

GENERAL DESCRIPTION

The SGM42630 is a bipolar stepper motor driver suitable for automated positioning and movement control in equipment such as printers, scanners and robotic mechanisms. To control the stepper motor, two H-bridges are integrated in the device for the two motor windings along with a microstepping indexer logic. Bridge currents are regulated by chopping the motor supply voltage across the windings.

The step (STEP) and direction (DIR) inputs are provided for simple interfacing to the controller. The device also provides two microstepping input pins (USM0 and USM1) to choose the step size (full, half, quarter and eighth step).

Fast, slow and mixed (fast then slow) decay modes are selectable by applying proper voltage to DECAY input. Programmable blanking and off-time of the H-bridge PWM and selectable decay modes make the device very flexible and capable for driving a wide range of stepper motors with up to 2.6A per winding.

A number of protection features are provided in the device including over-current, short-circuit, under-voltage lockout, and over-temperature shutdown.

The device is available in a Green TSSOP-28 (Exposed Pad) package.

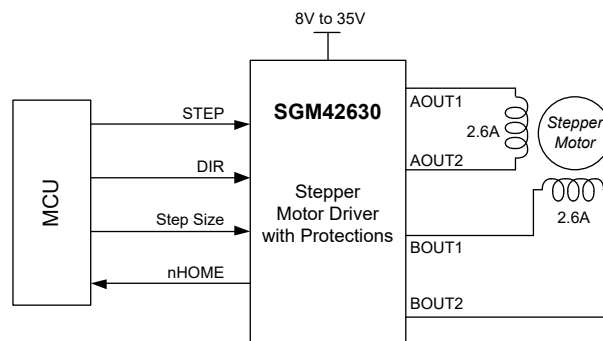
FEATURES

- 8V to 35V Motor Power Supply Voltage Range
- Up to 2.6A Current per Winding
- Low On-Resistance (0.29Ω for HS + LS, @ +25°C)
- Microstepping Indexer: 1, 1/2, 1/4 and 1/8
- Step and Direction Interface
- Programmable Decay, Blanking and Off-Time
- Auto-Decay Mode
- UVLO for VM, VCC, VCP, VGD Voltages
- Over-Current Protection (OCP)
- Thermal Shutdown (TSD)
- Available in a Green TSSOP-28 (Exposed Pad) Package

APPLICATIONS

Printers
Textile Machinery
Positioning and Tracking
Factory Automation
Robotics

SIMPLIFIED SCHEMATIC

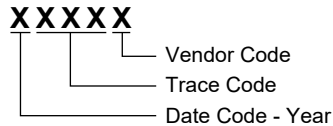


PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM42630	TSSOP-28 (Exposed Pad)	SGM42630YPTS28G/TR	SGM42630 YPTS28 XXXXX	Tape and Reel, 4000

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

- Motor Power Supply Voltage, V_M (V_{MA} or V_{MB}) ... -0.3V to 38V
- Logic Power Supply Voltage, V_{CC} -0.3V to 6V
- Digital Pins Input Voltage -0.5V to 6V
- VREF Input Voltage, V_{REF} 0V to V_{CC}
- ISEN_x Pins Voltage -0.5V to 0.875V
- Peak Output Current (Motor Drive) Limited Internally
- Package Thermal Resistance
- TSSOP-28 (Exposed Pad), θ_{JA} 32°C/W
- Operating Junction Temperature +150°C
- Storage Temperature Range -65°C to +150°C
- Lead Temperature (Soldering, 10s) +260°C
- ESD Susceptibility
- HBM 4000V
- CDM 1000V

RECOMMENDED OPERATING CONDITIONS

- Motor Power Supply Voltage ⁽¹⁾, V_M 8V to 35V
- Logic Power Supply Voltage, V_{CC} 3V to 5.5V
- VREF Input Voltage, V_{REF} 0 to V_{CC}
- R_x Resistance Value, R_x 12kΩ to 100kΩ
- C_x Capacitance Value, C_x 470pF to 3000pF
- Operating Junction Temperature Range -40°C to +150°C

NOTE: 1. VMA and VMB pins must be connected to the same source (VM).

