DESCRIPTION

The A3085A is a half-duplex RS-485 transceiver with ±15kV IEC 61000-4-2 contact ESD protection. This device contains one driver and one receiver. The A3085A includes 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 logic high even if all transmitters on a terminated bus are disabled. The A3085A features reduced slew-rate driver that minimizes EMI and reduces reflections caused by improperly terminated cables, allowing error-free data transmission up to 500kbps. The A3085A has a 1/8 unit load receiver input impedance that allows up to 256 transceivers on the bus.

The A3085A is available in SOP8 package

FEATURES

- +3.3V or +5V Operation
- True Fail-Safe Receiver
- Maximum Data Rate: 500kbps (V_{CC}=5V)
  250kbps (V_{CC}=3.3V)
- Allow Up to 256 Transceivers on the Bus
- I/O Pins ESD Protection:
  ±15kV IEC 61000-4-2, Contact Discharge
- Available in SOP8 package

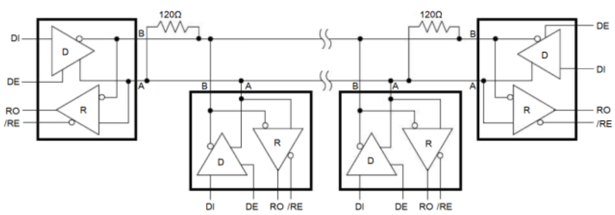
APPLICATION

- Smart Meter
- DVR
- RS-485 Communications
- Level Translators
- Transceivers for EMI-Sensitive Applications
- Industrial-Control Local Area Networks
- Energy Meter Networks
- Lighting Systems

ORDERING INFORMATION

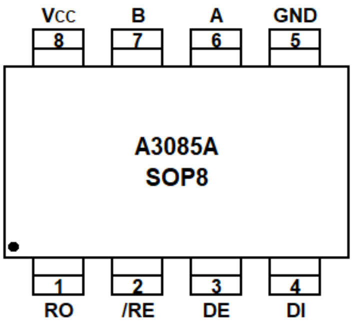
Package Type	Part Number	
SOP8 SPQ: 2,500pcs/Reel	M8	A3085AM8R
		A3085AM8VR
Note	V: Halogen free Package R: Tape & Reel	
AiT provides all RoHS products		

TYPICAL APPLICATION



Typical Half-Duplex RS-485 Network

PIN DESCRIPTION



Top View

Pin #	Symbol	Functions
1	RO	Receiver Output.
2	/RE	Receiver Output Enable. /RE is low to enable the Receiver; /RE is high to disable the Receiver.
3	DE	Driver Output Enable. DE is high to enable the Driver; DE is low to disable the Driver.
4	DI	Driver Input
5	GND	Ground.
6	A	Non-inverting Receiver Input and Non-inverting Driver Output.
7	B	Inverting Receiver Input and Inverting Driver Output.
8	V_{CC}	Power Supply.

FUNCTION TABLE

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 (High-Z)	

Receiving			
Inputs			Outputs
/RE	DE	A-B	RO
0	X	>-50mV	1
0	X	<-200mV	0
0	X	Open/Shorted	1
1	1	X	High-Z
1	0	X	Shutdown (High-Z)

ABSOLUTE MAXIMUM RATINGS

V_{CC}, Power Supply	+7V
/RE, DE, Control Input Voltage	-0.3V ~ V_{CC}+0.3V
DI, Transmitter Input Voltage	-0.3V ~ V_{CC}+0.3V
A, B, Transmitter Output Voltage	±13V
A, B, Receiver Input Voltage	±13V
RO, Receiver Output Voltage	-0.3V ~ V_{CC}+0.3V
Operating Temperature	-40℃ ~ +85℃
Storage Temperature	-65℃ ~ +150℃
Operating Junction Temperature	125℃

Stress beyond above listed “Absolute Maximum Ratings” may lead permanent damage to the device. These are stress ratings only and operations of the device at these or any other conditions beyond those indicated in the operational sections of the specifications are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

