GENERAL DESCRIPTION

The SGM6033 is a high-efficient step-down switching voltage regulator, providing 1A output current and adjustable output voltage. This device is capable to provide an input voltage supply range of 2.5V to 5.5V. The 4.6MHz fixed frequency operation allows the use of a 470nH output inductor and a 4.7μF output capacitor.

The SGM6033 also can work in power-save mode under moderate and light load conditions through pulse frequency modulation (PFM). The 26μA typical quiescent current and the power-save mode can further improve the system efficiency which can reach a maximum of 90%. It has the excellent load transient response capability. The SGM6033 also includes the features of internal soft-start, input under-voltage lockout, thermal shutdown and overload protection.

The SGM6033 is available in Green TDFN-2×2-6L and WLCSP-1.21×0.81-6B packages. It operates over an ambient temperature range of -40℃ to +125℃.

FEATURES

- **2.5V to 5.5V Input Voltage Range**
- **1A Output Current Capability**
- **26μA Typical Quiescent Current**
- **4.6MHz Fixed Frequency Operation**
- **Excellent Efficiency and Load Transient Response**
- **0.8V Reference Voltage**
- **Low Ripple Light-Load PFM Mode**
- **Internal Soft-Start**
- **Input Under-Voltage Lockout (UVLO)**
- **Thermal Shutdown**
- **Overload Protection**
- **Output Discharge**
- **Available in Green TDFN-2×2-6L and WLCSP-1.21×0.81-6B Packages**
- **-40℃ to +125℃ Operating Temperature Range**

APPLICATIONS

Digital Cameras
4G, WiFi, WiMAsX, and WiBro Data Cards
Tablet Computers
Netbooks, Ultra-Mobile PCs

TYPICAL APPLICATION

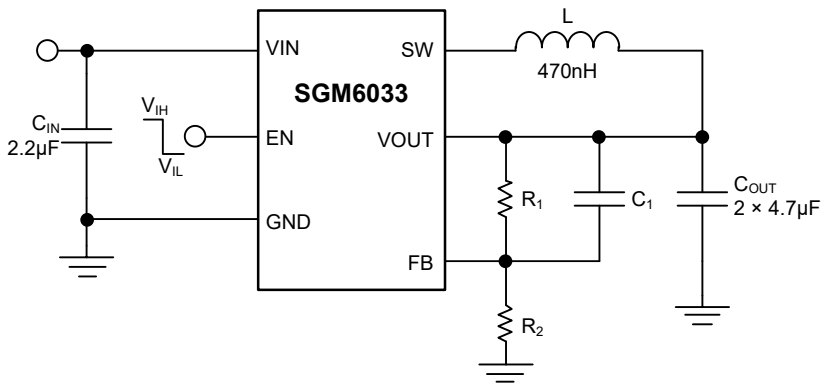


Figure 1. Typical Application Circuit

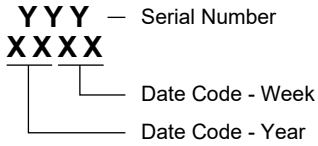
PACKAGE/ORDERING INFORMATION

MODEL	PACKAGE DESCRIPTION	SPECIFIED TEMPERATURE RANGE	ORDERING NUMBER	PACKAGE MARKING	PACKING OPTION
SGM6033-ADJ	TDFN-2×2-6L	-40℃ to +125℃	SGM6033-ADJXTDI6G/TR	MX1 XXXX	Tape and Reel, 3000
	WLCSP-1.21×0.81-6B	-40℃ to +125℃	SGM6033-ADJXG/TR	X2XX	Tape and Reel, 3000

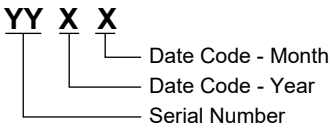
MARKING INFORMATION

NOTE: XXXX = Date Code. XX = Date Code.

TDFN-2×2-6L



WLCSP-1.21×0.81-6B



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 ..... -0.3V to 6.5V
Voltage on SW and EN ..... -0.3V to V_{IN} + 0.3V (1)
Package Thermal Resistance
TDFN-2×2-6L, θ_{JA} ..... 120℃/W
WLCSP-1.21×0.81-6B, θ_{JA} ..... 150℃/W
Junction Temperature ..... +150℃
Storage Temperature Range ..... -65℃ to +150℃
Lead Temperature (Soldering, 10s) ..... +260℃
ESD Susceptibility
HBM 4000V
MM 400V
CDM 1000V

NOTE: 1. Lesser of 6.5V or V_{IN} + 0.3V.

RECOMMENDED OPERATING CONDITIONS

Inductor, L 470nH
Input Capacitor, C_{IN} 2.2μF
Output Capacitor, C_{OUT} ..... 2 × 4.7μF
Supply Voltage Range ..... 2.5V to 5.5V
Operating Temperature Range ..... -40℃ to +125℃

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

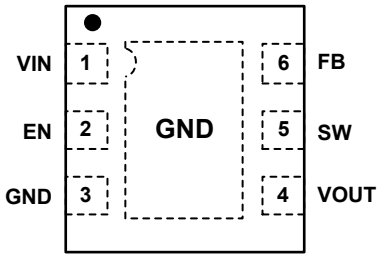
This integrated circuit can be damaged if ESD protections are not considered carefully. SGMICRO recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance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

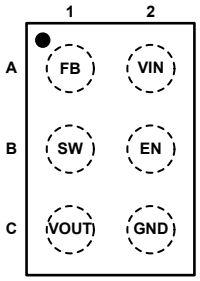
PIN CONFIGURATIONS

(TOP VIEW)



TDFN-2×2-6L

(TOP VIEW)



WLCSP-1.21×0.81-6B

PIN DESCRIPTION

PIN		NAME	FUNCTION
TDFN-2×2-6L	WLCSP-1.21×0.81-6B		
1	A2	VIN	Input Voltage. Connect to input power source.
2	B2	EN	Forcing this pin above 1.5V enables the part. Forcing this pin below 0.3V shuts down the device. In shutdown, all functions are disabled, drawing less than 1μA supply current. Do not leave EN floating.
3	C2	GND	Ground. Power and IC ground. All signals are referenced to this pin.
4	C1	VOUT	V_{OUT}. Connect to output voltage.
5	B1	SW	Switching Node. Connect to output inductor.
6	A1	FB	Buck Regulator Output Feedback Pin.
Exposed Pad	–	GND	Connect to GND.

