µP7312K

Constant Voltage and Constant Current Controller

1. Description

The uP7312K is a highly integrated solution for a constant voltage/constant current mode SMPS application.

The uP7312K contains one 1.21V voltage reference, one low voltage reference used in current sensing circuit and two operational amplifiers. The 1.21V voltage reference, combined with one operational amplifier, makes of an ideal voltage controller for use in adapters and battery chargers. The low voltage reference, combined with another operational amplifier, makes of an ideal current limiter for output low side current sensing.

The uP7312K has lower reference voltage for current control loop, thus higher power efficiency is achieved in SMPS applications such as low power charger

The uP7312K is available in SOT26 package.

2. Applications

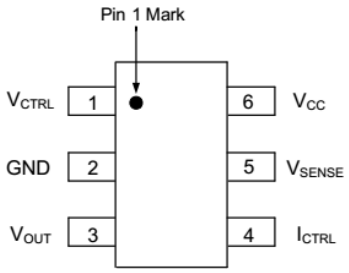
- AC/DC Adapters
- Battery Chargers

3. Features

- Both Constant Voltage and Current
- Precision Internal Voltage Reference
- Low External Component Count
- Easy Compensation
- Low Supply Current: 180uA
- Current Control Loop Reference: 70mV
- Operating Supply Voltage: 1.7V to 40V

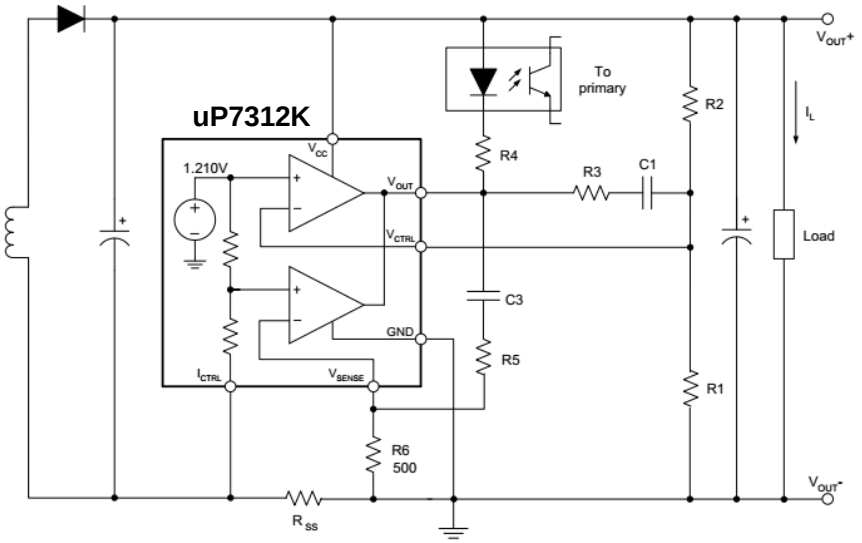
4. Pin Assignments

(Top View)



SOT26 (K6 Package)

