

1-Bit Dual-Supply Unidirectional Bus Transceiver

FEATURES

- **Power-Supply Range:**
 V_{CCA} and V_{CCB} : 1.65V to 5.5V
- **V_{CC} Isolation:** If Either V_{CC} is at GND, Both Ports are in the High-Impedance State
- **Low power consumption, 4 μ A Max**
- **Output drive up to ± 24 mA @3.0V**
- **No Power-Supply Sequencing Required:** Either V_{CCA} or V_{CCB} can be Ramped First
- **I_{OFF} :** Supports Partial-Power-Down Mode Operation
- **Extended Temperature:** -40°C to +125°C

APPLICATIONS

- Industrial
- Enterprise
- Telecom, such as VOIP
- Personal electronic

DESCRIPTION

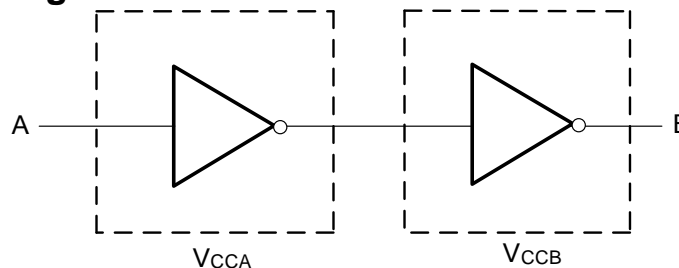
The RS1T34 is 1-bit non-inverting bus transceiver uses two separate configurable power supply rails. The A port is designed to track V_{CCA} , which supporting operating voltages from 1.65V to 5.5V, and the B port supporting operating voltages from 1.65V to 5.5V while it tracks the V_{CCB} supply. This allows for universal low-voltage Unidirectional translation between any of the 1.8V, 2.5V, 3.3V and 5V voltage nodes.

The RS1T34 is designed for asynchronous communication between two data buses. The A bus is input side, the B bus is output side.

The RS1T34 is fully specified for partial power-down applications using I_{OFF} . The I_{OFF} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

The RS1T34 is available in Green SOT23-5 and SC70-5 packages. It operates over an ambient temperature range of -40°C to +125°C.

Functional Block Diagram

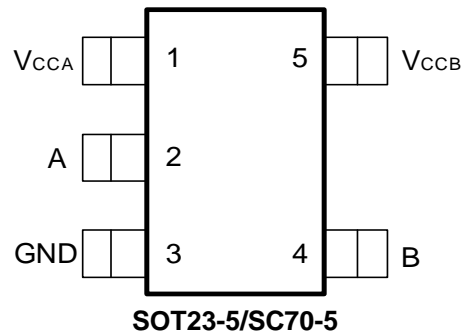


Revision History

Note: Page numbers for previous revisions may differ from page numbers in the current version.

VERSION	Change Date	Change Item
A.1	2021/09/29	Initial version completed

PIN CONFIGURATIONS



PIN DESCRIPTION

PIN	NAME	TYPE (1)	FUNCTION
SOT23-5/SC70-5			
1	V _{CCA}	P	A Port Supply Voltage. $1.65V \leq V_{CCA} \leq 5.5V$
2	A	I	Input A. Reference to V _{CCA} .
3	GND	-	Ground.
4	B	O	Output B. Reference to V _{CCB} .
5	V _{CCB}	P	B Port Supply Voltage. $1.65V \leq V_{CCB} \leq 5.5V$.

(1) I=input, O=output, P=power

Function Table (2)

INPUT (1)	OUTPUT
A PORT (3)	B PORT (3)
H	H
L	L

Note:

- (1) The input circuit of the data I/O is always active.
- (2) When either V_{CCA} or V_{CCB} is at GND level, the device goes into suspend mode.
- (3) H=High voltage level, L=Low voltage level.

SPECIFICATIONS

Absolute Maximum Ratings

Over operating free-air temperature range (unless otherwise noted) ⁽¹⁾

SYMBOL	PARAMETER		MIN	MAX	UNIT
V _{CCA} ⁽³⁾	Supply Voltage Range		-0.5	6.5	V
V _{CCB} ⁽³⁾	Supply Voltage Range		-0.5	6.5	V
V _I ⁽²⁾	Input Voltage Range	A port	-0.5	6.5	V
V _O ⁽²⁾	Voltage range applied to any output in the high-impedance or power-off state		-0.5	V _{CCB} +0.5	V
I _{IK}	Input clamp current	V _I <0		-50	mA
I _{OK}	Output clamp current	V _O <0		-50	mA
I _O	Continuous output current			±50	mA
	Continuous current through V _{CCA} , V _{CCB} or GND			±100	mA
T _J	Junction temperature			150	°C
T _{stg}	Storage temperature		-65	+150	

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.

