

GT74LVCR2245

Octal Bus Transceiver with 3-State Outputs

1 Features	2 Application
- Operates from 1.65 V to 5.5 V - Inputs accept voltages to 5.5 V - Max t_{pd} of 2.6 ns at 3.3 V - All outputs have equivalent 26-Ω series resistors, so no external resistors are required - I_{off} supports live Insertion, partial-power-down mode, and back-drive protection - Supports mixed-mode signal operation on all ports (5-V input/output voltage with 3.3-V V_{CC}) - Operation temperature range: -40°C to $+125^{\circ}\text{C}$	- Wearable health and fitness devices - Network switches - Servers - Tests and measurements

3 Description	Functional Block Diagram
The GT74LVCR2245 device is an octal bus transceiver is designed for 1.65V to 5.5V V_{CC} operation. This device 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 diagram illustrates the internal logic of the transceiver. It features two 3-input AND gates at the top, which serve as the output enable ($\overline{OE}$) control logic. The inputs to these gates are $\overline{DIR}$ and $\overline{OE}$. Below the AND gates, there are two inverters. The first inverter takes input A1 and its output is connected to the output of the first AND gate. The second inverter takes input B1 and its output is connected to the output of the second AND gate. Both AND gates have a common output line that branches out to seven other channels, as indicated by the bracket and text 'To Seven Other Channels'.

4 Revision History

Revision	Date	Note
Rev. A1. 0	2023. 12. 18	Original Version
Rev. A1. 1	2023. 12. 18	1.Updated Package Qty 2.Added Tape and Reel Information
Rev. A1. 2	2023. 12. 26	1.Added Marking 2.Added MSL
Rev. A1. 3	2024. 01. 26	Updated Part Name
Rev. A1. 4	2024. 11. 25	Updated Operating Voltage

The latest datasheet version should be checked on the GTIC official website, as the company does not actively inform customers about updates to the datasheet.

5 Device Summary, Pin and Packages

Table 5-1. Device Summary⁽¹⁾

Serial Name	Part Name	Package	BodySize(Nom)	Marking ⁽²⁾⁽⁴⁾	MSL ⁽³⁾	Package Qty
GT74LVCR2245	GT74LVCR2245TG	TSSOP20	6.50mm×4.40mm	GT74LVCR2245 XXXXXXX	3	Tape and Reel,4000

(1) For all available packages, please contact product sales.

(2) 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.

(3) MSL, The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications.

(4) "XXXXX" in Marking will be appeared as the batch code.

5 Device Summary, Pin and Packages(Continued)

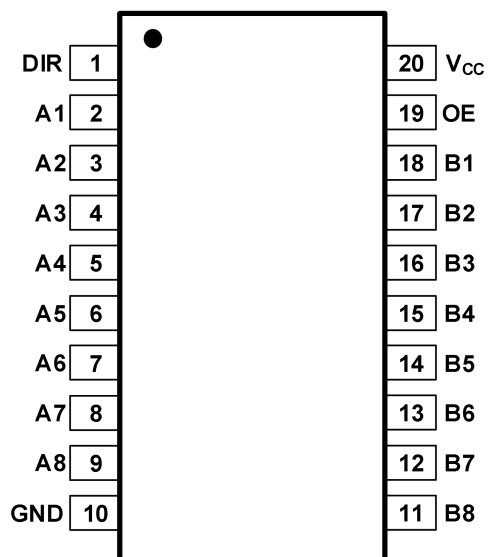


Fig.5-1.GT74LVCR2245:TG (TSSOP20) Package

Table 5-2 Pin Definition

Pin		I/O	Description
Name	TG		
DIR	1	I	Direction Pin
A1	2	I/O	A1 Input or Output
A2	3	I/O	A2 Input or Output
A3	4	I/O	A3 Input or Output
A4	5	I/O	A4 Input or Output
A5	6	I/O	A5 Input or Output
A6	7	I/O	A6 Input or Output
A7	8	I/O	A7 Input or Output
A8	9	I/O	A8 Input or Output
GND	10	—	Ground Pin
B8	11	I/O	B8 Input or Output
B7	12	I/O	B7 Input or Output
B6	13	I/O	B6 Input or Output
B5	14	I/O	B5 Input or Output
B4	15	I/O	B4 Input or Output
B3	16	I/O	B3 Input or Output
B2	17	I/O	B2 Input or Output
B1	18	I/O	B1 Input or Output
$\overline{OE}$	19	I	Output Enable
V _{CC}	20	—	Power Pin