DC ELECTRICAL CHARACTERISTICS

(5V Operation)

V_{CC}=+5V±5%, T_A=-40℃ ~ +85℃, Typical Values are V_{CC}=+5V and T_A = 25℃[NOTE1]

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Power Supply	V_{CC}		4.5	-	5.5	V
Driver						
Differential Driver Output (no load)	V_{OD1}	Figure 1	-	-	V_{CC}	V
Differential Driver Output	V_{OD2}	Figure 1, R=27Ω	1.5	-	-	V
Change in Magnitude of Differential Output Voltage[NOTE2]	ΔV_{OD}	Figure 1, R=27Ω	-	-	0.2	V
Driver Common-mode Output Voltage	V_{OC}	Figure 1, R=27Ω	1.0	-	3.0	V
Change in Magnitude of Common-Mode Voltage[NOTE2]	ΔV_{OC}	Figure 1, R=27Ω	-	-	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
Input Current(A and B)	I_{IN4}	DE=GND, V_{CC}=GND or 5.25V, V_{IN}=12V	-	-	125	μA
		DE=GND, V_{CC}=GND or 5.25V, V_{IN}=-7V	-75	-	-	μA
Driver Short-Circuit Output Current	I_{OSD}	A Pin Short to B Pin	-100	-	100	mA
Receiver						
Receiver Differential Threshold Voltage	V_{TH}	-7V≤V_{CM}≤12V	-200	-125	-50	mV
Receiver Input Hysteresis	ΔV_{TH}		-	40	-	mV
Receiver Output High Voltage	V_{OH}	I_O=-8mA, V_{ID}=-50mV	4.0	-	-	V
Receiver Output Low Voltage	V_{OL}	I_O=8mA, V_{ID}=-200mV	-	-	0.4	V
Three-State Output Current at Receiver	I_{OZR}		-	-	±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	-	±95	mA
Supply Current						
Supply Current	I_{CC}	No load, /RE= DI=GND or V_{CC}, DE=V_{CC}	-	350	600	μA
		No load, /RE= DI=GND or V_{CC}, DE=GND	-	370	600	μA
Supply Current in Shutdown Mode	I_{SHDN}	DE=GND, /RE=V_{CC}, DI=V_{CC} or GND	-	-	10	μA

(3.3V Operation)

V_{CC}=+3.3V±5%,T_A=-40℃ ~ +85℃, Typical Values are V_{CC}=+3.3V and T_A = 25℃NOTE1

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
Power Supply	V_{CC}			3	-	3.6	V
Driver							
Differential Driver Output (no load)	V_{OD1}	Figure 1		-	-	V_{CC}	V
Differential Driver Output	V_{OD2}	Figure 1, R=27Ω		0.8	1.15	-	V
Change in Magnitude of Differential Output VoltageNOTE2	ΔV_{OD}	Figure 1, R=27Ω		-	-	0.2	V
Driver Common-mode Output Voltage	V_{OC}	Figure 1, R=27Ω		1.0	-	3.0	V
Change in Magnitude of Common-Mode VoltageNOTE2	ΔV_{OC}	Figure 1, R=27Ω		-	-	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
Input Current(A and B)	I_{IN4}	DE=GND, V_{CC}= GND or 3.6V	V_{IN}=12V	-	-	125	μA
			V_{IN}=-7V	-75-	-	-	
Driver Short-Circuit Output Current	I_{OSD}	A Pin Short to B Pin		-100	-	100	mA
Receiver							
Receiver Differential Threshold Voltage	V_{TH}	-7V≦V_{CM}≦12V		-200	-125	-50	mV
Receiver Input Hysteresis	ΔV_{TH}			-	40	-	mV
Receiver Output High Voltage	V_{OH}	I_O=-1.5mA, V_{ID}=-50mV		4.0	-	-	V
Receiver Output Low Voltage	V_{OL}	I_O=2.5mA, V_{ID}=-200mV		-	-	0.4	V
Three-State Output Current at Receiver	I_{OZR}			-	-	±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	-	±95	mA
Supply Current							
Supply Current	I_{CC}	No load , /RE= DI=GND or V_{CC}	DE=V_{CC}	-	270	600	μA
			DE=GND	-	290	600	μA
Supply Current in Shutdown Mode	I_{SHDN}	DE=GND, /RE=V_{CC}, DI=V_{CC} or GND		-	-	10	μA

NOTE1: 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.

