Temperature Switch IC with Hysteresis
Monolithic IC MM3688

Outline

This IC is a temperature switch IC that changes the IC output level from Low to High when the temperature around the IC reaches the detection temperature. With the hysteresis function, IC output level returns to Low when the ambient temperature drops to the hysteresis temperature selected after detection. Detection temperature TDET can be selected in 1.0°C steps between the range of 60 to 90°C with rank expansion, with detection temperature accuracy of ±2.0°C.
Current consumption is less than 1/10 of our existing products at 0.12μA typ.

Features (Except where noted otherwise Topr=+25°C)

1. Detection temperature range.	+60~+90°C
2. Low current consumption.	0.12μA typ.
3. High Temperature accuracy.	±2.0°C
4. Low power supply operation range.	1.6~5.0V
5. Operating temperature range.	−40~+125°C
6. Hysteresis temperature	5°C steps (10, 15, 20, 25°C)

Package

PLP-4A

Applications

1. Smartphones, Cellular phones
2. Flat TVs
3. Game equipments
4. Tablets, PCs
5. System thermal monitor
6. OA equipments

Model Name

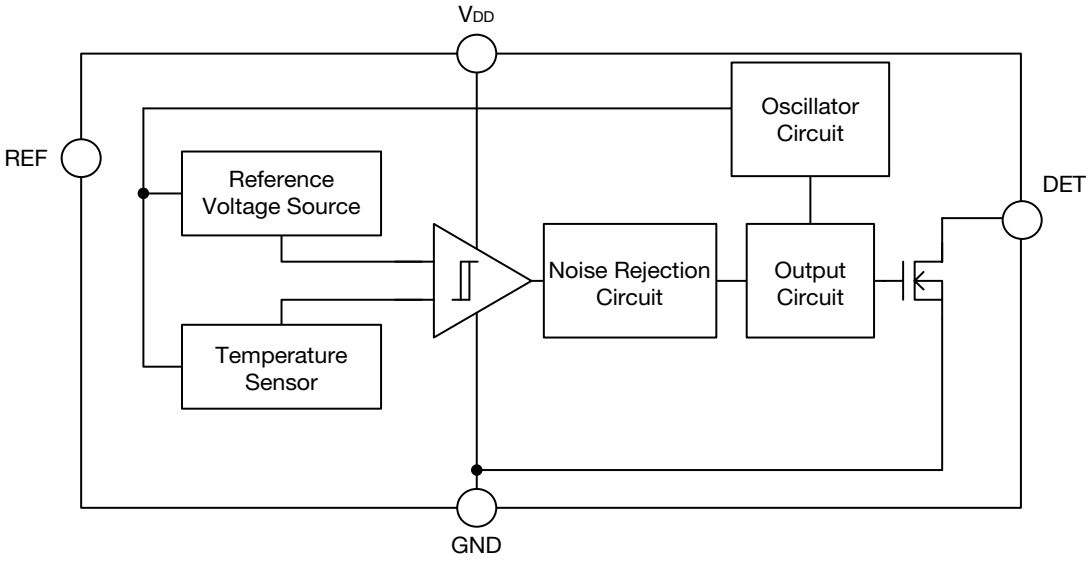
M M 3 6 8 8 × × × R R E

1 2 3 4

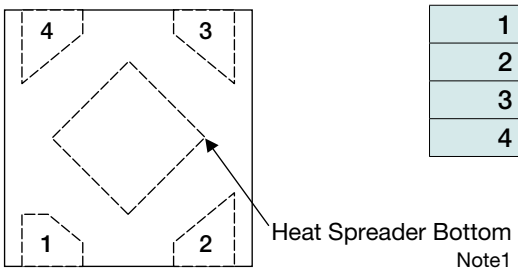
1		2	
Hysteresis Temperature (THYS)		Detecitng Temperature (TDET)	
B	THYS=10°C	60	TDET=60°C
C	THYS=15°C	~	TDET is 1.0°C steps
D	THYS=20°C		
E	THYS=25°C	90	TDET=90°C