(3) The value of V_{CCA} and V_{CCB} are provided in the recommended operating conditions table.

ESD Ratings

			VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human-body model (HBM)	±3000	V
		Machine Model (MM)	±400	V

Thermal Information:

THERMAL METRIC ⁽¹⁾		RS1T34		UNIT
		5PINS	5PINS	
		SOT23-5	SC70-5	
R _{θJA}	Junction-to-ambient thermal resistance	250	312.5	°C/W
R _{θJC (top)}	Junction-to-case(top) thermal resistance	84.3	141.8	°C/W
R _{θJB}	Junction-to-board thermal resistance	39.5	84.5	°C/W
Ψ _{JT}	Junction-to-top characterization parameter	2.86	3.9	°C/W
Ψ _{JB}	Junction-to-board characterization parameter	58.7	82.1	°C/W

PACKAGE/ORDERING INFORMATION

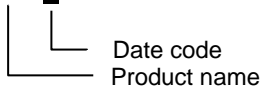
PRODUCT	ORDERING NUMBER	TEMPERATURE RANGE	PACKAGE LEAD	PACKAGE MARKING ⁽¹⁾	MSL ⁽²⁾	PACKAGE OPTION
RS1T34	RS1T34XF5	-40°C ~+125°C	SOT23-5	1T34	MSL3	Tape and Reel,3000
	RS1T34XC5	-40°C ~+125°C	SOT353 (SC70-5)	1T34X	MSL3	Tape and Reel,3000

NOTE:

- (1) There may be additional marking, which relates to the lot trace code information (data code and vendor code), the logo or the environmental category on the device.
- (2) MSL, The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications.

MARKING INFORMATION

1T34 X



Recommended Operating Conditions

V_{CCA} is the supply voltage associated with the input port. V_{CCB} is the supply voltage associated with the output port.

PARAMETER		$V_{CCA}^{(1)}$	$V_{CCB}^{(2)}$	MIN	TYP	MAX	UNIT
Supply voltage ⁽¹⁾	V_{CCA}			1.65		5.5	V
	V_{CCB}			1.65		5.5	
High-level input Voltage	$V_{IH}^{(4)}$	1.65V to 1.95V		$V_{CCA} \times 0.65$			V
		2.3V to 2.7V		1.7			
		3V to 3.6V		2			
		4.5V to 5.5V		$V_{CCA} \times 0.7$			
Low-level input Voltage	$V_{IL}^{(4)}$	1.65V to 1.95V				$V_{CCA} \times 0.35$	V
		2.3V to 2.7V				0.7	
		3V to 3.6V				0.8	
		4.5V to 5.5V				$V_{CCA} \times 0.3$	
Input voltage	V_I			0		5.5	V
Output voltage	V_O			0		V_{CCB}	V
High-level output current (I_{OH})			1.65V to 1.95V			-4	mA
			2.3V to 2.7V			-8	
			3V to 3.6V			-24	
			4.5V to 5.5V			-32	
Low-level output current (I_{OL})			1.65V to 1.95V			4	mA
			2.3V to 2.7V			8	
			3V to 3.6V			24	
			4.5V to 5.5V			32	
Input transition rise or fall rate ($\Delta t/\Delta v$)	Data inputs ⁽³⁾	1.65V to 1.95V				20	ns/V
		2.3V to 2.7V				20	
		3V to 3.6V				10	
		4.5V to 5.5V				5	
T _A Operating free-air temperature				-40		125	°C

(1) V_{CCA} is the V_{CC} associated with the data input port.

(2) V_{CCB} is the V_{CC} associated with the output port.

(3) All unused or driven (floating) data inputs (I/O_S) of the device must be held at logic HIGH or LOW (preferably V_{CCI} or GND) to ensure proper device operation and minimize power.

(4) For V_{CCA} values not specified in the data sheet, $V_{IH} \text{ min} = V_{CCA} \times 0.7 \text{ V}$, $V_{IL} \text{ max} = V_{CCA} \times 0.3 \text{ V}$.

