SGM2578
Ultra Small, Low Input Voltage, Low R_{ON} Load Switch

GENERAL DESCRIPTION

The SGM2578 is a single channel power distribution switch. The switch operates from a wide range of 1V to 5V supply voltage, and is controlled by the EN pin. It can be used in USB power distribution applications.

A 54mΩ low R_{ON} N-MOSFET is integrated. The small size and quiescent current make the device very suitable for space limited, battery-powered applications.

A number of protection features are provided in the device including soft-start, current limit and thermal shutdown. The internal reverse-voltage function will protect devices on the input side of the switch. The SGM2578 has automatic discharge function to quickly discharge V_{OUT} in the disabled status.

The SGM2578 is available in a Green WLCSP-0.9×0.9-4B package and operates over a temperature range of -40℃ to +85℃.

FEATURES

- **Low Input Voltage: 1V to 5V**
- **Low On-Resistance (R_{ON})**
  - **R_{ON} = 54mΩ at V_{IN} = 5.0V**
  - **R_{ON} = 54mΩ at V_{IN} = 3.6V**
  - **R_{ON} = 58mΩ at V_{IN} = 2.5V**
  - **R_{ON} = 74mΩ at V_{IN} = 1.8V**
  - **R_{ON} = 84mΩ at V_{IN} = 1.2V**
  - **R_{ON} = 84mΩ at V_{IN} = 1.0V**
- **Continuous Switch Current: 1A (MAX)**
- **Quiescent Current: 5μA (TYP)**
- **Shutdown Current: < 1.5μA**
- **Quick Output Discharge (QOD)**
- **Soft-Start Function**
- **Evaluated to IEC 60950-1, Ed 2, Am1, Annex CC, Test Program 1 with CB Report**
- **Available in a Green WLCSP-0.9×0.9-4B Package**

APPLICATIONS

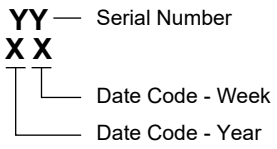
Portable Medical Equipment
Battery Powered Equipment
Hot-Plug Power Supply
Motherboard USB Power Switch
Portable Media Players

PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM2578	WLCSP-0.9×0.9-4B	-40℃ to +85℃	SGM2578YG/TR	K2 XX	Tape and Reel, 3000

MARKING INFORMATION

NOTE: XX = Date 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

Input Voltage Range, V_{IN} ..... -0.3V to +5.5V
Output Voltage Range, V_{OUT} ..... -0.3V to (V_{IN} + 0.3V)
EN Voltage Range, V_{EN} ..... -0.3V to +5.5V
Maximum Continuous Switch Current, I_{MAX}
V_{IN} ≥ 1.2V..... 1000mA
V_{IN} = 1.0V 600mA
Package Thermal Resistance
WLCSP-0.9×0.9-4B, θ_{JA} ..... 188℃/W
Junction Temperature .....+150℃
Storage Temperature Range.....-65℃ to +150℃
Lead Temperature (Soldering, 10s) .....+260℃
ESD Susceptibility
HBM.....2000V
MM.....300V

RECOMMENDED OPERATING CONDITIONS

Operating Temperature Range .....-40℃ to +85℃
Input Voltage Range, V_{IN}.....1V to 5V
EN Voltage Range, V_{EN}.....0V to 5V
Output Voltage Range, V_{OUT} ..... 0V to V_{IN}

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

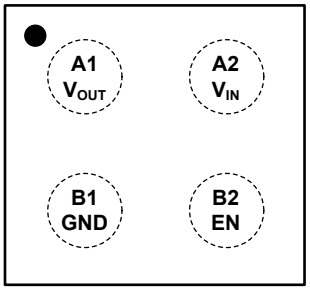
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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

(TOP VIEW)



WLCSP-0.9×0.9-4B

PIN DESCRIPTION

PIN	NAME	FUNCTION
A1	V_{OUT}	Switch Output.
A2	V_{IN}	Switch Input and Power Supply. A ceramic capacitor needs to be added between V_{IN} pin and GND.
B1	GND	Ground.
B2	EN	Chip Enable Pin. Logic high to enable the device. The pull-down resistor of EN pin is about 560kΩ.

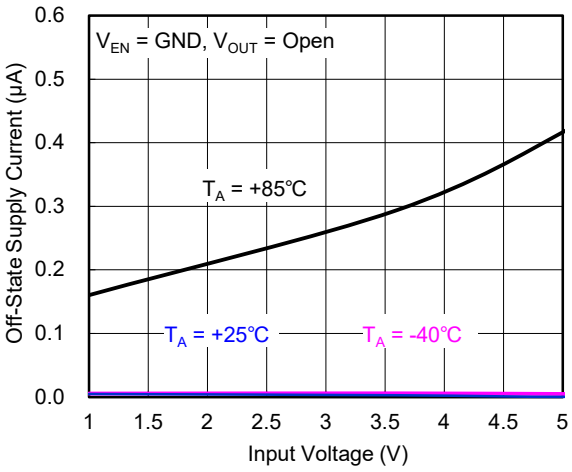
ELECTRICAL CHARACTERISTICS

(Full = -40℃ to +85℃, V_{IN} = 3.6V, unless otherwise noted.)