ELECTRICAL CHARACTERISTICS

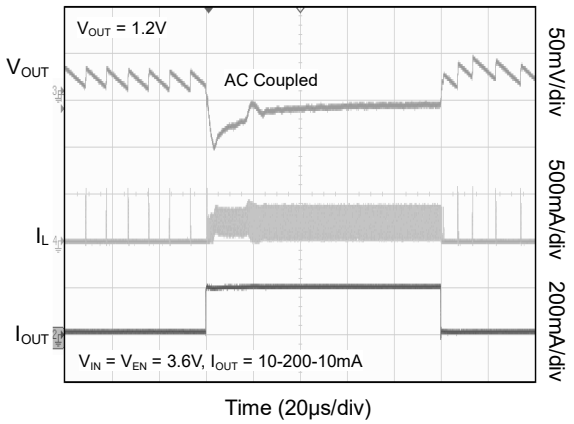
(Minimum and maximum values are at V_{IN} = V_{EN} = 2.5V to 5.5V, Full = -40℃ to +125℃; typical values are at V_{IN} = V_{EN} = 3.6V, T_A = +25℃, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TYP	MAX	UNITS
Power Supplies							
Input Voltage Range	V_{IN}		Full	2.5		5.5	V
Feedback Input Bias Current	I_{FB}	V_{FB} = 0.8V	+25℃			0.1	μA
Quiescent Current	I_Q	No Load, Not Switching	Full		26	40	μA
Shutdown Supply Current	I_{SD}	EN = GND	+25℃		0.47	1	μA
Under-Voltage Lockout Threshold	V_{UVLO}	Rising V_{IN}	+25℃		2.15	2.42	V
Under-Voltage Lockout Hysteresis	V_{UVHYST}		+25℃		170		mV
EN Logic Input							
Enable High-Level Input Voltage	V_{IH}		Full	1.5			V
Enable Low-Level Input Voltage	V_{IL}		Full			0.3	V
Switching							
Switching Frequency	f_{SW}	V_{IN} = 3.6V	+25℃	4	4.6	5.2	MHz
Output							
Regulated Feedback Voltage	V_{FB}		Full	0.777	0.8	0.826	V
Soft-Start	t_{SS}	From EN Rising Edge	+25℃		200		μs
Output Driver							
PMOS On-Resistance	$R_{DS(ON)}$	V_{IN} = V_{GS} = 3.6V	+25℃		350		mΩ
NMOS On-Resistance		V_{IN} = V_{GS} = 3.6V	+25℃		250		mΩ
PMOS Peak Current Limit	$I_{LIM(OL)}$		+25℃	1610	1900	2290	mA
Output Discharge Resistance	R_{DIS}	EN = GND	+25℃		230		Ω
Thermal Shutdown	T_{TSD}				160		℃
Thermal Shutdown Hysteresis	T_{HYS}				15		℃

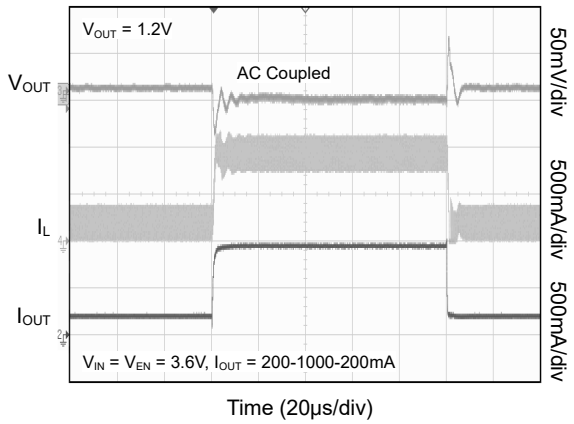
TYPICAL PERFORMANCE CHARACTERISTICS

T_A = +25℃, V_{IN} = V_{EN} = 3.6V, unless otherwise noted.

