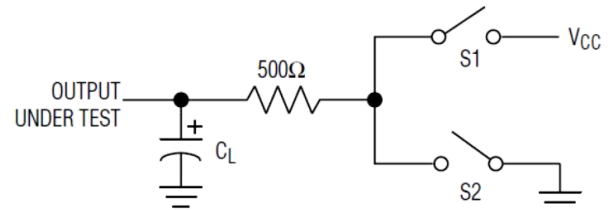Figure 3. Driver Timing Test Circuit

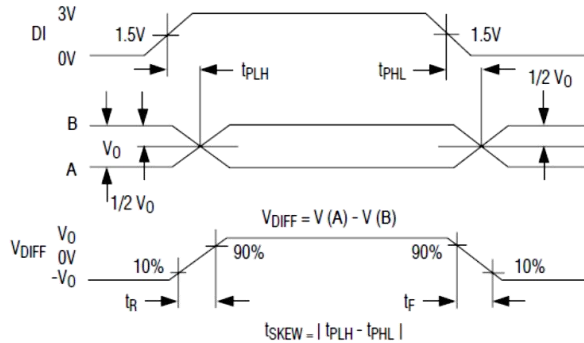Figure 4. Driver Enable/Disable Timing Test Load

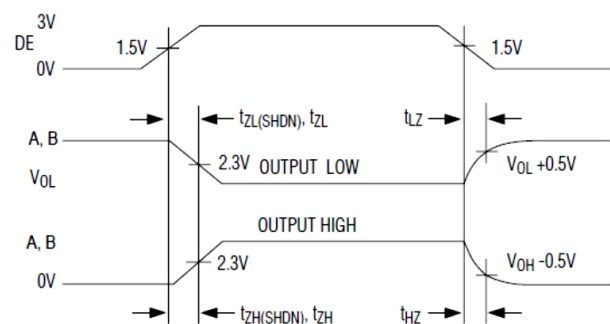Figure 5. Driver Propagation Delays

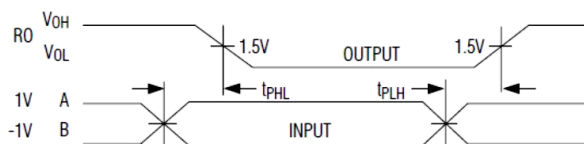Figure 6. Driver Enable and Disable Times
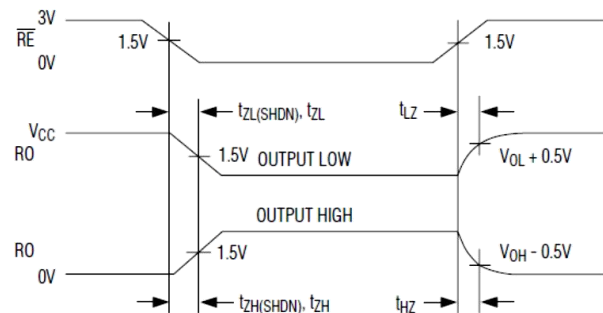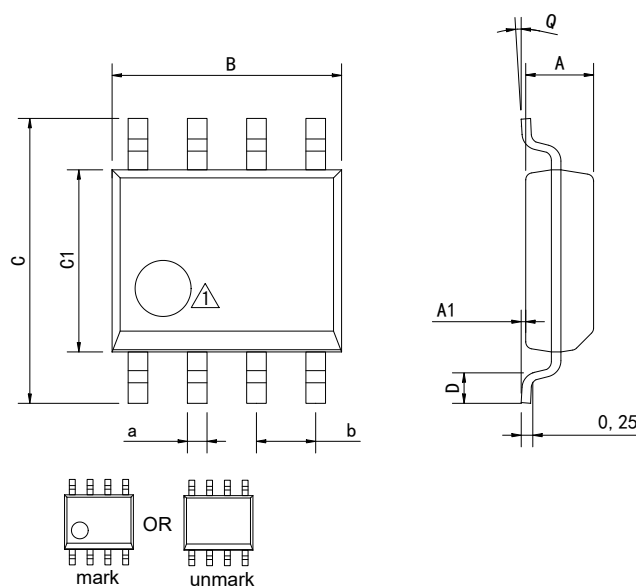