3		4	
Package		Packing Specifications	
R	PLP-4A	R	R HOUSING (PLP-4A Standard)
		L	L HOUSING

Block Diagram



Pin Assignment

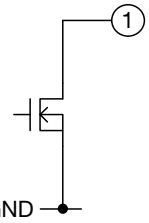
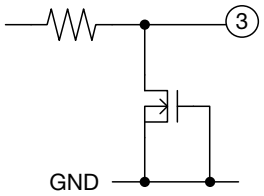


PLP-4A
(TOP VIEW)

1	DET
2	GND
3	REF
4	VDD

Note1 : The tab on the center of the bottom face is connected to the IC substrate inside the package. To use the device, it should be shorted to GND or OPEN.

Pin Description

Pin No.	Pin Name	Function	Internal Equivalent Circuit
1	DET	Temp. Detect Output Pin	
2	GND	Ground pin	
3	REF(Note2)	REF pin	
4	V_{DD}	Power supply pin	

Note2 : REF pin is connected with the internal circuit because it use for testing.
When REF pin is connected with resistance and capacity, this product produce improper operating signals. Please set REF pin to the open state.

Absolute Maximum Ratings

Item	Symbol	Ratings	Units
Supply voltage	V_{DD}	−0.3~6.0	V
Terminal voltage	DET_{max}	−0.3~6.0	V
Junction temperature	T_{jMAX}	150	°C
Storage temperature	T_{stg}	−55~125	°C
Power dissipation	Pd	400 (Note3)	mW

Note3 : With PC Board of glass epoxy (60 × 40 × 1.6^{t}mm)

Recommended Operating Conditions

Item	Symbol	Ratings	Units
Operating ambient temperature	T_{opr}	−40~125	°C
Operating supply voltage	V_{op}	1.6~5.0	V

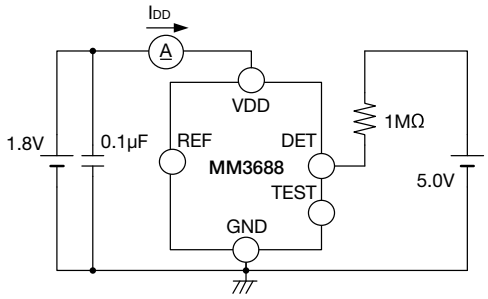
Electrical Characteristics (Except where noted otherwise Ta=25°C, VDD=1.8V)

Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units
Operating supply voltage	V_{op}	TDET=60~90°C	1.6	1.8	5.0	V
Detecting temperature accuracy (Note4)	T_{DETAC}		-2.0		2.0	°C
Hysteresis temperature	T_{HYS}	THYS=10°C		10.0		°C
		THYS=15°C		15.0		
		THYS=20°C		20.0		
		THYS=25°C		25.0		
Supply current	I_{DD}			0.12	0.30	µA
DET sink current	I_{DETL}	VDET=0.4V, VDET=Low Level	4	12		mA
DET leak current	I_{LEAK}	VDET=5.0V, VDET=High Level			0.1	µA
Interval timer	t_{int}			50		ms
VDD start-up response time	t_{VSR}	RPULL-UP=1M		100	500	µs

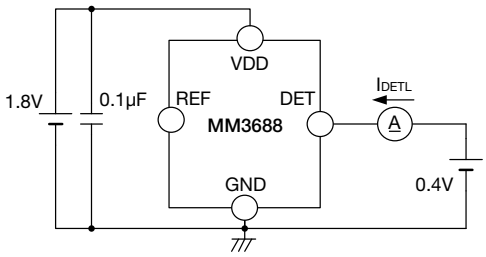
Note4 : Detection temperature can be selected in 1.0°C steps (60~90°C).