6 Voltage, Temperature, ESD and Thermal Ratings

6.1 Absolute Maximum Ratings⁽¹⁾

Parameters			Min	Max.	Unit
V _{CC}	Supply Voltage Range		-0.5	6.5	V
V _I	Input Voltage Range		-0.5	6.5	V
V _O	Voltage Range Applied to Any Output in The High-impedance or Power-Off State ⁽²⁾		-0.5	6.5	V
V _O	Voltage Range applied to Any Output in The High or Low State ⁽²⁾⁽³⁾		-0.5	V _{CC} +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 _{CC} or GND			±100	mA

(1) Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. 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 output positive-voltage rating may be exceeded up to 6.5 V maximum if the output current rating is observed.

6.2 ESD Ratings

ESD			Value	Unit
V(ESD)	Electrostatic Discharge	Human-Body Model (HBM) ⁽¹⁾	8K	V
		Charged-Device Model (CDM) ⁽²⁾	2K	V

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

6 Voltage, Temperature, ESD and Thermal Ratings(Continued)

6.3 Recommended Operating Conditions

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

Symbol	Parameter	Min	Max	Unit
V _{CC}	Supply Voltage	Operating	1.65	5.5
		Data Retention Only	1.5	125
V _{IH}	High-Level Input Voltage	V _{CC} =1.65 V to 1.95 V	0.65 × V _{CC}	V
		V _{CC} =2.3 V to 2.7 V	1.7	
		V _{CC} =2.7 V to 3.6 V	2	
		V _{CC} =3.6 V to 5.5 V	4.2	
V _{IL}	Low-Level Input Voltage	V _{CC} =1.65 V to 1.95 V	0.35 × V _{CC}	V
		V _{CC} =2.3 V to 2.7 V	0.7	
		V _{CC} =2.7 V to 3.6 V	0.8	
		V _{CC} =3.6 V to 5.5 V	1.8	
V _I	Input Voltage	0	5.5	V
V _O	Output Voltage	High or Low State	0	V _{CC}
		3-State	0	5.5
I _{OH}	High-Level Output Current	V _{CC} =1.65 V	-2	mA
		V _{CC} =2.3 V	-4	
		V _{CC} =2.7 V	-8	
		V _{CC} =3 V	-12	
		V _{CC} =5.5 V	-12	
I _{OL}	Low-Level Output Current	V _{CC} =1.65 V	2	mA
		V _{CC} =2.3 V	4	
		V _{CC} =2.7 V	8	
		V _{CC} =3 V	12	
		V _{CC} =5.5 V	12	
Δt/Δv	Input Transition Rise or Fall Rate		10	ns/V
T _A	Operating Free-air Temperature	-40	125	°C

(1) All unused digital inputs of the device must be held at V_{CC} or GND to ensure proper device operation.

