SGM7SZ244S
Octal Buffer/Line Driver with 3-State Outputs

GENERAL DESCRIPTION

The SGM7SZ244S is an octal buffer/line driver with 3-state outputs, which can accept supply voltage range from 1.8V to 5.5V.

The device can be used as two 4-bit buffers or one 8-bit buffer. The $1\overline{OE}$ and $2\overline{OE}$ are two output enable inputs, and each controls four of the 3-state outputs. When $n\overline{OE}$ is set high, the outputs are in high-impedance state. When $n\overline{OE}$ is set low, data transmits from the nAn inputs to the nYn outputs.

The SGM7SZ244S is available in Green TSSOP-20, TQFN-3×3-20L and TQFN-5.5×3.5-24L packages. It operates over an ambient temperature range of -40℃ to +125℃.

FEATURES

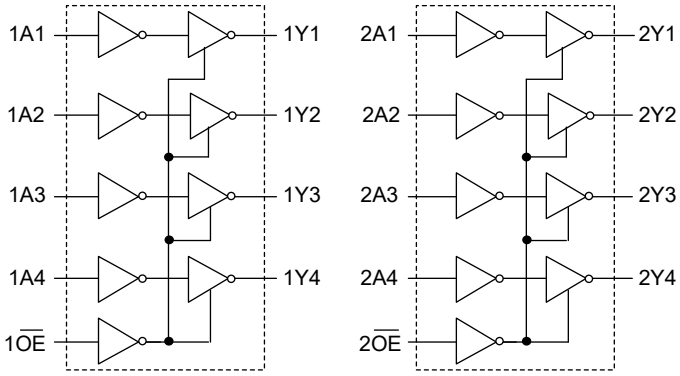
- **Wide Supply Voltage Range: 1.8V to 5.5V**
- **Input and Output Interface Capability to 5.5V System Environment**
- **+7.8mA/-7.8mA Output Current at V_{CC} = 5.0V**
- **3-State Buffers**
- **Support Partial Power-Down Mode**
- **-40℃ to +125℃ Operating Temperature Range**
- **Available in Green TSSOP-20, TQFN-3×3-20L and TQFN-5.5×3.5-24L Packages**

FUNCTION TABLE

CONTROL INPUT	INPUT	OUTPUT
$n\overline{OE}$	**nAn**	**nYn**
L	H	H
L	L	L
H	*X*	Z

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

LOGIC DIAGRAM

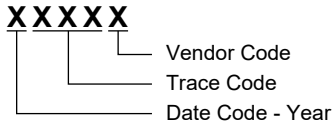


PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM7SZ244S	TSSOP-20	-40℃ to +125℃	SGM7SZ244SXTS20G/TR	SGM06MXTS20 XXXXX	Tape and Reel, 4000
	TQFN-3×3-20L	-40℃ to +125℃	SGM7SZ244SXTQG20G/TR	SGM 0D3QG XXXXX	Tape and Reel, 4000
	TQFN-5.5×3.5-24L	-40℃ to +125℃	SGM7SZ244SXTQQ24G/TR	SGM7SZ244S XTQQ XXXXX	Tape and Reel, 3000

MARKING INFORMATION

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



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 (1)

Supply Voltage Range, V_{CC} ..... -0.3V to 6.0V
Input Voltage, V_I (2) ..... -0.3V to 6.0V
Output Voltage, V_O (2)
High-State or Low-State..... -0.3V to MIN(6.0V, V_{CC} + 0.3V)
3-State Mode ..... -0.3V to 6.0V
Input Clamp Current, I_{IK} (V_I < 0V) .....-20mA
Output Clamp Current, I_{OK} (V_O < 0V) .....-20mA
Continuous Output Current, I_O (V_O = 0V to V_{CC}) ..... ±40mA
Continuous Current through V_{CC} or GND..... ±70mA
Junction Temperature (3) .....+150℃
Storage Temperature Range..... -65℃ to +150℃
Lead Temperature (Soldering, 10s).....+260℃
ESD Susceptibility
HBM.....2000V
CDM 1000V

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range, V_{CC} .....1.8V to 5.5V
Input Voltage Range, V_I .....0V to 5.5V
Output Voltage, V_O
High-State or Low-State..... 0V to V_{CC}
3-State Mode .....0V to 5.5V
Operating Temperature Range .....-40℃ to +125℃

OVERSTRESS CAUTION

1. 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.