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.

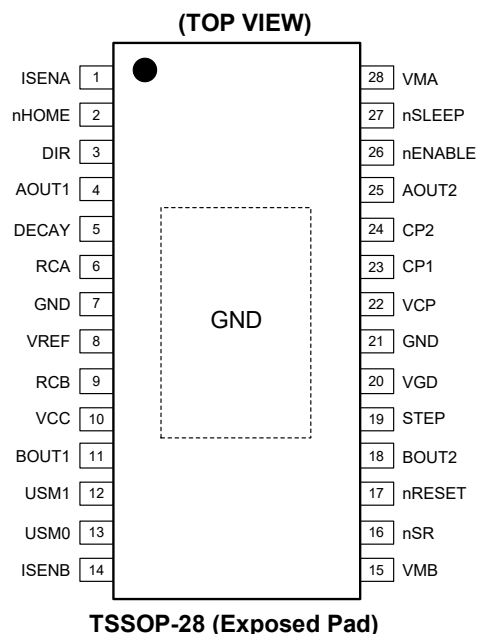
ESD SENSITIVITY CAUTION

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 DESCRIPTIONS

PIN		TYPE	FUNCTION
NO.	NAME		
1	IENA	-	Bridge A I_{SENSE} (GND). Connect to VM power ground through the current sense resistor for bridge A.
2	nHOME	O	Home Position Logic Output. Goes low when step table is at home state and high at other states.
3	DIR	I	Direction Input. Logic high or low sets the direction of stepping. Has a weak internal pull-down.
4	AOUT1	O	Bridge A Node 1. Connect to one end (+) of the stepper motor winding A.
5	DECAY	I	Decay Mode Select with Weak Internal Pull-Down. Voltage applied to this pin sets one of the three decay modes. See details in motor driver description. Use a 0.1 μ F ~ 0.22 μ F ceramic capacitor to bypass it to GND.
6	RCA	I	Bridge A Blanking and Off-Time Setting. Connect to the parallel programming resistor (R_A) and capacitor (C_A). See Current Regulation section for the adjustment details and Equations 1, 2 and 3.
7, 21	GND	-	Ground Reference.
8	VREF	I	Current Set Reference Input. Apply the reference voltage to set the full-scale winding current value.
9	RCB	I	Bridge B Blanking and Off-Time Setting. Connect to the parallel programming resistor (R_B) and capacitor (C_B). See Current Regulation section for the adjustment details and Equations 1, 2 and 3.
10	VCC	-	Digital Logic Supply Voltage (3V to 5.5V). Use a 0.1 μ F ceramic decoupling capacitor to GND.
11	BOUT1	O	Bridge B Node 1. Connect to one end (+) of the stepper motor winding B.
12	USM1	I	Micro-Step Mode Selection Logic Input 1. USM0 and USM1 are logic inputs to set the step size to one of the 4 options (full, half, quarter and eight micro-steps/step). It has a weak internal pull-down.
13	USM0	I	Micro-Step Mode Selection Logic Input 0. USM0 and USM1 are logic inputs to set the step size to one of the 4 options (full, half, quarter and eight micro-steps/step). It has a weak internal pull-down.
14	ISENB	-	Bridge B I_{SENSE} (GND). Connect to VM power ground through the current sense resistor for bridge B.
15	VMB	-	Power Supply for Bridge B. Connect to the motor power supply (8V to 35V). Both VMA and VMB pins should be connected to the same supply.
16	nSR	I	Synchronous Rectification Enable Input. Synchronous rectification is enabled if nSR pin is pulled low. Float nSR pin to enter the auto-decay mode with synchronous rectification. With nSR = high there is no synchronous rectification and body diodes conduct the reverse current. In this case maximum body diode currents must be guaranteed to be less than 1.3A.
17	nRESET	I	Reset Input. Active low reset with weak internal VCC pull up to initializes microstepping indexer logic and disable H-bridge outputs.
18	BOUT2	O	Bridge B Node 2. Connect to the other end (-) of the stepper motor winding B. I_B is positive from BOUT1 to BOUT2.
19	STEP	I	Step Logic Input. Rising edge causes the microstepping indexer to move one step. It has a weak internal pull-down.
20	VGD	IO	Gate Drive Voltage of the Low-side Switches. Decouple to GND with a 0.22 μ F ceramic capacitor.
22	VCP	IO	Gate Drive Voltage of the High-side Switches. Decouple with a 0.22 μ F ceramic capacitor to VM pin.
23	CP1	IO	Charge Pump Flying Capacitor. Connect a 0.22 μ F capacitor between CP1 pin and CP2 pin.
24	CP2	IO	Charge Pump Flying Capacitor. Connect a 0.22 μ F capacitor between CP1 pin and CP2 pin.
25	AOUT2	O	Bridge A Node 2. Connect to the other end (-) of the stepper motor winding A. I_A is positive from AOUT1 to AOUT2.
26	nENABLE	I	Enable Input. Active low enable logic input with weak internal pull-up to VCC. A low enables outputs.
27	nSLEEP	I	Sleep Mode Input. Active low sleep mode logic input with weak internal pull-down. Apply high to enable device, and low to enter in the low-power sleep mode.
28	VMA	-	Power Supply for Bridge A. Connect to the motor power supply (8V to 35V). Both VMA and VMB pins should be connected to the same supply.
Exposed Pad	GND	G	Ground.

