

### GENERAL DESCRIPTION

The 74LV541AT is an octal buffer/line driver with 3-state outputs, which can accept supply voltage range from 4.5V to 5.5V. The device is the best choice for driving bus lines or buffer memory address registers. The inputs and outputs are placed on opposite sides of the package, making it easier to print circuit board layout. The inputs are compatible with TTL voltage that enables them to be connected to bipolar outputs and 3.3V devices. In addition, the device can support translating from 3.3V to 5V voltage.

The device features 3-state control gate consisting of a two-input AND gate with active-low inputs.  $\overline{OE1}$  and  $\overline{OE2}$  are two output enable inputs. When  $\overline{OE1}$  and  $\overline{OE2}$  are low, data transmits from  $A_n$  inputs to the  $Y_n$  outputs. When  $\overline{OE1}$  or  $\overline{OE2}$  is high, all outputs are in high-impedance state.

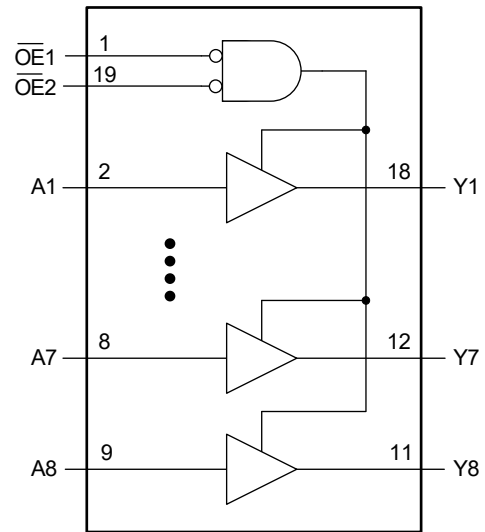
This device is highly suitable for partial power-down applications by using power-off leakage current ( $I_{OFF}$ ) circuit. When the device is powered down, the outputs are disabled, and the current backflow can be prevented from passing through the device.

The 74LV541AT is available in Green TSSOP-20 and TQFN-3.5x4.5-20AL packages. It operates over an operating temperature range of -40°C to +125°C.

### FEATURES

- **Supply Voltage Range: 4.5V to 5.5V**
- **Inputs Accept Voltages Higher than the Supply Voltage and up to 5.5V**
- **+16mA/-16mA Output Current**
- **Inputs are Compatible with TTL-Voltage**
- **All Ports Support Mixed-Mode Voltage Operation**
- **Support Partial Power-Down Mode**
- **-40°C to +125°C Operating Temperature Range**
- **Available in Green TSSOP-20 and TQFN-3.5x4.5-20AL Packages**

### LOGIC DIAGRAM



### FUNCTION TABLE

INPUT		OUTPUT	
$\overline{OE1}$	$\overline{OE2}$	$A_n$	$Y_n$
L	L	L	L
L	L	H	H
H	X	X	Z
X	H	X	Z

H = High Voltage Level  
 L = Low Voltage Level  
 Z = High-Impedance State  
 X = Don't Care

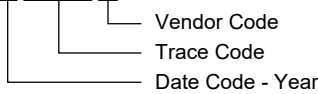
**PACKAGE/ORDERING INFORMATION**

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
74LV541AT	TSSOP-20	-40°C to +125°C	74LV541ATXTS20G/TR	178XTS20 XXXXX	Tape and Reel, 4000
	TQFN-3.5x4.5-20AL	-40°C to +125°C	74LV541ATXTVL20G/TR	177 XTVL20 XXXXX	Tape and Reel, 4000

**MARKING INFORMATION**

NOTE: XXXXX = Date Code, Trace Code and Vendor Code.

**XXXXX**



Green (RoHS & HSF): SG Micro Corp defines "Green" to mean Pb-Free (RoHS compatible) and free of halogen substances. If you have additional comments or questions, please contact your SGMICRO representative directly.