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

3. The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability.

ESD SENSITIVITY CAUTION

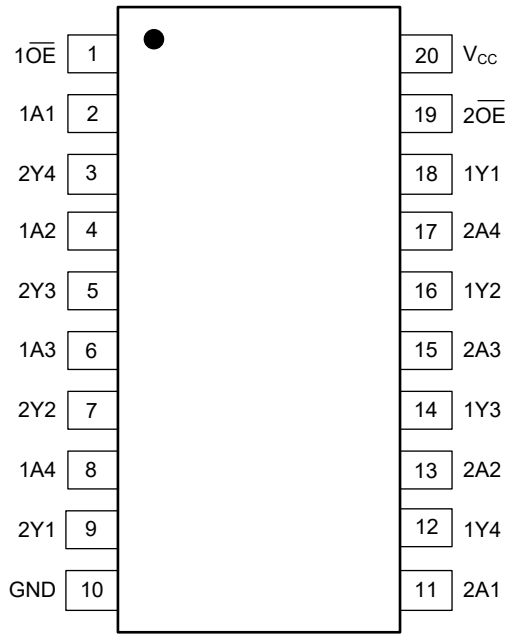
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance 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.

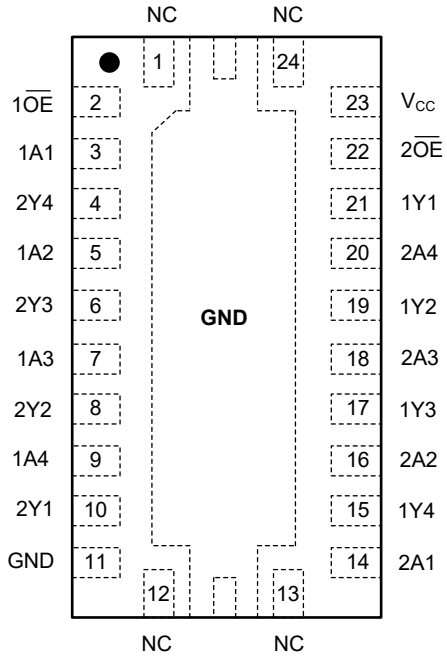
PIN CONFIGURATIONS

(TOP VIEW)



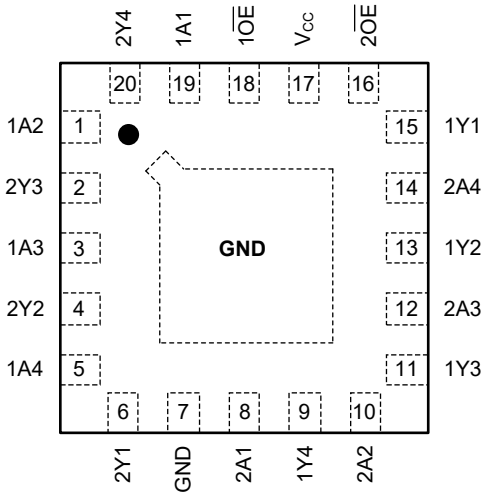
TSSOP-20

(TOP VIEW)



TQFN-5.5×3.5-24L

(TOP VIEW)



