GT74LVCR2245
Octal Bus Transceiver with 3-State Outputs

1 Features	2 Application
- Operates from 1.65 V to 3.6 V	- Wearable health and fitness devices
- Inputs accept voltages to 5.5 V	- Network switches
- Max t_{pd} of 2.6 ns at 3.3 V	- Servers
- All Outputs Have Equivalent 26-Ω Series Resistors, So No External Resistors are Required	- Tests and measurements
- 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°C	

3 Description

The GT74LVCR2245 device is an octal bus transceiver is designed for 1.65-V to 3.6-V 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.

Functional Block Diagram

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

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	TSSOP-20	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.
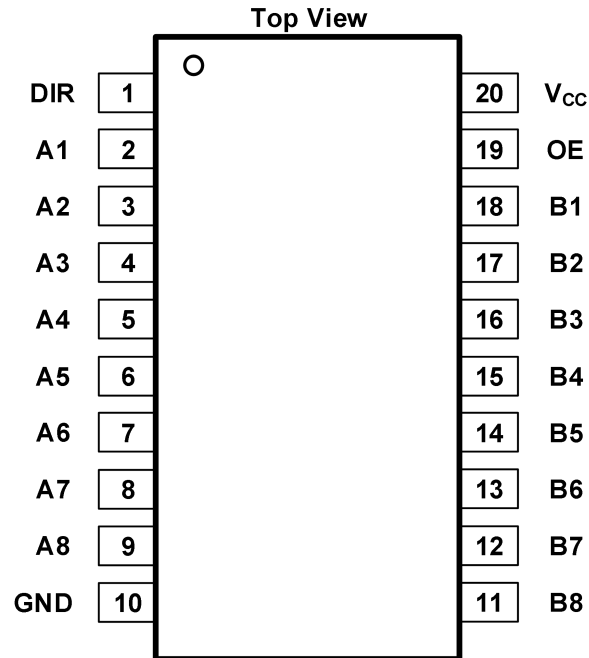
5 Device Summary, Pin and Packages (Continued)

Top View

```
         DIR  ┌ 1        20 ┐ V_CC
          A1  ┌ 2        19 ┐ OE
          A2  ┌ 3        18 ┐ B1
          A3  ┌ 4        17 ┐ B2
          A4  ┌ 5        16 ┐ B3
          A5  ┌ 6        15 ┐ B4
          A6  ┌ 7        14 ┐ B5
          A7  ┌ 8        13 ┐ B6
          A8  ┌ 9        12 ┐ B7
         GND  ┌ 10       11 ┐ B8
```

Fig.5-1. GT74LVCR2245:TSSOP20 Package

Table 5-2 Pin Definition

Pin NO.	Pin Name	Type	Description
1	DIR	I	Direction Pin
2	A1	I/O	A1 Input or Output
3	A2	I/O	A2 Input or Output
4	A3	I/O	A3 Input or Output
5	A4	I/O	A4 Input or Output
6	A5	I/O	A5 Input or Output
7	A6	I/O	A6 Input or Output
8	A7	I/O	A7 Input or Output
9	A8	I/O	A8 Input or Output
10	GND	—	Ground Pin
11	B8	I/O	B8 Input or Output
12	B7	I/O	B7 Input or Output
13	B6	I/O	B6 Input or Output
14	B5	I/O	B5 Input or Output
15	B4	I/O	B4 Input or Output
16	B3	I/O	B3 Input or Output
17	B2	I/O	B2 Input or Output
18	B1	I/O	B1 Input or Output
19	$\overline{OE}$	I	Output Enable
20	V_CC	—	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 negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.

(3)   The value of VCC is provided in the Recommended Operating Conditions table

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.