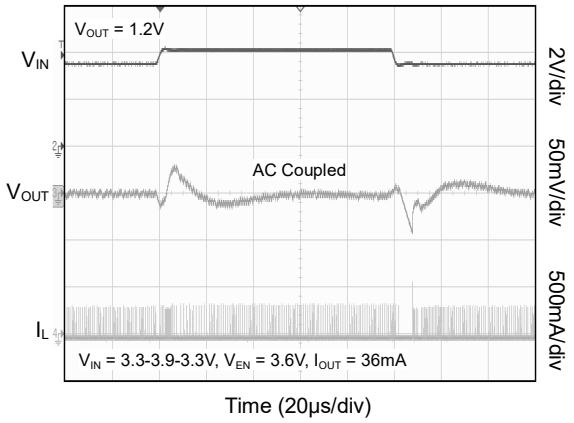
Load Transient



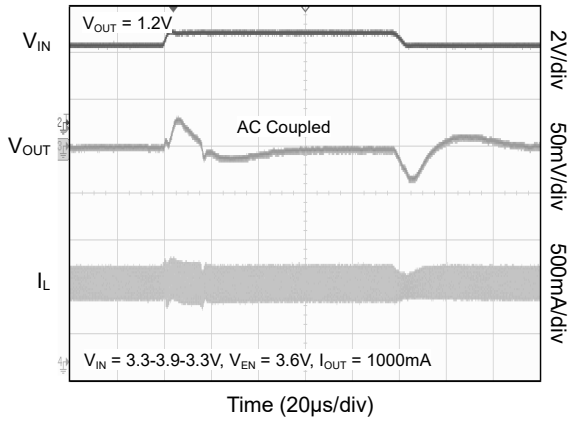
Load Transient



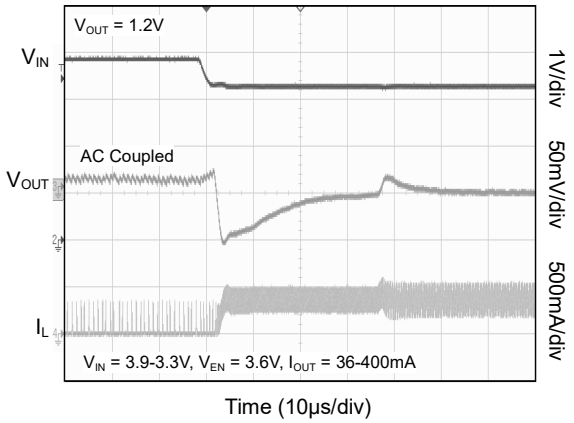
Line Transient



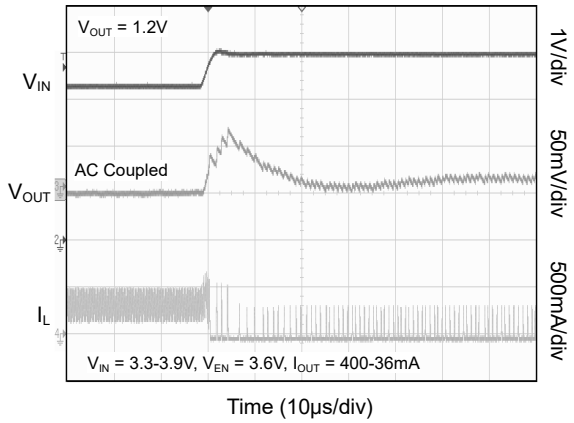
Line Transient



Combined Line/Load Transient



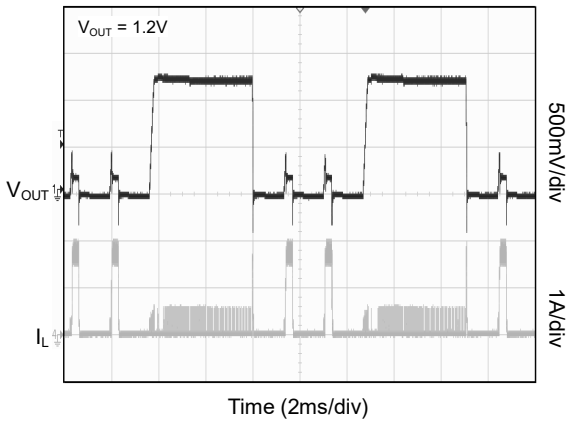
Combined Line/Load Transient



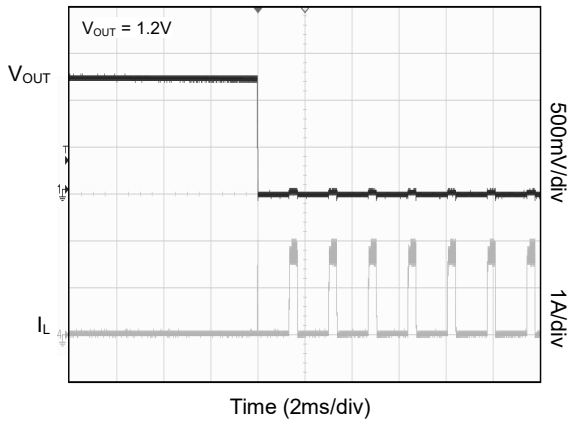
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25℃, V_{IN} = V_{EN} = 3.6V, unless otherwise noted.

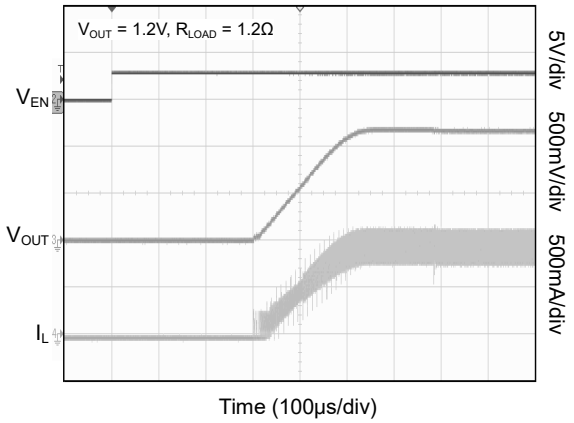
Over-Current, Load Increasing Past Current Limit