NOTE2: ΔV_{OD} and ΔV_{OC} are the changes in V_{OD} and V_{OC}, respectively, when the DI input changes state.

SWITCHING CHARACTERISTICS

(5V Operation)
V_{CC}=+5V±5%, T_A=-40℃ ~ +85℃, Typical values @ V_{CC}=+5V, T_A = 25℃

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Driver Input to Output	t_{DPLH}	Figure 3 and 5, R_{DIFF}=54Ω C_{L1}=C_{L2}=100pF	-	300	800	ns
	t_{DPHL}		-	300	800	
Driver Output Skew $\|T_{DPLH} – T_{DPHL}\|$	t_{DSKEW}	Figure 3 and 5, R_{DIFF}=54Ω C_{L1}=C_{L2}=100pF	-	-	100	ns
Driver Rise or Fall Time	t_{DR}, t_{DF}	Figure 3 and 5, R_{DIFF}=54Ω C_{L1}=C_{L2}=100pF	-	420	900	ns
Maximum Data Rate	F_{MAX}		500	-	-	kbps
Driver Enable to Output High	t_{DZH}	Figure 4 and 6, C_L=100pF S2 Closed	-	-	300	ns
Driver Enable to Output Low	t_{DZL}	Figure 4 and 6, C_L=100pF S1 Closed	-	-	500	ns
Driver Disable Time from Low	t_{DLZ}	Figure 4 and 6, C_L=15pF S1 Closed	-	-	900	ns
Driver Disable Time from High	t_{DHZ}	Figure 4 and 6, C_L=15pF S2 Closed	-	-	800	ns
Receiver Input to Output	t_{RPLH} t_{RPHL}	Figure 7 and 9, $\|V_{ID}\| \geq 2.0V$; rise and fall time of V_{ID}≦15ns	-	150	300	ns
$\|T_{RPLH} – T_{RPHL}\|$ Differential Receiver Skew	t_{RSKD}	Figure 7 and 9, $\|V_{ID}\| \geq 2.0V$; rise and fall time of V_{ID}≦15ns	-	10	-	ns
Receiver Enable to Output Low	t_{RZL}	Figure 2 and 8， C_{RL}=15pF S1 Closed	-	20	50	ns
Receiver Enable to Output High	t_{RZH}	Figure 2 and 8， C_{RL}=15pF S2 Closed	-	20	50	ns
Receiver Disable Time from Low	t_{RLZ}	Figure 2 and 8， C_{RL}=15pF S1 Closed	-	30	60	ns
Receiver Disable Time from High	t_{RHZ}	Figure 2 and 8， C_{RL}=15pF S2 Closed	-	30	60	ns
Time to Shutdown	t_{SHDN}		-	500	1000	ns
Driver Enable from Shutdown to Output High	$t_{DZH(SHDN)}$	Figure 4 and6， C_L=100pF S2 Closed	-	-	2500	ns
Driver Enable from Shutdown to Output Low	$t_{DZL(SHDN)}$	Figure 4 and 6， C_L=100pF S1 Closed	-	-	2500	ns
Receiver Enable from Shutdown to Output High	$t_{RZH(SHDN)}$	Figure 2 and 8， C_{RL}=15pF S2 Closed	-	-	2500	ns
Receiver Enable from Shutdown to Output Low	$t_{RZL(SHDN)}$	Figure 2 and 8， C_{RL}=15pF S1 Closed	-	-	2500	ns

(3.3V Operation)