NOTE: Directions: I = Input, O = Output, IO = Input or output, G = Ground.

ELECTRICAL CHARACTERISTICS

(T_J = +25°C, Full = -40°C to +85°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Power Supply							
Motor Power Supply Voltage	V _M		+25°C	8	12 or 24	35	V
Logic Power Supply Voltage	V _{CC}		+25°C	3	3.3	5.5	V
VM Operating Supply Current	I _{VM}	V _M = 35V, f _{PWM} < 50kHz	+25°C		0.45	0.6	mA
VCC Operating Supply Current	I _{VCC}	f _{PWM} < 50kHz	+25°C		1.1	1.5	mA
VM Sleep Mode Supply Current	I _{VMQ}	V _M = 35V	+25°C		20	330	nA
VCC Sleep Mode Supply Current	I _{VCCQ}		+25°C		12	15	μA
VM Under-Voltage Lockout Voltage	V _{M_UVLO}	V _M rising	+25°C		6.7	7	V
VCC Under-Voltage Lockout Voltage	V _{CC_UVLO}	V _{CC} rising	+25°C		2.72	2.95	V
VREF Input							
VREF Input Current	I _{REF}	V _{REF} = 3.3V	+25°C	-3		3	μA
Chopping Current Accuracy	ΔI _{CHOP}	V _{REF} = 2.0V, 70% current	+25°C	-10		10	%
Logic Inputs							
Pull-Up Resistance	R _{PU}	nENABLE, nRESET	+25°C		270		kΩ
Pull-Down Resistance	R _{PD}	DIR, STEP, nSLEEP, USM1, USM0, nSR	+25°C		270		kΩ
Input Low Voltage	V _{IL}		Full			0.2 × V _{CC}	V
Input High Voltage	V _{IH}		Full	0.8 × V _{CC}			V
Input Hysteresis	V _{HYS}		+25°C		0.4 × V _{CC}		V
nHOME Output							
Output Low Voltage	V _{OL}	I _O = 200μA	+25°C			0.3 × V _{CC}	V
Output High Voltage	V _{OH}	I _O = -200μA	+25°C	0.7 × V _{CC}			V
DECAY Input							
Low Threshold	V _{IL}	To select fast decay mode	+25°C		0.2 × V _{CC}		V
Mid Level Threshold	V _{MID}	To select mixed decay mode	+25°C		0.2 × V _{CC} to 0.6 × V _{CC}		V
High Threshold	V _{IH}	To select slow decay mode	+25°C		0.6 × V _{CC}		V
H-Bridge FETs							
LS + HS FET On-Resistance	R _{DS(ON)}	V _M = 24V, I _O = 0.4A	+25°C		290	380	mΩ
Off-State Leakage Current	I _{OFF}		+25°C	-15		15	μA
Protection							
Thermal Shutdown Temperature	T _{TSD}		+25°C		160		°C
Over-Current Protection	I _{OC}		+25°C		3.2		A
OCP Deglitch Time	t _{OC}		+25°C		1.5		μs
OCP Retry Time	t _{RET}		+25°C		1		s
Motor Driver							
Off-Time	t _{OFF}	R _X = 56kΩ, C _X = 680pF	+25°C	30	42	52	μs
Current Sense Blanking Time	t _{BLANK}	R _X = 56kΩ, C _X ≤ 1500pF	+25°C		2		μs
Dead Time	t _{DT}	nSR = 0	+25°C	100	200	800	ns
Rise Time	t _R		+25°C	15		80	ns
Fall Time	t _F		+25°C	15		80	ns

