

### General Description

Creating reference voltages and currents is of major importance in nearly every mixed signal circuit for biasing and comparative purposes.

Because of the ambient temperature's impact on most of the circuit's properties, the Bandgap reference makes use of two temperature dependencies having opposite characteristic:

- a pn junction voltage having a temperature coefficient of appr. -2 mV/K
- a multiple of the temperature voltage  $V_t$  having a temperature coefficient of appr. +0.085 mV/K

Combination of both allows achieving a zero first order temperature dependency. This analog IP cell generates a reference voltage of 1.22V. Trimming is not required. Additionally, the output voltage is converted to a constant current of 10uA. This current can be used for biasing purposes (current distribution on the mixed signal ASIC). Biasing is also possible using the appropriate voltage biasing outputs causing a 10uA current flow in a 20/4 or 10/4 P or N channel MOS respectively

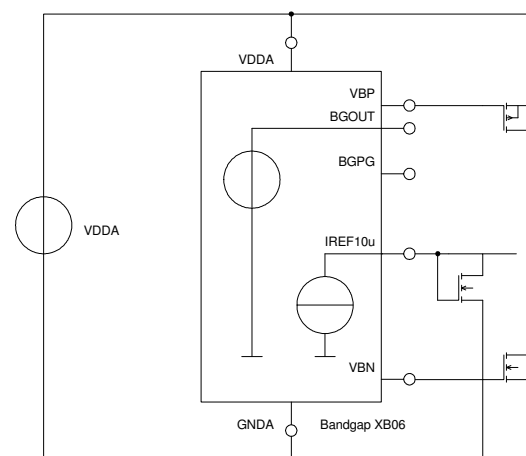
### Ratings, Parameters and Conditions

Parameter / Condition	Symbol	Min	Typ.	Max	Unit	Comment
<b>Electrical Parameters:</b>						
Supply Voltage	$V_{dd}$	4.75	5	5.25	V	
Supply Current	$I_{dd}$	200	330	505	$\mu$ A	
Output Voltage	$V_{BGOUT}$	1.21	1.22	1.235	V	
Output Current	$I_{IREF10\mu}$	8.5	10.4	12.5	$\mu$ A	
Temp. Coeff. $V_{BGOUT}$	$TC_{V_{BG}}$			54	ppm/ $^{\circ}$ C	
Voltage Coeff. $V_{BGOUT}$	$VC_{V_{BG}}$		1.6		mV/V	at typical conditions
PSRR $V_{BGOUT}$	$RR_{V_{BG}}$		80		dB	at typical conditions
Temp. Coeff. $I_{IREF10\mu}$	$TC_{I_{BG}}$			250	ppm/ $^{\circ}$ C	at typical conditions
Voltage Coeff. $I_{IREF10\mu}$	$VC_{V_{BG}}$		144		nA/V	at typical conditions
PSRR $I_{IREF10\mu}$	$RR_{V_{BG}}$		43		dB	at typical conditions
P Ch. Bias Voltage	$V_{PB}$		$V_{dd}-1.22$		V	at typical conditions
N Ch. Bias Voltage	$V_{NB}$		1.178		V	at typical conditions
<b>Absolute Maximum Ratings:</b>						
Operating Temperature	$T_{range}$	-40		120	$^{\circ}$ C	
Supply Voltage	$V_{dd}$	-0.3		7	V	
Input Voltage	$V_{in}$	-0.3		$V_{dd}+0.7$		
Output Voltage	$V_{out}$	-0.3		$V_{dd}+0.7$		
<b>Operating Conditions:</b>						
Ambient Temperature	$T_{amb}$	-20	27	80	$^{\circ}$ C	