V_{CC}=+3.3V±5%, T_A=-40℃ ~ +85℃, Typical values are at V_{CC}=+3.3V, T_A = 25℃

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Driver Input to Output	t_{DPLH}	Figure 3 and 5, R_{DIFF}=54Ω C_{L1}=C_{L2}=100pF	-	280	800	ns
	t_{DPHL}		-	280	800	
Driver Output Skew $\|T_{DPLH} - T_{DPHL}\|$	t_{DSKEW}	Figure 3 and 5, R_{DIFF}=54Ω C_{L1}=C_{L2}=100pF	-	-	100	ns
Driver Rise or Fall Time	t_{DR}, t_{DF}	Figure 3 and 5, R_{DIFF}=54Ω C_{L1}=C_{L2}=100pF	-	450	900	ns
Maximum Data Rate	F_{MAX}		250	-	-	kbps
Driver Enable to Output High	t_{DZH}	Figure 4 and 6, C_L=100pF S2 Closed	-	-	300	ns
Driver Enable to Output Low	t_{DZL}	Figure 4 and 6, C_L=100pF S1 Closed	-	-	500	ns
Driver Disable Time from Low	t_{DLZ}	Figure 4 and 6, C_L=15pF S1 Closed	-	-	900	ns
Driver Disable Time from High	t_{DHZ}	Figure 4 and 6, C_L=15pF S2 Closed	-	-	800	ns
Receiver Input to Output	t_{RPLH} t_{RPHL}	Figure 7 and 9, $\|V_{ID}\|$ ≥ 2.0V; rise and fall time of V_{ID}≦15ns	-	150	300	ns
$\|T_{RPLH} - T_{RPHL}\|$ Differential Receiver Skew	t_{RSKD}	Figure 7 and 9, $\|V_{ID}\|$ ≥ 2.0V; rise and fall time of V_{ID}≦15ns	-	10	-	ns
Receiver Enable to Output Low	t_{RZL}	Figure 2 and 8， C_{RL}=15pF S1 Closed	-	20	50	ns
Receiver Enable to Output High	t_{RZH}	Figure 2 and 8， C_{RL}=15pF S2 Closed	-	20	50	ns
Receiver Disable Time from Low	t_{RLZ}	Figure 2 and 8， C_{RL}=15pF S1 Closed	-	30	60	ns
Receiver Disable Time from High	t_{RHZ}	Figure 2 and 8， C_{RL}=15pF S2 Closed	-	30	60	ns
Time to Shutdown	t_{SHDN}		-	500	1000	ns
Driver Enable from Shutdown to Output High	$t_{DZH(SHDN)}$	Figure 4 and6， C_L=100pF S2 Closed	-	-	2500	ns
Driver Enable from Shutdown to Output Low	$t_{DZL(SHDN)}$	Figure 4 and 6， C_L=100pF S1 Closed	-	-	2500	ns
Receiver Enable from Shutdown to Output High	$t_{RZH(SHDN)}$	Figure 2 and 8， C_{RL}=15pF S2 Closed	-	-	2500	ns
Receiver Enable from Shutdown to Output Low	$t_{RZL(SHDN)}$	Figure 2 and 8， C_{RL}=15pF S1 Closed	-	-	2500	ns