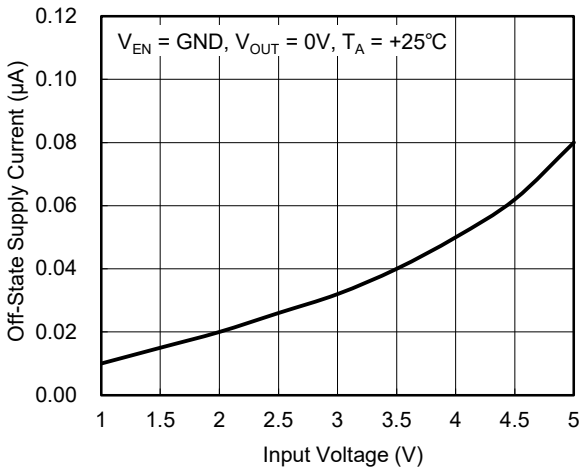
PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TYP	MAX	UNITS
Power Supplies and Currents								
Quiescent Current	I_{IN}	I_{OUT} = 0, V_{IN} = V_{EN}		Full		5	12	μA
Off-State Supply Current	$I_{IN(OFF)}$	V_{EN} = GND, V_{OUT} = Open		Full		0.01	1.5	μA
Off-State Supply Current	$I_{IN(LEAK)}$	V_{EN} = GND, V_{OUT} = 0V		Full		0.01	1	μA
EN Pin Pull-Down Resistor	$R_{PULL-DOWN}$			+25℃	360	560	800	kΩ
Resistance and Switch Characteristics								
On-State Resistance	R_{ON}	I_{OUT} = 200mA	V_{IN} = 5.0V	+25℃		54		mΩ
			V_{IN} = 3.6V	+25℃		54		
			V_{IN} = 2.5V	+25℃		58		
			V_{IN} = 1.8V	+25℃		74		
			V_{IN} = 1.2V	+25℃		84		
			V_{IN} = 1.0V	+25℃		84		
Output Pull-Down Resistance	R_{PD}	V_{IN} = 3.3V, V_{EN} = GND, I_{OUT} = 30mA		+25℃		50		Ω
EN								
Enable Input Logic High Voltage	V_{IH}	V_{IN} = 1V to 5V		+25℃	1.6			V
Enable Input Logic Low Voltage	V_{IL}			+25℃	0		0.4	V
Switching Characteristics								
Turn-On Time	t_{ON}	V_{IN} = 3.6V, R_L = 10Ω, C_L = 0.1μF		+25℃		680		μs
Turn-Off Time	t_{OFF}			+25℃		3.4		
V_{OUT} Rise Time	t_R			+25℃		590		
V_{OUT} Fall Time	t_F			+25℃		2.6		
Turn-On Time	t_{ON}	V_{IN} = 1.0V, R_L = 10Ω, C_L = 0.1μF		+25℃		695		μs
Turn-Off Time	t_{OFF}			+25℃		34		
V_{OUT} Rise Time	t_R			+25℃		435		
V_{OUT} Fall Time	t_F			+25℃		14		

TYPICAL PERFORMANCE CHARACTERISTICS

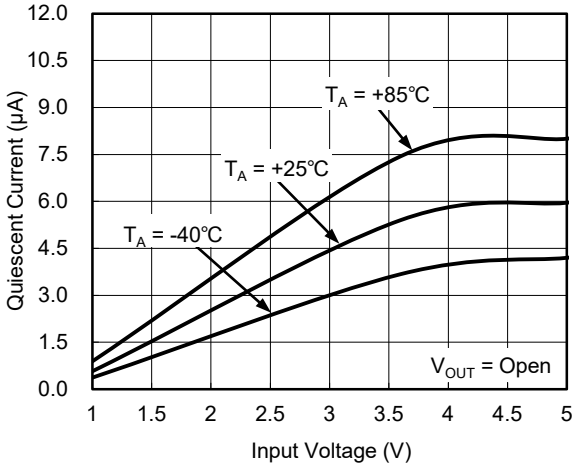
Off-State Supply Current ($I_{IN(OFF)}$) vs. Input Voltage



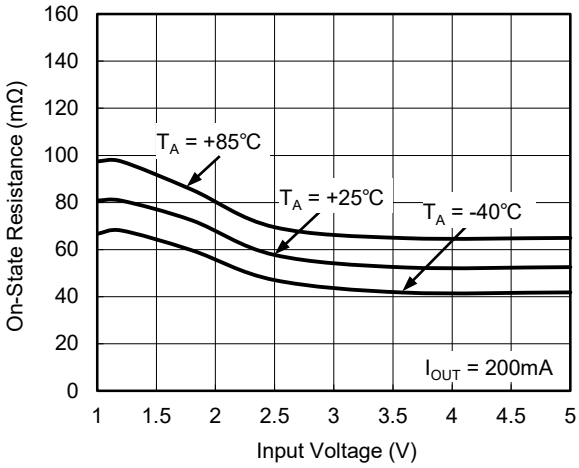
Off-State Supply Current ($I_{IN(LEAK)}$) vs. Input Voltage