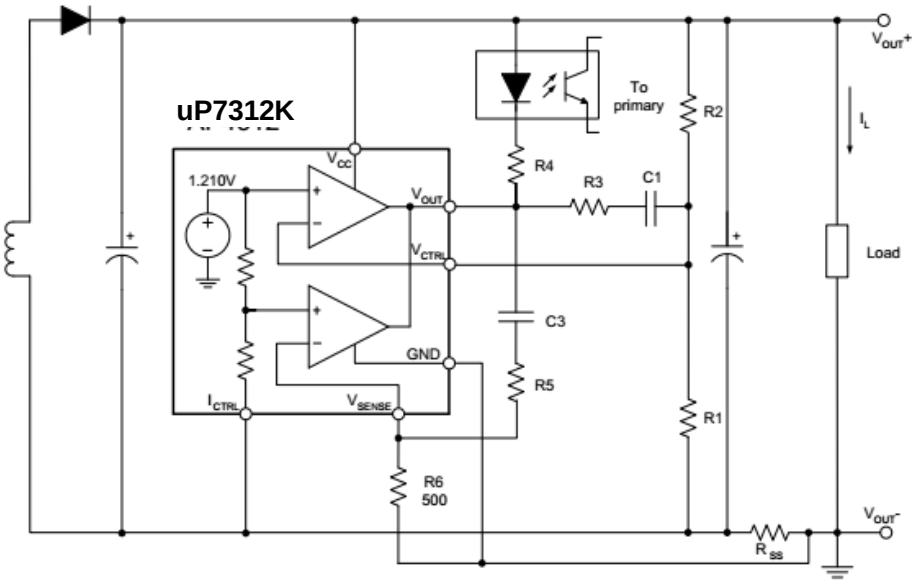
5. Typical Application



$$V_{OUT} = V_{REF} \times \frac{R1 + R2}{R1}$$

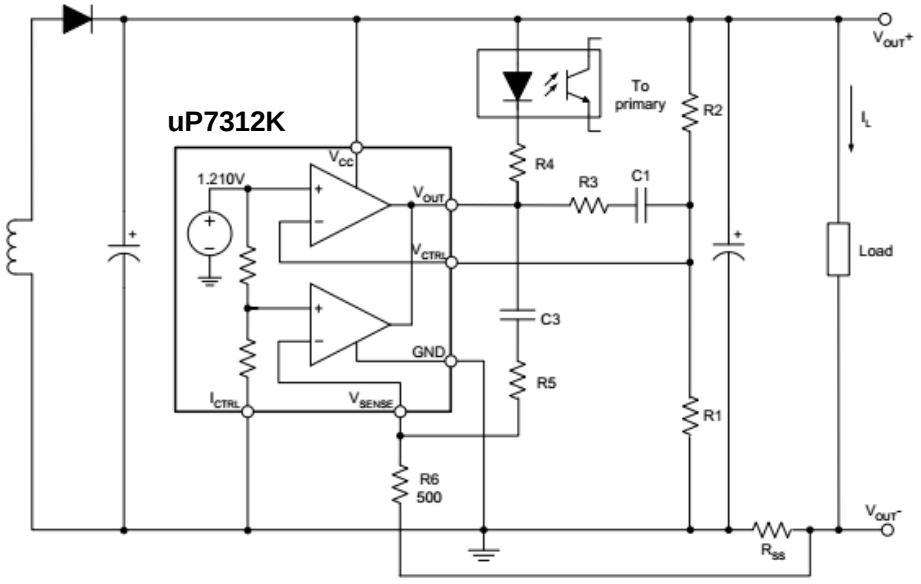
$$CurrentLimit = \frac{V_{SENSE}}{R_{SS}}$$

Typical Application 1



$$V_{OUT} = [V_{REF} + (I_L \times R_{SS})] \times \frac{R1 + R2}{R1} - (I_L \times R_{SS}) \qquad CurrentLimit = \frac{V_{SENSE}}{R_{SS}}$$

Typical Application 2



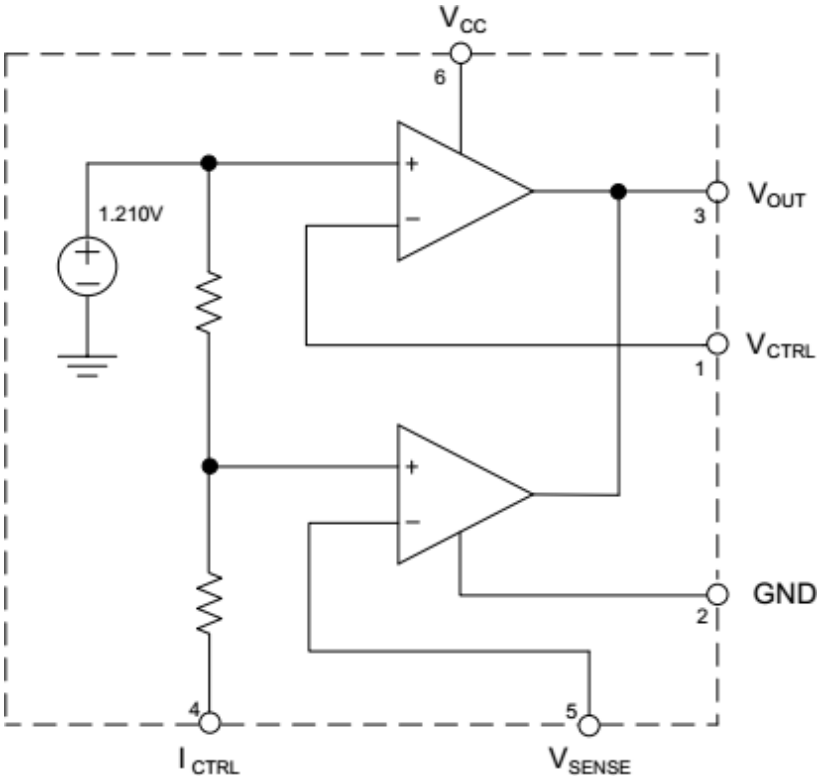
$$V_{OUT} = V_{REF} \times \frac{R1 + R2}{R1} - (I_L \times R_{SS}) \qquad CurrentLimit = \frac{V_{SENSE} \times V_{REF}}{(V_{SENSE} + V_{REF}) \times R_{SS}}$$