6.4 Thermal Information

Package Type	θ _{JA}	θ _{JC}	Unit
TSSOP20	102.5	35.9	°C/W

7 Electrical Specifications

7.1 Electrical Characteristics

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

Parameter		Test Conditions		Vcc	TA=25°C			–40°C to 125°C			Units
					Min	Typ ⁽¹⁾	Max	Min	Typ ⁽¹⁾	Max	
V _{OH}		I _{OH} =–100 μA		1.65 V to 5.5 V	V _{CC} – 0.2			V _{CC} – 0.2			V
		I _{OH} =–2 mA		1.65 V	1.2			1.2			
		I _{OH} =–4 mA		2.3 V	1.7			1.7			
				2.7 V	2.2			2.2			
		I _{OH} =–6 mA		3 V	2.4			2.4			
		I _{OH} =–8 mA		2.7 V	2			2			
		I _{OH} =–12 mA		3 V	2			2			
		I _{OH} =–12 mA		5.5V	5			5			
V _{OL}		I _{OL} =–100 μA		1.65 V to 5.5 V			0.2			0.2	V
		I _{OL} =–2 mA		1.65 V			0.45			0.45	
		I _{OL} =–4 mA		2.3 V			0.7			0.7	
				2.7 V			0.4			0.4	
		I _{OL} =–6 mA		3 V			0.55			0.55	
		I _{OL} =–8 mA		2.7 V			0.6			0.6	
		I _{OL} =–12 mA		3 V			0.8			0.8	
		I _{OL} =–12 mA		5.5V			0.4			0.4	
I _I	Control Inputs	V _I =0 to 5.5 V		3.6 V			±5			±5	μA
I _{off}		V _I or V _O =5.5 V		0			±10			±10	μA
I _{OZ} ⁽²⁾		V _O =0 to 5.5 V		3.6 V			10			10	μA
I _{CC}		V _I =V _{CC} or GND	I _O =0	3.6 V			10			10	μA
		3.6 V≤V _I ≤5.5 V ⁽³⁾					10			10	
ΔI _{CC}		One Input at V _{CC} – 0.6 V, Other Inputs at V _{CC} or GND		2.7 V to 5.5 V			500			500	μA
C _i	Control Inputs	V _I =V _{CC} or GND		3.3 V	7.1						pF
C _{io}	A or B ports	V _O =V _{CC} or GND		3.3 V	5						pF

(1) All typical values are at V_{CC}=3.3 V, TA=25°C.

(2) For I/O ports, the parameter IOZ includes the input leakage current.

(3) This applies in the disabled state only

7 Electrical Specifications(Continued)

7.2 Switching Characteristics, –40°C to 125°C

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

Parameter	From (Input)	To (Output)	V _{CC} =1.65V		V _{CC} =2.5V		V _{CC} =2.7V		V _{CC} =3.6V		V _{CC} =5.5V		Units
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
t _{pd}	A or B	B or A		6.6		3.4		3.1		2.6		1.8	ns
t _{en}	$\overline{OE}$	A or B		10.5		5.2		4.6		4.2		3.6	
t _{dis}	$\overline{OE}$	A or B		7		3.3		2.7		2.1		1.8	

7.3 Operating Characteristics

T_A=25°C

Parameter			Test Conditions	V _{CC} =1.8 V	V _{CC} =2.5 V	V _{CC} =3.6 V	V _{CC} =5.5 V	Units
				Typ	Typ	Typ	Typ	
C _{pd}	Power Dissipation Capacitance Per Transceiver	Outputs Enabled	f=10 MHz	11.1	11.4	12.7	13.5	pF
		Outputs Disabled		0.6	0.4	0.3	0.1	