TIMING PARAMETERS AND REQUIREMENTS

(T_J = +25°C, unless otherwise noted.)

SYMBOL	FUNCTION	MIN	MAX	UNITS
f _{STEP}	Step frequency.		500	kHz
t _{WH (STEP)}	Step pulse high duration.	1		μs
t _{WL (STEP)}	Step pulse low duration.	1		μs
t _{SU (STEP)}	Command set-up time, before STEP rising.	250		ns
t _{H (STEP)}	Command hold time, after STEP rising.	250		ns
t _{WAKE}	Wake-up time, exit sleep (nSLEEP rising) to STEP input cannot be accepted.		1	ms
t _{nSLEEP}	Sleep time, enter sleep (nSLEEP falling) to outputs disabled.		2.5	μs
t _{nENABLE}	Enable time, enable (nENABLE falling) to outputs enabled.		20	μs
t _{DISABLE}	Disable time, disable (nENABLE rising) to outputs disabled.		20	μs
t _{nRESETR}	Reset release time, (nRESET rising) to outputs enabled.		5	μs
t _{nRESET}	Reset time, (nRESET falling) to outputs disabled.		5	μs

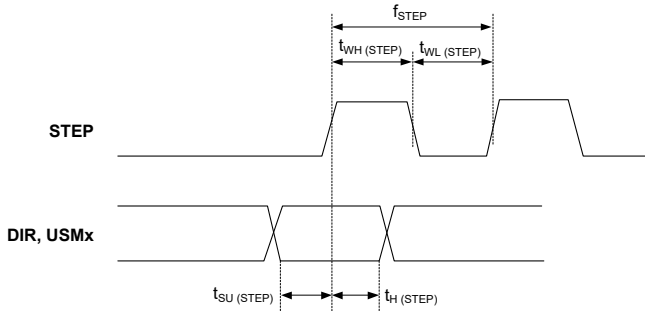


Figure 1. STEP Timing Definition

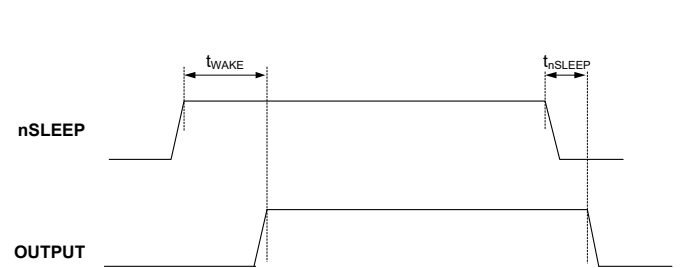