TEST CIRCUITS AND TIMING DIAGRAMS

Figure 1：Driver DC Test Load

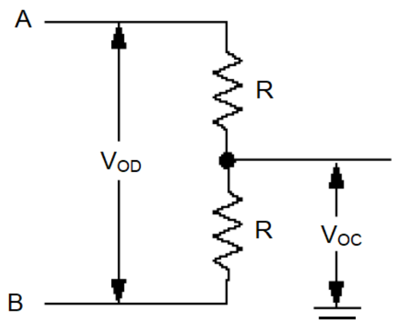


Figure 2：Receiver Enable/Disable Timing Test Load

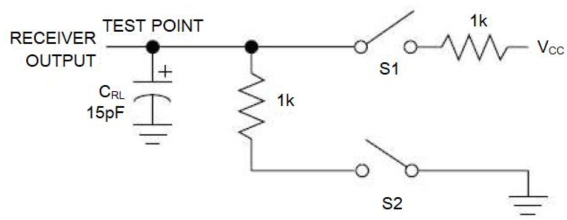


Figure 3：Driver Timing Test Circuit

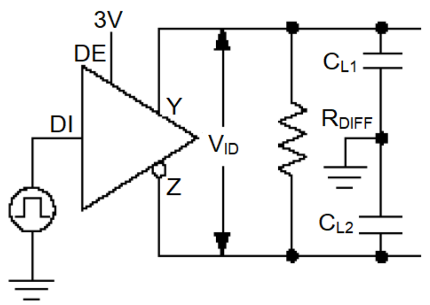


Figure 4：Driver Enable/Disable Timing test Load

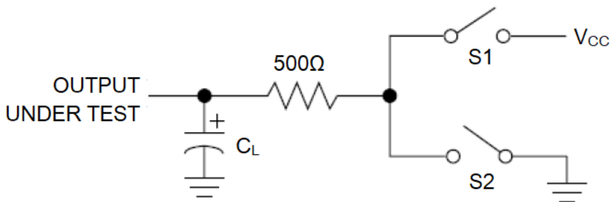


Figure 5：Driver Propagation Delays

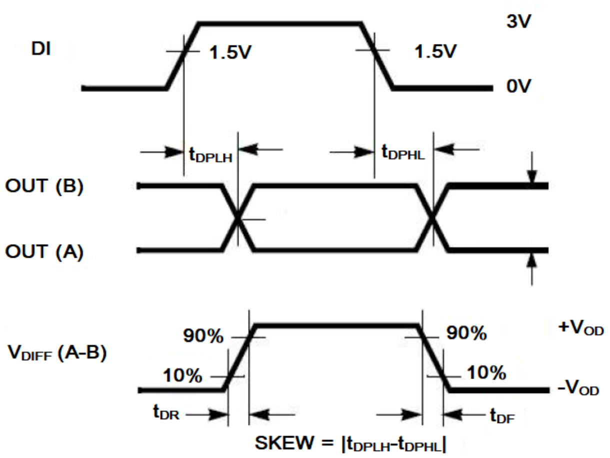


Figure 6：Driver Enable and Disable Times

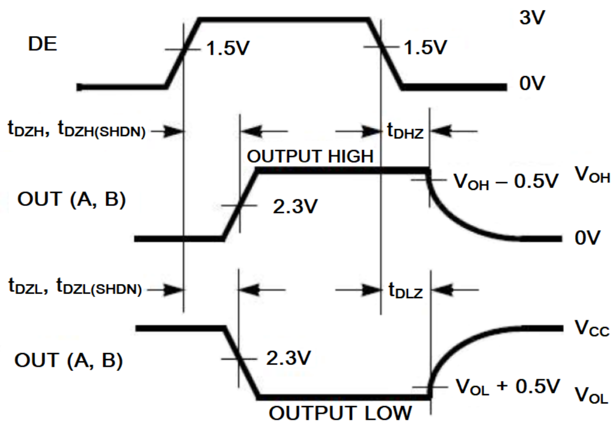


Figure 7：Receiver Propagation Delays

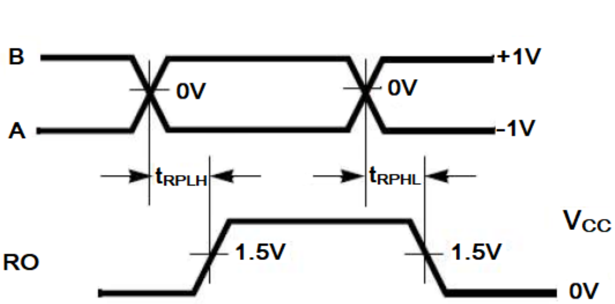


