1118c014.m Temperature Monitor GS70 (btmonitor_ssdhb)

Cell Specification Document Ver. 0.1

Note: Any functions and/or specifications not explicitly listed in this document are not guaranteed to be implemented in the circuit.

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Date	27th Apr 2011	

HISTORY

Version	Date	Author	Notes
Ver. 0.1	27th Apr 2011	Kartik Shenoy	1

NOTES:

1. Creation.

SUMMARY

1 Reference Documents

- http://www.india.ti.com/~gateway/products/gs70/docs/diffio/tmonitor_integration.pdf
- Maxim-IC – MAX1617A Data Sheet - http://pdfserv.maxim-ic.com/en/ds/MAX1617A.pdf

2 Glossary

3 Scope

The purpose of this document is to specify new macros needed for the GS70 library.

Any functions or specs not specifically listed in this document are not guaranteed to be in the circuit.

4 Purpose for Development

Several customers are using external chips to monitor and control the temperature in their systems. These designs require that ASICs have a diode that is accessible to their monitoring chips. One such monitoring chip is listed above (Maxim). TI needs to provide a macro that contains a diode designed to work with these specific vendors (and their families of monitoring chips) as well as others that might follow similar methods.

5 Operational Requirements

5.1 Truth table

N/A

5.2 Functionality

The macro is a PNP bipolar transistor. The padp port is the emitter (anode) and the padn port is the base (cathode). The collector terminal of the PNP is internally connected to the substrate (vss). A 1.8V supply is required to provide ESD protection for the input pads. A 3.3V/2.5V/1.5V/1V supplies may also be used, but care should be taken to ensure pad voltage doesn't exceed the supply voltage, as it could introduce a measurement error due to forward biasing of the ESD diodes in normal operation.

There are four varieties of the temperature monitor macro available to accommodate a variety of placement options:

btmonitor_ssdhb: ssd form factor IO (placed in the IO periphery)

5.2.1 Operational conditions and characteristics

Item #	Subject:	Requirement:
1	Process	1118C014.M (GS70)
2	Nominal IO power supply	3.3V/2.5V/1.8 V (recommended) / 1.5 V/1V
3	btmonitorg: Form Factor/ Size	300um x 80um (Y*X)
4	Vf @ 1uA	>0.25v
5	Vf @ 100uA	<0.95v
6	Input current (max)	+/-600uA[1]
7	Maximum padn/padp voltage	3.6V/2.8V/2V/1.65V/1.1V depending on the supply voltage.
8	Fail safe / non-fail safe (yes/no)	Non-failsafe
9	BIDI Requirements	None
10	Load [capacitive (pF) or transmission line (ohms)]	None

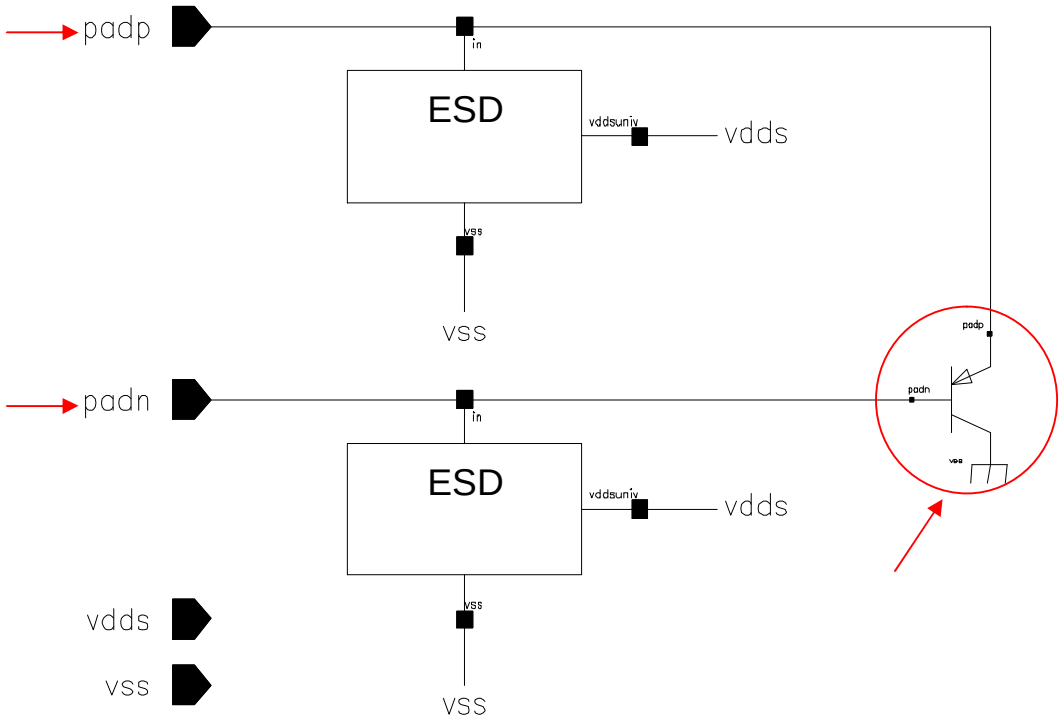
1 – DC EM limitation.