**ABSOLUTE MAXIMUM RATINGS**

Supply Voltage Range, $V_{CC}$ .....	-0.5V to 7V
Input Voltage Range, $V_I$ <sup>(1)</sup> .....	-0.5V to 7V
Output Voltage Range, $V_O$ <sup>(1)</sup>	
High-State or Low-State .....	-0.5V to MIN(7V, $V_{CC} + 0.5V$ )
3-State or Power-Down Mode .....	-0.5V to 7V
Input Clamp Current, $I_{IK}$ ( $V_I < 0V$ ) .....	-20mA
Output Clamp Current, $I_{OK}$ ( $V_O < 0V$ ) .....	-50mA
Continuous Output Current, $I_O$ ( $V_O = 0V$ to $V_{CC}$ ) .....	$\pm 35mA$
Continuous Current through $V_{CC}$ or GND .....	$\pm 70mA$
Junction Temperature <sup>(2)</sup> .....	+150°C
Storage Temperature Range .....	-65°C to +150°C
Lead Temperature (Soldering, 10s) .....	+260°C
ESD Susceptibility <sup>(3)(4)</sup>	
HBM .....	$\pm 2000V$
CDM .....	$\pm 1000V$

**NOTES:**

1. The input and output voltage ratings may be exceeded if the input and output clamp current ratings are observed.
2. The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability.
3. For human body model (HBM), all pins comply with ANSI/ESDA/JEDEC JS-001 specifications.
4. For charged device model (CDM), all pins comply with ANSI/ESDA/JEDEC JS-002 specifications.
5. Unused input pins must be held at  $V_{CC}$  or GND to guarantee the device in normal operation.

**RECOMMENDED OPERATING CONDITIONS**

Operating Supply Voltage Range, $V_{CC}$ .....	4.5V to 5.5V
Input Voltage Range, $V_I$ <sup>(5)</sup> .....	0V to 5.5V
Output Voltage Range, $V_O$	
High-State or Low-State .....	0V to $V_{CC}$
3-State or Power-Down Mode .....	0V to 5.5V
Output Current, $I_O$ .....	$\pm 16mA$
Input Transition Rise or Fall Rate, $\Delta t/\Delta V$	
$V_{CC} = 4.5V$ to $5.5V$ .....	20ns/V (MAX)
Operating Temperature Range .....	-40°C to +125°C

**OVERSTRESS CAUTION**

Stresses beyond those listed in Absolute Maximum Ratings may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect reliability. Functional operation of the device at any conditions beyond those indicated in the Recommended Operating Conditions section is not implied.

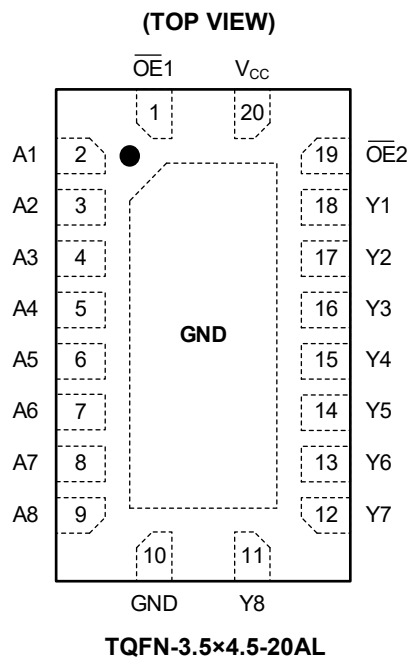
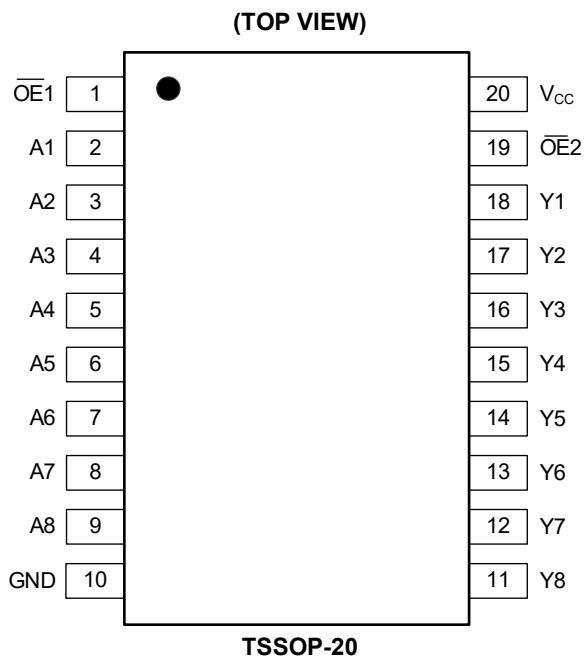
**ESD SENSITIVITY CAUTION**

This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because even small parametric changes could cause the device not to meet the published specifications.