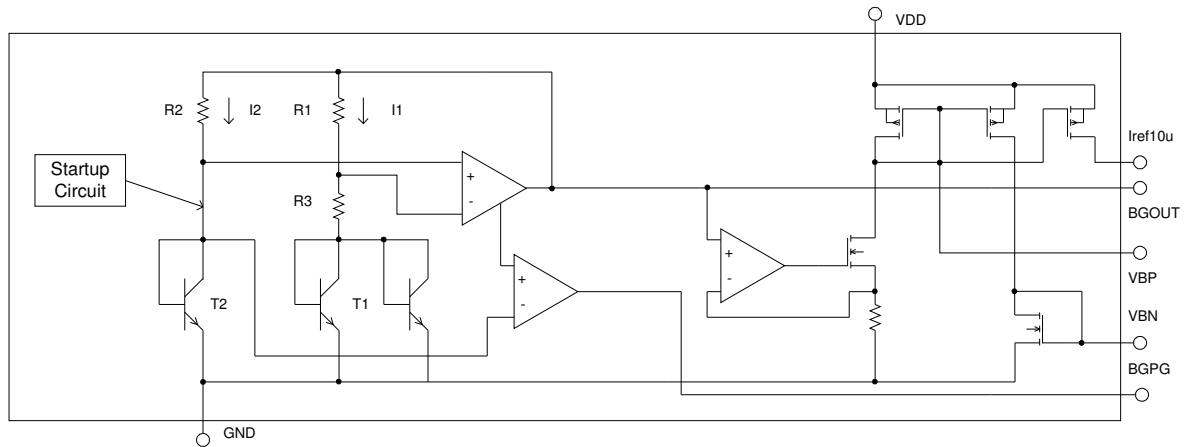
### IO-Description

Interface	I/O	Function	Comment
VDDA	Input	Supply	
GND A	Input	Supply	
BGOUT	Output	Reference voltage	
BGPG	Output	Power good	logical HIGH when Bandgap is in stable operating point
IREF10u	Output	Reference current	
(PD)	Input	Power down	optional

### Symbol / external schematic



### Block Diagramm

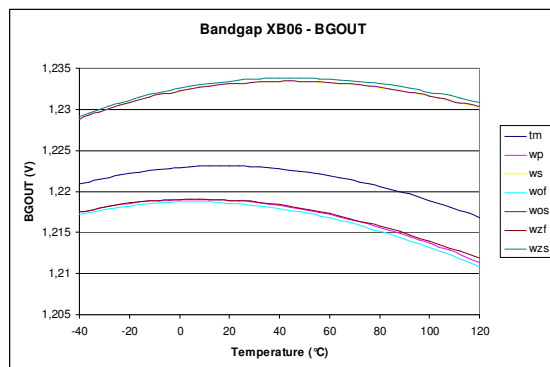


### Layout Dimensions

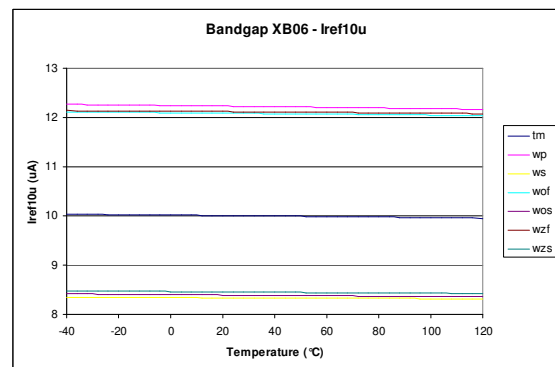
Name	Dimensions XY	Area
BG1 XB06	500µm x 400µm	0,2µm <sup>2</sup>

### Simulation Results

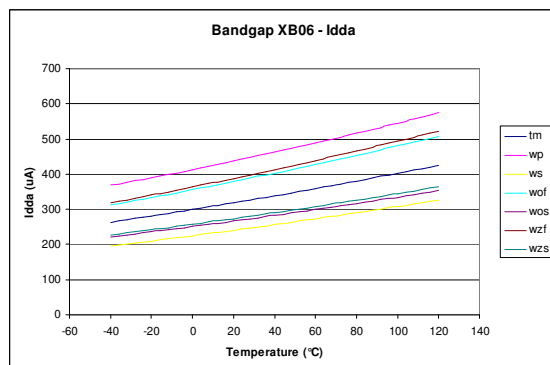
Output voltage versus temperature



Output current versus temperature



Supply current versus temperature



Dieses Projekt wird im Rahmen der Technologieförderung mit Mitteln des Europäischen Fonds für regionale Entwicklung (EFRE) und mit Mitteln des Freistaates Sachsen gefördert.