Electrical Characteristics

over recommended operating free-air temperature range (unless otherwise noted) ^{(1) (2)}

PARAMETER		CONDITIONS	V _{CCA}	V _{CCB}	TEMP	MIN	TYP	MAX	UNIT	
V _{OH}		I _{OH} = -100 μA V _I = V _{IH}	1.65V to 4.5V	1.65V to 4.5V	Full	V _{CCB} - 0.1			V	
		I _{OH} = -4mA V _I = V _{IH}	1.65V	1.65V		1.2				
		I _{OH} = -8mA V _I = V _{IH}	2.3V	2.3V		1.9				
		I _{OH} = -24mA V _I = V _{IH}	3V	3V		2.4				
		I _{OH} = -32mA V _I = V _{IH}	4.5V	4.5V		3.8				
V _{OL}		I _{OL} = 100 μA V _I = V _{IL}	1.65V to 4.5V	1.65V to 4.5V					0.1	V
		I _{OL} = 4mA V _I = V _{IL}	1.65V	1.65V					0.45	
		I _{OL} = 8mA V _I = V _{IL}	2.3V	2.3V					0.3	
		I _{OL} = 24mA V _I = V _{IL}	3V	3V					0.55	
		I _{OL} = 32mA V _I = V _{IL}	4.5V	4.5V					0.55	
I _i	Input leakage current	V _I = V _{CCA} or GND	1.65V to 5.5V	1.65V to 5.5V	+25°C			±1	μA	
					Full			±2		
I _{off}	A or B Port	V _I or V _O = 0 to 5.5V	0V	0V to 5.5V	+25°C			±1	μA	
					Full			±2		
			0V to 5.5V	0V	+25°C			±1		
					Full			±2		
I _{CCA}	V _{CCA} supply current	V _I = V _{CCA} or GND I _O = 0	1.65V to 5.5V	1.65V to 5.5V	Full			3	μA	
			5V	0V	Full			2		
			0V	5V	Full			-2		
I _{CCB}	V _{CCB} supply current	V _I = V _{CCA} or GND I _O = 0	1.65V to 5.5V	1.65V to 5.5V	Full			3	μA	
			5V	0V	Full			-2		
			0V	5V	Full			2		
I _{CCA} + I _{CCB}	Combined supply current	V _I = V _{CCA} or GND I _O = 0	1.65V to 5.5V	1.65V to 5.5V	Full			4	μA	
ΔI _{CCA}	A port	One A port at V _{CCA} - 0.6 V, B port = open	3V to 5.5V	3V to 5.5V	Full			50	μA	
ΔI _{CCB}	B port	One B port at V _{CCB} - 0.6 V, A port = open	3V to 5.5V	3V to 5.5V	Full			50	μA	
C _i	Input capacitance	V _I = GND or V _{CCA}	0V to 3.6V	0V to 3.6V	+25°C		8.5		pF	
C _o	Output capacitance	V _O = GND	0V to 3.6V	0V to 3.6V	+25°C		8.5		pF	

(1) V_{CCA} is the V_{CC} associated with the input port.

(2) V_{CCB} is the V_{CC} associated with the output port.

Timing Requirements

 $V_{CCA}=1.8V\pm 0.15V$

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB}=1.8V\pm 0.15V$		$V_{CCB}=2.5V\pm 0.2V$		$V_{CCB}=3.3V\pm 0.3V$		$V_{CCB}=5V\pm 0.5V$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	B	3	17.5	2	9.3	1.5	7.5	1.8	9.1	ns
t_{PHL}			2	10.3	1.7	6.4	1.1	4.5	2.4	9.8	

 $V_{CCA}=2.5V\pm 0.2V$

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB}=1.8V\pm 0.15V$		$V_{CCB}=2.5V\pm 0.2V$		$V_{CCB}=3.3V\pm 0.3V$		$V_{CCB}=5V\pm 0.5V$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	B	2.2	15.2	1.3	7.6	1.4	7	1.1	5.1	ns
t_{PHL}			1.7	10.5	1.4	7.3	1.4	5.9	0.9	4.5	

 $V_{CCA}=3.3V\pm 0.3V$

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB}=1.8V\pm 0.15V$		$V_{CCB}=2.5V\pm 0.2V$		$V_{CCB}=3.3V\pm 0.3V$		$V_{CCB}=5V\pm 0.5V$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	B	2.1	15.5	1.4	8	0.8	6.7	0.6	4.3	ns
t_{PHL}			1.9	11.8	1.3	7	0.9	5.9	0.9	5.2	

