

GENERAL DESCRIPTION

The SGM65231 is a high bandwidth bus switch with a low and flat on-resistance (R_{ON}). The low and flat on-resistance allows for minimal propagation delay and supports rail-to-rail switching on the data input/output (I/O) ports. The device also features low data I/O capacitance to minimize capacitive loading and signal distortion on the data bus. Specifically designed to support high bandwidth applications, the SGM65231 provides an optimized interface solution ideally suited for broadband communications, networking and data-intensive computing systems.

The SGM65231 is organized as an 8-bit bus switch with a single output-enable (\overline{OE}) input. When \overline{OE} is low, the bus switch is ON and the A port is connected to the B port, allowing bidirectional data flow between ports. When \overline{OE} is high, the bus switch is OFF and a high impedance state exists between the A and B ports.

This device is fully specified for partial-power-down applications using I_{OFF} . The I_{OFF} circuitry prevents damaging current backflow through the device when it is powered down. The device has isolation during power off.

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

The SGM65231 is available in Green TQFN-4.5×3.5-20L and TSSOP-20 packages. It operates over an operating temperature range of -40°C to +125°C.

FEATURES

- High Bandwidth Data Path (up to 500MHz)
- 5V Tolerant I/Os with Device Powered Up or Powered Down
- Low and Flat On-Resistance (R_{ON}) Characteristics Over Operating Range: 4.5Ω (TYP)
- Rail-to-Rail Switching on Data I/O Ports
 - ♦ 0V to 5V Switching with 3.3V V_{CC}
 - ♦ 0V to 3.3V Switching with 2.5V V_{CC}
- Bidirectional Data Flow
- Low Input/Output Capacitance Minimizes Loading and Signal Distortion
- Data and Control Inputs Provide Undershoot Clamp Diodes
- Low Power Consumption: $I_{CC} = 0.5mA$ (TYP)
- V_{CC} Operating Range from 2.3V to 3.6V
- Data I/Os Support 0V to 5V Signaling Levels: (0.8V, 1.2V, 1.5V, 1.8V, 2.5V, 3.3V, 5V)
- Control Input Can Be Driven by TTL or 5V/3.3V CMOS Outputs
- I_{OFF} Supports Partial-Power-Down Mode Operation
- Available in Green TQFN-4.5×3.5-20L and TSSOP-20 Packages

APPLICATIONS

PCI Interface
Differential Signal Interface
Memory Interleaving, Bus Isolation
Low Distortion Signal Gating

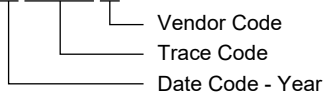
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM65231	TQFN-4.5×3.5-20L	-40°C to +125°C	SGM65231XTQS20G/TR	SGM65231 XTQS20 XXXXX	Tape and Reel, 4000
	TSSOP-20	-40°C to +125°C	SGM65231XTS20G/TR	SGM65231XTS20 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}	-0.3V to 4.6V
Control Input Voltage Range ⁽¹⁾ , V_{IN}	-0.3V to 7V
Switch I/O Voltage Range ⁽¹⁾⁽²⁾ , $V_{I/O}$	-0.3V to 7V
Junction Temperature	+150°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10s)	+260°C
ESD Susceptibility	
HBM	7000V
CDM	1000V

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range, V_{CC}	2.3V to 3.6V
High-Level Control Input Voltage, V_{IH} ($V_{CC} = 2.3V$ to $2.7V$)	1.7V to 5.5V
($V_{CC} = 2.7V$ to $3.6V$)	2V to 5.5V
Low-Level Control Input Voltage, V_{IL} ($V_{CC} = 2.3V$ to $2.7V$)	0V to 0.7V
($V_{CC} = 2.7V$ to $3.6V$)	0V to 0.8V
Data Input/Output Voltage, $V_{I/O}$	0V to 5.5V
Operating Temperature Range	-40°C to +125°C

NOTES:

1. All voltages are with respect to ground, unless otherwise specified.
2. V_I and V_O are used to denote specific conditions for $V_{I/O}$.