Typical Application 3

6. Pin descriptions

Pin number	Pin Name	Pin Functions
1	V_{CTRL}	Input pin of the voltage control loop
2	GND	Ground
3	V_{OUT}	Output pin. Sinking current only
4	I_{CTRL}	Input pin of the current control loop
5	V_{SENSE}	Input pin of the current control loop
6	V_{CC}	Power Supply

7. Functional Block Diagram



8. Absolute Maximum Ratings(Note 1)

Parameter	Name	Range	Unit
Power Supply Voltage	V_{CC}	40	V
Input Voltage (V_{IN} Pin)	V_{IN}	-0.3 to V_{CC}	V
Junction Temperature	T_J	+150	°C
Storage Temperature	T_{STG}	-65 to +150	°C
Lead Temperature (Soldering, 5sec)	T_{LEAD}	+260	°C
Thermal Resistance (Junction to Ambient)	θ_{JA}	250	°C/W

Note1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

9. Thermal Impedance

Symbol	Parameter	Value	Unit
θ_{JC}	Thermal Resistance (Junction to Case)	84	°C/W

10. Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
VCC	Power Voltage Supply	1.7	40	V

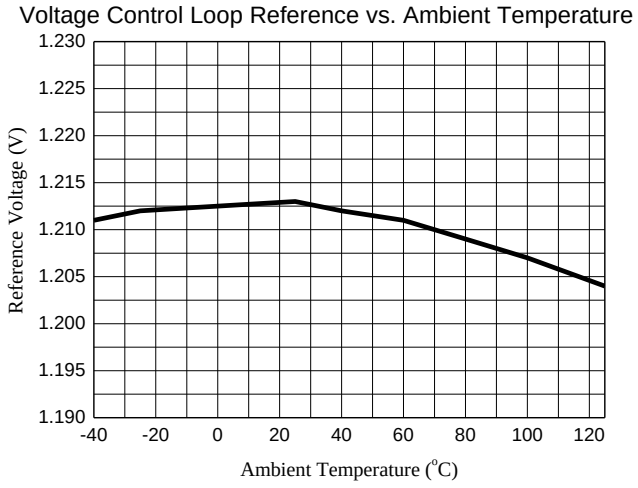
11. Electrical Parameter

(@V_{CC}=20V, T_A=25 °C, unless otherwise specified.)

