

GENERAL DESCRIPTION

The SGM48013 is a high-speed gate driver capable of effectively driving MOSFET and IGBT power switches. It allows for up to 8A source and 13A sink peak currents at $V_{DD} = 20V$. The SGM48013 provides a comprehensive set of protection features such as thermal shutdown protection, under-voltage lockout and short-circuit protection. It operates with a wide supply range of 4.5V to 20V.

The SGM48013 is available in a Green SOT-23-5 package. It operates over a temperature range of $-40^{\circ}C$ to $+125^{\circ}C$.

APPLICATIONS

Power MOSFETs
IGBT Driving for Power Supplies
Motor Drivers

FEATURES

- Simple and Reliable
- 8A Source and 13A Sink Peak Currents
- Wide Supply Voltage Range: 4.5V to 20V
- Fast Propagation Delay: 30ns (TYP)
- Fast Rise Time: 7ns (TYP)
- Fast Fall Time: 8ns (TYP)
- Ringing Suppression
- Negative Voltage Capability on IN Pin:
-10V when $(V_{DD} - V_{IN}) \leq 22V$
- Negative Voltage Capability on OUT Pin:
-5V (Pulse < 500ns)
- Comprehensive Protection Features
 - ♦ Thermal Shutdown Protection
 - ♦ Under-Voltage Lockout
 - ♦ Short-Circuit Protection
- $-40^{\circ}C$ to $+125^{\circ}C$ Operating Temperature Range
- Available in a Green SOT-23-5 Package

TYPICAL APPLICATIONS

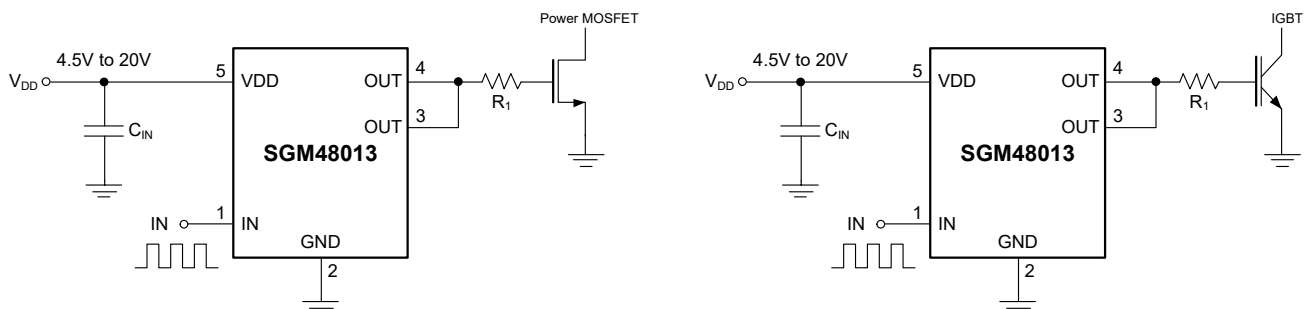


Figure 1. Typical Application Circuits

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM48013	SOT-23-5	-40°C to +125°C	SGM48013XN5G/TR	CB9XX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XX = Date Code.

YYY X X

Date Code - Week

Date Code - Year

Serial Number

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

VDD	-0.3V to 22V
Continuous IN, when ($V_{DD} - V_{IN}$) $\leq$ 22V	-10V to $V_{DD} + 0.3V$
Continuous OUT (DC).....	-0.3V to $V_{DD} + 0.3V$
Pulse OUT (Pulse < 500ns).....	-5V to $V_{DD} + 0.3V$
Power Dissipation, P_D @ $T_A = +25^\circ C$	0.67W
SOT-23-5	0.67W
Package Thermal Resistance	185°C/W
SOT-23-5, θ_{JA}	+150°C
Junction Temperature	-65°C to +150°C
Storage Temperature Range.....	+260°C
Lead Temperature (Soldering, 10s)	ESD Susceptibility
HBM.....	8000V
CDM	1000V

RECOMMENDED OPERATING CONDITIONS

Supply Voltage Range	4.5V to 20V
Operating Junction 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.