6.3 Recommended Operating Conditions

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

			Min	Max	Unit
V_{CC}	Supply Voltage	Operating	1.65	3.6	V
		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_{IL}	Low-Level Input Voltage	V_{CC} = 1.65 V to 1.95 V		0.35 x 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_I	Input Voltage		0	5.5	V
V_O	Output Voltage	High or Low State	0	V_{CC}	V
		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	
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	
Δt/Δv	Input Transition Rise or Fall Rate			10	ns/V
T_A	Operating Free-air Temperature		-40	125	°C

(1)   All unused inputs of the device must be held at VCC 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 3.6 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			
V_{OL}		$I_{OL} = -100$ μA		1.65 V to 3.6 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_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 $\leq V_I \leq 5.5$ 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 3.6 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 VCC = 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

7.2 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		Units
			Min	Max	Min	Max	Min	Max	Min	Max	
t_{pd}	A or B	B or A		6.6		3.4		3.1		2.6	
t_{en}	$\overline{OE}$	A or B		10.5		5.2		4.6		4.2	V
t_{dis}	$\overline{OE}$	A or B		7		3.3		2.7		2.1	

7.3 Operating Characteristics

T_A=25°C

Parameter		Test Conditions	V_{CC} = 1.8 V Typ	V_{CC} = 2.5 V Typ	V_{CC} = 3.6 V Typ	Units
C_{pd}	Power Dissipation Capacitance Per Transceiver	Outputs Enabled	11.1	11.4	12.7	pF
		Outputs Disabled	0.6	0.4	0.3	

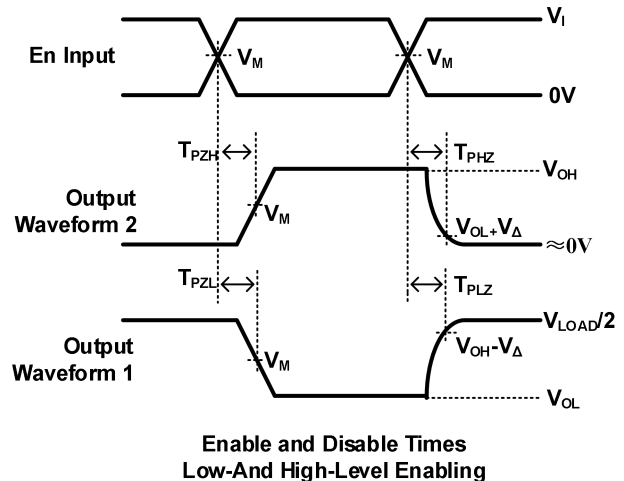## 8 Typical Characteristics
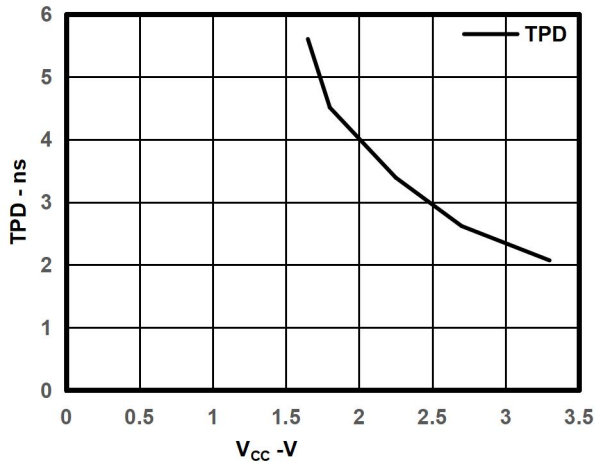
Fig.8-1. Typical TPD vs Vcc at 25℃
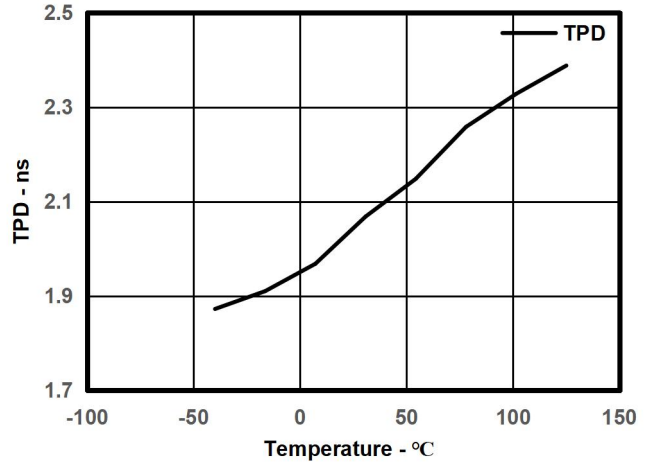
Fig.8-2. Typical TPD vs Temp at 3.3V