TQFN-3×3-20L

PIN DESCRIPTION

PIN			NAME	FUNCTION
TSSOP-20	TQFN-3×3-20L	TQFN-5.5×3.5-24L		
1, 19	18, 16	2, 22	$1\overline{OE}$, $2\overline{OE}$	Output Enable Inputs (Active Low).
2, 4, 6, 8	19, 1, 3, 5	3, 5, 7, 9	1A1, 1A2, 1A3, 1A4	Data Inputs.
3, 5, 7, 9	20, 2, 4, 6	4, 6, 8, 10	2Y4, 2Y3, 2Y2, 2Y1	Data Outputs.
10	7	11	GND	Ground.
11, 13, 15, 17	8, 10, 12, 14	14, 16, 18, 20	2A1, 2A2, 2A3, 2A4	Data Inputs.
12, 14, 16, 18	9, 11, 13, 15	15, 17, 19, 21	1Y4, 1Y3, 1Y2, 1Y1	Data Outputs.
20	17	23	V_{CC}	Supply Voltage.
–	–	1, 12, 13, 24	NC	No Connection.
–	Exposed Pad	Exposed Pad	GND	Connect it to GND internally. This pad is not an electrical connection point.

ELECTRICAL CHARACTERISTICS

(Full = -40℃ to +125℃, all typical values are measured at T_A= +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
High-Level Input Voltage	V_{IH}	V_{CC} = 1.8V		Full	1.20			V
		V_{CC} = 3.3V		Full	1.75			
		V_{CC} = 5.0V		Full	2.20			
Low-Level Input Voltage	V_{IL}	V_{CC} = 1.8V		Full			0.40	V
		V_{CC} = 3.3V		Full			0.65	
		V_{CC} = 5.0V		Full			0.65	
High-Level Output Voltage	V_{OH}	V_I = V_{IH}	V_{CC} = 1.8V, I_{OH} = -20μA	Full	1.75	1.795		V
			V_{CC} = 3.3V, I_{OH} = -20μA	Full	3.25	3.295		
			V_{CC} = 5.0V, I_{OH} = -20μA	Full	4.95	4.995		
			V_{CC} = 3.3V, I_{OH} = -6mA	Full	3.20	3.265		
			V_{CC} = 5.0V, I_{OH} = -7.8mA	Full	4.88	4.965		
Low-Level Output Voltage	V_{OL}	V_I = V_{IL}	V_{CC} = 1.8V, I_{OL} = 20μA	Full		0.005	0.05	V
			V_{CC} = 3.3V, I_{OL} = 20μA	Full		0.005	0.05	
			V_{CC} = 5.0V, I_{OL} = 20μA	Full		0.01	0.05	
			V_{CC} = 3.3V, I_{OL} = 6mA	Full		0.05	0.15	
			V_{CC} = 5.0V, I_{OL} = 7.8mA	Full		0.06	0.15	
Input Leakage Current	I_I	V_{CC} = 5.5V, V_I = V_{CC} or 0V		Full		±0.01	±1	μA
Off-State Output Current	I_{OZ}	V_{CC} = 5.5V, V_O = V_{CC} or 0V		Full		±0.01	±8	μA
Supply Current	I_{CC}	V_{CC} = 5.5V, V_I = V_{CC} or 0V, I_O = 0A		Full		0.01	10	μA
Power-Off Leakage Current	I_{OFF}	V_{CC} = 0V, V_I or V_O = 0V to 5.5V		Full		±0.01	±10	μA
Input Capacitance	C_I	V_{CC} = 1.8V to 5.5V		+25℃		6.5		pF
Input/Output Capacitance	C_{IO}			+25℃		6.5		pF