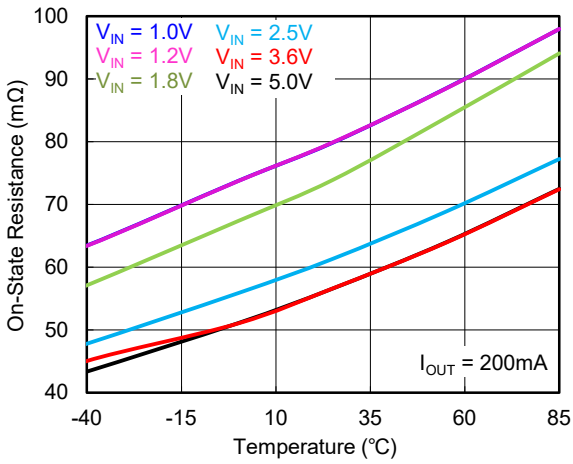
Quiescent Current vs. Input Voltage



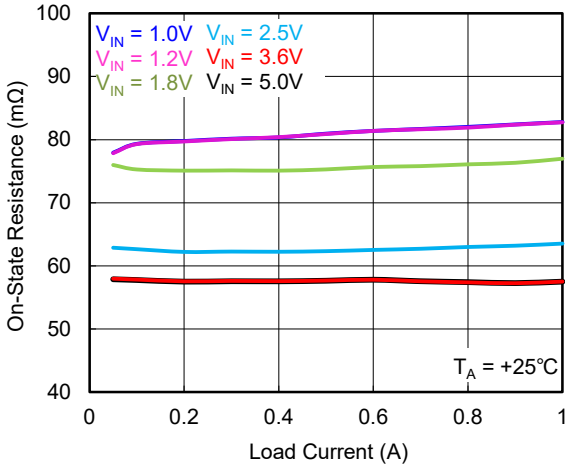
On-State Resistance vs. Input Voltage



On-State Resistance vs. Temperature

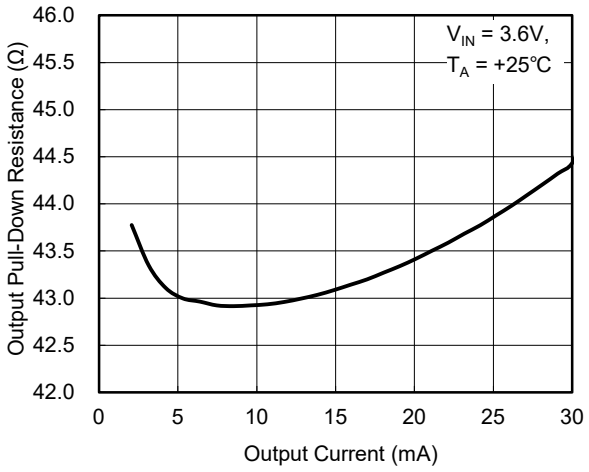


On-State Resistance vs. Load Current

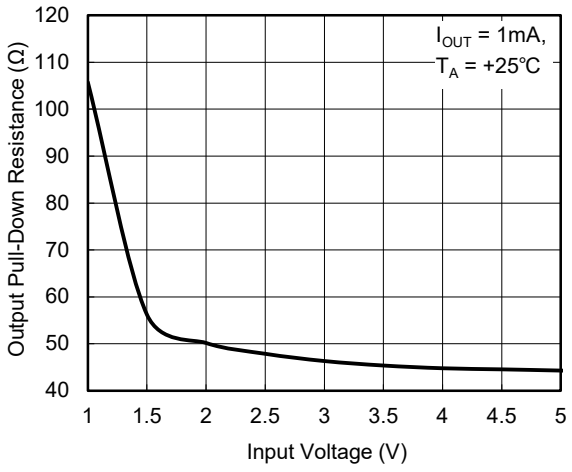


TYPICAL PERFORMANCE CHARACTERISTICS (continued)

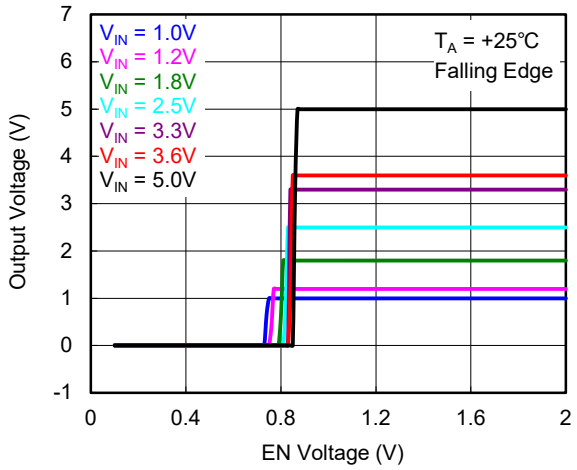
Output Pull-Down Resistance vs. Output Current