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.

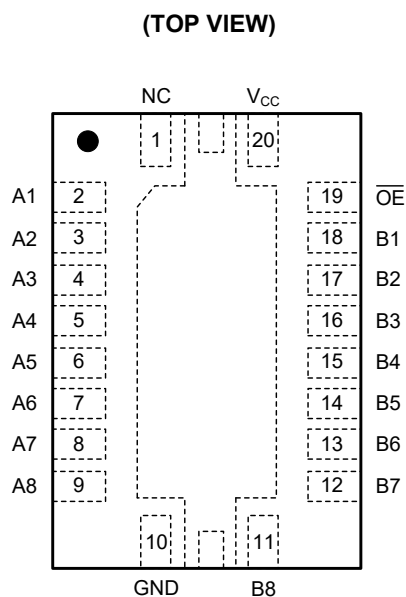
ESD SENSITIVITY CAUTION

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.

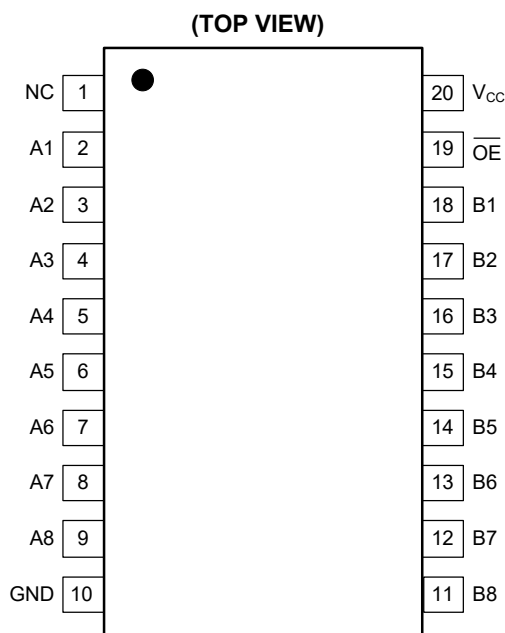
DISCLAIMER

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

PIN CONFIGURATIONS



TQFN-4.5x3.5-20L

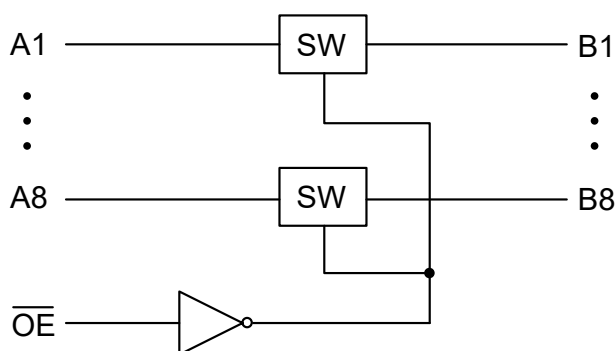


TSSOP-20

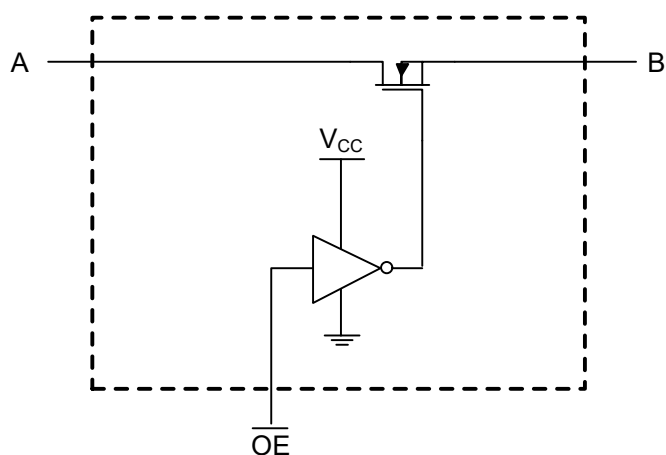
PIN DESCRIPTION

PIN	NAME	I/O	FUNCTION
TQFN-4.5x3.5-20L/TSSOP-20			
1	NC	—	No Internal Connection.
2	A1	I/O	Bidirectional Analog Input/Output 1.
3	A2	I/O	Bidirectional Analog Input/Output 2.
4	A3	I/O	Bidirectional Analog Input/Output 3.
5	A4	I/O	Bidirectional Analog Input/Output 4.
6	A5	I/O	Bidirectional Analog Input/Output 5.
7	A6	I/O	Bidirectional Analog Input/Output 6.
8	A7	I/O	Bidirectional Analog Input/Output 7.
9	A8	I/O	Bidirectional Analog Input/Output 8.
10	GND	—	Ground.
11	B8	I/O	Bidirectional Analog Input/Output 8.
12	B7	I/O	Bidirectional Analog Input/Output 7.
13	B6	I/O	Bidirectional Analog Input/Output 6.
14	B5	I/O	Bidirectional Analog Input/Output 5.
15	B4	I/O	Bidirectional Analog Input/Output 4.
16	B3	I/O	Bidirectional Analog Input/Output 3.
17	B2	I/O	Bidirectional Analog Input/Output 2.
18	B1	I/O	Bidirectional Analog Input/Output 1.
19	OE	I	Output Enable (Active Low).
20	V _{CC}	—	Power Supply.

LOGIC DIAGRAM (POSITIVE LOGIC)



SIMPLIFIED SCHEMATIC, EACH SWITCH (SW)



FUNCTION TABLE

INPUT \overline{OE}	INPUT/OUTPUT A	FUNCTION
L	B	A port = B port
H	Z	Disconnect

ELECTRICAL CHARACTERISTICS

(Full = -40°C to +125°C, typical values are at $V_{CC} = 3.3V$, $T_A = +25^\circ C$, unless otherwise noted.) ⁽¹⁾

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS	
Clamp Diode Voltage	V_{IK}	$V_{CC} = 3.6V$, $I_I = -18mA$	Full			-1.8	V	