DYNAMIC CHARACTERISTICS

(See Figure 1 for test circuit. Full = -40℃ to +125℃, all typical values are measured at T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN (1)	TYP	MAX (1)	UNITS
Propagation Delay (2)	t_{PD}	nAn to nYn, C_L = 50pF	V_{CC} = 1.8V	Full	1.0	12.2	24	ns
			V_{CC} = 3.3V	Full	1.0	6.0	10.5	
			V_{CC} = 5.0V	Full	1.0	4.9	8.6	
		nAn to nYn, C_L = 150pF	V_{CC} = 1.8V	Full	1.0	13.5	28	
			V_{CC} = 3.3V	Full	1.0	6.8	12.0	
			V_{CC} = 5.0V	Full	1.0	5.7	9.6	
Enable Time (2)	t_{EN}	$n\overline{OE}$ to nYn, C_L = 50pF	V_{CC} = 1.8V	Full	1.0	15.7	30	ns
			V_{CC} = 3.3V	Full	1.0	8.6	13.0	
			V_{CC} = 5.0V	Full	1.0	7.4	10.5	
		$n\overline{OE}$ to nYn, C_L = 150pF	V_{CC} = 1.8V	Full	1.0	17.3	34	
			V_{CC} = 3.3V	Full	1.0	9.2	14.3	
			V_{CC} = 5.0V	Full	1.0	7.9	11.2	
Disable Time (2)	t_{DIS}	$n\overline{OE}$ to nYn, C_L = 50pF	V_{CC} = 1.8V	Full	1.0	18.0	30	ns
			V_{CC} = 3.3V	Full	1.0	12.0	21	
			V_{CC} = 5.0V	Full	1.0	10.7	19.0	
		$n\overline{OE}$ to nYn, C_L = 150pF	V_{CC} = 1.8V	Full	1.0	31	50	
			V_{CC} = 3.3V	Full	1.0	24	42	
			V_{CC} = 5.0V	Full	1.0	23	40	
Output Rise and Fall Times	t_R, t_F	C_L = 15pF	V_{CC} = 1.8V	Full	0.1	1.8	5.8	ns
			V_{CC} = 3.3V	Full	0.1	0.9	2.4	
			V_{CC} = 5.0V	Full	0.1	0.8	1.8	
		C_L = 30pF	V_{CC} = 1.8V	Full	0.1	1.9	6.8	
			V_{CC} = 3.3V	Full	0.1	0.9	2.8	
			V_{CC} = 5.0V	Full	0.1	0.9	2.2	
		C_L = 50pF	V_{CC} = 1.8V	Full	0.1	2.2	7.8	
			V_{CC} = 3.3V	Full	0.1	2.6	5.2	
			V_{CC} = 5.0V	Full	0.1	1.2	2.7	
Power Dissipation Capacitance (3)	C_{PD}	No load		+25℃		24.6		pF

NOTES:

1. Specified by design and characterization, not production tested.
2. t_{PD} is the same as t_{PLH} and t_{PHL}. t_{DIS} is the same as t_{PLZ} and t_{PHZ}. t_{EN} is the same as t_{PZL} and t_{PZH}.
3. C_{PD} is used to determine the dynamic power dissipation (P_D 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_i = Input frequency in MHz.

   f_o = Output frequency in MHz.