Figure 7. Receiver Propagation Delays

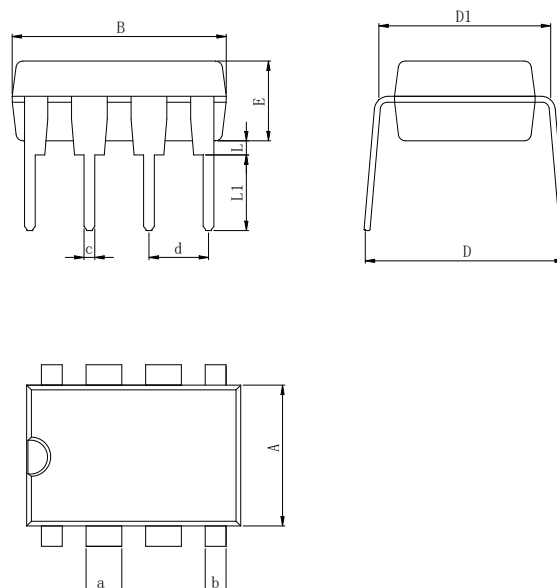Figure 8. Receiver Enable and Disable Times

Physical Dimensions

SOP-8

△ Package top mark may be in lower left corner or unmark

Dimensions In Millimeters(SOP-8)								
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	1.35	0.05	4.90	5.80	3.80	0.40	0°	0.35	1.27 BSC
Max:	1.55	0.20	5.10	6.20	4.00	0.80	8°	0.45	

DIP-8

Dimensions In Millimeters(DIP-8)									
Symbol:	A	B	D	D1	E	L	L1	a	b	c	d
Min:	6.10	9.00	8.10	7.42	3.10	0.50	3.00	1.50	0.85	0.40	2.54 BSC
Max:	6.68	9.50	10.9	7.82	3.55	0.70	3.60	1.55	0.90	0.50	

Physical Dimensions

MSOP-8
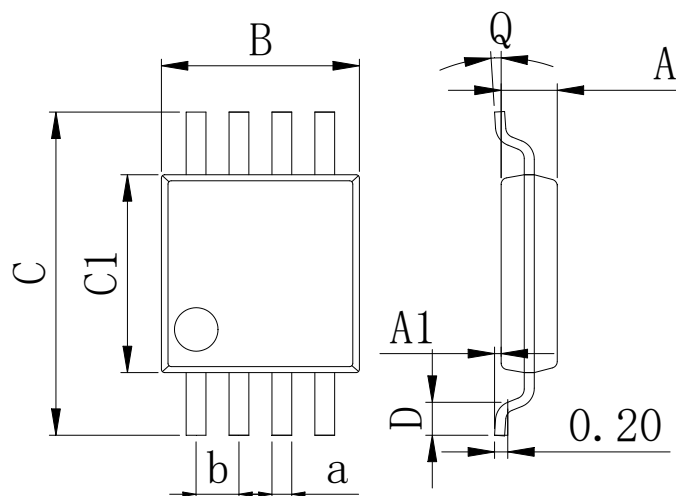
Dimensions In Millimeters(MSOP-8)								
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.80	0.05	2.90	4.75	2.90	0.35	0°	0.25	0.65 BSC
Max:	0.90	0.20	3.10	5.05	3.10	0.75	8°	0.35	

DFN-8 3*3
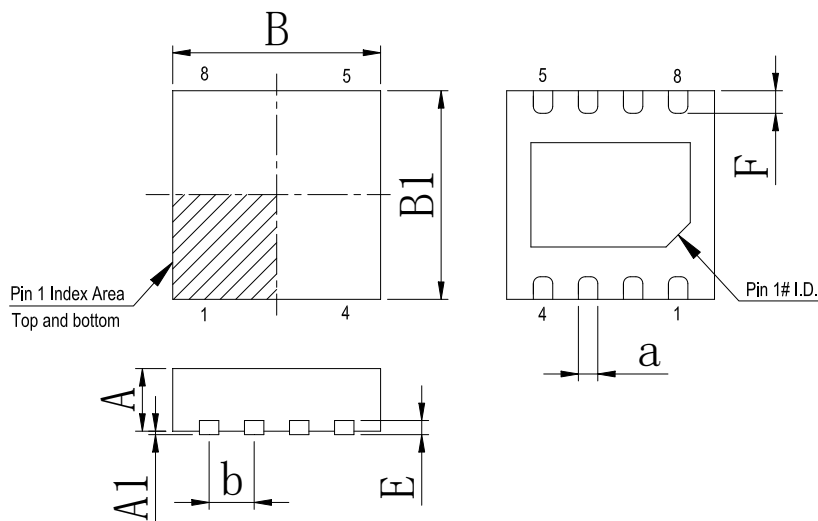
Dimensions In Millimeters(DFN-8 3*3)							
Symbol:	A	A1	B	B1	E	F	a	b
Min:	0.85	0.00	2.90	2.90	0.20	0.30	0.20	0.65 BSC
Max:	0.95	0.05	3.10	3.10	0.25	0.50	0.34	

Revision History

REVISION NUMBER	DATE	REVISION	PAGE
V1.0	2018-7	New	1-13
V1.1	2025-9	Document Reformatting	1-13

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