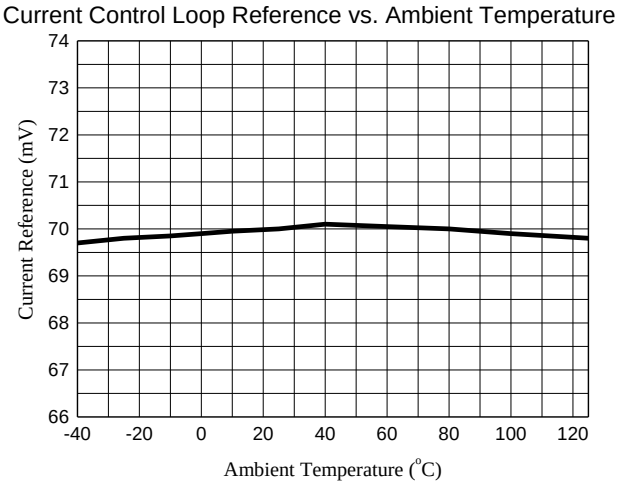
Symbol	Parameters	Conditions	Min	Typ	Max	Unit
TOTAL CURRENT CONSUMPTION						
I_{CC}	Total Supply Current Not Including the Output Sinking Current	T_A=+25°C	–	180	–	μA
		-40°C <T_A<+105°C	–	–	300	
VOLTAGE CONTROL LOOP						
Gmv	Transconductance of Voltage Control Loop Op-Amp (Sink Current Only)	T_A=+25°C	1	3.5	–	mA/mV
		-40°C <T_A<+105°C	–	2.5	–	
V_{REF}	Voltage Control Loop Reference	T_A=+25°C	1.204	1.21	1.216	V
		-40°C <T_A<+105°C	1.186		1.234	
I_{IBV}	Input Bias Current (V_{CTRL})	T_A=+25°C	–	50	–	nA
		-40°C <T_A<+105°C	–	100	–	
CURRENT CONTROL LOOP						
Gmi	Transconductance of Current Control Loop Op-Amp (Sink Current Only)	T_A=+25°C	1.5	7	–	mA/mV
		-40°C <T_A<+105°C	1.5	7	–	
V_{SENSE}	Current Control Loop Reference	T_A=+25°C	67.9	70	72.1	mV
		-40°C <T_A<+105°C	66		74	
I_{IBI}	Current Out of Pin I_{CTRL} at V_{SENSE}	T_A=+25°C	–	18	–	μA
		-40°C <T_A<+105°C	–	35	–	
OUTPUT STAGE						
V_{OL}	Low Output Voltage Level	T_A=+25°C, I_{SINK}=2mA	–	100	–	mV
		-40°C <T_A<+105°C, I_{SINK}=2mA	–	100	–	
I_{OS}	Output Short Circuit Current. Output to V_{CC}. Sink Current Only	T_A=+25°C	–	27	50	mA
		-40°C <T_A<+105°C	–	35	–	

12. Performance Characteristics

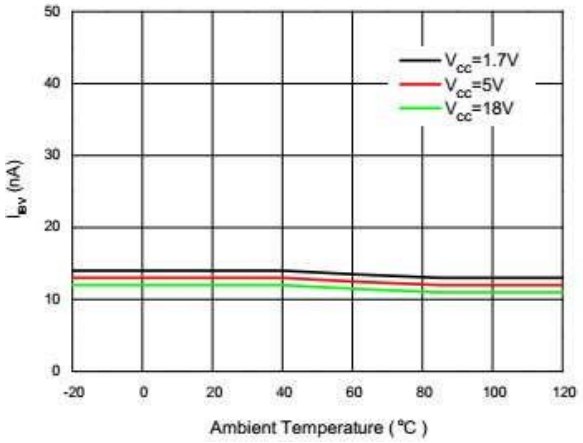
Voltage Control Loop Reference vs. Ambient Temperature



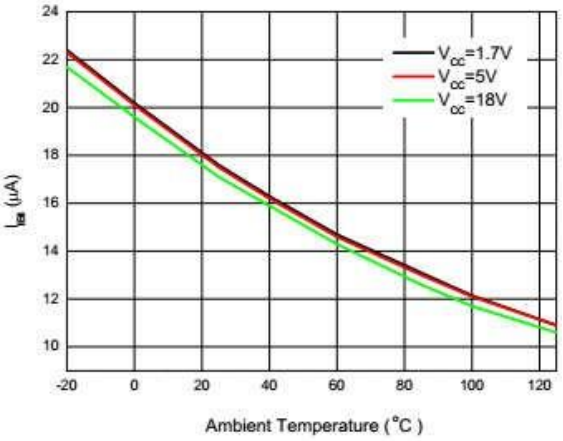
Current Control Loop Reference vs. Ambient Temperature