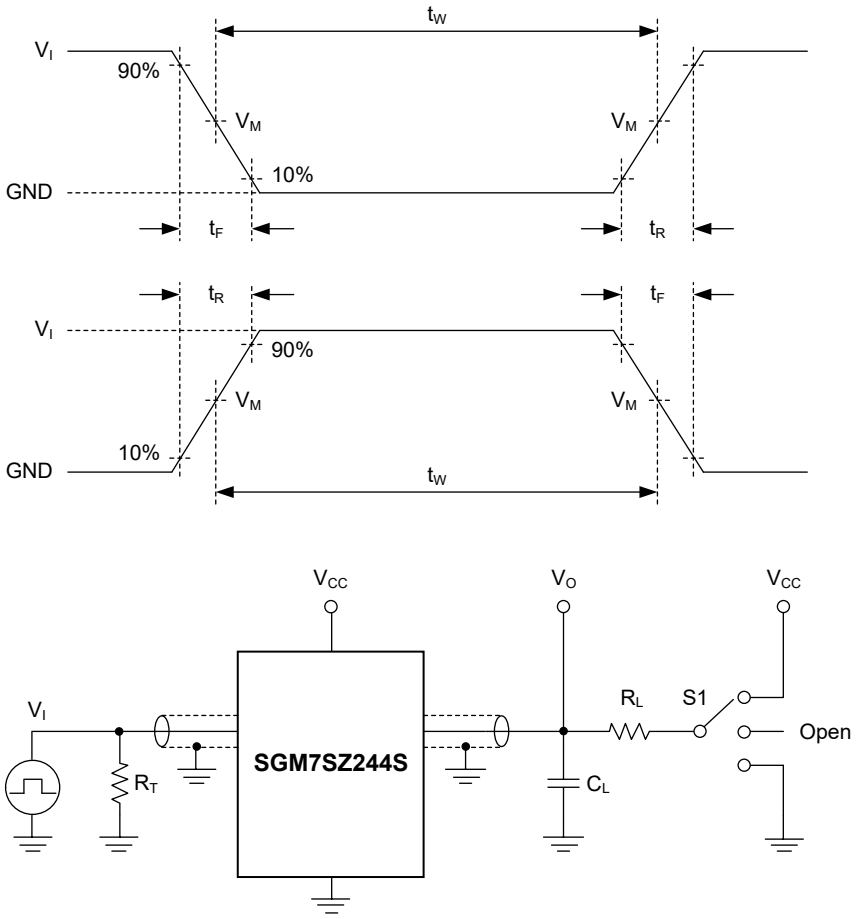
   C_L = Output load capacitance in pF.

   V_{CC} = Supply voltage in Volts.

   N = Number of inputs switching.

   $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = Sum of 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).

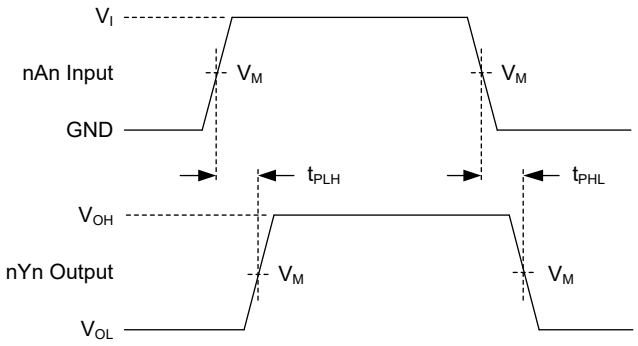
S1: Test selection switch.

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_{PHL}, t_{PLH}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
1.8V to 5.5V	V_{CC}	≤ 2.5ns	50pF, 150pF	1kΩ	Open	GND	V_{CC}

WAVEFORMS

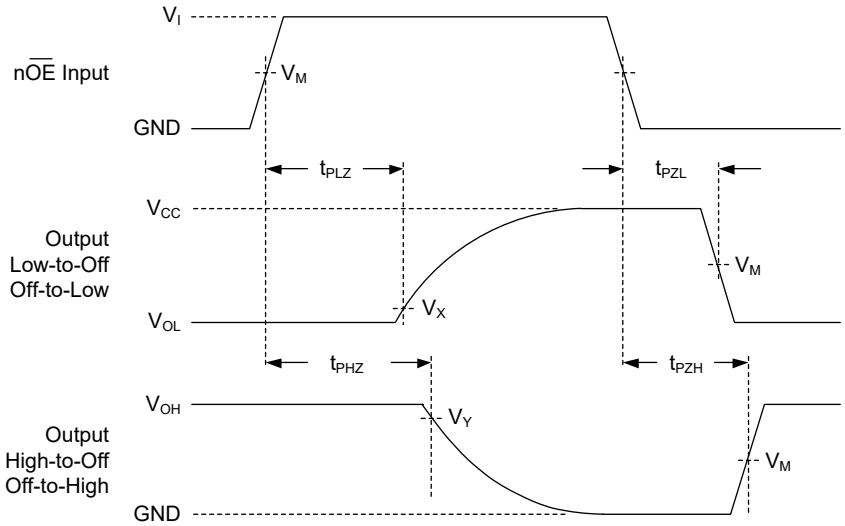


Test conditions are given in Table 1.