Figure 2. nSLEEP Timing Definition

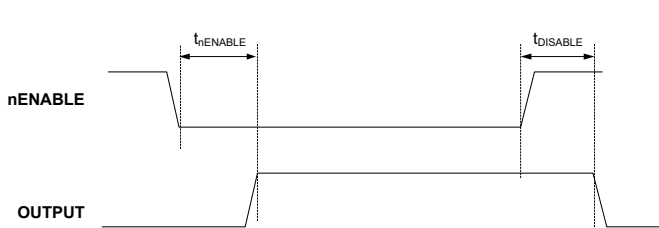


Figure 3. nENABLE Timing Definition

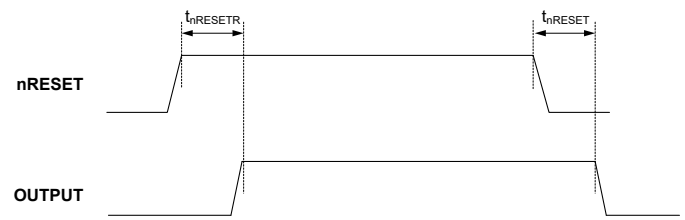
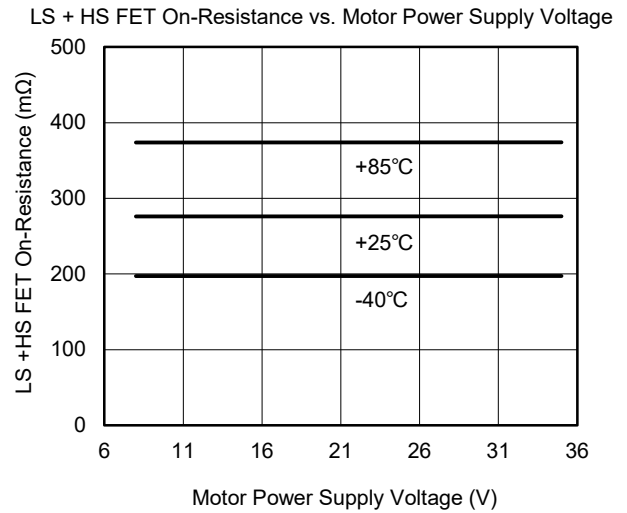
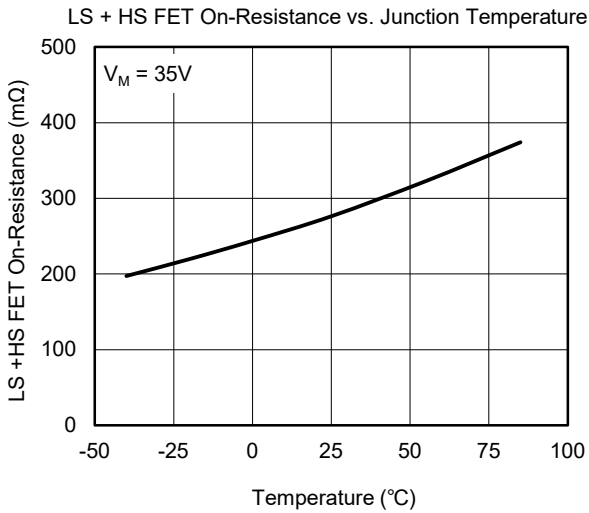
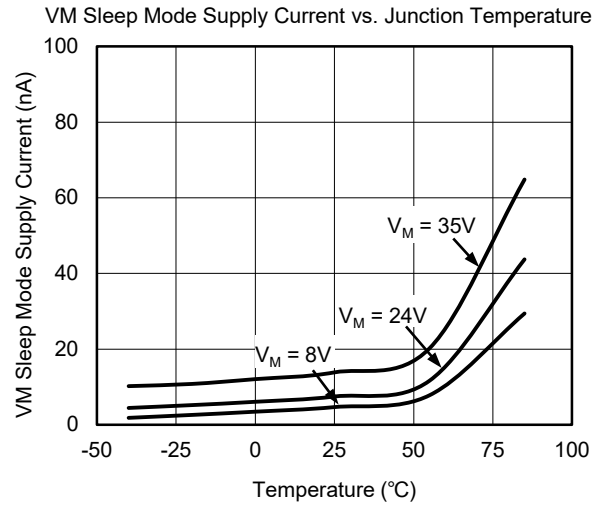
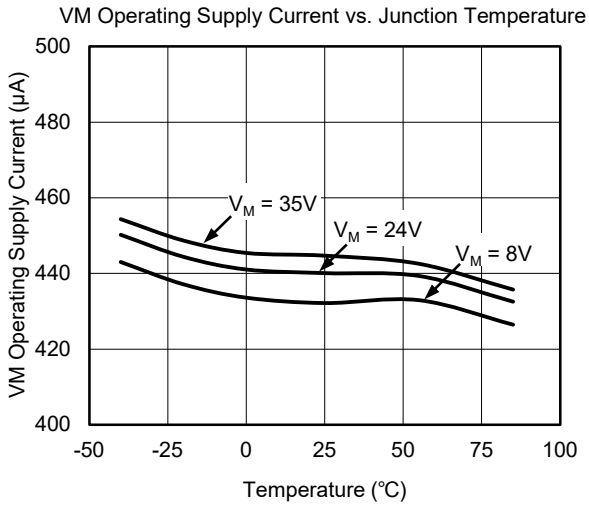
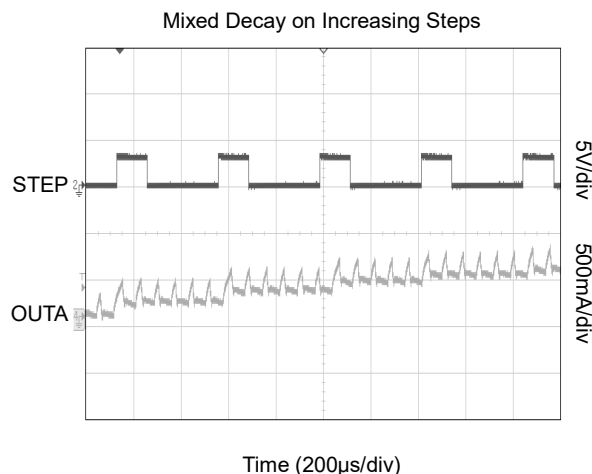
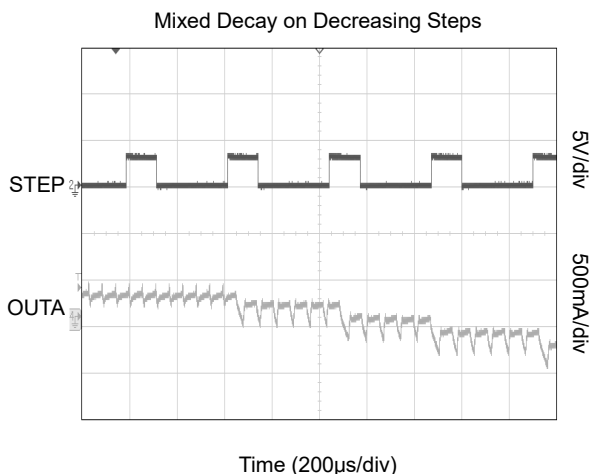
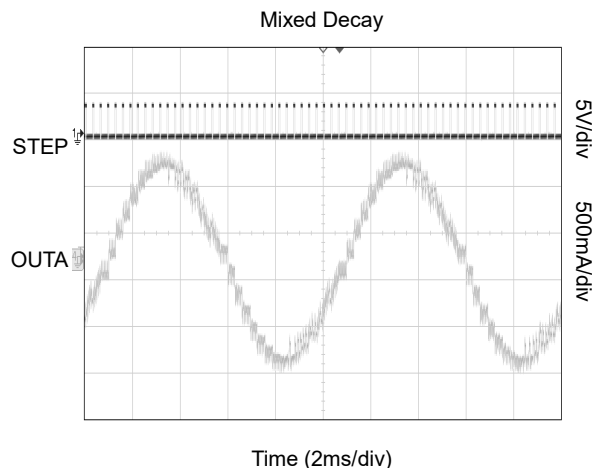
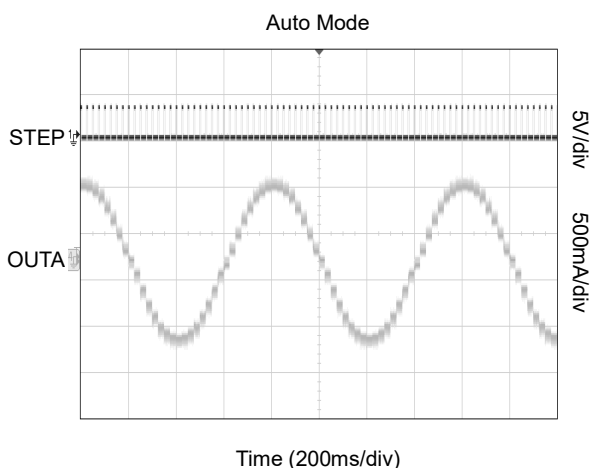