Control Input Leakage Current	I_{IN}	$V_{CC} = 3.6V$, $V_{IN} = 0V$ to $5.5V$	+25°C		±0.01	±0.5	µA	
			Full			±1		
3-State Output Leakage ⁽²⁾	I_{OZ}	$V_{CC} = 3.6V$, $V_O = 0V$ to $5.5V$, $V_I = 0V$, Switch Off, $V_{IN} = V_{CC}$ or GND	+25°C		±0.01	±0.5	µA	
			Full			±1		
Off Leakage Current	I_{OFF}	$V_{CC} = 0V$, $V_O = 0V$ to $5.5V$, $V_I = 0V$	+25°C		±0.01	±0.5	µA	
			Full			±1		
Quiescent Supply Current	I_{CC}	$V_{CC} = 3.6V$, $I_{IO} = 0$, Switch On or Off, $V_{IN} = V_{CC}$ or GND	+25°C		0.5	0.7	mA	
			Full			1		
Increase in I_{CC} Per Control Input ⁽³⁾	ΔI_{CC}	$V_{CC} = 3.6V$, $V_{IN} = 3V$	+25°C		0.5	5	µA	
			Full			30		
Per Control Input ⁽⁴⁾	I_{CCD}	$V_{CC} = 3.6V$, A and B ports open, Control input switching at 50% duty cycle	+25°C		0.4	0.55	mA/MHz	
			Full			0.65		
Control Input Capacitance	C_{IN}	$V_{CC} = 3.3V$, $V_{IN} = 5.5V$, $3.3V$, or $0V$	+25°C		5		pF	
Input/Output Off Capacitance	$C_{IO(OFF)}$	$V_{CC} = 3.3V$, $V_{IO} = 5.5V$, $3.3V$, or $0V$, Switch Off, $V_{IN} = V_{CC}$ or GND	+25°C		7		pF	
Input/Output On Capacitance	$C_{IO(ON)}$	$V_{CC} = 3.3V$, $V_{IO} = 5.5V$, $3.3V$, or $0V$, Switch On, $V_{IN} = V_{CC}$ or GND	+25°C		10		pF	
On-Resistance ⁽⁵⁾	R_{ON}	$V_{CC} = 2.3V$ ⁽⁶⁾	$V_I = 0V$, $I_O = 30mA$	+25°C		4.5	6.5	Ω
				Full			7.5	
		$V_I = 1.7V$, $I_O = -15mA$	+25°C		4.5	6.5		
			Full			8		
		$V_{CC} = 3V$	$V_I = 0V$, $I_O = 30mA$	+25°C		4.5	6.5	
				Full			7.5	
$V_I = 2.4V$, $I_O = -15mA$	+25°C		4.5	6.5				
	Full			7.5				
High-Level Control Input Voltage	V_{IH}	$V_{CC} = 2.3V$ to $2.7V$	Full		1.7	5.5	V	
		$V_{CC} = 2.7V$ to $3.6V$						
Low-Level Control Input Voltage	V_{IL}	$V_{CC} = 2.3V$ to $2.7V$	Full		0	0.7		
		$V_{CC} = 2.7V$ to $3.6V$						
		$V_{CC} = 2.3V$ to $2.7V$						
		$V_{CC} = 2.7V$ to $3.6V$						