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 (nAn) to Output (nYn) 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_{CC}	V_I	V_M (1)	V_M	V_X	V_Y
1.8V to 5.5V	V_{CC}	0.5 × V_{CC}	0.5 × 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.

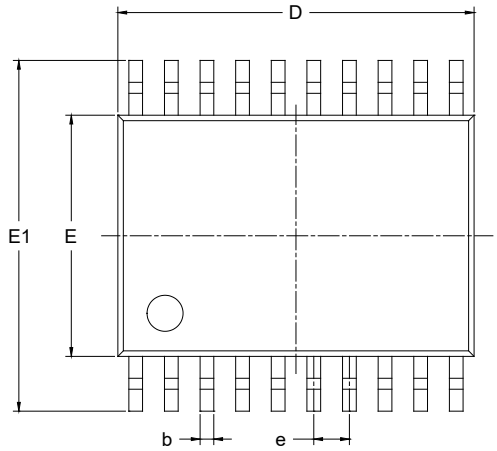
REVISION HISTORY

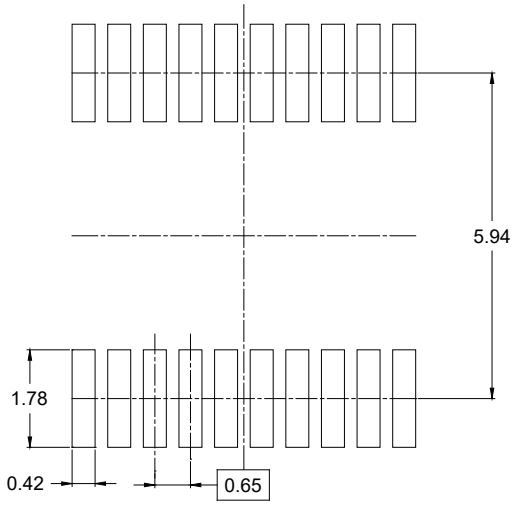
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Original (JULY 2023) to REV.A	Page
Changed from product preview to production data	All

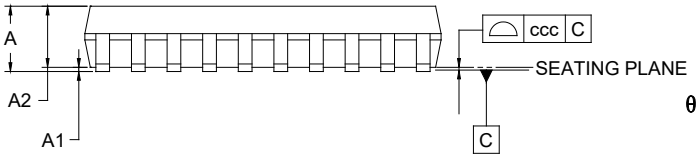
PACKAGE OUTLINE DIMENSIONS

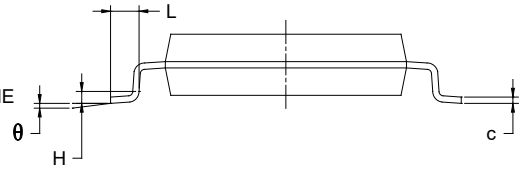
TSSOP-20





RECOMMENDED LAND PATTERN (Unit: mm)



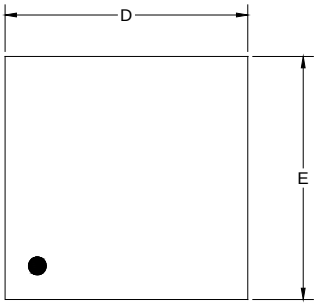


Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A	-	-	1.200
A1	0.050	-	0.150
A2	0.800	-	1.050
b	0.190	-	0.300
c	0.090	-	0.200
D	6.400	-	6.600
E	4.300	-	4.500
E1	6.200	-	6.600
e	0.650 BSC		
L	0.450	-	0.750
H	0.250 TYP		
θ	0°	-	8°
ccc	0.100		