**DISCLAIMER**

SG Micro Corp reserves the right to make any change in circuit design, or specifications without prior notice.

## PIN CONFIGURATIONS



## PIN DESCRIPTION

PIN	NAME	FUNCTION
1, 19	$\overline{OE}1$ , $\overline{OE}2$	Output Enable Inputs (Active-Low).
2, 3, 4, 5, 6, 7, 8, 9	A1, A2, A3, A4, A5, A6, A7, A8	Data Inputs.
18, 17, 16, 15, 14, 13, 12, 11	Y1, Y2, Y3, Y4, Y5, Y6, Y7, Y8	Data Outputs.
10	GND	Ground.
20	V <sub>CC</sub>	Supply Voltage.
Exposed Pad	GND	Connect it to GND internally. This pad is not an electrical connection point. TQFN-3.5x4.5-20AL package only.

**ELECTRICAL CHARACTERISTICS**(Full = -40°C to +125°C, all typical values are measured at T<sub>A</sub> = +25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
High-Level Input Voltage	V <sub>IH</sub>	V <sub>CC</sub> = 4.5V to 5.5V	Full	2			V
Low-Level Input Voltage	V <sub>IL</sub>	V <sub>CC</sub> = 4.5V to 5.5V	Full			0.8	V
High-Level Output Voltage	V <sub>OH</sub>	V <sub>CC</sub> = 4.5V, I <sub>OH</sub> = -50μA	Full	4.4	4.49		V
		V <sub>CC</sub> = 4.5V, I <sub>OH</sub> = -16mA	Full	3.8	4.27		
Low-Level Output Voltage	V <sub>OL</sub>	V <sub>CC</sub> = 4.5V, I <sub>OL</sub> = 50μA	Full		0.01	0.1	V
		V <sub>CC</sub> = 4.5V, I <sub>OL</sub> = 16mA	Full		0.24	0.55	
Input Leakage Current	I <sub>I</sub>	V <sub>CC</sub> = 0V to 5.5V, V <sub>I</sub> = 5.5V or GND	Full		±0.01	±1	μA
Off-State Output Current	I <sub>OZ</sub>	V <sub>CC</sub> = 5.5V, V <sub>O</sub> = V <sub>CC</sub> or GND	Full		±0.01	±5	μA
Power-Off Leakage Current	I <sub>OFF</sub>	V <sub>CC</sub> = 0V, V <sub>I</sub> or V <sub>O</sub> = 0V to 5.5V	Full		±0.01	±5	μA
Supply Current	I <sub>CC</sub>	V <sub>CC</sub> = 5.5V, V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0A	Full		0.06	20	μA
Additional Supply Current	ΔI <sub>CC</sub>	V <sub>CC</sub> = 5.5V, one input at 3.4V, other inputs at V <sub>CC</sub> or GND	Full		0.04	1.5	mA
Input Capacitance	C <sub>I</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	+25°C		4		pF

**DYNAMIC CHARACTERISTICS**(See Figure 1 for test circuit. Full = -40°C to +125°C, all typical values are measured at T<sub>A</sub> = +25°C, V<sub>CC</sub> = 5V ± 0.5V, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN <sup>(1)</sup>	TYP	MAX <sup>(1)</sup>	UNITS	
Propagation Delay <sup>(2)</sup>	t <sub>PD</sub>	An to Yn	C <sub>L</sub> = 15pF	Full	0.5	5.5	8.7	ns
			C <sub>L</sub> = 50pF	Full	0.5	6.0	9.8	
Enable Time <sup>(2)</sup>	t <sub>EN</sub>	$\overline{\text{OEn}}$ to Yn	C <sub>L</sub> = 15pF	Full	0.5	7.5	11.7	ns
			C <sub>L</sub> = 50pF	Full	0.5	8.0	13.4	
Disable Time <sup>(2)</sup>	t <sub>DIS</sub>	$\overline{\text{OEn}}$ to Yn	C <sub>L</sub> = 15pF	Full	0.5	5.5	8.9	ns
			C <sub>L</sub> = 50pF	Full	1.0	7.5	11.0	
Channel-to-Channel Skew Time	t <sub>SKO</sub>		+25°C		160		ns	
Power Dissipation Capacitance <sup>(3)</sup>	C <sub>PD</sub>	Outputs enabled, C <sub>L</sub> = 50pF, f = 10MHz	+25°C		14		pF	