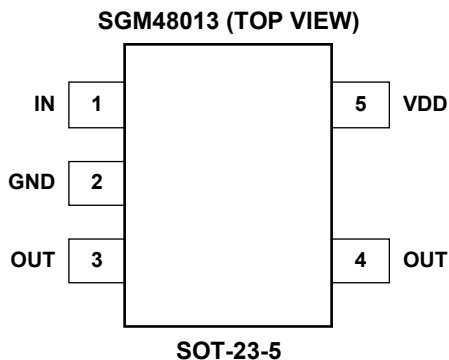
ESD SENSITIVITY CAUTION

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 CONFIGURATION



PIN DESCRIPTION

PIN	NAME	I/O	FUNCTION
1	IN	I	Non-Inverting Input. OUT pins are held low if IN is floating.
2	GND	G	Ground. All signals are referenced to this pin.
3, 4	OUT	O	Source/Sink Current Output of Driver.
5	VDD	P	Supply Input. Place a 4.7 μ F decoupling capacitor between this pin and GND pin close to the device.

NOTE:

P: power supply, I: input, O: output, G: ground.

FUNCTION TABLE

IN	OUT
L	L
H	H
Floating	L

ELECTRICAL CHARACTERISTICS

(V_{DD} = 12V, C_{IN} = 4.7μF, typical values are at T_J = +25°C, Full = -40°C to +125°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Power Supplies							
VDD Operating Supply Voltage	V _{DD}		Full	4.5		20	V
VDD Operating Supply Current	I _{VDD}	IN floating	+25°C		90	120	μA
		V _{IN} = 5V	+25°C		685	880	
VDD Under-Voltage Lockout Voltage	V _{UVLO}	V _{DD} rising	Full	3.8	4.1	4.4	V
VDD Under-Voltage Lockout Voltage Hysteresis	V _{HYS}		+25°C		200		mV
Input							
Input Low Voltage	V _{IL}		Full			0.7	V
Input High Voltage	V _{IH}		Full	2.5			V
Input Low Current	I _{IL}	V _{IN} = 0V	+25°C		0.1	1	μA
Input High Current	I _{IH}	V _{IN} = 20V	+25°C		115	150	μA
Outputs							
Pull-Up Resistance ⁽¹⁾	R _{OH}	V _{DD} = 12V, I _{OUT_SOURCE} = 50mA	Full		4.7	7.4	Ω
		V _{DD} = 4.5V, I _{OUT_SOURCE} = 50mA	Full		5.3	8.3	
Pull-Down Resistance	R _{OL}	V _{DD} = 12V, I _{OUT_SINK} = -50mA	Full		255	440	mΩ
		V _{DD} = 4.5V, I _{OUT_SINK} = -50mA	Full		265	460	
Peak Output Current	I _{PK_SOURCE}	V _{DD} = 20V, C _L = 0.22μF, f _{SW} = 1kHz	+25°C		8		A
	I _{PK_SINK}		+25°C		13		A
Switching Characteristics							
Rise Time	t _R	C _L = 2.2nF, see Figure 2	+25°C		7		ns
Fall Time	t _F		+25°C		8		ns
Propagation Delay (IN) to OUT	t _{D1}	C _L = 2.2nF, 3V input pulse, see Figure 2	+25°C		26		ns
	t _{D2}		+25°C		30		ns
Protection Circuits							
Thermal Shutdown Temperature	T _{TSD}				165		°C
Thermal Shutdown Temperature Hysteresis	T _{HYS}				30		°C

NOTE:

1. R_{OH} represents constant pull-up resistance only. Pull-up resistance R_{OH_PULSE} operates in pulse mode during the output rising stage, R_{OH_PULSE} = 565mΩ (TYP).