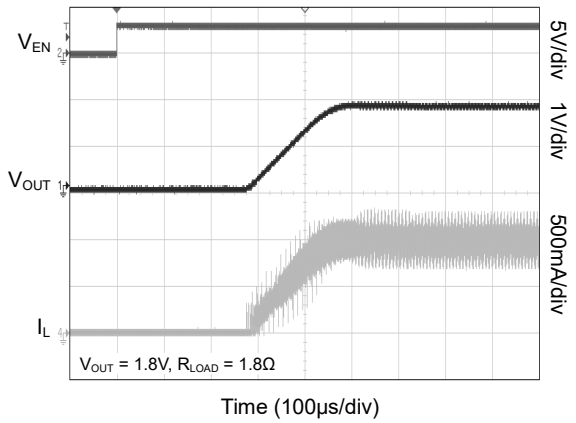
250mΩ Fault, Rapid Fault



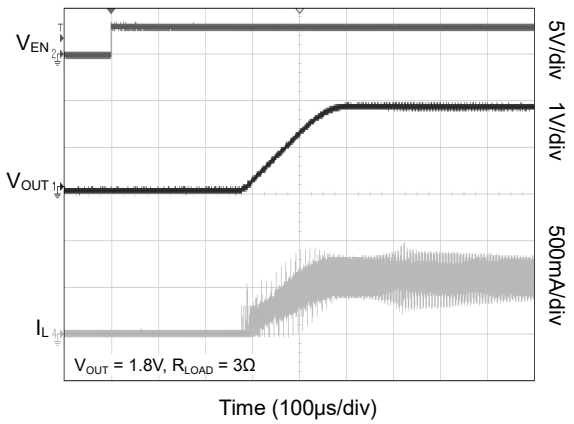
Startup



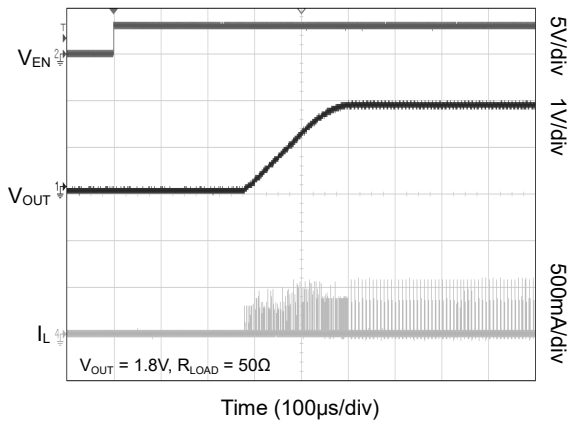
Startup



Startup



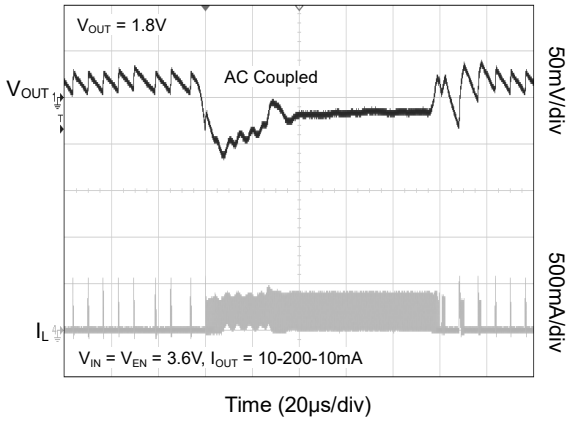
Startup



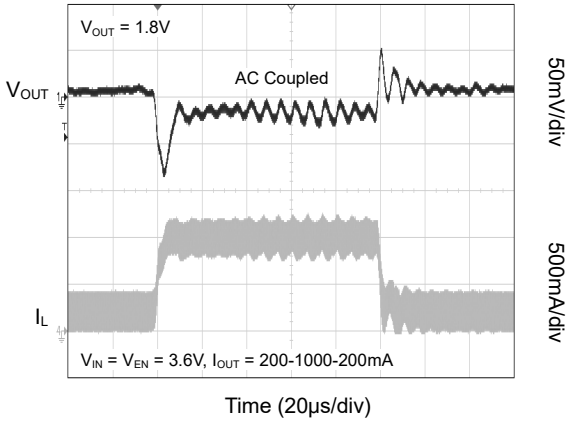
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25℃, V_{IN} = V_{EN} = 3.6V, unless otherwise noted.