## NOTES:

- Specified by design and characterization, not production tested.
- t<sub>PD</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>, t<sub>DIS</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>, t<sub>EN</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.
- C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$$

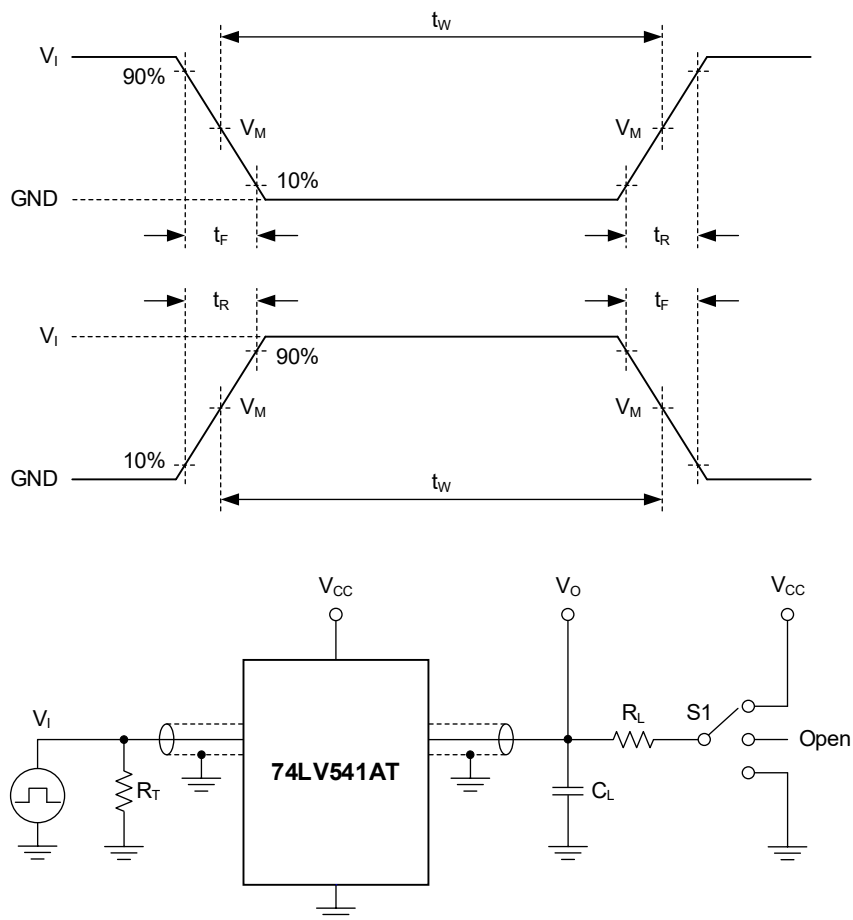
where:

f<sub>i</sub> = input frequency in MHz.f<sub>o</sub> = output frequency in MHz.C<sub>L</sub> = output load capacitance in pF.V<sub>CC</sub> = supply voltage in Volts.

N = number of inputs switching.

Σ(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of the outputs.

## TEST CIRCUIT



Test conditions are given in Table 1.

Definitions for test circuit:

$R_L$ : Load resistance.

$C_L$ : Load capacitance (includes jig and probe).

$R_T$ : Termination resistance (equals to output impedance  $Z_O$  of the pulse generator).

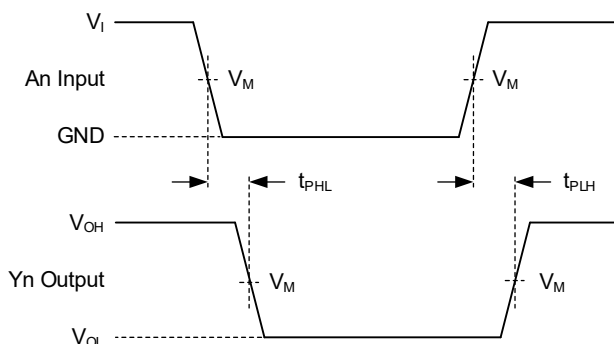
S1: Test selection switch.