TIMING DIAGRAM

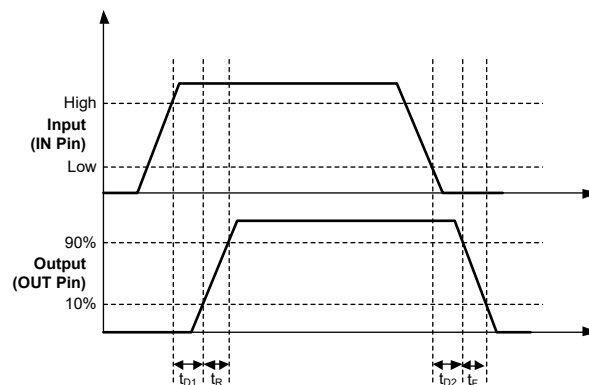
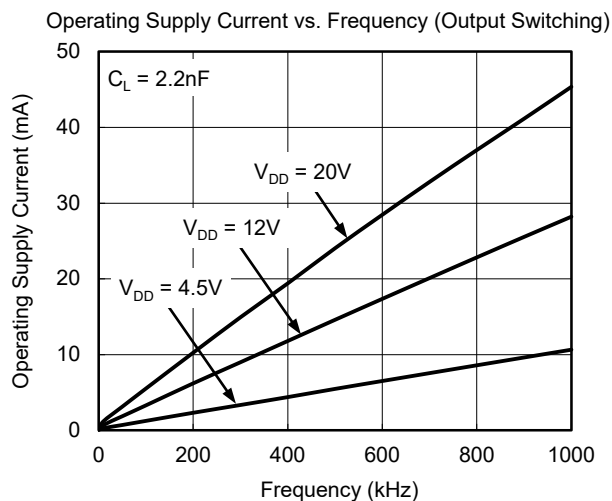
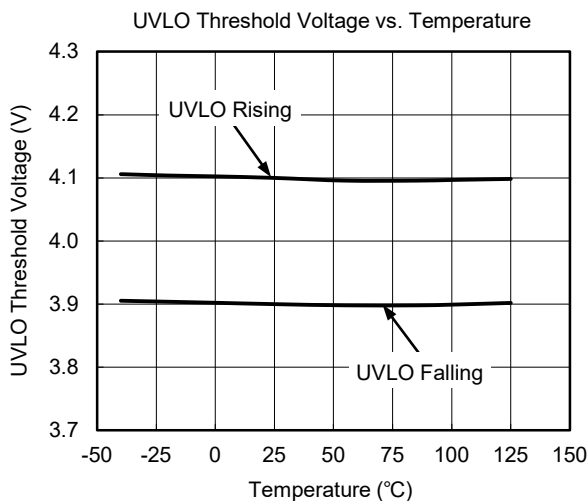