 $V_{CCA}=5V\pm 0.5V$

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CCB}=1.8V\pm 0.15V$		$V_{CCB}=2.5V\pm 0.2V$		$V_{CCB}=3.3V\pm 0.3V$		$V_{CCB}=5V\pm 0.5V$		UNIT
			MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	B	2.1	16.6	1	7.4	0.6	5.2	0.7	5.1	ns
t_{PHL}			1.8	12.2	0.9	6.2	1.1	7.2	0.8	5.6	

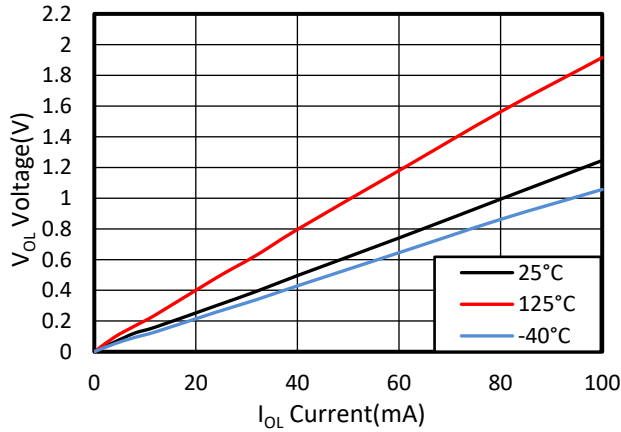
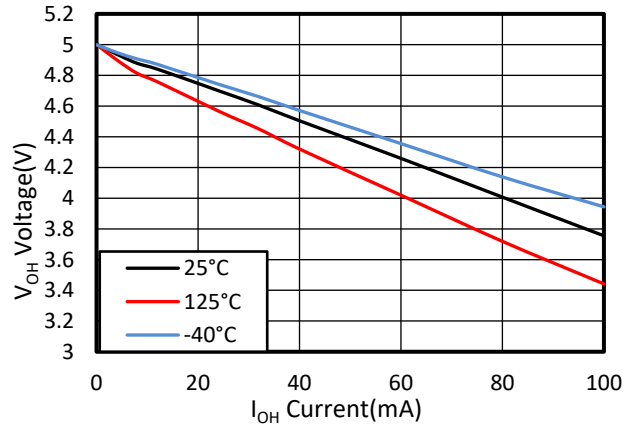
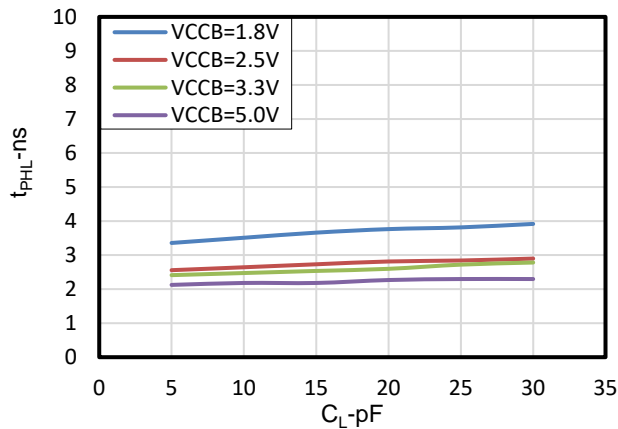
Operating Characteristics

 $T_A=25^\circ C$

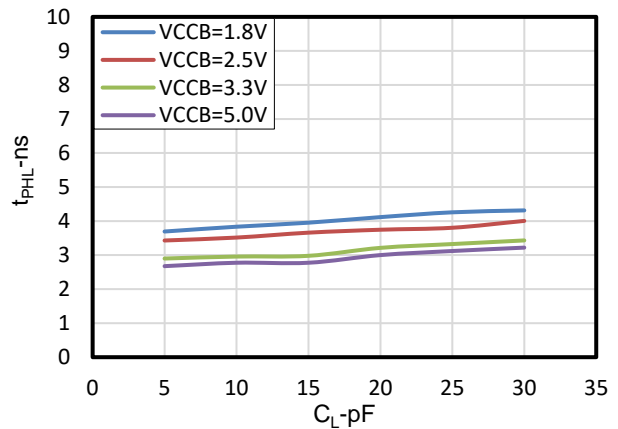
PARAMETER ⁽¹⁾		CONDITIONS	$V_{CCA}=V_{CCB}=1.8V$	$V_{CCA}=V_{CCB}=2.5V$	$V_{CCA}=V_{CCB}=3.3V$	$V_{CCA}=V_{CCB}=5V$	UNIT
			TYP	TYP	TYP	TYP	
C_{pdA}	A port input, B port output	$C_L=0pF$ $f=10MHz$ $t_r=t_f=1ns$	2	2	2	3	pF
C_{pdB}	A port input, B port output	$C_L=0pF$ $f=10MHz$ $t_r=t_f=1ns$	13	13	14	16	pF