8 Typical Characteristics

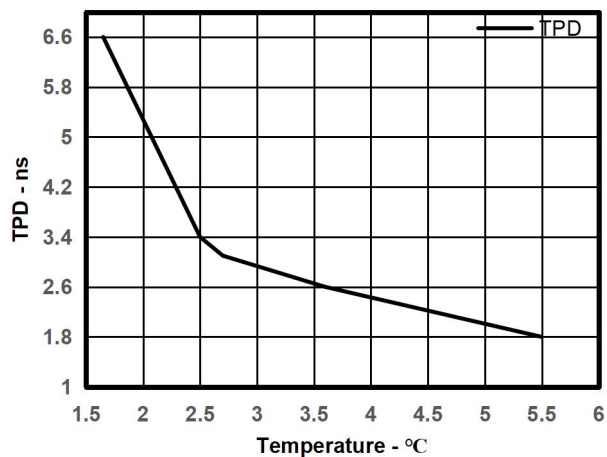


Fig.8-1. Typical TPD vs Vcc at 25°C

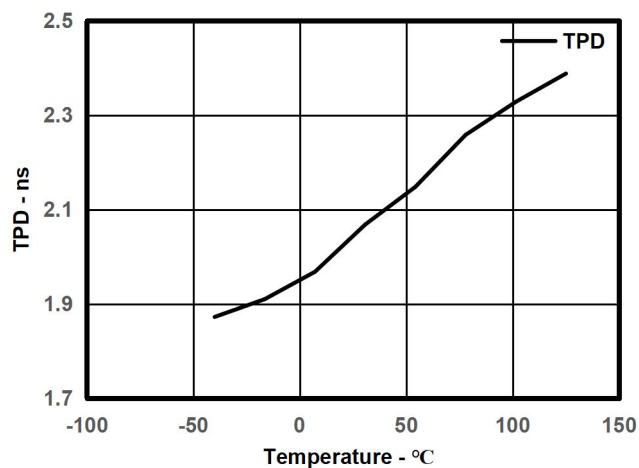
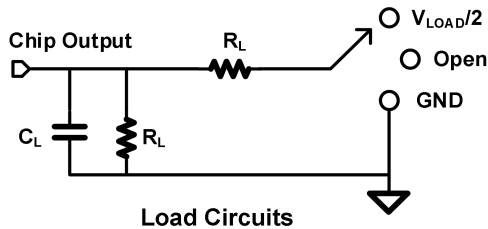


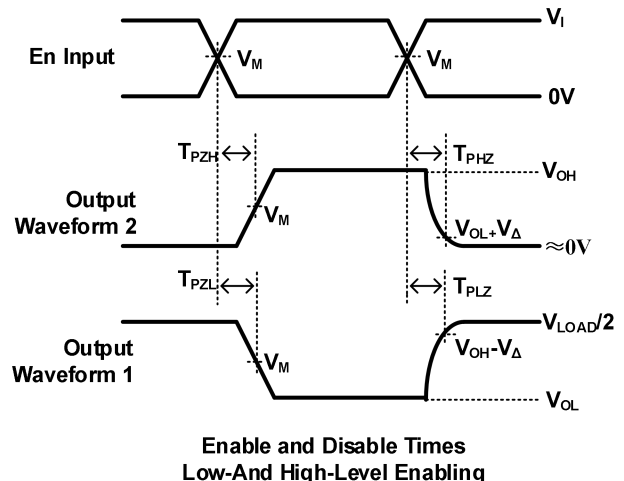
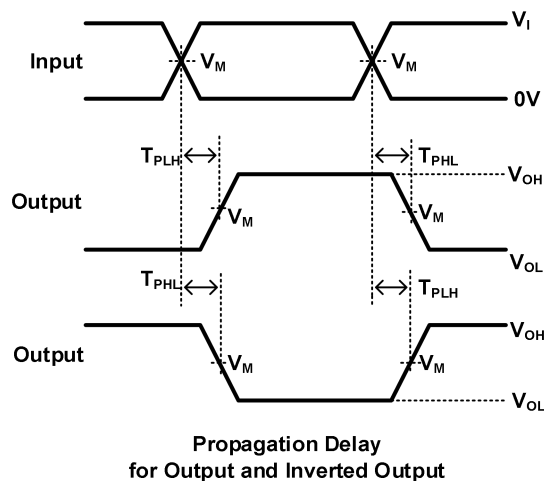
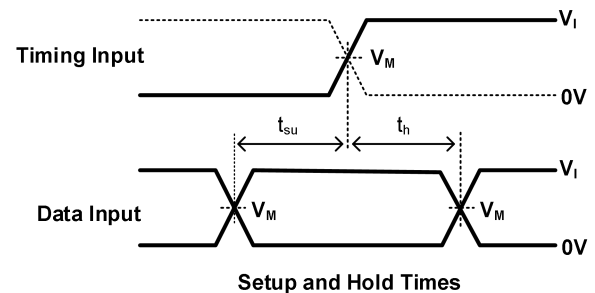
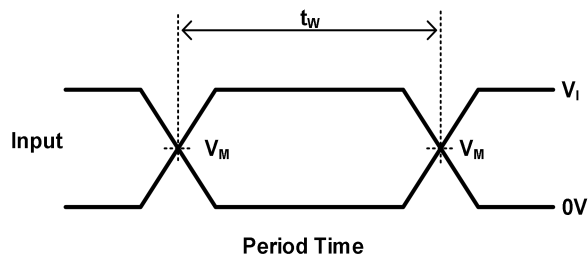
Fig.8-2. Typical TPD vs Temp at 3.3V