Measuring Circuit

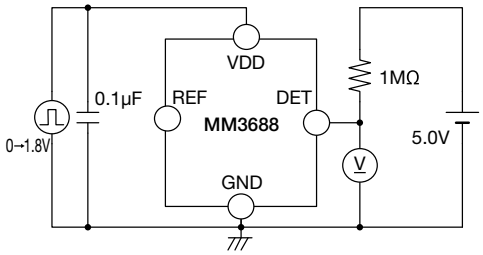
1. Supply Current



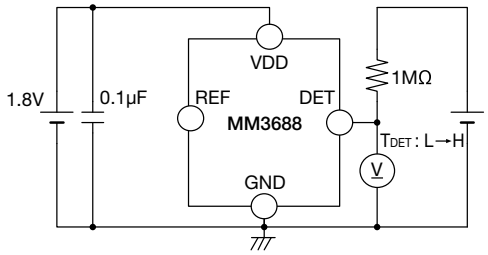
2. DET Sink Current
State of DET output Low level



3. Start-up Response

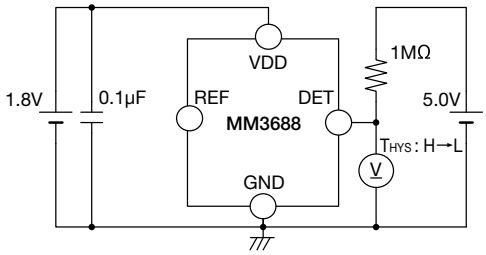


4. Detecting Temperature



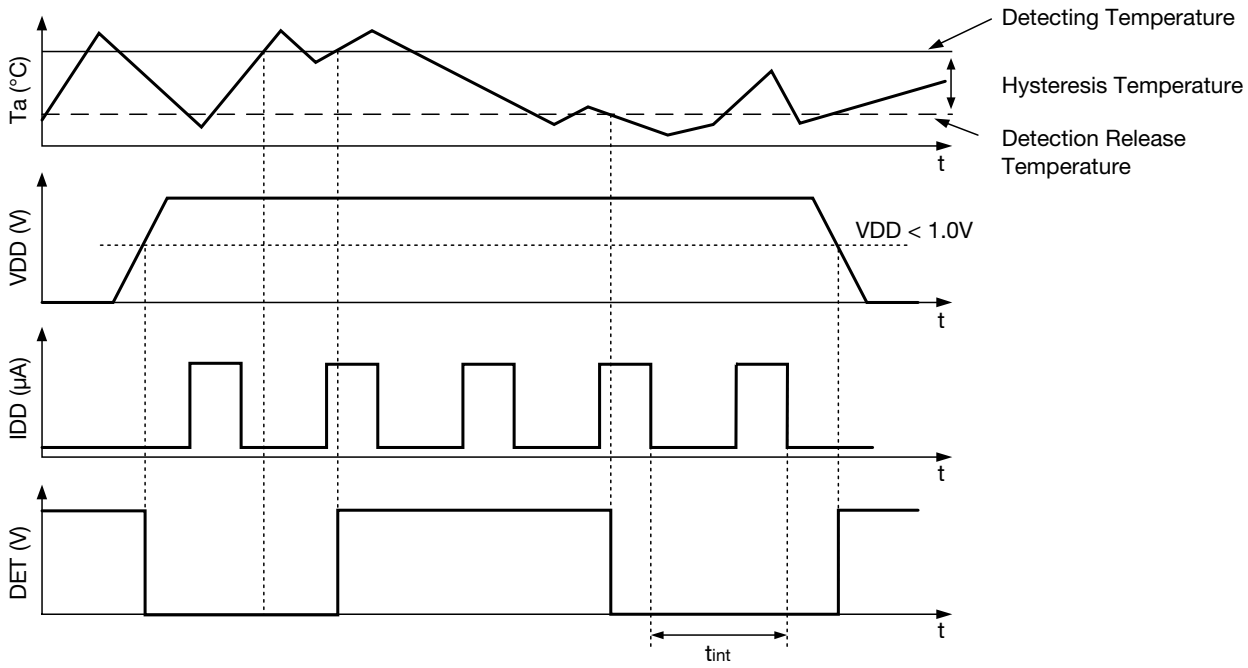
L : State of DET output Low level
H : State of DET output High level
Ta = +40→100°C