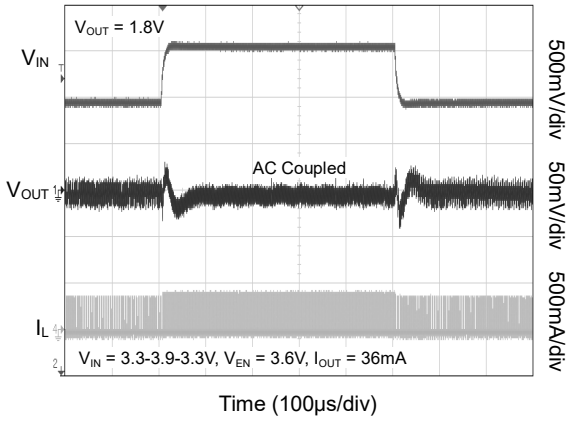
Load Transient



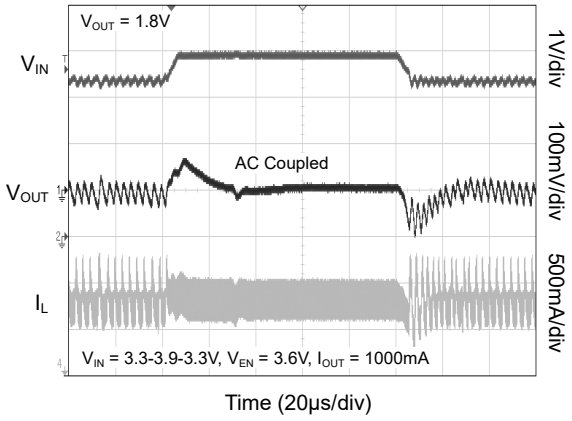
Load Transient



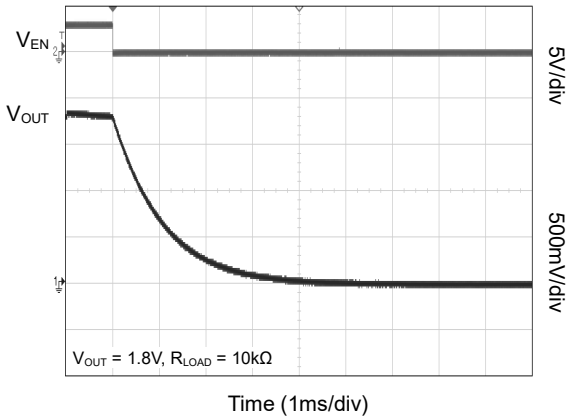
Line Transient



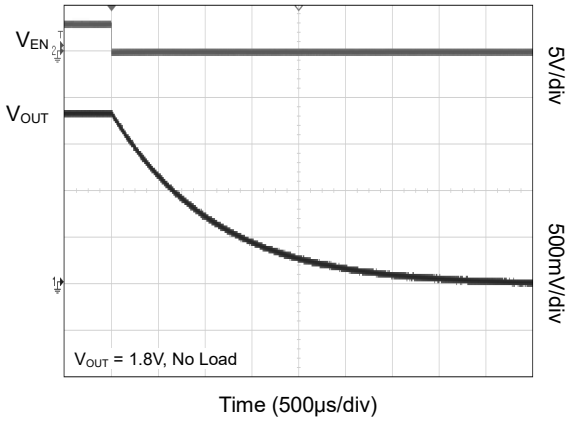
Line Transient



Shutdown



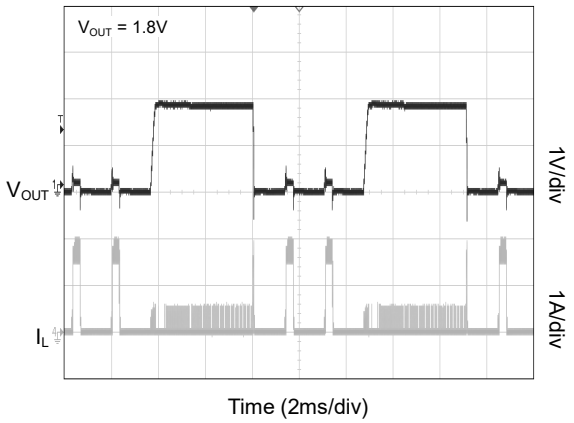
Shutdown



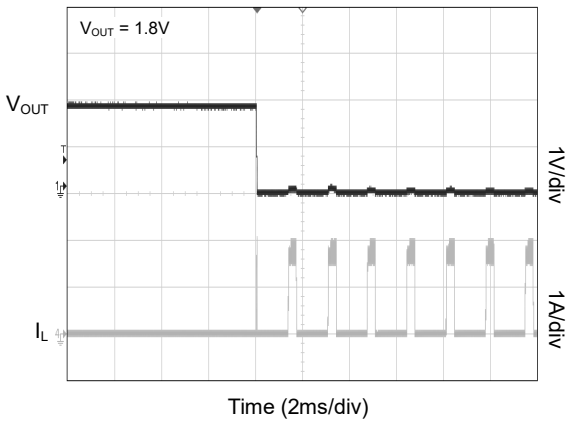
TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25℃, V_{IN} = V_{EN} = 3.6V, unless otherwise noted.

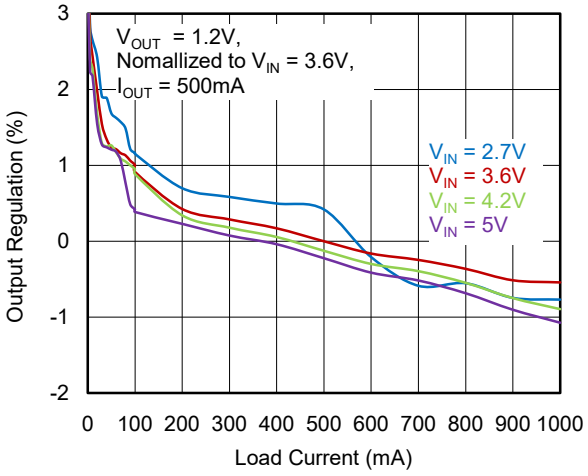
Over-Current, Load Increasing Past Current Limit