9 Parameter Measurement Information



TEST	S1
T_{PHL}/T_{PLH}	OPEN
T_{PLZ}/T_{PZL}	V_{LOAD}
T_{PHZ}/T_{PZH}	GND

V_{CC}	Inputs		V_M	V_{LOAD}	C_L	R_L	V_{Δ}
	V_I	T_r/T_f					
$1.8V \pm 0.15V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	1k Ω	0.15V
$2.5V \pm 0.15V$	V_{CC}	$\leq 2ns$	$V_{CC}/2$	$2 \times V_{CC}$	30pF	500 Ω	0.15V
$3.3V \pm 0.15V$	3V	$\leq 2.5ns$	1.5V	6V	50pF	500 Ω	0.3V
$5V \pm 0.15V$	V_{CC}	$\leq 2.5ns$	$V_{CC}/2$	$2 \times V_{CC}$	50pF	500 Ω	0.3V



Notes: A. C includes probe and jig capacitance.

B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.

C. All input pulses are supplied by generators having the following characteristics: PRR 10 MHz, Z = 50.

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

E. t_{PLZ} and t_{PHZ} are the same as t_{dis} .

F. t_{PZL} and t_{PZH} are the same as t_{en} .

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

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

10 Detailed Description

10.1 Overview

The GT74LVCR2245 device is designed for asynchronous communication between data buses. The device transmits data from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable (OE) input can be used to disable the device so the buses are effectively isolated.

All outputs, which are designed to sink up to 12mA, include equivalent 26Ω resistors to reduce overshoot and undershoot.

Inputs can be driven from either 3.3V or 5V devices. This feature allows the use of this device as a translator in a mixed 3.3V/5V system environment.

This device 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.

To ensure the high-impedance state during power up or power down, OE should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

10.2 Functional Block Diagram

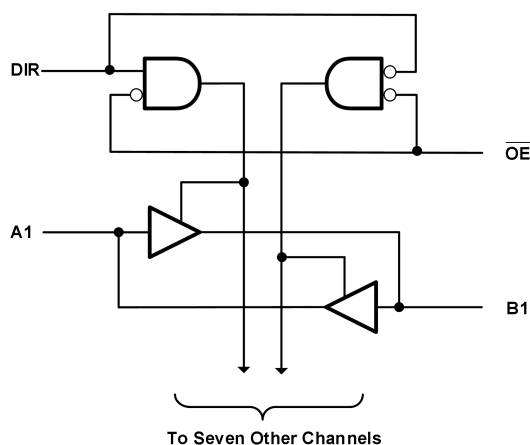


Fig.10-1.Logic Diagram (Positive Logic)

10.3 Feature Description

- Wide operating voltage range: Operates from 1.65V to 5.5V
- Allows down-voltage translation: Inputs accept voltages to 5.5V
- I_{off} feature: Allows voltages on the inputs and outputs when V_{CC} is 0V

10.4 Device Functional Modes

Table 10-1 Function Table

Inputs		Operation
OE	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

11 Application Note

11.1 Application Information

This 8-bit octal noninverting bus transceiver is designed for 1.65V to 5.5V V_{CC} operation. This device 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. To ensure the high-impedance state during power up or power down, OE should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