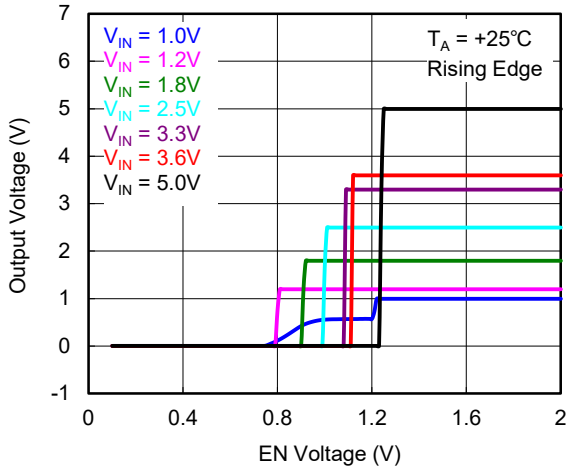
Output Pull-Down Resistance vs. Input Voltage



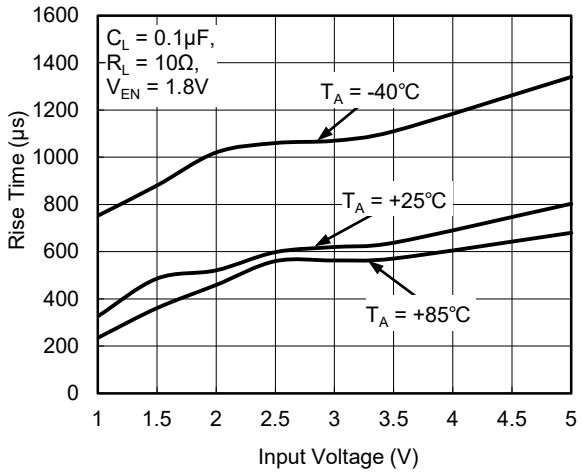
Output Voltage vs. EN Voltage Threshold (EN Pin Voltage Decreasing)



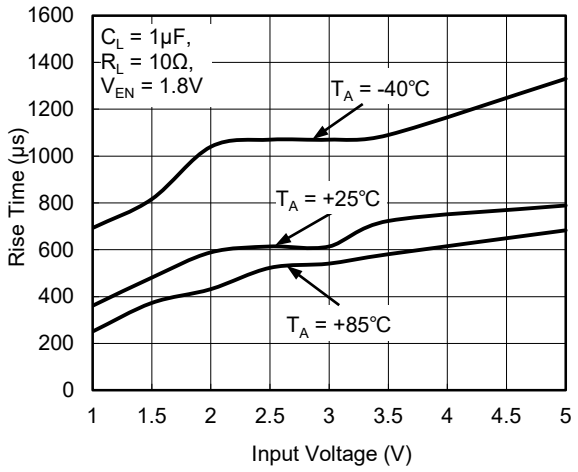
Output Voltage vs. EN Voltage Threshold (EN Pin Voltage Increasing)



Rise Time vs. Input Voltage (C_L = 0.1μF)

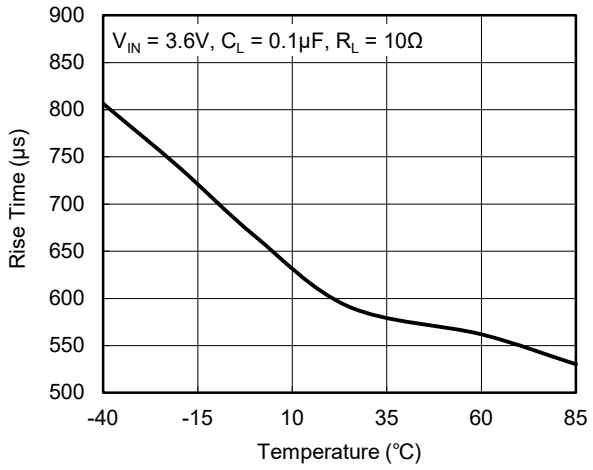


Rise Time vs. Input Voltage (C_L = 1μF)

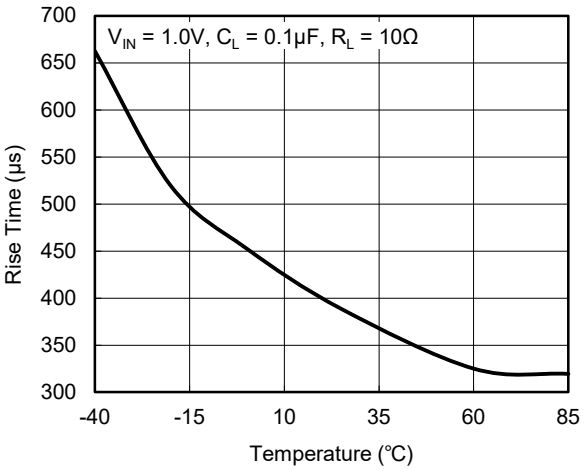


TYPICAL PERFORMANCE CHARACTERISTICS (continued)