NOTES:

- V_{IN} and I_{IN} refer to control input. V_I , V_O , I_I and I_O refer to data pins.
- For I/O ports, the parameter I_{OZ} includes the input leakage current.
- This is the increase in supply current for each input that is at the specified TTL voltage level, rather than V_{CC} or GND.
- This parameter specifies the dynamic power supply current associated with the operating frequency of a single control input.
- Measured by the voltage drop between the A and B terminals at the indicated current through the switch. On-resistance is determined by the lower of the voltages of the two (A or B) terminals.
- Typical values are at $V_{CC} = 2.5V$.

SWITCHING CHARACTERISTICS

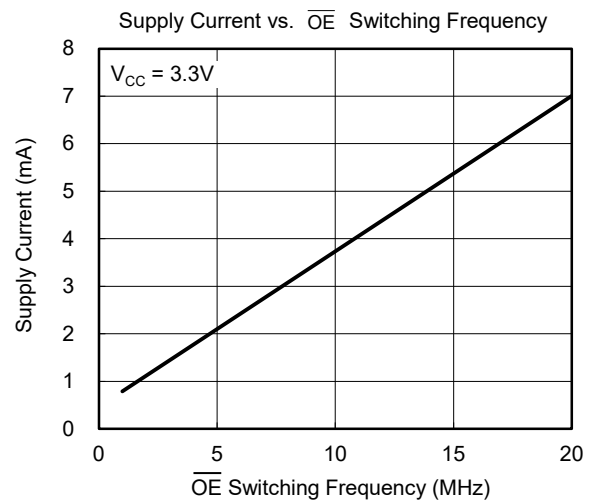
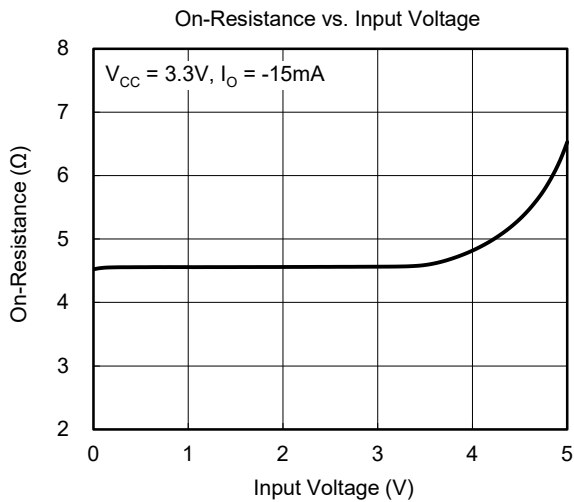
(T_A = +25°C, unless otherwise noted.) (see Figure 1)