Figure 1. Test Circuit for Measuring Switching Times

Table 1. Test Conditions

SUPPLY VOLTAGE	INPUT		LOAD		S1 POSITION		
$V_{CC}$	$V_I$	$t_R, t_F$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PLZ}, t_{PZL}$	$t_{PHZ}, t_{PZH}$
4.5V to 5.5V	$V_{CC}$	$\leq 2.5\text{ns}$	15pF, 50pF	1k $\Omega$	Open	$V_{CC}$	GND

## WAVEFORMS

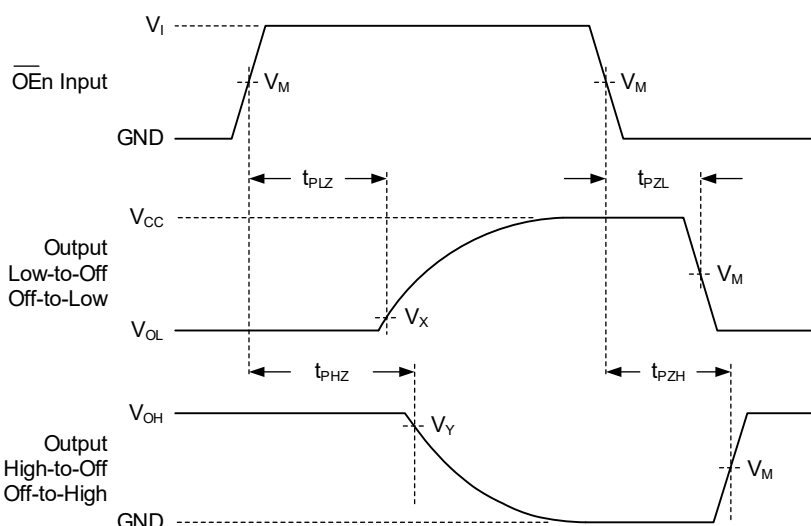


Test conditions are given in Table 1.

Measurement points are given in Table 2.

Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Figure 2. Input (An) to Output (Yn) Propagation Delay Times**



Test conditions are given in Table 1.

Measurement points are given in Table 2.

Logic levels:  $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Figure 3. Enable and Disable Times**

**Table 2. Measurement Points**

SUPPLY VOLTAGE	INPUT		OUTPUT		
	$V_I$	$V_M^{(1)}$	$V_M$	$V_X$	$V_Y$
$V_{CC}$ 4.5V to 5.5V	$V_{CC}$	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.3V$	$V_{OH} - 0.3V$

NOTE:

1. The measurement points should be  $V_{IH}$  or  $V_{IL}$  when the input rising or falling time exceeds 2.5ns.

**REVISION HISTORY**

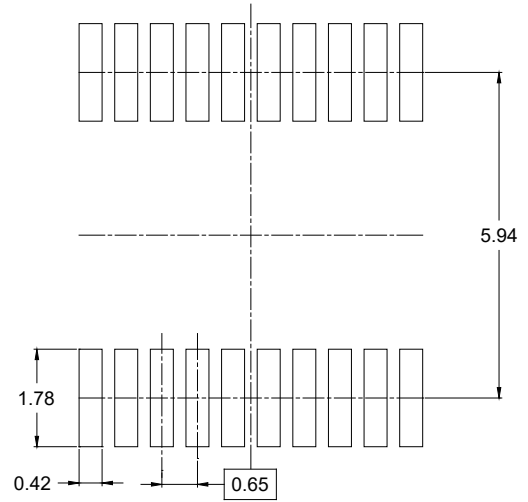
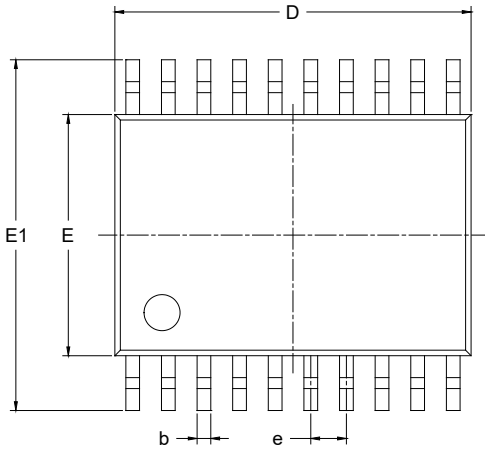
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (NOVEMBER 2024) to REV.A	Page
Changed from product preview to production data.....	All