Figure 8：Receiver Enable and Disable Times

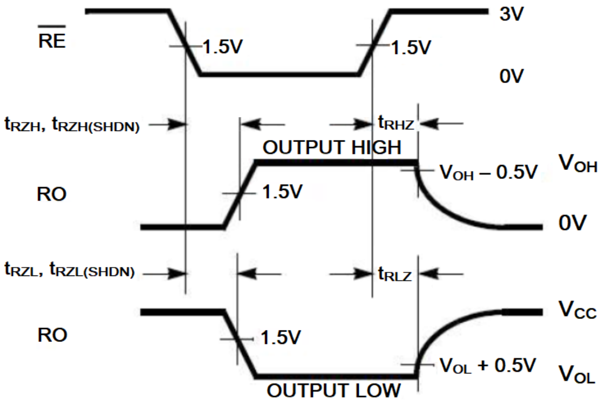
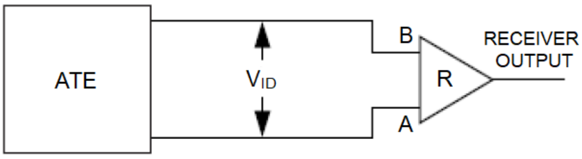
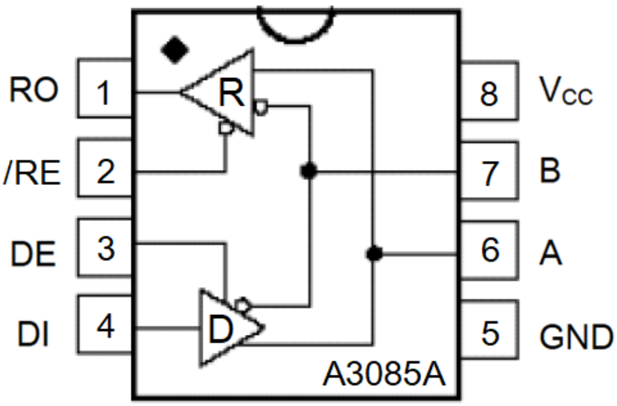


Figure 9：Receiver Propagation Delay Test Circuit

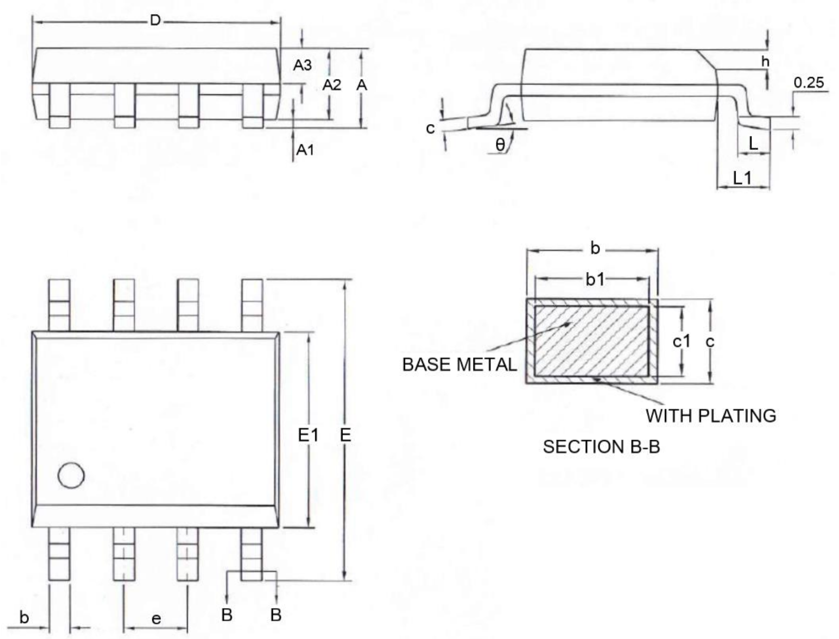


BLOCK DIAGRAM



PACKAGE INFORMATION

Dimension in SOP8 (Unit: mm)



Symbol	Min	Max
A	-	1.77
A1	0.08	0.28
A2	1.20	1.60
A3	0.55	0.75
b	0.39	0.48
b1	0.38	0.44
c	0.20	0.26
c1	0.19	0.21
D	4.70	5.10
E	5.80	6.20
E1	3.70	4.10
e	1.27 BSC	
h	0.25	0.50
L	0.50	0.80
L1	1.05 REF	
θ	0°	8°

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