5.2.2 Operating Conditions

Item #	Subject:	Requirement:
1	Temperature range	-40° C to 125° C
2	Core Supply range (max/nom/min)	N/A
3	IO Supply Range (max/nom/min)	1.98V/1.8V/1.62V (recommended) 1.65V/1.5V/1.35V 2.75V/2.5V/2.35V 3.63V/3.3V/3V 1.1V/1V/0.9V
4	Load Description	N/A

6 Appendix

6.1 Schematic



Note: btmonitor_ssdhb are IO macros with 2 PAD connections: padn and padp

6.2 Ideality factor (n) as a function of PVT and bias current

IL=10uA, IH=100uA

Models	Actual Temp.[°C]	VBE @IL= 10uA	VBE @IH= 100uA	• VBE[mV]	Ideality (n)	Temp. meas[°C]	Temp. error[°C]
Weak	25	0.5958	0.6580	62.209	1.051	37.6	12.6
Nominal	25	0.5659	0.6265	60.556	1.023	29.3	4.3
Strong	25	0.5330	0.5918	58.766	0.992	20.4	-4.6

IL=1uA, IH=10uA

Models	Actual Temp.[°C]	VBE @IL= 1uA	VBE @IH= 10uA	• VBE[mV]	Ideality (n)	Temp. meas[°C]	Temp. error[°C]
Weak	25	0.5338	0.5958	62.012	1.047	36.6	11.6
Nominal	25	0.5056	0.5659	60.317	1.019	28.2	3.2
Strong	25	0.4745	0.5330	58.517	0.988	19.2	-5.8

IL=1uA, IH=200uA

Models	Actual Temp.[°C]	VBE @IL= 1uA	VBE @IH= 200uA	• VBE[mV]	Ideality (n)	Temp. meas[°C]	Temp. error[°C]
Weak	25	0.5338	0.6770	143.162	1.051	37.6	12.6
Nominal	25	0.5056	0.6449	139.320	1.023	29.3	4.3
Strong	25	0.4745	0.6097	135.191	0.992	20.3	-4.7

IL=20uA, IH=10uA

Models	Actual Temp.[°C]	VBE @IL= 20uA	VBE @IH= 10uA	• VBE[mV]	Ideality (n)	Temp. meas[°C]	Temp. error[°C]
Weak	25	0.6145	0.5958	-18.678	1.048	36.8	11.8
Nominal	25	0.5841	0.5659	-18.177	1.020	28.5	3.5
Strong	25	0.5507	0.5330	-17.638	0.990	19.5	-5.5

IL=20uA, IH=200uA

Models	Actual Temp.[°C]	VBE @IL= 20uA	VBE @IH= 200uA	• VBE[mV]	Ideality (n)	Temp. meas[°C]	Temp. error[°C]
Weak	25	0.6145	0.6770	62.47153	1.055	38.9	13.9
Nominal	25	0.5841	0.6449	60.82667	1.027	30.7	5.7
Strong	25	0.5507	0.6097	59.03564	0.997	21.8	-3.2

6.3 Effect of I-R drop on temperature sense diode performance

The resistance of the routes connected to padn and padp traces will further degrade the accuracy of the temperature sense diode. The total route resistance includes all package parasitic R as well as board traces.

Guideline:
Temperature error due to parasitic resistance on both padn and padp routes
= 0.8 to 2.0 degC/ohm

These values are from simulations using the min and max spec values given in the MAX1617A and ADM1032 datasheets. This is in addition to any error from ideality factors of both the local and remote temperature sense diodes.