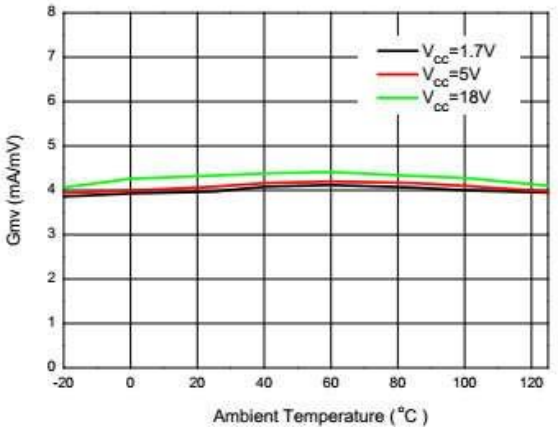
Input Bias Current (V_{CTRL} vs. Ambient Temperature



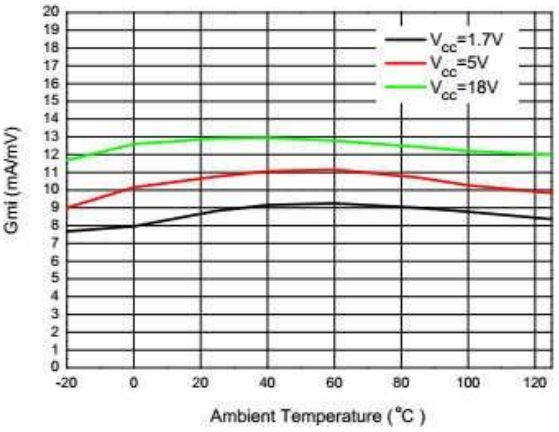
Current Out of Pin I_{CTRL} at V_{SENSE} vs. Ambient Temperature



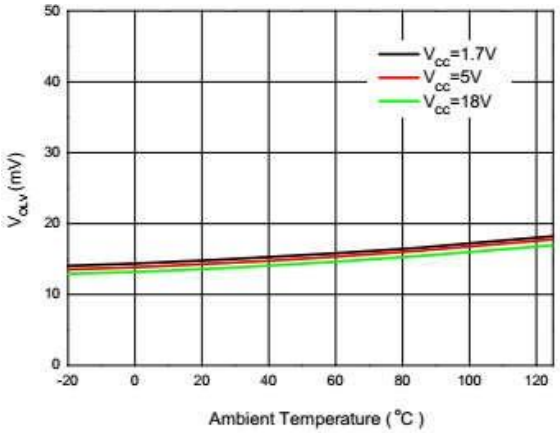
Transconductance of Voltage Control Loop Op-Amp vs. Ambient Temperature



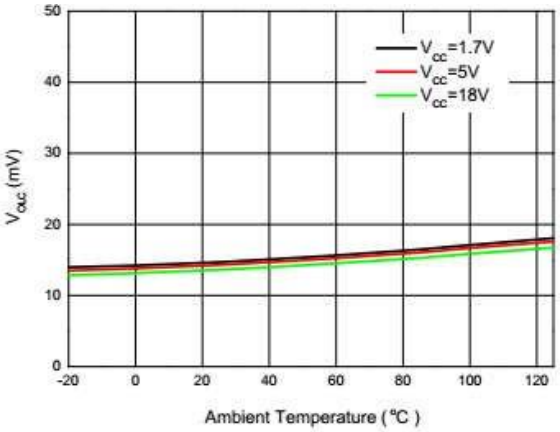
Transconductance of Current Control Loop Op-Amp vs. Ambient Temperature



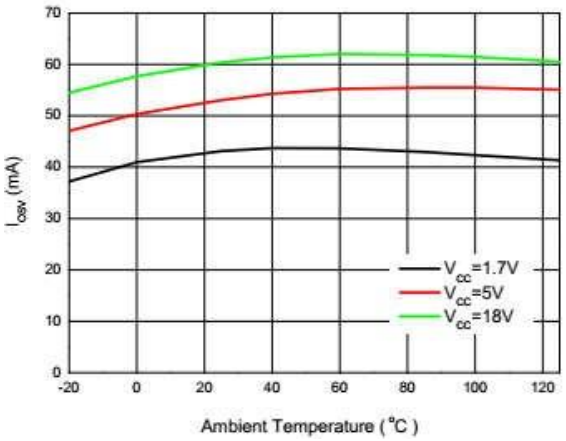
Low Output Level of Voltage Control Loop Op-Amp vs. Ambient Temperature