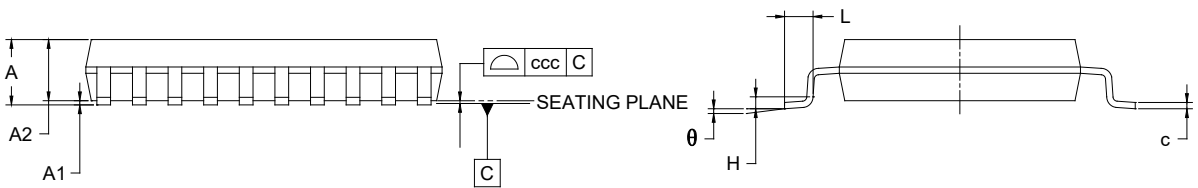
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PACKAGE OUTLINE DIMENSIONS

TSSOP-20



RECOMMENDED LAND PATTERN (Unit: mm)



Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	-	-	1.200
A1	0.050	-	0.150
A2	0.800	-	1.050
b	0.190	-	0.300
c	0.090	-	0.200
D	6.400	-	6.600
E	4.300	-	4.500
E1	6.200	-	6.600
e	0.650 BSC		
L	0.450	-	0.750
H	0.250 TYP		
θ	0°	-	8°
ccc	0.100		

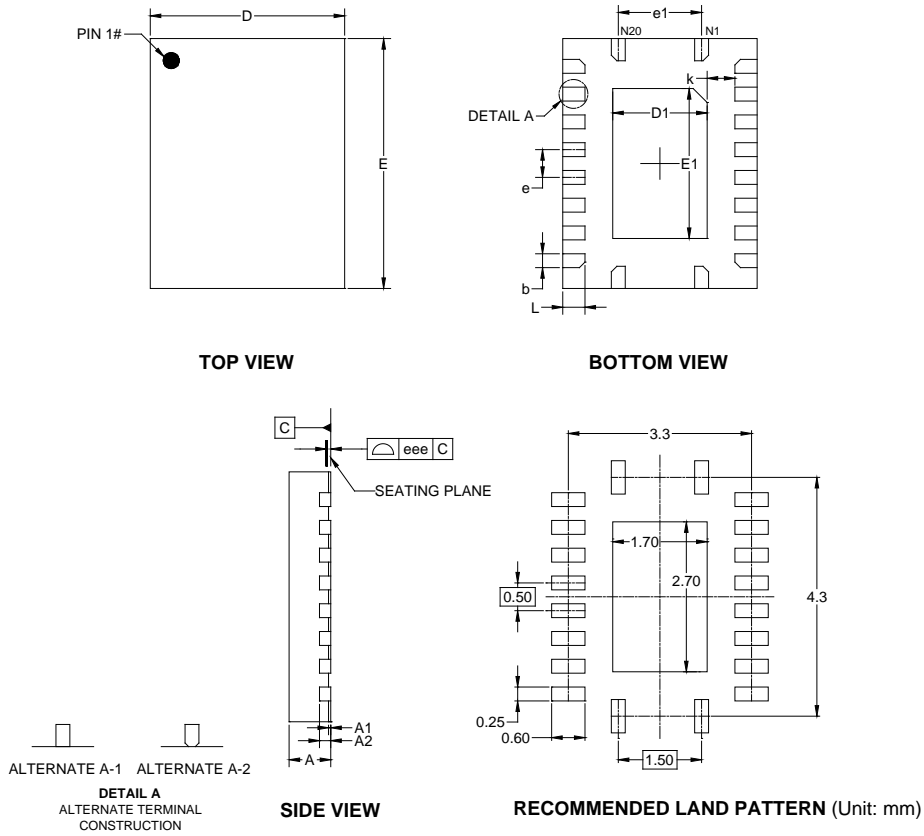
NOTES:

1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.
3. Reference JEDEC MO-153.