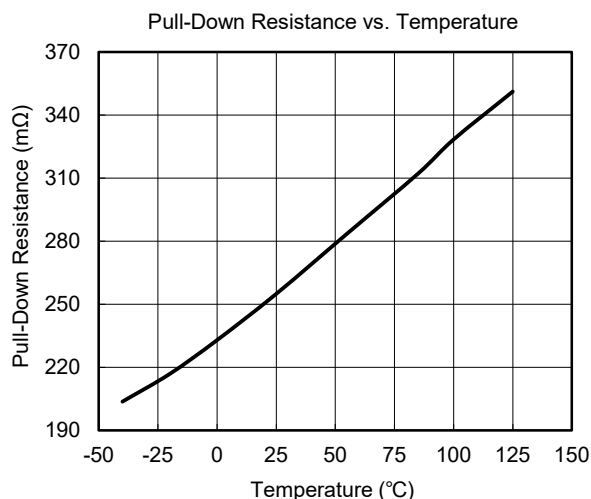
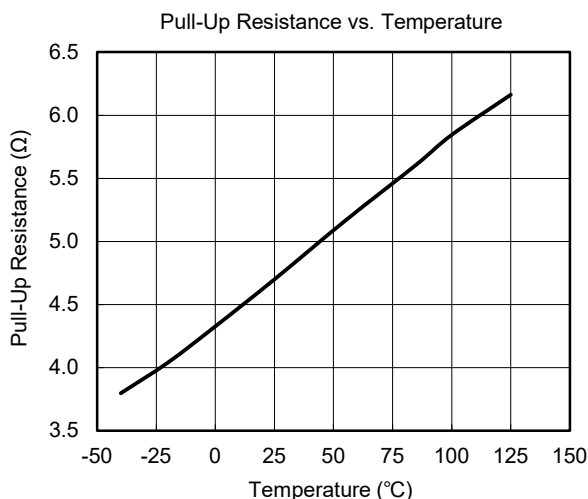
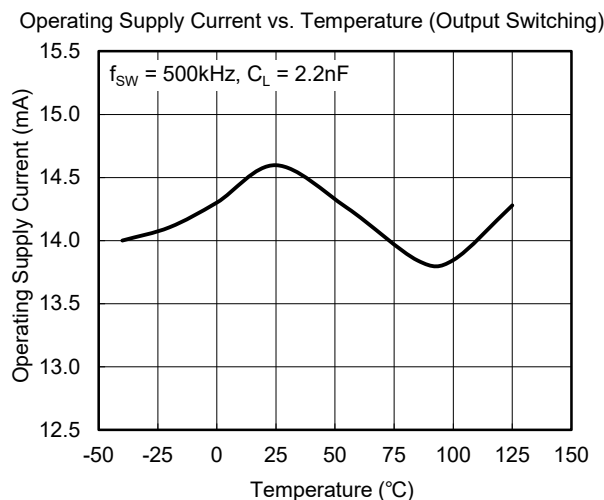
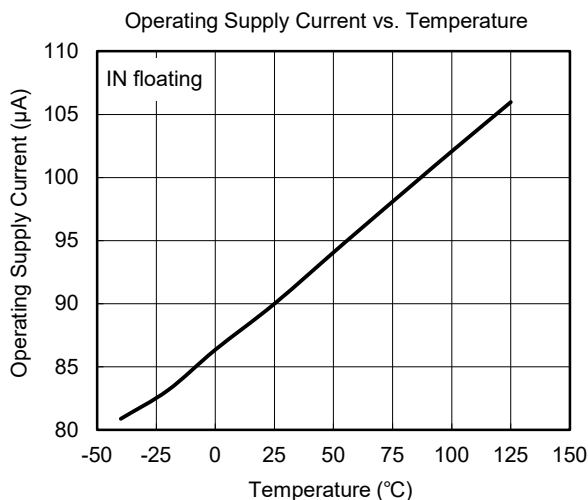