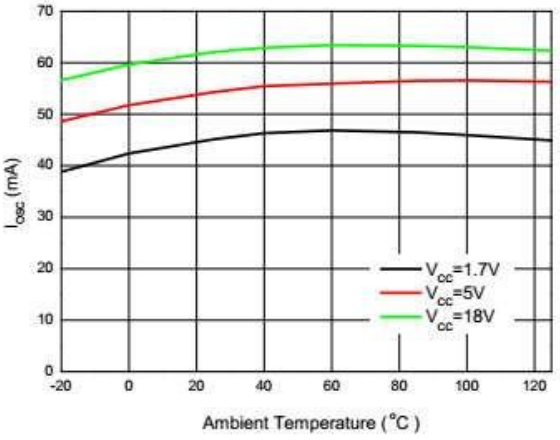
Low Output Level of Current Control Loop Op-Amp vs. Ambient Temperature



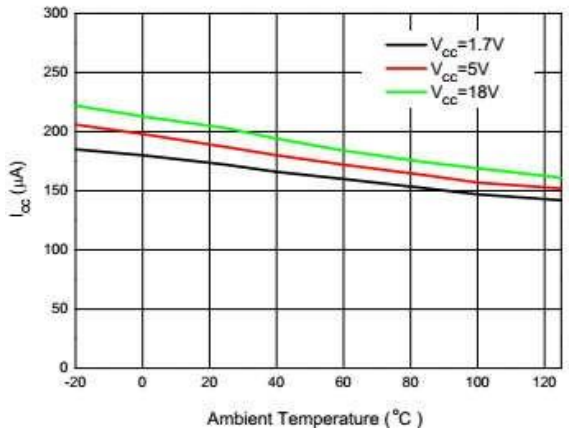
Output Short Circuit Current of Voltage Control Loop Op-Amp vs. Ambient Temperature



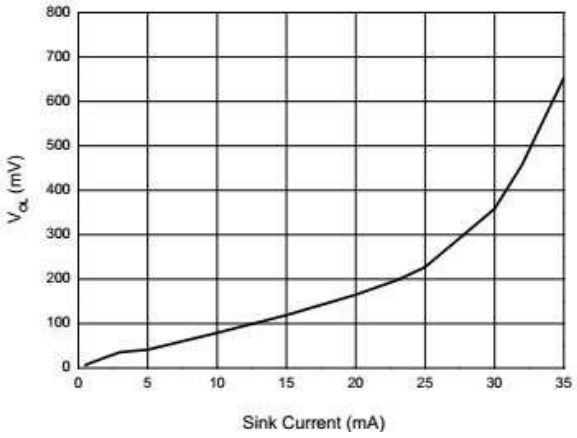
Output Short Circuit Current of Current Control Loop Op-Amp vs. Ambient Temperature



Total Supply Current Not Including the Output Sinking Current vs. Ambient Temperature



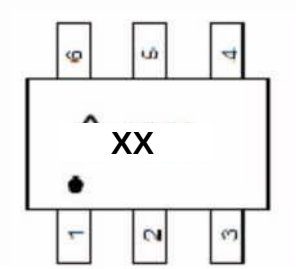
Low Output Voltage Level vs. Sink Current