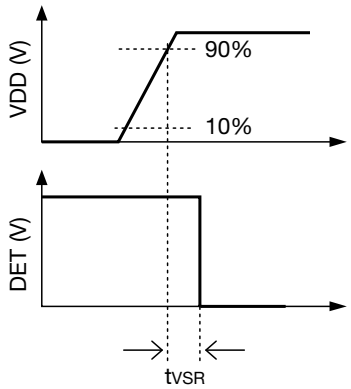
5. Hysteresis Temperature



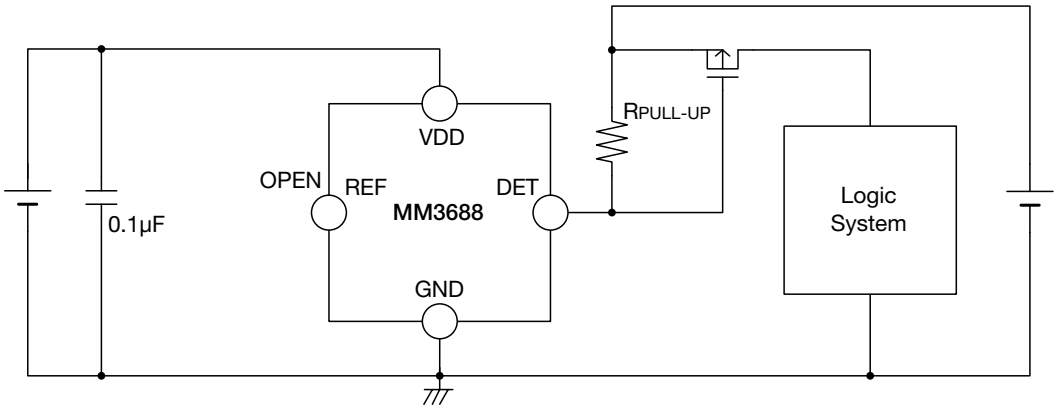
L : State of DET output Low level
H : State of DET output High level
Ta = +100→40°C

Timing Chart





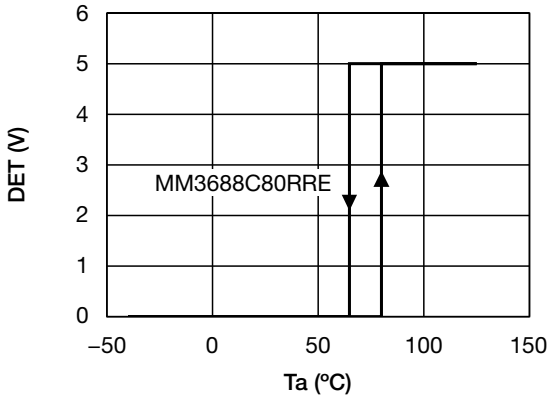
Typical Application Circuit



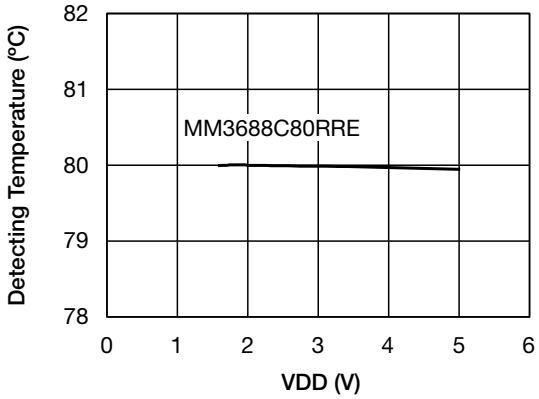
· We shall not be liable for any trouble or damage caused by using this circuit.
· In the event a problem which may affect industrial property or any other rights of us or a third party is encountered during the use of information described in these circuit, Mitsumi Electric Co., Ltd. shall not be liable for any such problem, nor grant a license therefore.