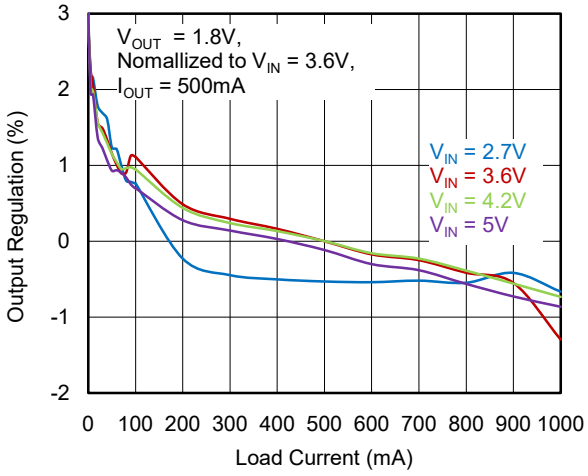
250mΩ Fault, Rapid Fault



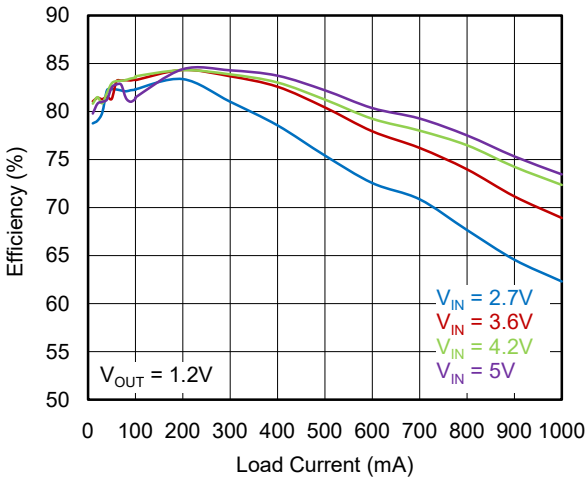
ΔVOUT (%) vs. Load Current



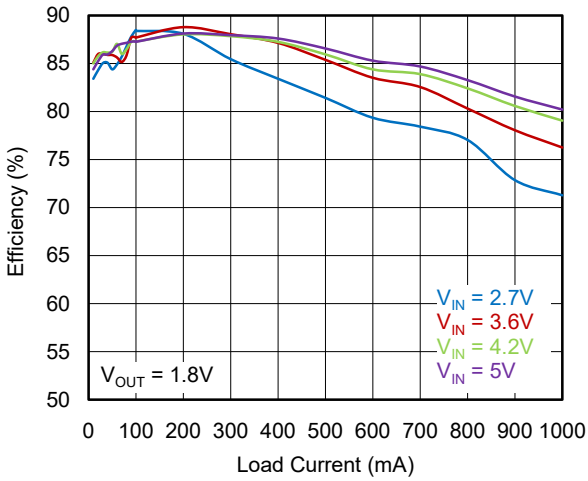
ΔVOUT (%) vs. Load Current



Efficiency vs. Load Current

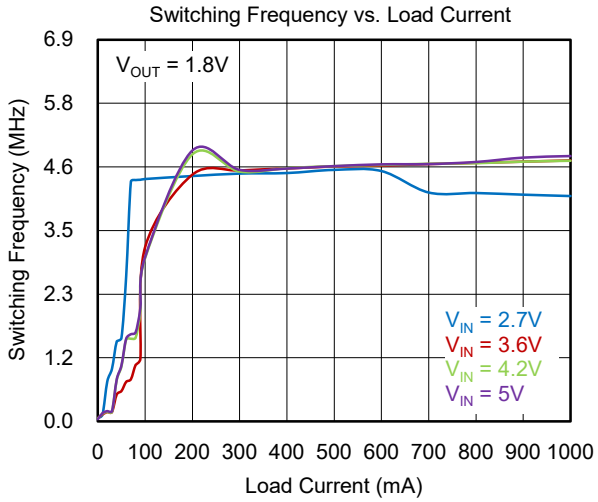


Efficiency vs. Load Current



TYPICAL PERFORMANCE CHARACTERISTICS (continued)

T_A = +25℃, V_{IN} = V_{EN} = 3.6V, unless otherwise noted.



REVISION HISTORY

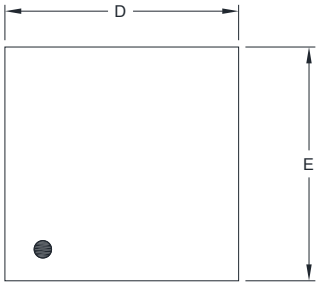
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

JULY 2020 – REV.A to REV.A.1	Page
Updated the Operating Temperature Range	1, 2, 4

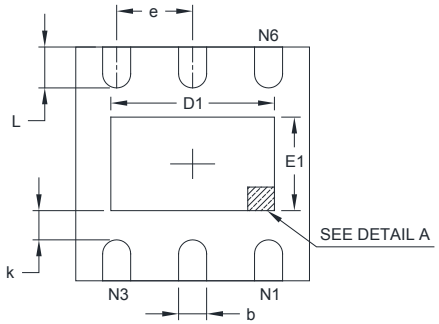
Changes from Original (JANUARY 2019) to REV.A	
Changed from product preview to production data	All

PACKAGE OUTLINE DIMENSIONS

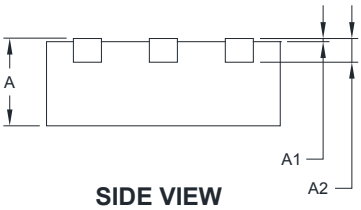
TDFN-2×2-6L



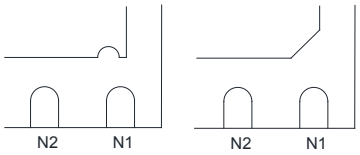
TOP VIEW



BOTTOM VIEW



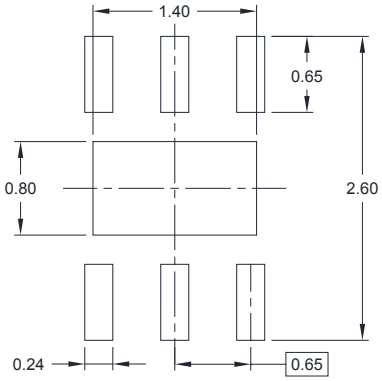
SIDE VIEW



DETAIL A

Pin #1 ID and Tie Bar Mark Options

NOTE: The configuration of the Pin #1 identifier is optional, but must be located within the zone indicated.

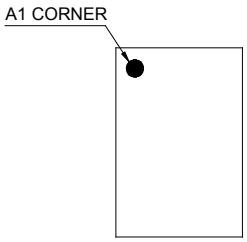


RECOMMENDED LAND PATTERN (Unit: mm)

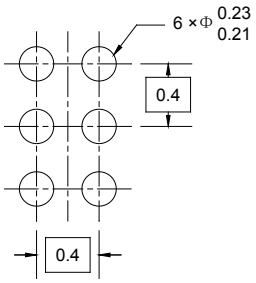
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	1.900	2.100	0.075	0.083
D1	1.100	1.450	0.043	0.057
E	1.900	2.100	0.075	0.083
E1	0.600	0.850	0.024	0.034
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.650 TYP		0.026 TYP	
L	0.250	0.450	0.010	0.018