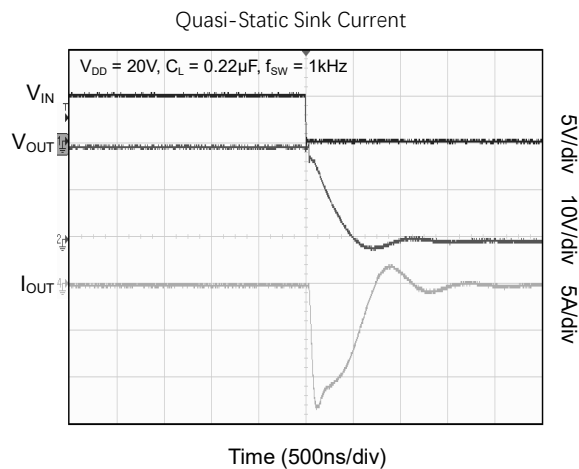
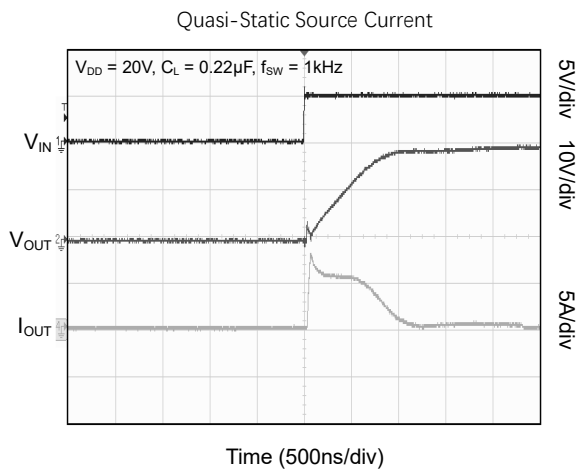
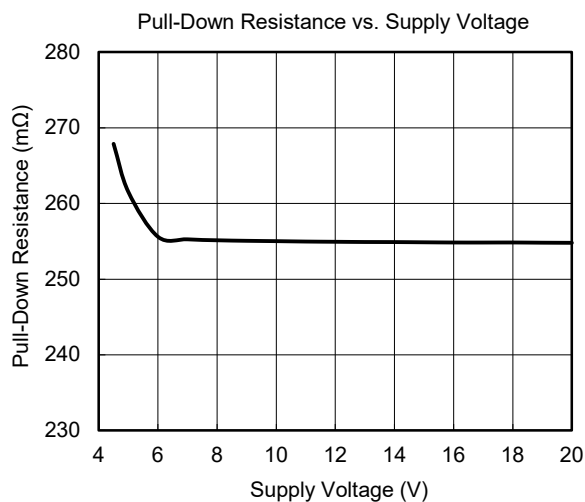
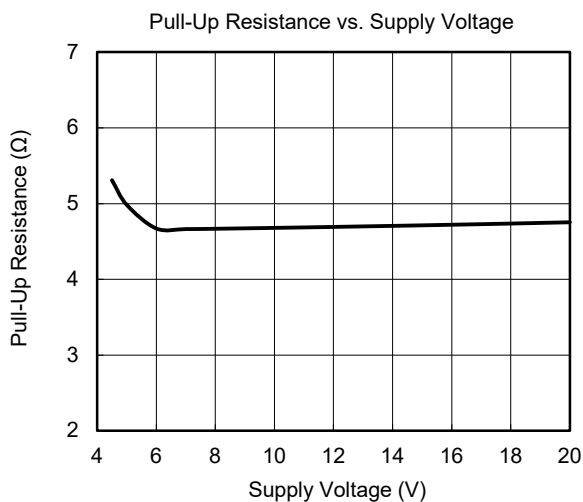
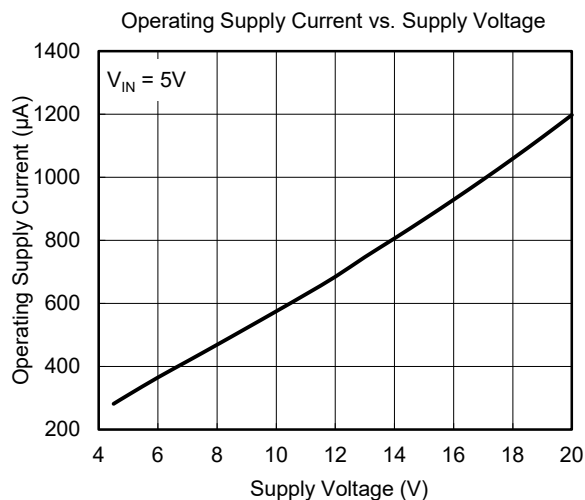
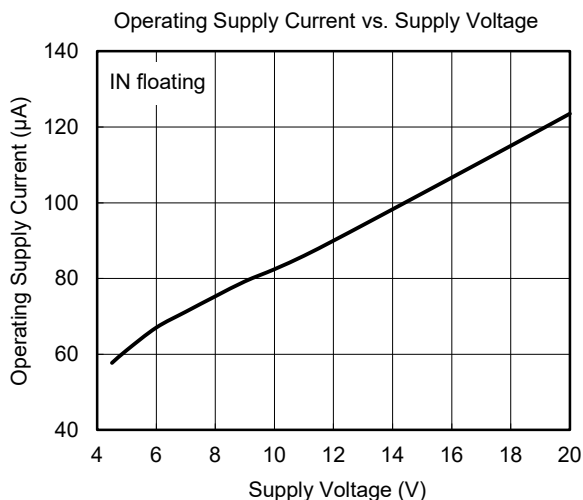
Figure 2. Non-Inverting Configuration