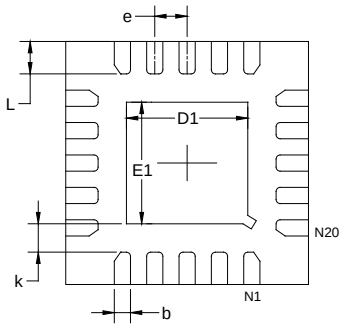
NOTES:
1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.
3. Reference JEDEC MO-153.

PACKAGE OUTLINE DIMENSIONS

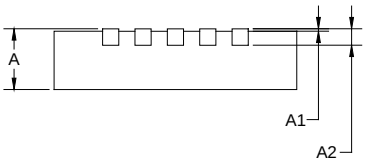
TQFN-3×3-20L



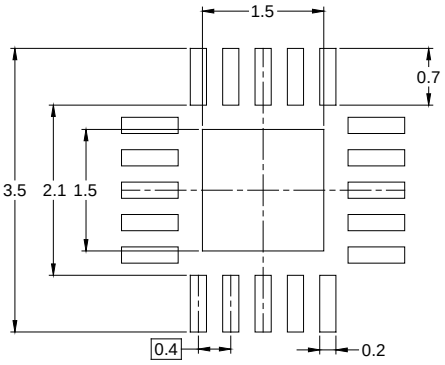
TOP VIEW



BOTTOM VIEW



SIDE VIEW



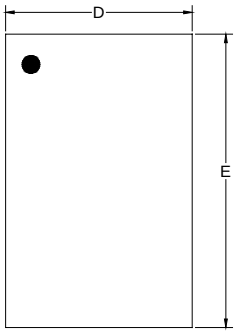
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	2.924	3.076	0.115	0.121
D1	1.400	1.600	0.055	0.063
E	2.924	3.076	0.115	0.121
E1	1.400	1.600	0.055	0.063
k	0.200 MIN		0.008 MIN	
b	0.150	0.250	0.006	0.010
e	0.400 TYP		0.016 TYP	
L	0.324	0.476	0.013	0.019

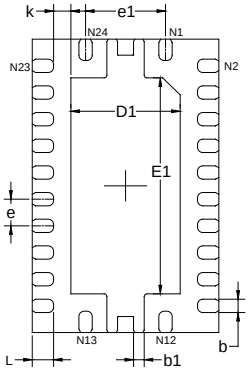
NOTE: This drawing is subject to change without notice.

PACKAGE OUTLINE DIMENSIONS

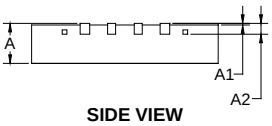
TQFN-5.5×3.5-24L



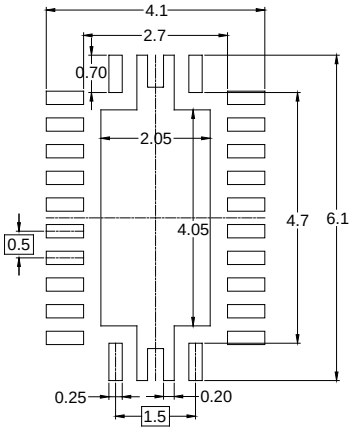
TOP VIEW



BOTTOM VIEW



SIDE VIEW



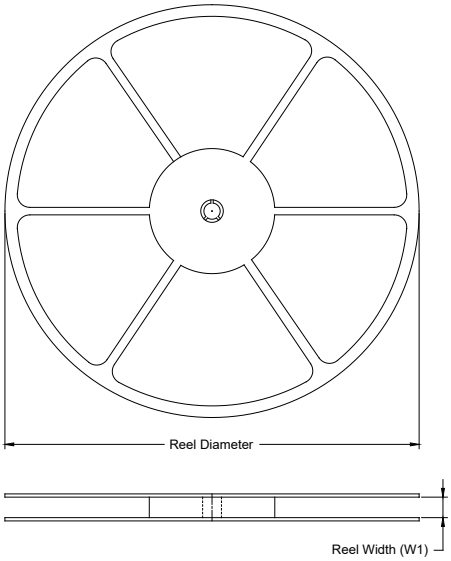
RECOMMENDED LAND PATTERN (Unit: mm)