11.2 Typical Application

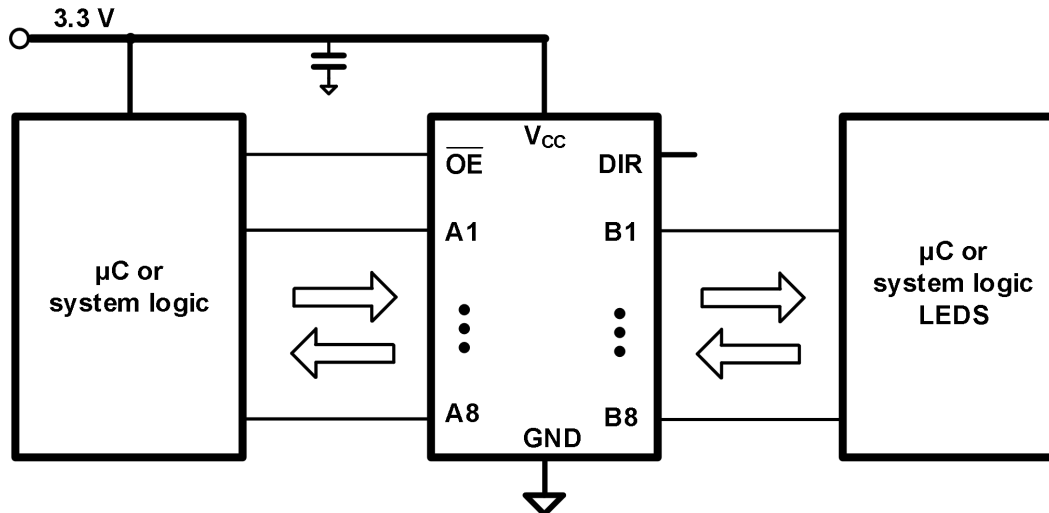
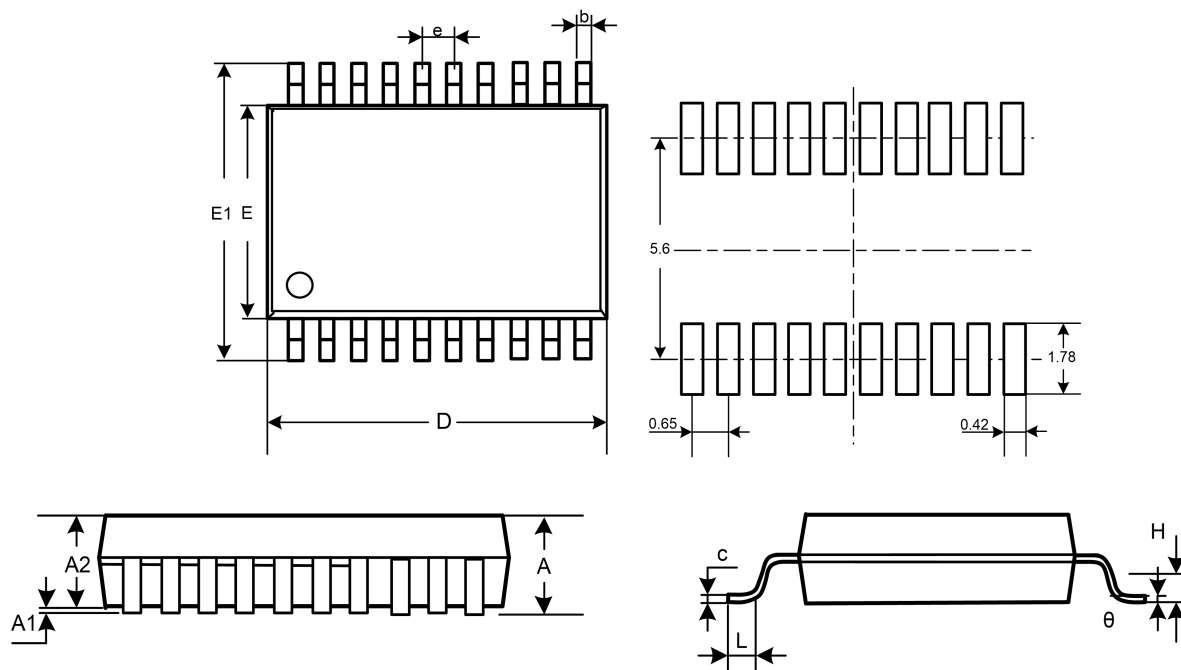