TYPICAL PERFORMANCE CHARACTERISTICS

At $T_J = +25^\circ\text{C}$, $V_{DD} = 12\text{V}$, $C_{IN} = 4.7\mu\text{F}$, unless otherwise noted.



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

At $T_J = +25^\circ\text{C}$, $V_{DD} = 12\text{V}$, $C_{IN} = 4.7\mu\text{F}$, unless otherwise noted.

FUNCTIONAL BLOCK DIAGRAM

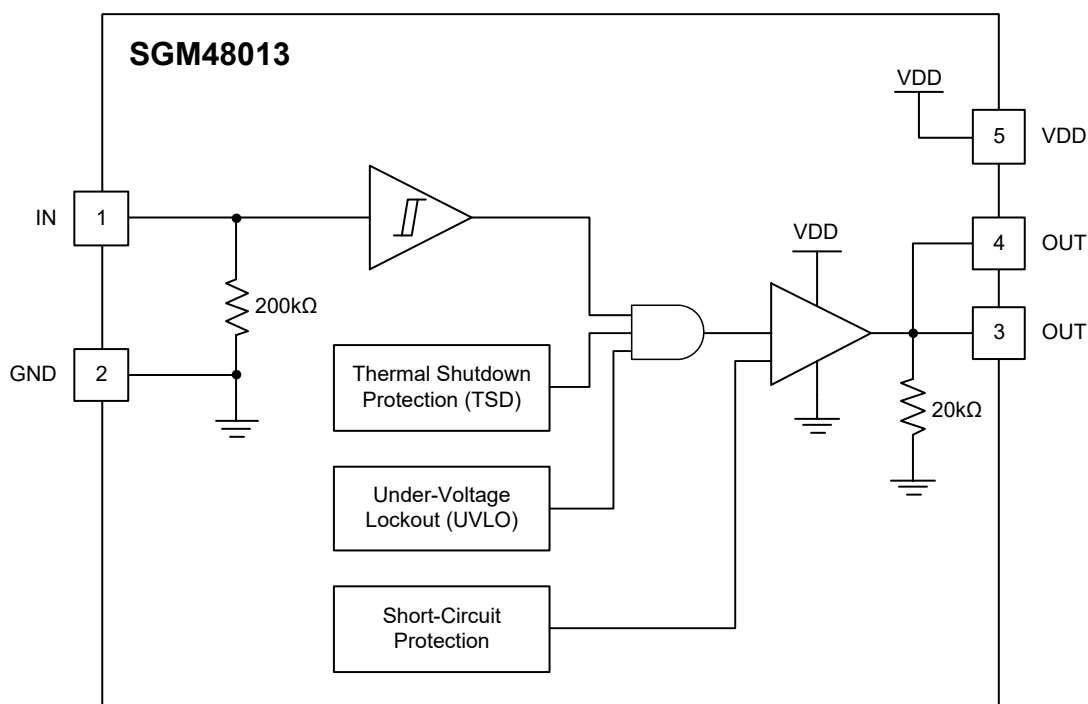


Figure 3. Functional Block Diagram

DETAILED DESCRIPTION

The SGM48013 is a reliable and high-speed gate driver for power MOSFETs and IGBTs with a comprehensive set of protection features such as thermal shutdown protection, under-voltage lockout and short-circuit protection. The outputs are forced low immediately if any of the above mentioned conditions occurs, except short-circuit protection. When short-circuit protection

occurs, the outputs enter into high impedance, and the driver will be re-enabled after the protection period (16ms, TYP) expires.

The SGM48013 offers a unique output stage design. It can effectively suppress the output voltage ringing and the overshoot/undershoot on the outputs.

REVISION HISTORY

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

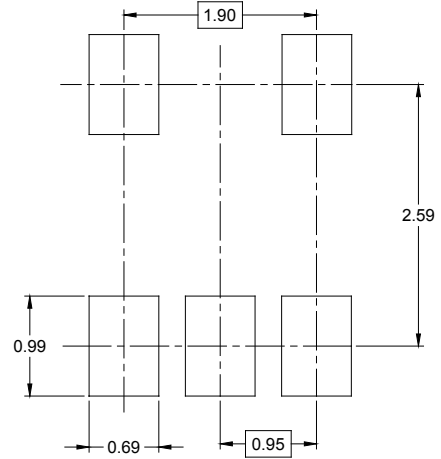
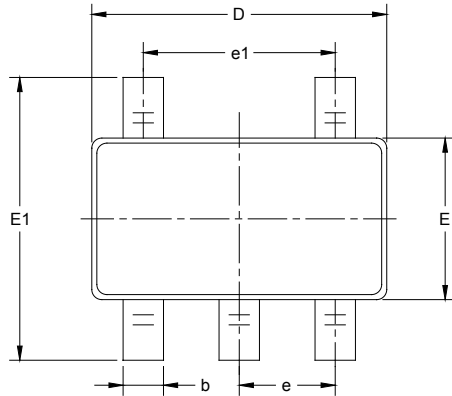
Changes from Original (SEPTEMBER 2020) to REV.A

Page

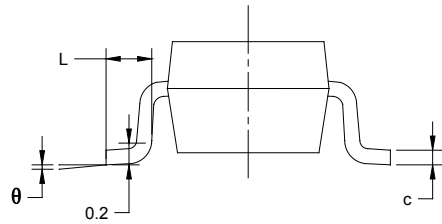
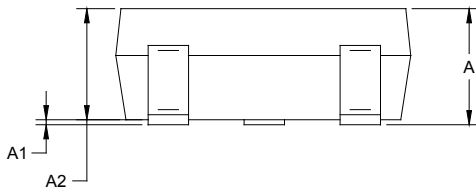
Changed from product preview to production data.....All