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	3.400	3.600	0.134	0.142
D1	1.950	2.150	0.077	0.085
E	5.400	5.600	0.213	0.220
E1	3.950	4.150	0.156	0.163
k	0.325 REF		0.013 REF	
b	0.200	0.300	0.008	0.012
b1	0.150	0.250	0.006	0.010
L	0.300	0.500	0.012	0.020
e	0.500 BSC		0.020 BSC	
e1	1.500 BSC		0.059 BSC	

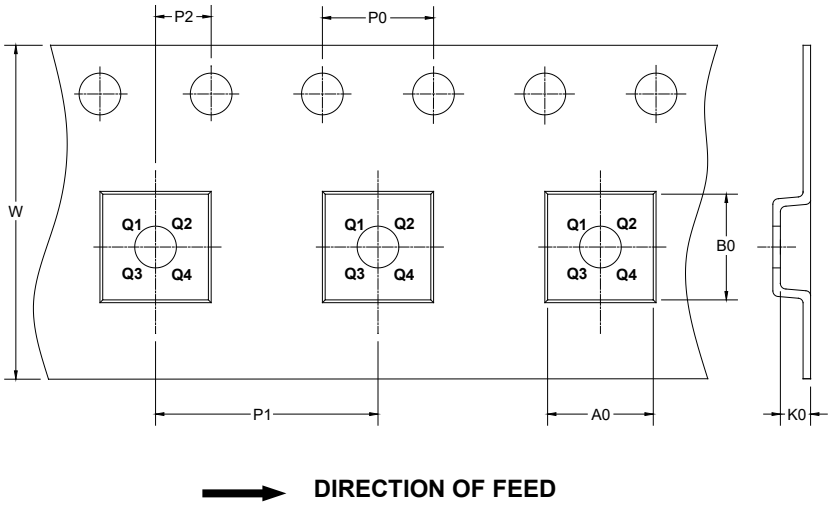
NOTE: This drawing is subject to change without notice.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



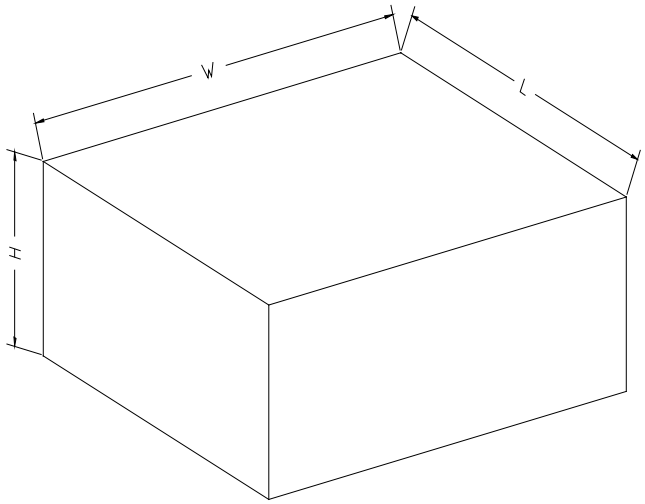
NOTE: The picture is only for reference. Please make the object as the standard.

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-3×3-20L	13"	12.4	3.30	3.30	1.10	4.0	8.0	2.0	12.0	Q2
TQFN-5.5×3.5-24L	13"	12.4	3.80	5.80	1.00	4.0	8.0	2.0	12.0	Q1

DD0001

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