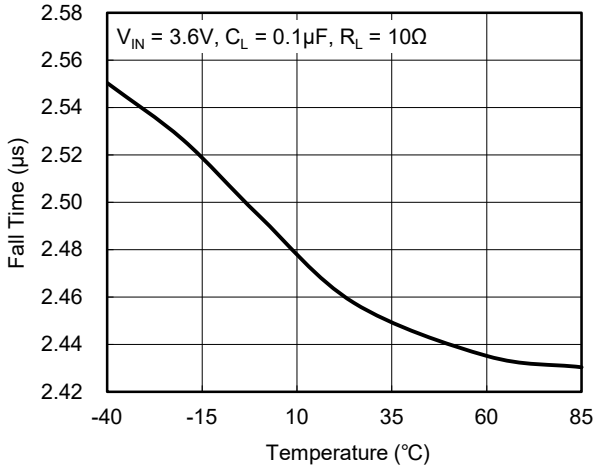
Rise Time vs. Temperature



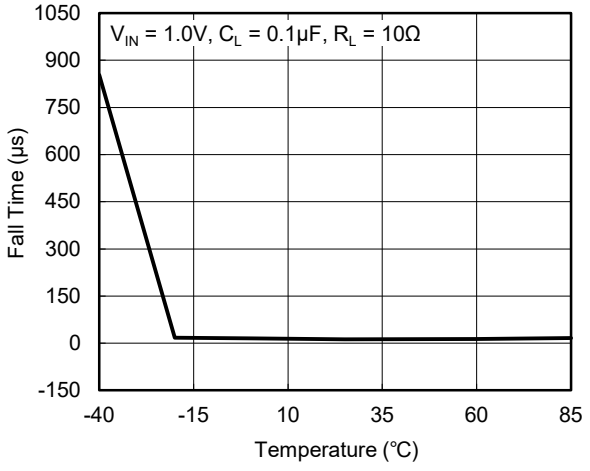
Rise Time vs. Temperature



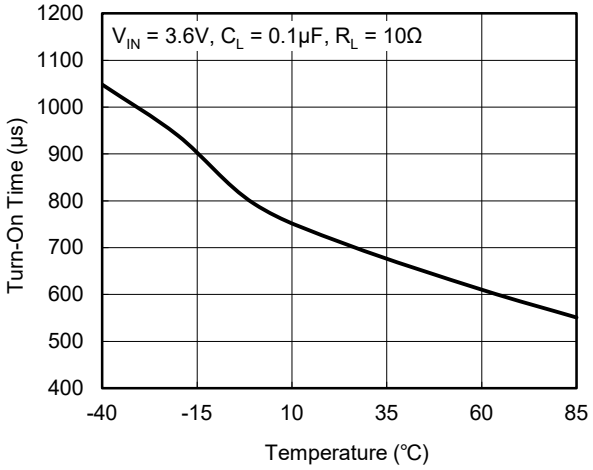
Fall Time vs. Temperature



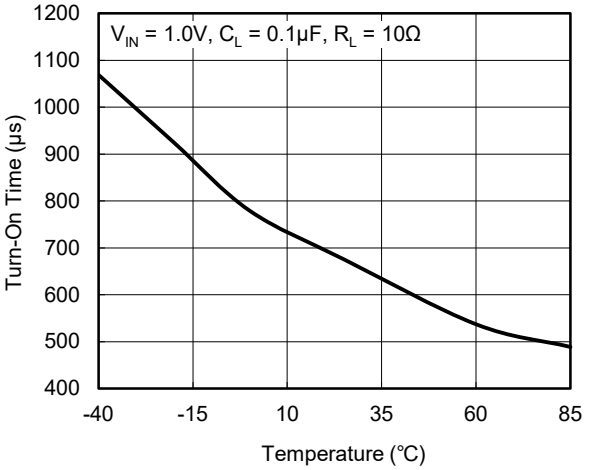
Fall Time vs. Temperature



Turn-On Time vs. Temperature

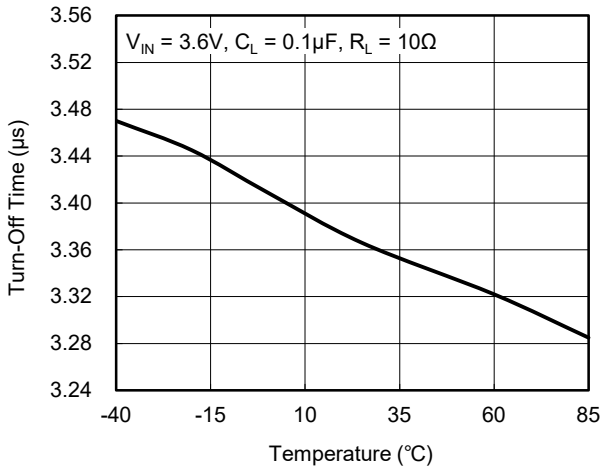


Turn-On Time vs. Temperature

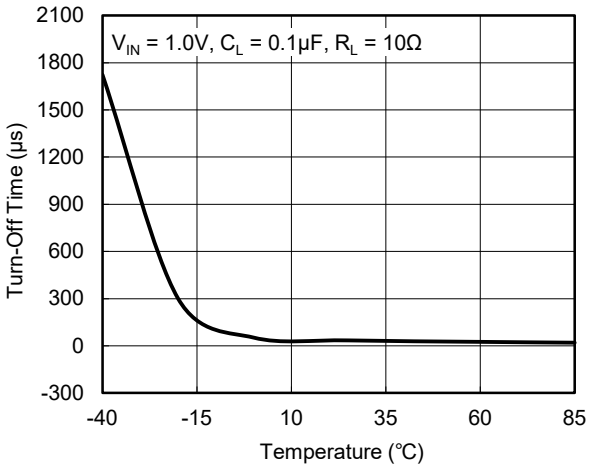


TYPICAL PERFORMANCE CHARACTERISTICS (continued)