9 Parameter Measurement Information

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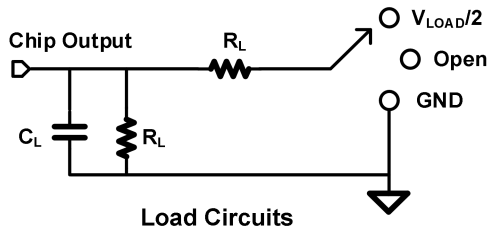
TEST	S1
T_{PHL}/T_{PLH}	OPEN
T_{PLZ}/T_{PZL}	V_{LOAD}
T_{PHZ}/T_{PZH}	GND

V_{CC}	Inputs		V_M	V_{LAOD}	C_L	R_L	V_Δ
	V_I	T_r/T_f					
1.8V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	$2×V_{CC}$	30pF	1kΩ	0.15V
2.5V±0.15V	V_{CC}	≤2ns	$V_{CC}/2$	$2×V_{CC}$	30pF	500Ω	0.15V
3.3V±0.15V	3V	≤2.5ns	1.5V	6V	50pF	500Ω	0.3V
5V±0.15V	V_{CC}	≤2.5ns	$V_{CC}/2$	$2×V_{CC}$	50pF	500Ω	0.3V

Period Time

Setup and Hold Times

Propagation Delay
for Output and Inverted Output

Enable and Disable Times
Low-And High-Level Enabling
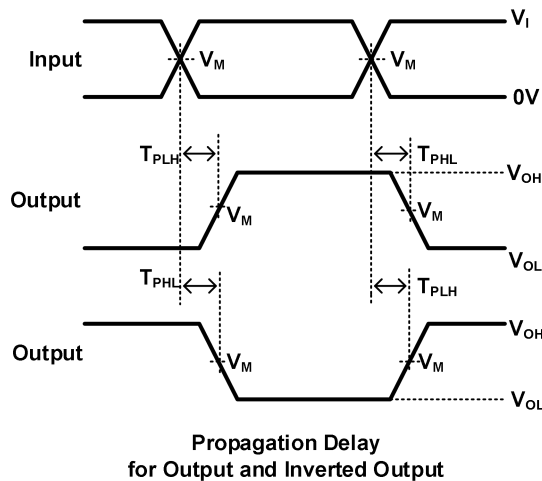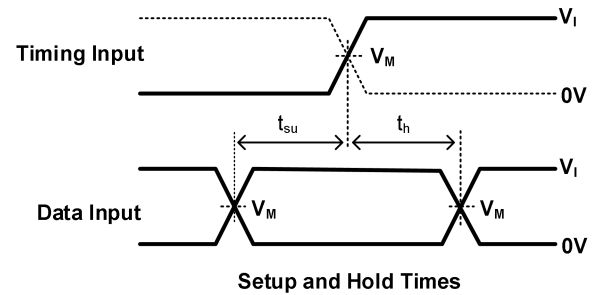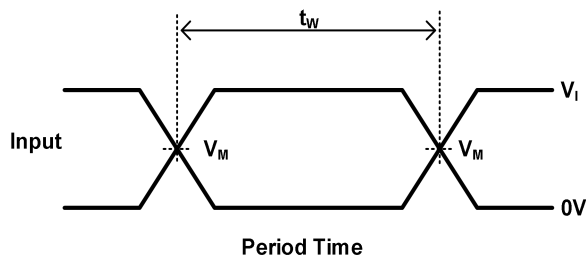
Notes: A. C includes probe and jig capacitance.
  B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.
  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 12 mA, include equivalent 26-Ω resistors to reduce overshoot and undershoot.

Inputs can be driven from either 3.3-V or 5-V devices. This feature allows the use of this device as a translator in a mixed 3.3-V/5-V 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.
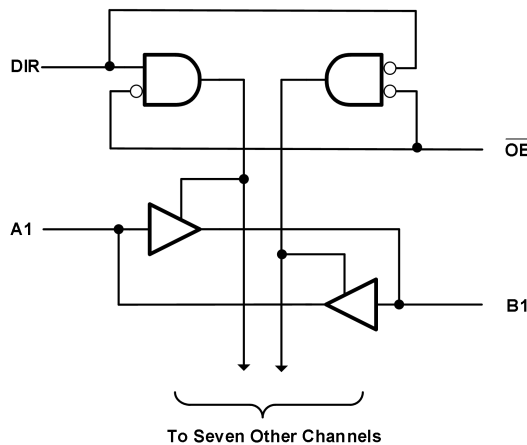
10.2 Functional Block Diagram