PACKAGE OUTLINE DIMENSIONS

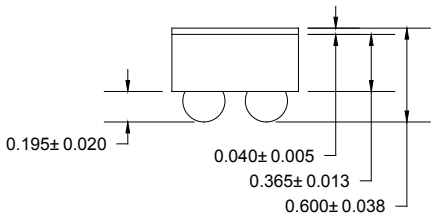
WLCSP-1.21×0.81-6B



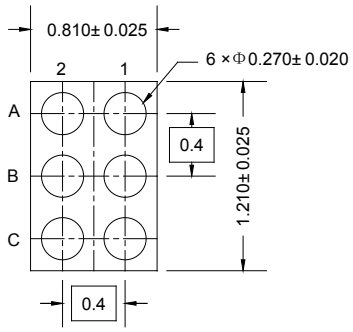
TOP VIEW



RECOMMENDED LAND PATTERN



SIDE VIEW

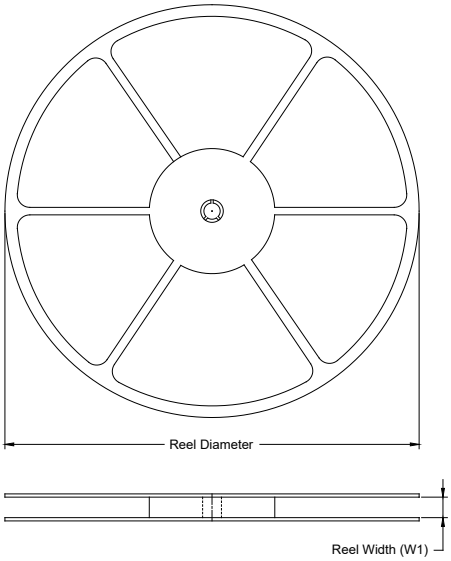


BOTTOM VIEW

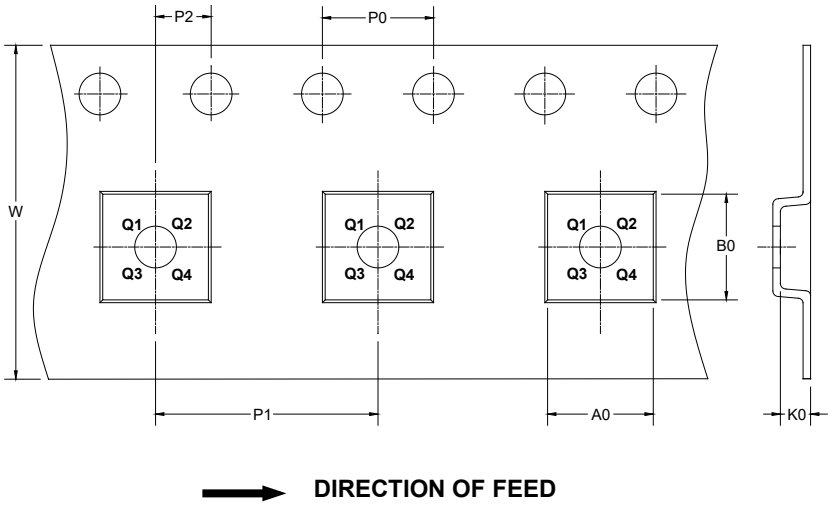
NOTE: All linear dimensions are in millimeters.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



TAPE DIMENSIONS



DIRECTION OF FEED

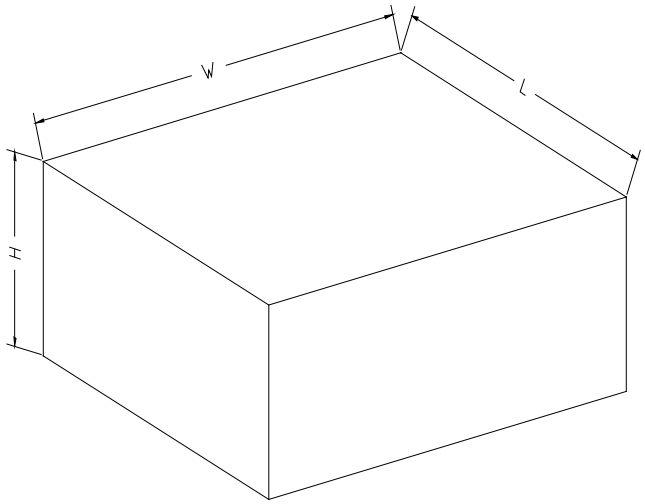
NOTE: The picture is only for reference. Please make the object as the standard.

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
TDFN-2×2-6L	7″	9.5	2.30	2.30	1.10	4.0	4.0	2.0	8.0	Q1
WLCSP-1.21×0.81-6B	7″	9.2	0.90	1.32	0.68	4.0	4.0	2.0	8.0	Q1

DD0001

CARTON BOX DIMENSIONS



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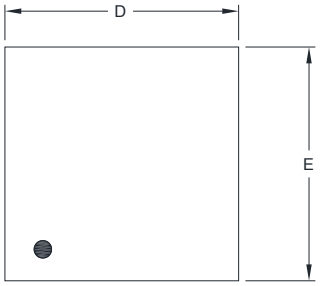
KEY PARAMETER LIST OF CARTON BOX

Reel Type	Length (mm)	Width (mm)	Height (mm)	Pizza/Carton
7″ (Option)	368	227	224	8
7″	442	410	224	18

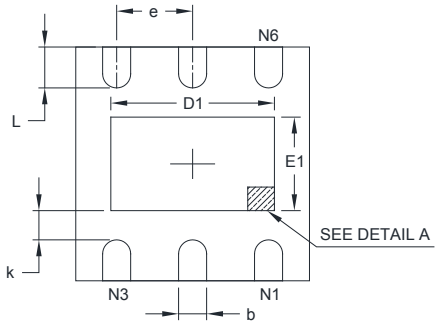
DD0002

PACKAGE OUTLINE DIMENSIONS

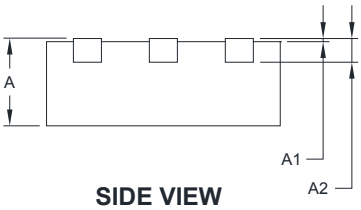
TDFN-2×2-6L



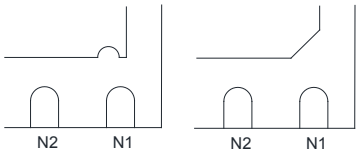
TOP VIEW



BOTTOM VIEW



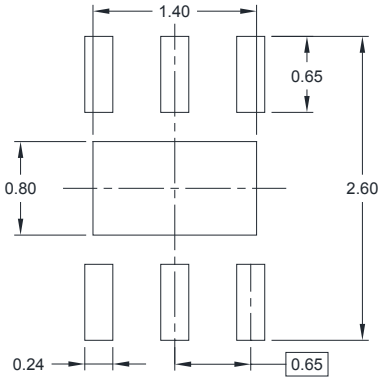
SIDE VIEW



DETAIL A

Pin #1 ID and Tie Bar Mark Options

NOTE: The configuration of the Pin #1 identifier is optional, but must be located within the zone indicated.