PACKAGE OUTLINE DIMENSIONS

TQFN-3.5x4.5-20AL

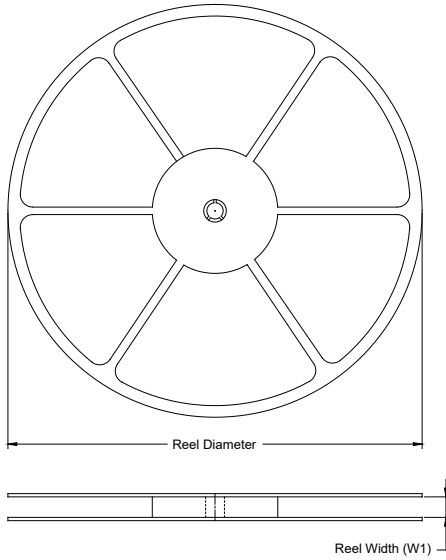


Symbol	Dimensions In Millimeters		
	MIN	NOM	MAX
A	0.700	-	0.800
A1	0.000	-	0.050
A2	0.203 REF		
b	0.200	-	0.300
D	3.400	-	3.600
D1	1.600	-	1.800
E	4.400	-	4.600
E1	2.600	-	2.800
e	0.500 BSC		
e1	1.500 BSC		
L	0.300	-	0.500
k	0.500 REF		
eee	0.080		

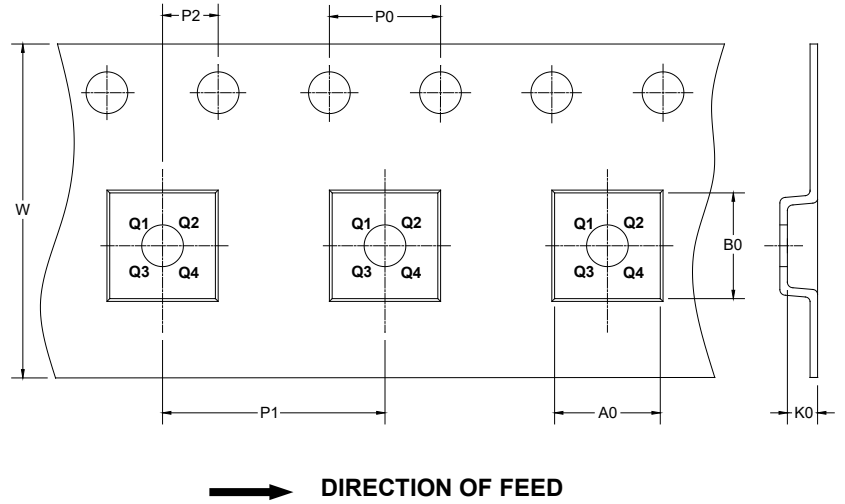
NOTE: This drawing is subject to change without notice.

## TAPE AND REEL INFORMATION

### REEL DIMENSIONS



### TAPE DIMENSIONS



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

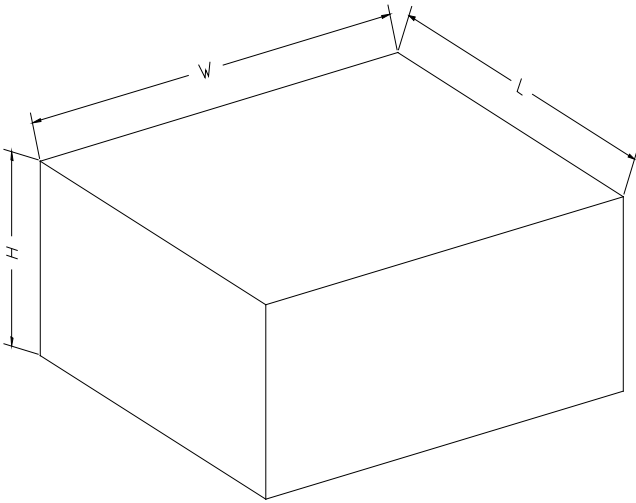
### KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
TSSOP-20	13"	16.4	6.80	6.90	1.50	4.0	8.0	2.0	16.0	Q1
TQFN-3.5×4.5-20AL	13"	12.4	3.80	4.80	1.10	4.0	8.0	2.0	12.0	Q1

DD0001

# PACKAGE INFORMATION

## CARTON BOX DIMENSIONS



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

## KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
13"	386	280	370	5

DD0002