Figure 10-1. Logic Diagram (Positive Logic)

10.3 Feature Description

-Wide operating voltage range: Operates from 1.65 V to 3.6 V
-Allows down-voltage translation: Inputs accept voltages to 5.5 V
-I_{off} feature: Allows voltages on the inputs and outputs when VCC is 0 V

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 1.65-V to 3.6-V VCC 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.
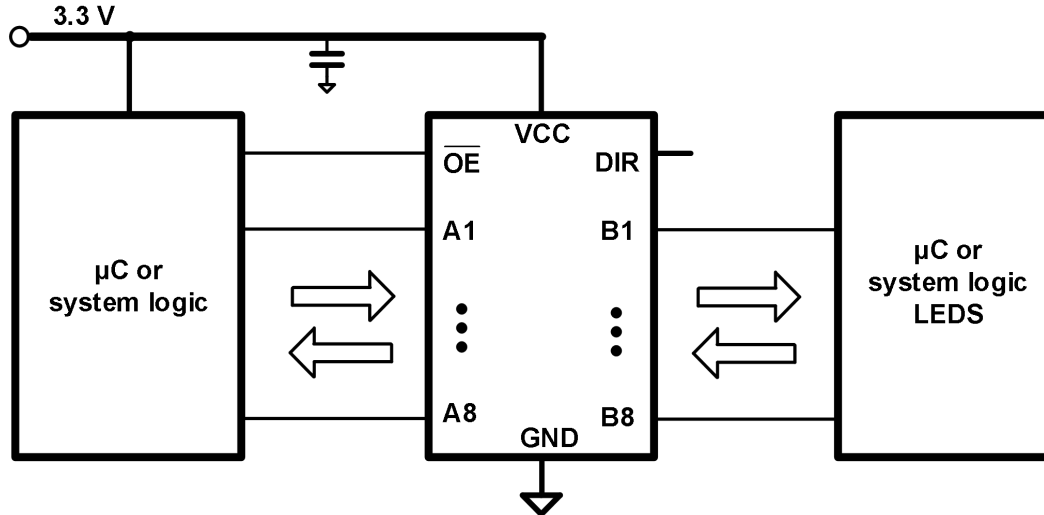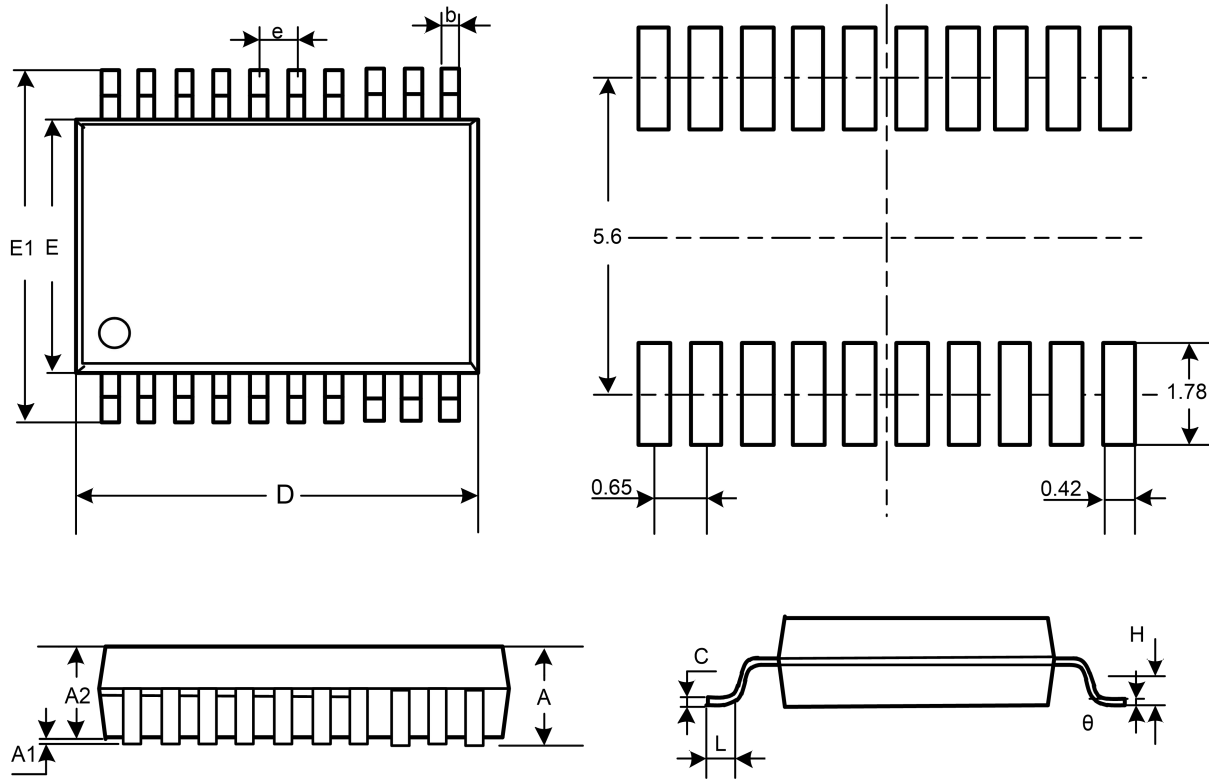
11.2 Typical Application