Typical Characteristics (Except where noted otherwise Ta=25°C, VDD=1.8V)

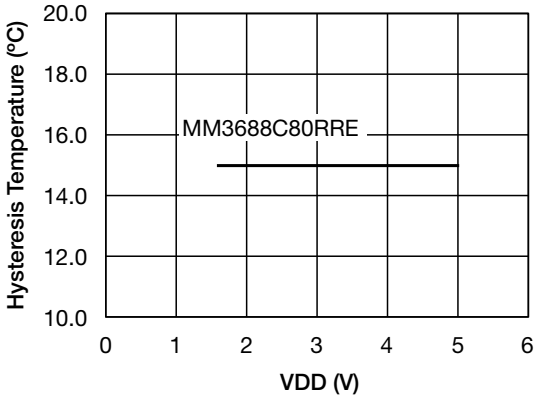
Ambient temperature - Supply current



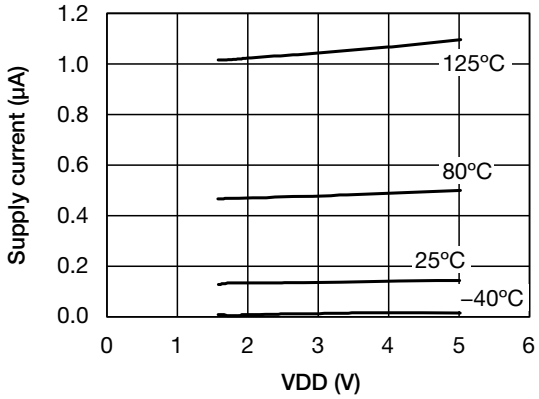
Supply voltage - Detecting temperature



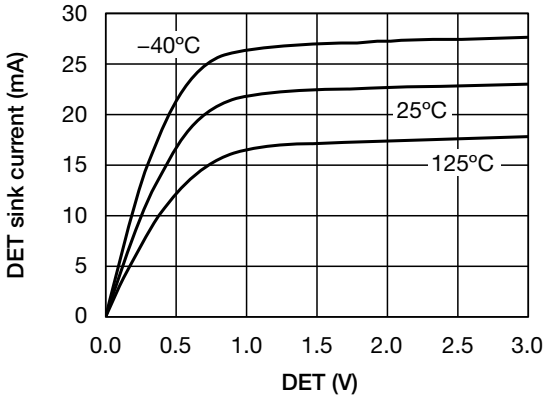
Supply voltage - Hysteresis temperature



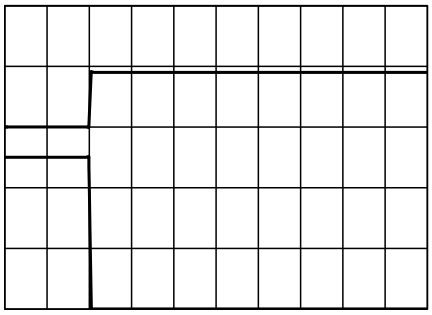
Supply voltage - Supply current



Supply voltage - DET sink current

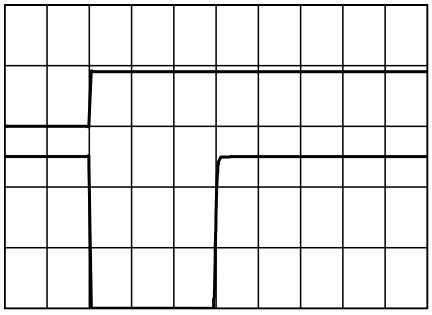


Start-up response (Ta＜TDET)



t (5ms/div)

Start-up response (Ta≧TDET)



t (5ms/div)

Supply voltage – Interval timer