Figure 4. nRESET Timing Definition

TYPICAL PERFORMANCE CHARACTERISTICS



TYPICAL PERFORMANCE CHARACTERISTICS (continued)



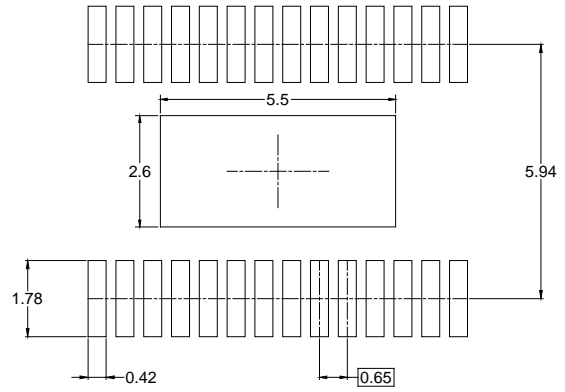
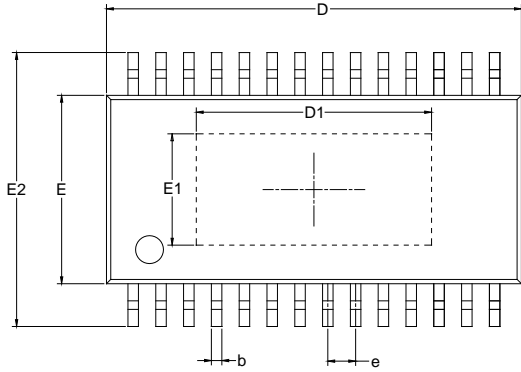
REVISION HISTORY

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

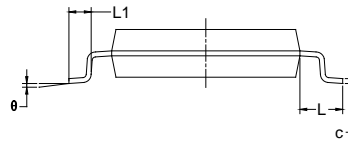
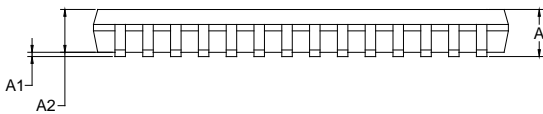
DECEMBER 2021 – REV.A.2 to REV.A.3	Page
Updated Timing Parameters and Requirements section	5
OCTOBER 2021 – REV.A.1 to REV.A.2	Page
Updated Typical Performance Characteristics section	7
Updated Detailed Description section	11
Updated Package Outline Dimensions section	17
JANUARY 2021 – REV.A to REV.A.1	Page
Updated Absolute Maximum Ratings section.....	2
Changes from Original (DECEMBER 2019) to REV.A	Page
Changed from product preview to production data.....	All

PACKAGE OUTLINE DIMENSIONS

TSSOP-28 (Exposed Pad)



RECOMMENDED LAND PATTERN (Unit: mm)



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	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	9.600	9.800	0.378	0.386
D1	5.300	5.700	0.209	0.224
E	4.300	4.500	0.169	0.177
E1	2.400	2.800	0.094	0.110
E2	6.200	6.600	0.244	0.260
e	0.650 BSC		0.026 BSC	
L	1.000 BSC		0.039 BSC	
L1	0.450	0.750	0.018	0.030
θ	0°	8°	0°	8°

NOTES:

1. Body dimensions do not include mode flash or protrusion.
2. This drawing is subject to change without notice.

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
TSSOP-28 (Exposed Pad)	13"	17.6	6.80	10.20	1.60	4.0	8.0	2.0	16.0	Q1

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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

单击下面可查看定价，库存，交付和生命周期等信息

[>>SGMICRO\(圣邦微电子\)](#)