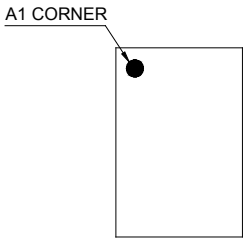


RECOMMENDED LAND PATTERN (Unit: mm)

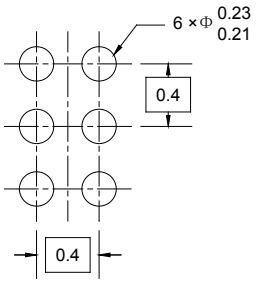
Symbol	Dimensions In Millimeters		Dimensions In Inches	
	MIN	MAX	MIN	MAX
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203 REF		0.008 REF	
D	1.900	2.100	0.075	0.083
D1	1.100	1.450	0.043	0.057
E	1.900	2.100	0.075	0.083
E1	0.600	0.850	0.024	0.034
k	0.200 MIN		0.008 MIN	
b	0.180	0.300	0.007	0.012
e	0.650 TYP		0.026 TYP	
L	0.250	0.450	0.010	0.018

PACKAGE OUTLINE DIMENSIONS

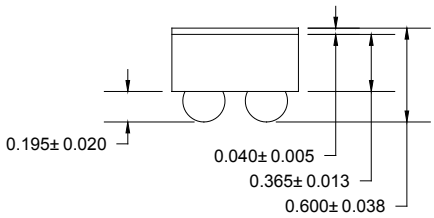
WLCSP-1.21×0.81-6B



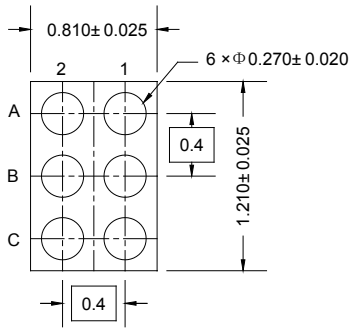
TOP VIEW



RECOMMENDED LAND PATTERN



SIDE VIEW

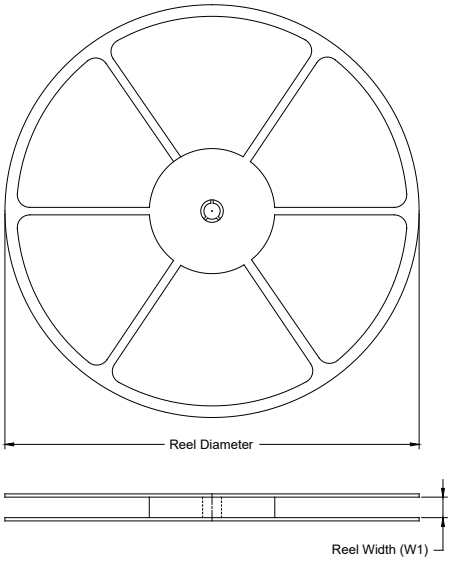


BOTTOM VIEW

NOTE: All linear dimensions are in millimeters.

TAPE AND REEL INFORMATION

REEL DIMENSIONS



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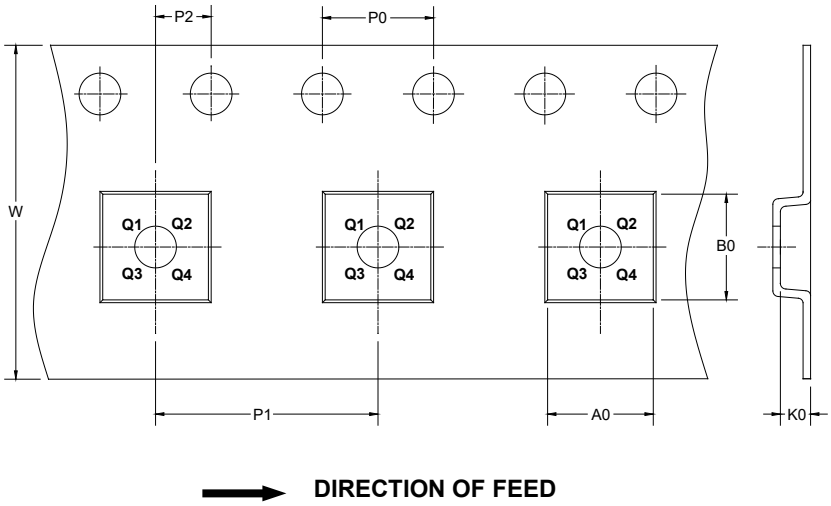

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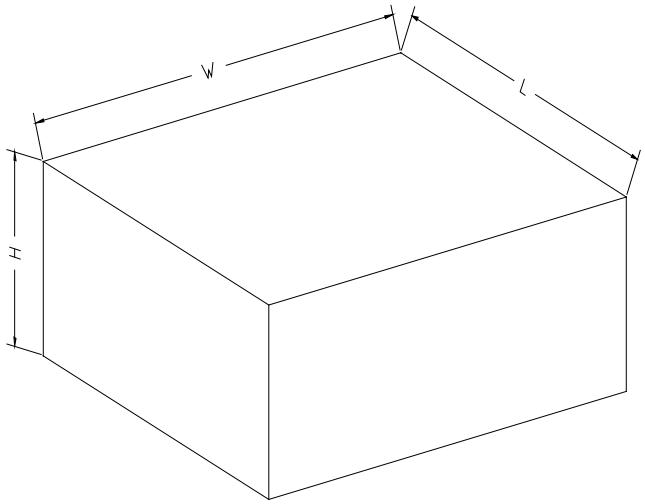

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