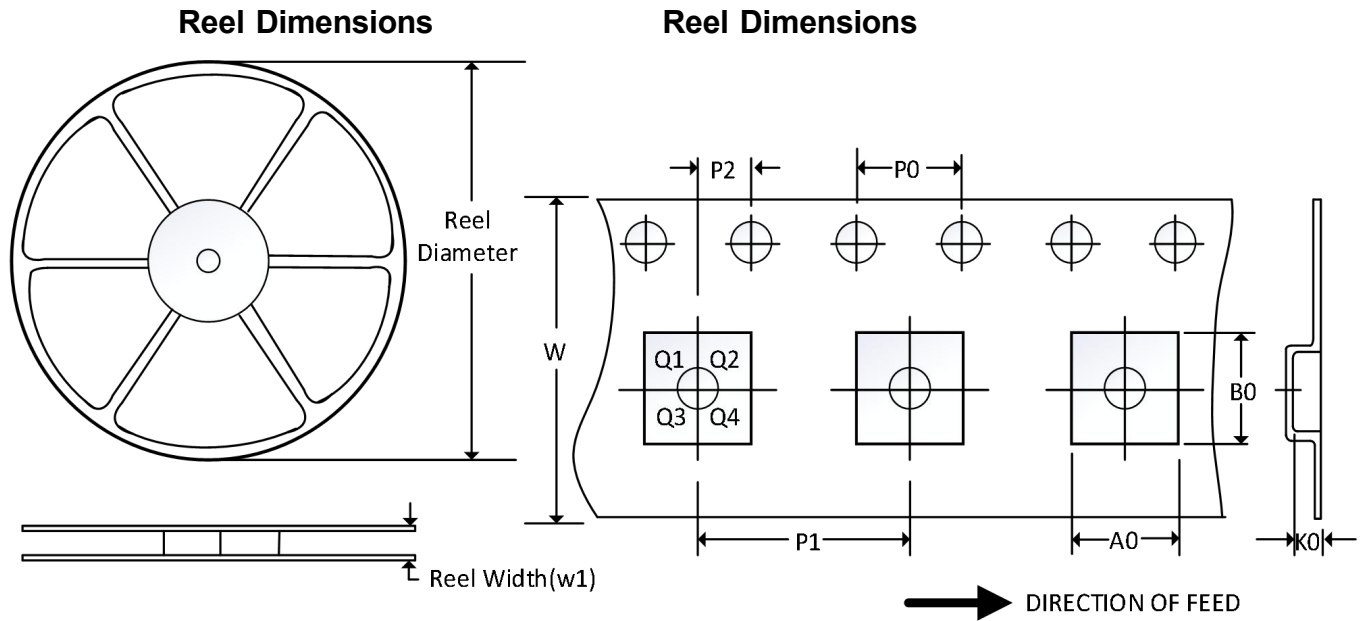**Figure11-1. Typical Application Schematic**

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

Reel Dimensions

Reel Diameter

W

Reel Width(w1)

Reel Dimensions

P2

P0

Q1 Q2
Q3 Q4

B0

P1

A0

K0

DIRECTION OF FEED

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
TSSOP-20	13''	12.4	6.75	6.95	1.20	4.0	8.0	2.0	12.0	Q1

NOTE:

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