PARAMETER	SYMBOL	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 2.5V ± 0.2V			V _{CC} = 3.3V ± 0.3V			UNITS
				MIN	TYP	MAX	MIN	TYP	MAX	
Maximum Switching Frequency for Control Input	f _{OE} ⁽¹⁾	OE	A or B		10			20		MHz
Propagation Delay	t _{PD}	A or B	B or A		0.4			0.5		ns
Enable Time	t _{EN}	OE	A or B		8			7.3		ns
Disable Time	t _{DIS}	OE	A or B		6.5			6.5		ns

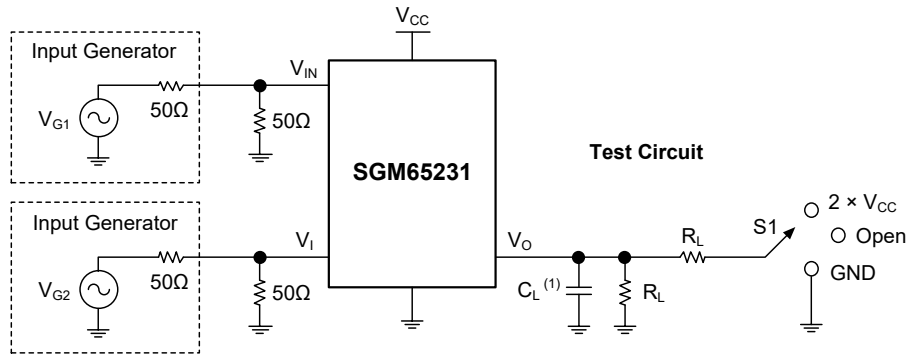
NOTE:

1. Maximum switching frequency for control input (V_O > V_{CC}, V_I = 5V, R_L ≥ 1MΩ, C_L = 0pF).

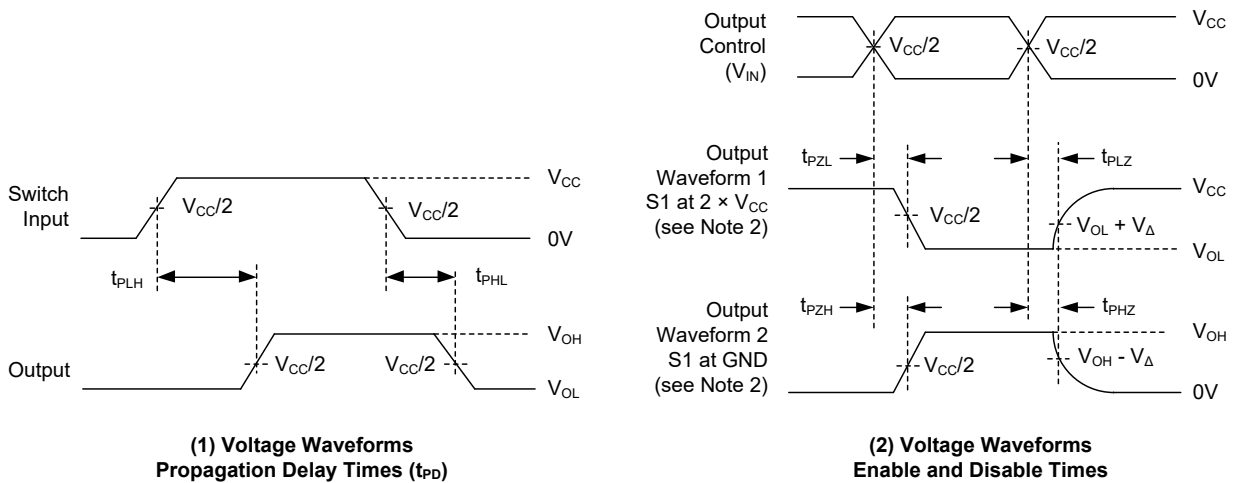
TYPICAL PERFORMANCE CHARACTERISTICS



PARAMETER MEASUREMENT INFORMATION



PARAMETER	V _{CC}	S1	R _L	V _I	C _L	V _Δ
t _{PD}	2.5V ± 0.2V 3.3V ± 0.3V	Open Open	500Ω 500Ω	V _{CC} or GND V _{CC} or GND	30pF 50pF	
t _{PLZ} /t _{PZL}	2.5V ± 0.2V 3.3V ± 0.3V	2 × V _{CC} 2 × V _{CC}	500Ω 500Ω	GND GND	30pF 50pF	0.15V 0.3V
t _{PHZ} /t _{PZH}	2.5V ± 0.2V 3.3V ± 0.3V	GND GND	500Ω 500Ω	V _{CC} V _{CC}	30pF 50pF	0.15V 0.3V



NOTES:

- C_L includes probe and jig capacitance.
- 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.
- All input pulses are supplied by generators having the following characteristics: PRR ≤ 10MHz, Z_O = 50Ω, t_r ≤ 2.5ns, t_f ≤ 2.5ns.
- The outputs are measured one at a time, with one transition per measurement.
- t_{PLZ} and t_{PHZ} are the same as t_{DIS}.
- t_{PZL} and t_{PZH} are the same as t_{EN}.
- t_{PLH} and t_{PHL} are the same as t_{PD}.

Figure 1. Test Circuit and Voltage Waveforms

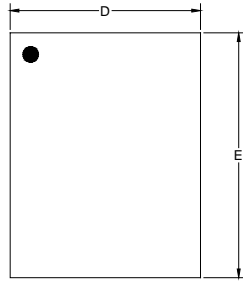
REVISION HISTORY

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

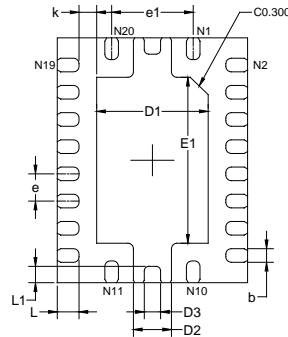
SEPTEMBER 2020 – REV.A to REV.A.1	Page
Updated TSSOP-20 Package	10, 11
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Changes from Original (JULY 2020) to REV.A	Page
Changed from product preview to production data.....	All