(1) Power dissipation capacitance per transceiver

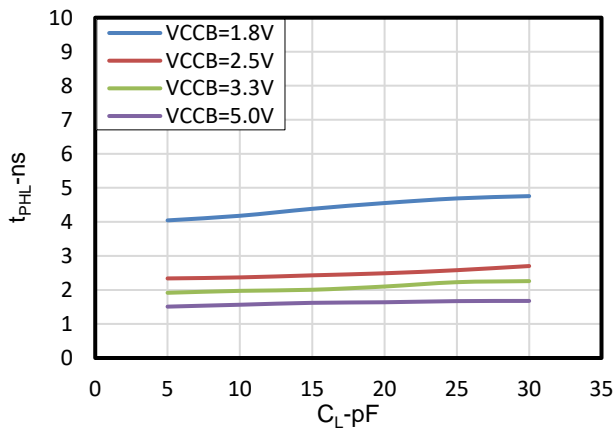
Typical Characteristics


Figure 1. Voltage vs Current

Figure 2. Voltage vs Current


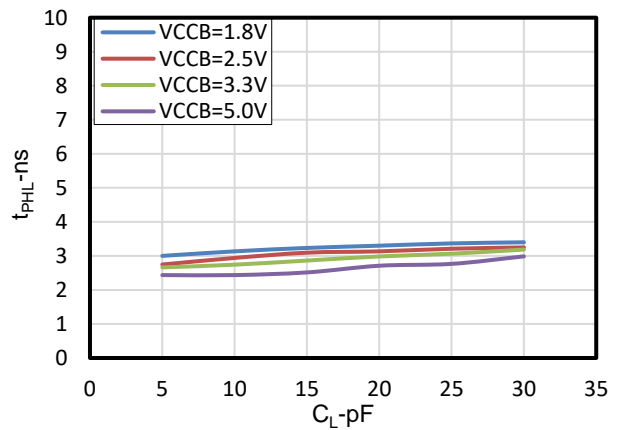
$T_A = 25^\circ\text{C}$, $V_{CCA} = 1.8\text{V}$

Figure 3. Typical Propagation Delay High-to-Low (A to B) vs Load Capacitance


$T_A = 25^\circ\text{C}$, $V_{CCA} = 2.5\text{V}$

Figure 4. Typical Propagation Delay High-to-Low (A to B) vs Load Capacitance


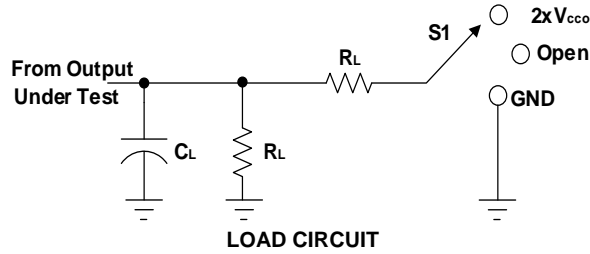
$T_A = 25^\circ\text{C}$, $V_{CCA} = 3.3\text{V}$

Figure 5. Typical Propagation Delay High-to-Low (A to B) vs Load Capacitance


$T_A = 25^\circ\text{C}$, $V_{CCA} = 5\text{V}$

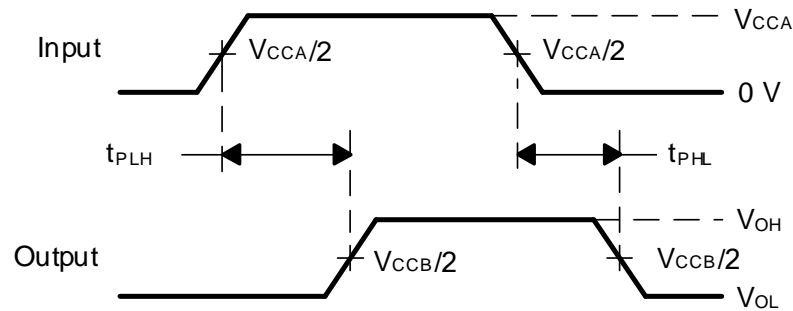
Figure 6. Typical Propagation Delay High-to-Low (A to B) vs Load Capacitance