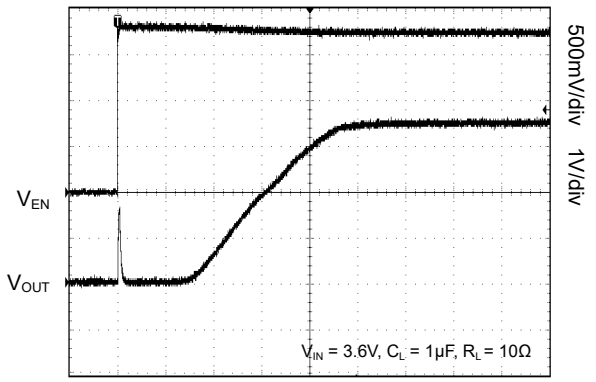
Turn-Off Time vs. Temperature



Turn-Off Time vs. Temperature

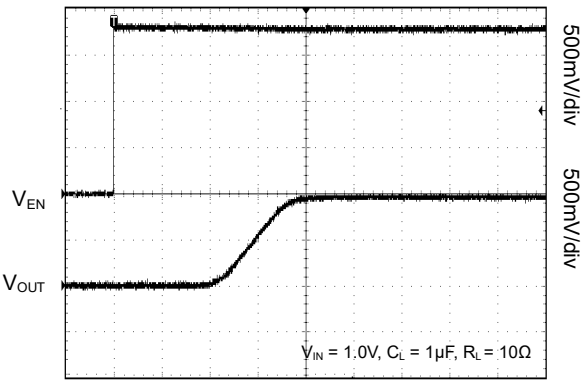


Turn-On Response Time



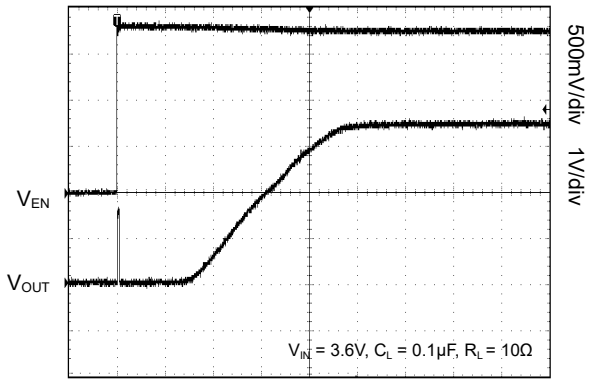
Time (200μs/div)

Turn-On Response Time



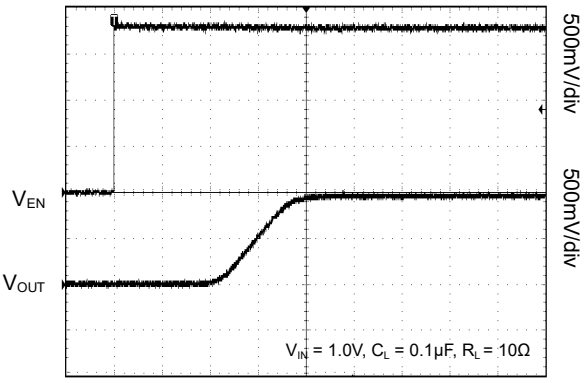
Time (200μs/div)

Turn-On Response Time



Time (200μs/div)

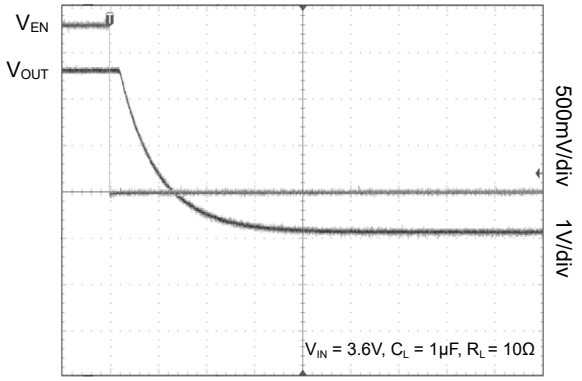
Turn-On Response Time



Time (200μs/div)

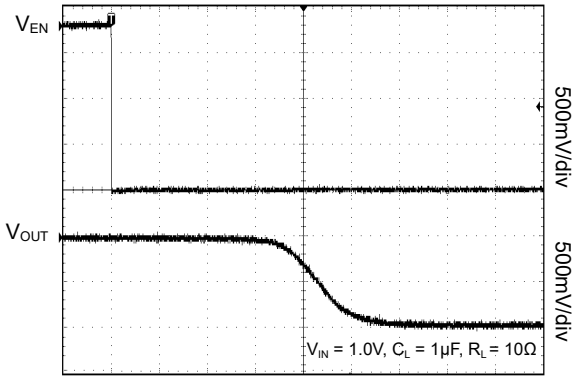
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