PACKAGE OUTLINE DIMENSIONS

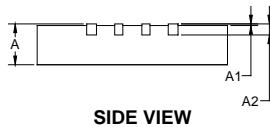
TQFN-4.5x3.5-20L



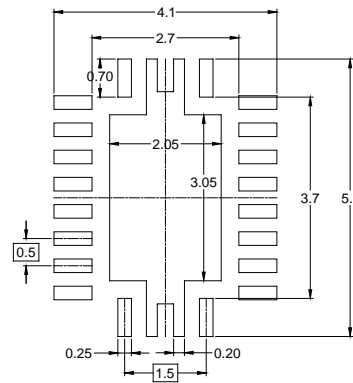
TOP VIEW



BOTTOM VIEW



SIDE VIEW

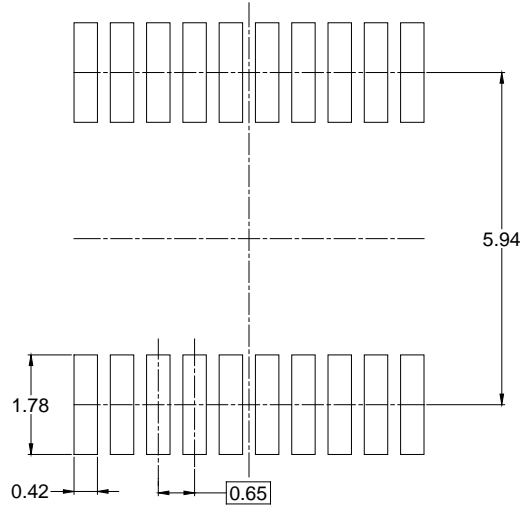
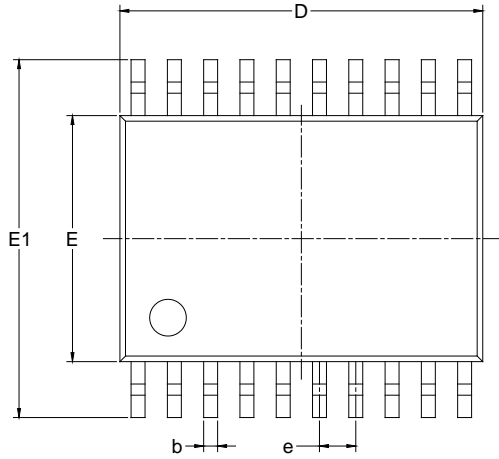


RECOMMENDED LAND PATTERN (Unit: mm)

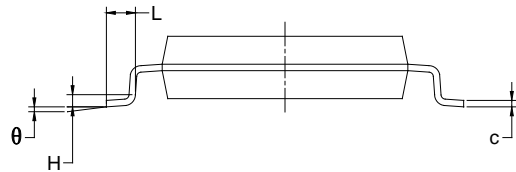
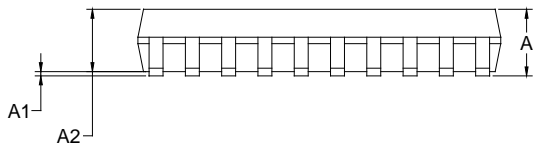
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	3.400	3.600	0.134	0.142
D1	1.950	2.150	0.077	0.085
D2	0.650	0.850	0.026	0.033
D3	0.250	0.450	0.010	0.018
E	4.400	4.600	0.173	0.181
E1	2.950	3.150	0.116	0.124
k	0.325 REF		0.013 REF	
b	0.200	0.300	0.008	0.012
L	0.300	0.500	0.012	0.020
L1	0.224	0.376	0.009	0.015
e	0.500 BSC		0.020 BSC	
e1	1.500 BSC		0.060 BSC	

PACKAGE OUTLINE DIMENSIONS

TSSOP-20



RECOMMENDED LAND PATTERN (Unit: mm)



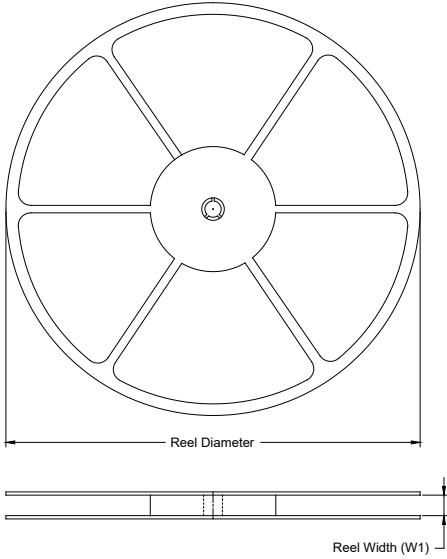
Symbol	Dimensions In Millimeters		
	MIN	MOD	MAX
A		-	1.200
A1	0.050	-	0.150
A2	0.800	-	1.050
b	0.190	-	0.300
c	0.090	-	0.200
D	6.400	-	6.600
E	4.300	-	4.500
E1	6.250	-	6.550
e	0.650 BSC		
L	0.450	-	0.750
H	0.250 TYP		
θ	0°	-	8°

NOTES:

1. Body dimensions do not include mode flash or protrusion.
2. 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
TQFN-4.5×3.5-20L	13"	12.4	3.75	4.75	0.95	4.0	8.0	2.0	12.0	Q1
TSSOP-20	13"	16.4	6.90	7.00	1.50	4.0	8.0	2.0	16.0	Q1

D00001

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