Parameter Measurement Information



TEST	S1
t_{pd}	Open

V_{CC}	C_L	R_L	V_{TP}
$1.8V \pm 0.15V$	15pF	2k Ω	0.15V
$2.5V \pm 0.2V$	15pF	2k Ω	0.15V
$3.3V \pm 0.3V$	15pF	2k Ω	0.3V
$5V \pm 0.5V$	15pF	2k Ω	0.3V



NOTES: A. C_L includes probe and jig capacitance.

B. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_o = 50 \Omega$, $dv/dt \geq 1V/ns$.

C. The outputs are measured one at a time, with one transition per measurement.

D. t_{PLH} and t_{PHL} are the same as t_{pd} .

E. V_{CCA} is the V_{CC} associated with the input port.

F. All parameters and waveforms are not applicable to all devices.

Figure 7. Load Circuit and Voltage Waveforms

Application Information

The RS1T34 can be used in level-translation applications for interfacing devices or systems operating at different interface voltages with one another.

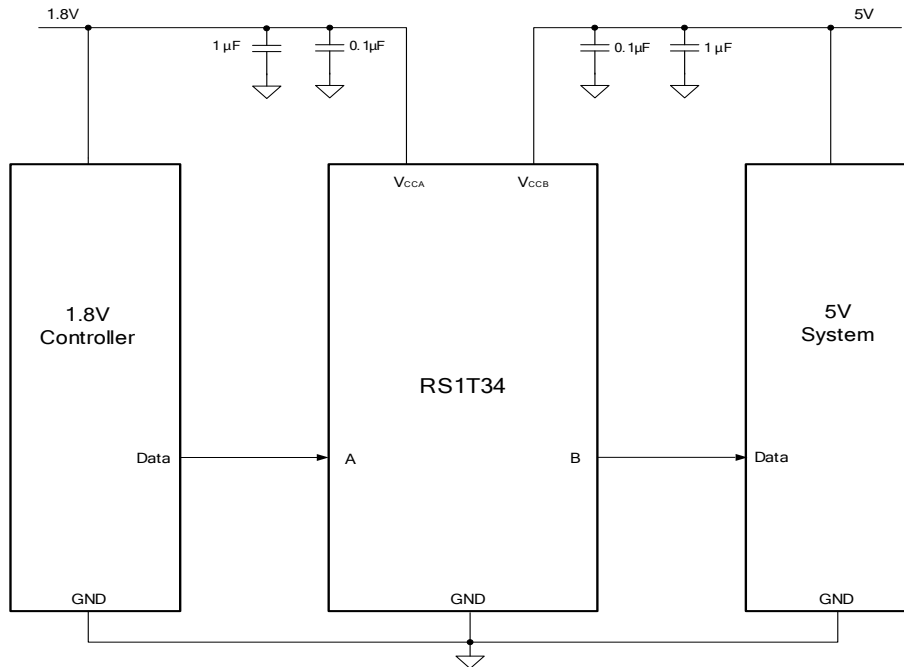
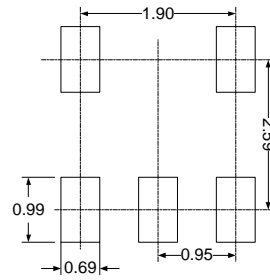
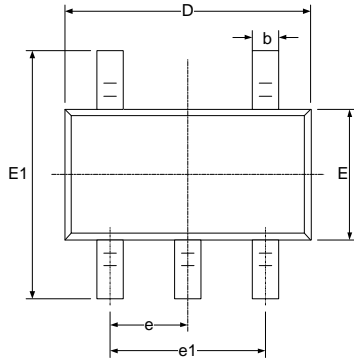
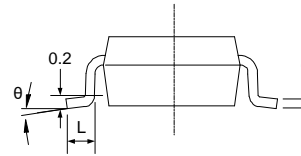
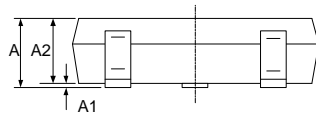