PACKAGE OUTLINE DIMENSIONS

SOT-23-5



RECOMMENDED LAND PATTERN (Unit: mm)

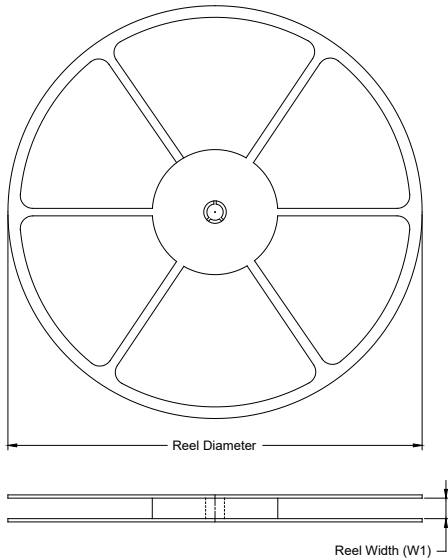


Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950 BSC		0.037 BSC	
e1	1.900 BSC		0.075 BSC	
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°

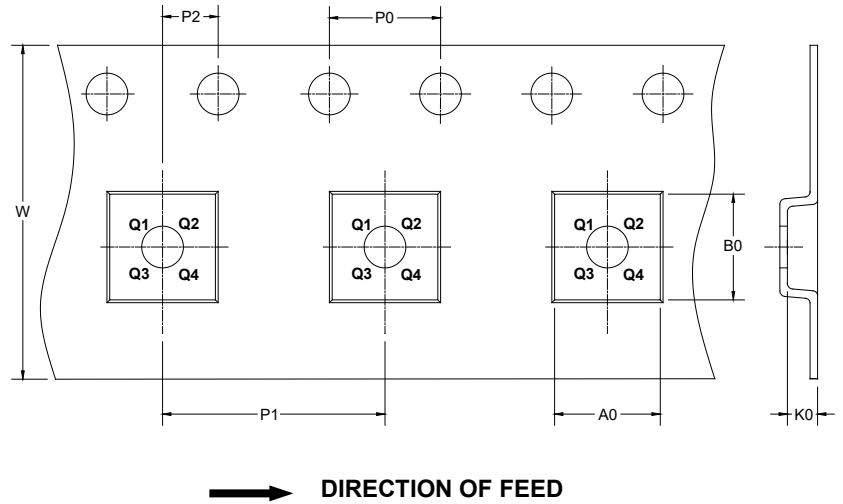
PACKAGE INFORMATION

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



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

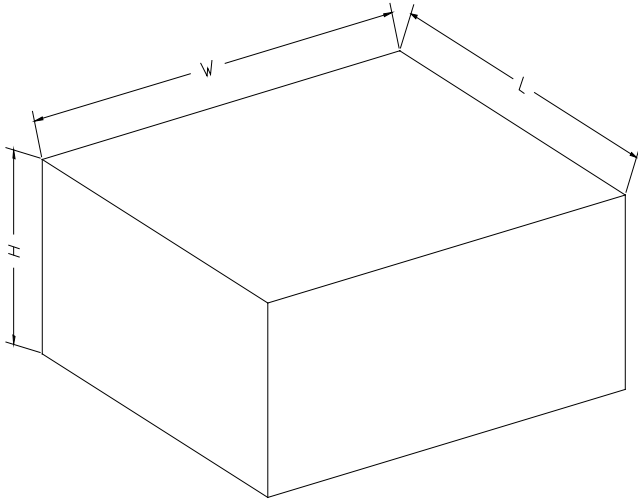
KEY PARAMETER LIST OF TAPE AND REEL

Package Type	Reel Diameter	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P0 (mm)	P1 (mm)	P2 (mm)	W (mm)	Pin1 Quadrant
SOT-23-5	7"	9.5	3.20	3.20	1.40	4.0	4.0	2.0	8.0	Q3

DD00001

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
7" (Option)	368	227	224	8
7"	442	410	224	18

DD0002