Turn-Off Response Time



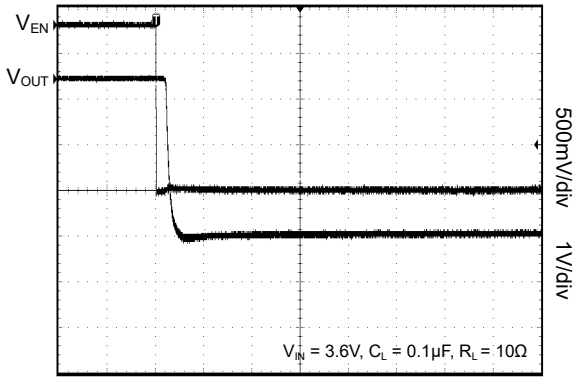
Time (10μs/div)

Turn-Off Response Time



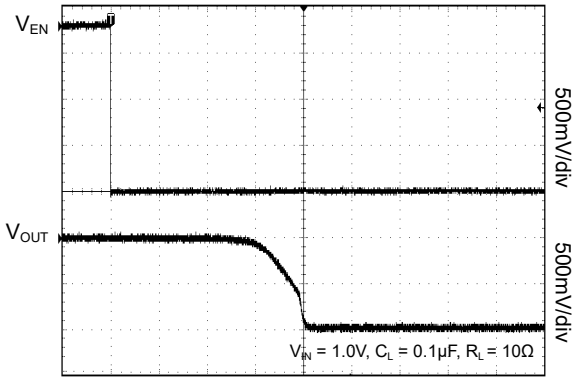
Time (10μs/div)

Turn-Off Response Time



Time (10μs/div)

Turn-Off Response Time



Time (10μs/div)

FUNCTIONAL BLOCK DIAGRAM

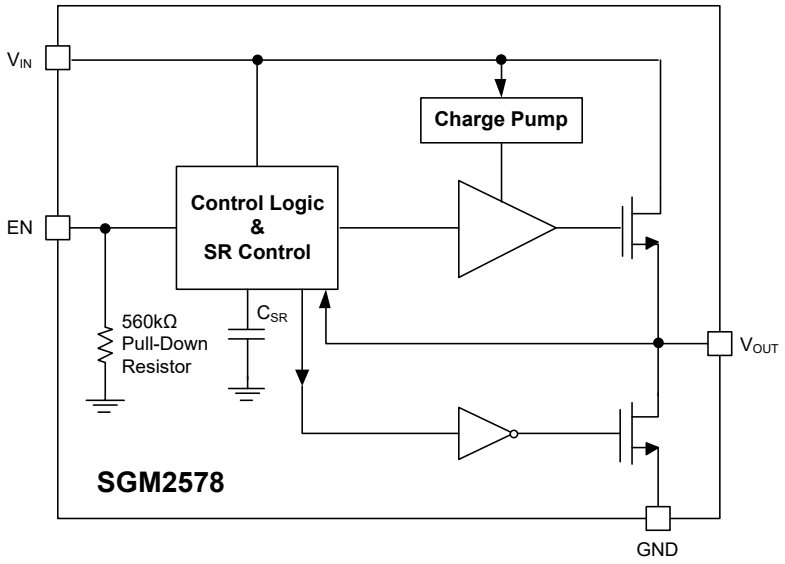


Figure 1. Block Diagram

REVISION HISTORY

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

MAY 2019 – REV.A.4 to REV.B	Page
Updated Package/Ordering Information section	2

AUGUST 2018 – REV.A.3 to REV.A.4	Page
Updated Typical Performance Characteristics section	9

MARCH 2018 – REV.A.2 to REV.A.3	Page
Updated Feature section	1
Update Typical Performance Characteristics section	5

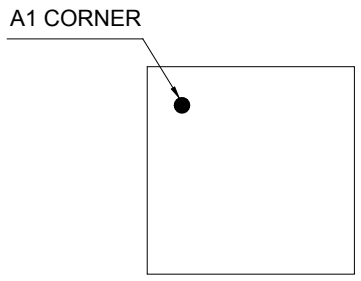
MAY 2017 – REV.A.1 to REV.A.2	Page
Updated Packing Option	2

JUNE 2014 – REV.A to REV.A.1	Page
Changed the package	13

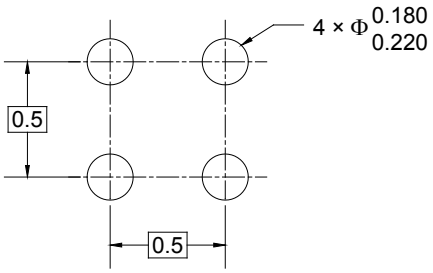
Changes from Original (MAY 2014) to REV.A	Page
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