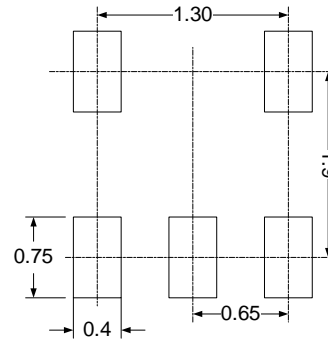
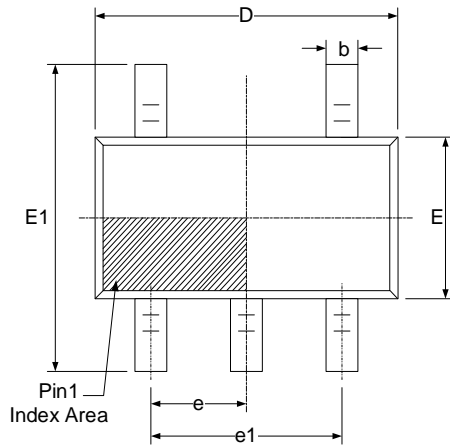
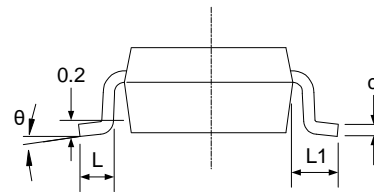
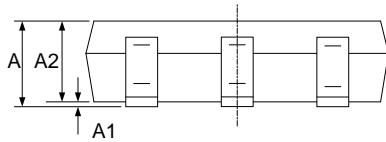
Figure 8. Typical Application Circuit

PACKAGE OUTLINE DIMENSIONS

SOT23-5


RECOMMENDED LAND PATTERN (Unit: mm)


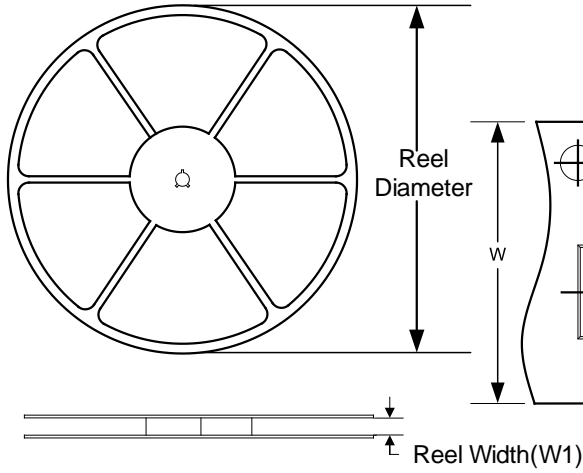
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

SOT353(SC70-5)

RECOMMENDED LAND PATTERN (Unit: mm)


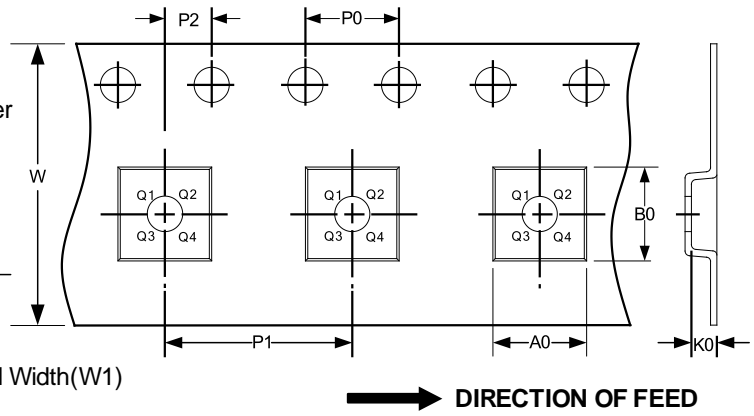
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.900	1.100	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.000	0.035	0.039
b	0.150	0.350	0.006	0.014
c	0.080	0.150	0.003	0.006
D	2.000	2.200	0.079	0.087
E	1.150	1.350	0.045	0.053
E1	2.150	2.450	0.085	0.096
e	0.650(BSC)		0.026(BSC)	
e1	1.300(BSC)		0.051(BSC)	
L	0.260	0.460	0.010	0.018
L1	0.525		0.021	
θ	0°	8°	0°	8°

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSION



NOTE: The picture is only for reference. Please make the object as the standard.

KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT23-5	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3
SOT353 (SC70-5)	7"	9.5	2.25	2.55	1.20	4.0	4.0	2.0	8.0	Q3