Fig.11-1. Typical Application Schematic

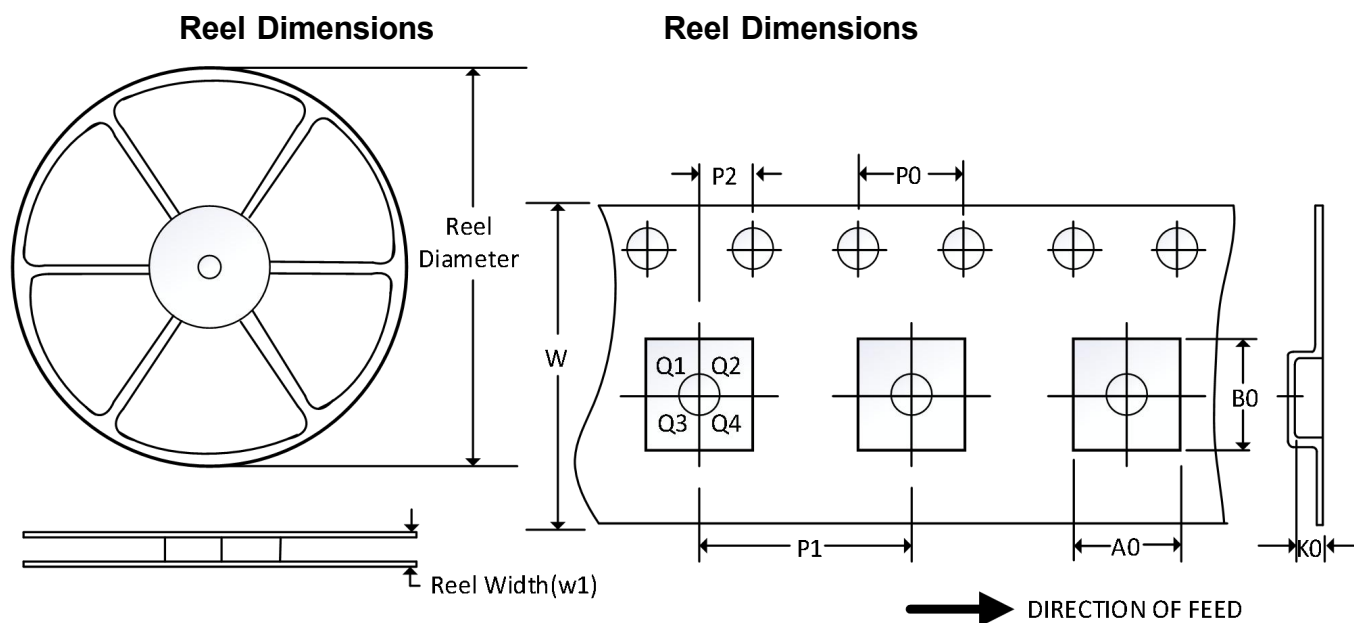
12 Package Outline Dimension

TSSOP20



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A		1.200		0.047
A1	0.050	0.150	0.002	0.006
A2	0.800	1.050	0.031	0.041
b	0.200	0.280	0.008	0.011
c	0.130	0.170	0.005	0.007
D	6.400	6.600	0.252	0.260
E	4.300	4.500	0.169	0.177
E1	6.200	6.600	0.244	0.260
e	0.650BSC		0.026BSC	
L	0.450	0.750	0.018	0.030
H	0.250TYP		0.010TYP	
θ	0°	8°	0°	8°

13 Tape and Reel Information



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
TSSOP20	13"	12.4	6.75	6.95	1.20	4.0	8.0	2.0	12.0	Q1

NOTE:

- All dimensions are nominal.
- Plastic or metal protrusions of 0.15mm maximum per side are not included.