13. Ordering Information

Package	Part Number	Marking ID	Packing
SOT26	uP7312K	12	3000/Tape & Reel

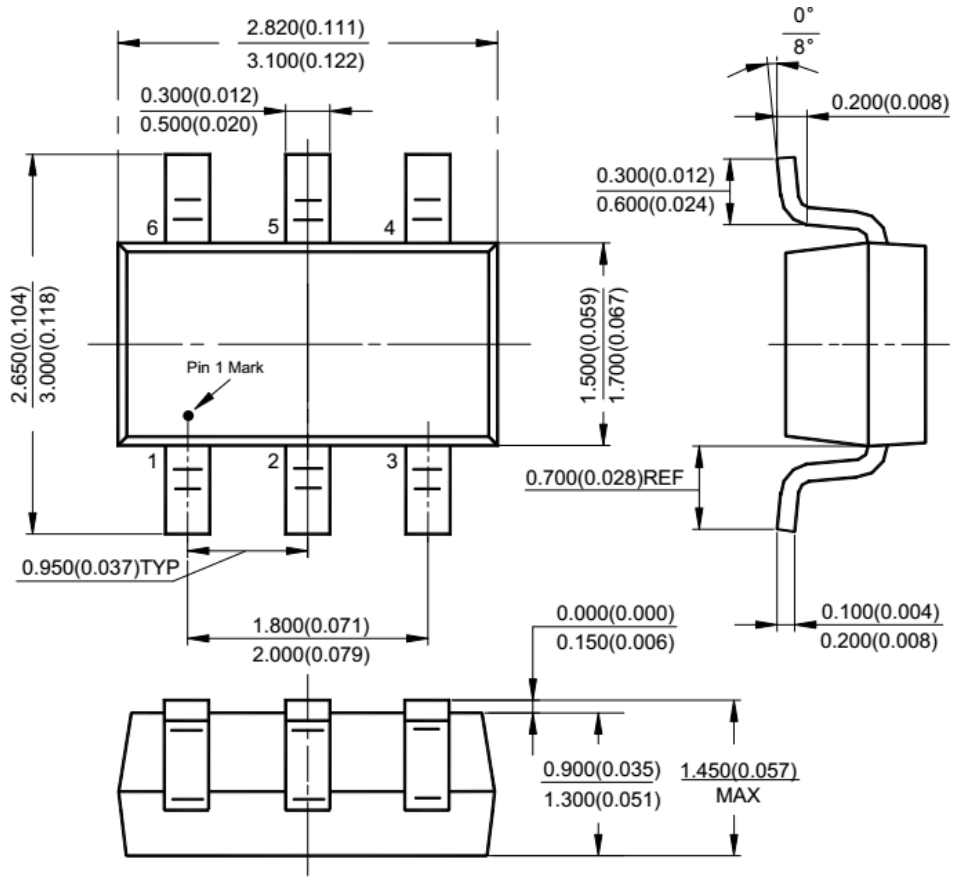
14. Marking Information



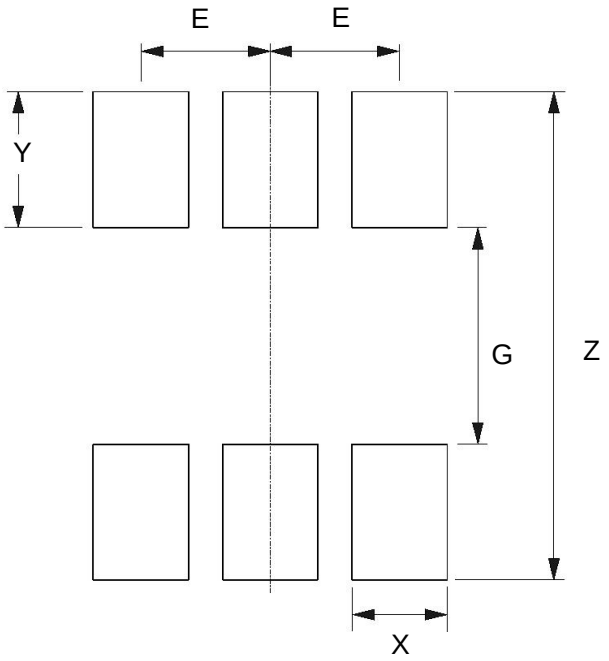
XX: Marking ID (See ordering information)

15. Mechanical dimensions(All dimensions in mm(inch).)

(1) Package Type: SOT26



16. Suggested Pad Layout



Dimensions	Z (mm)/(inch)	G (mm)/(inch)	X (mm)/(inch)	Y (mm)/(inch)	E (mm)/(inch)
Value	3.600/0.142	1.600/0.063	0.700/0.028	1.000/0.039	0.950/0.037