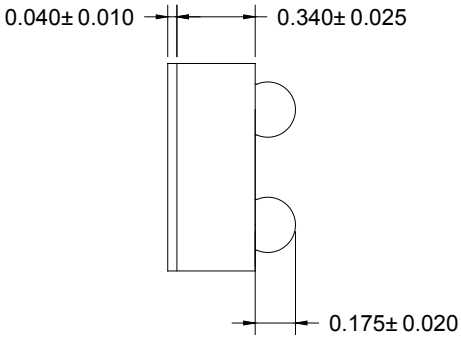
WLCSP-0.9×0.9-4B



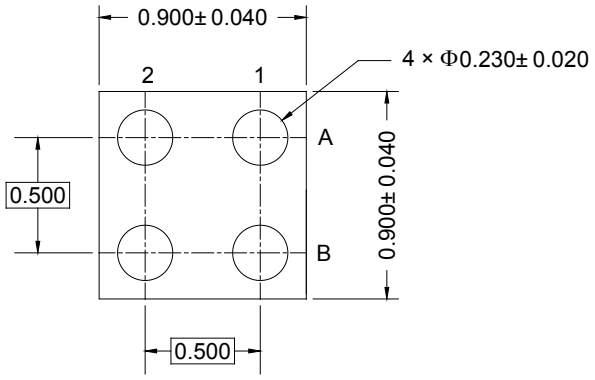
TOP VIEW



RECOMMENDED LAND PATTERN



SIDE VIEW

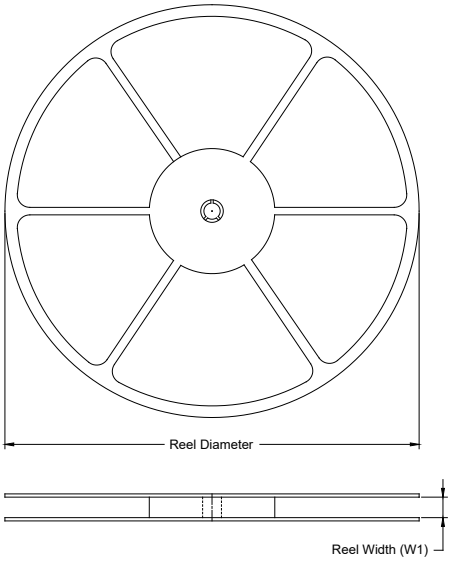


BOTTOM VIEW

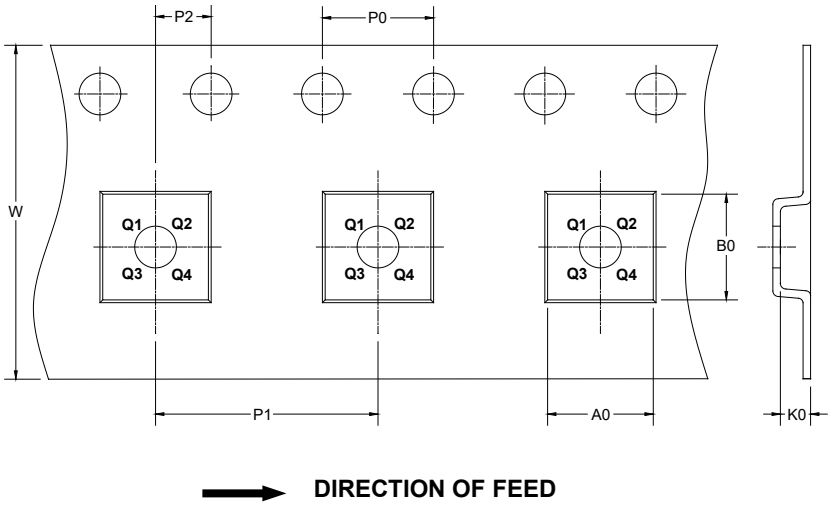
NOTE: All linear dimensions are in millimeters.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



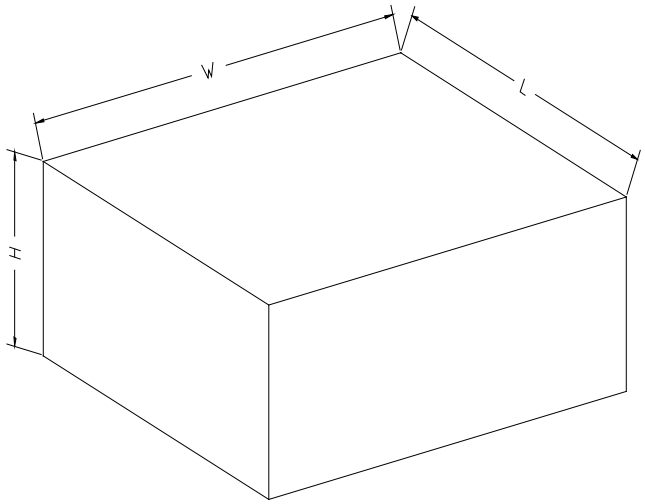
NOTE: The picture is only for reference. Please make the object as the standard.

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
WLCSP-0.9×0.9-4B	7″	9.2	1.00	1.00	0.70	4.0	4.0	2.0	8.0	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
7″ (Option)	368	227	224	8
7″	442	410	224	18

DD0002