

M61016F

BUILT-IN 2-CHANNEL SPD SENSOR DETECT AMOUNT OF LIGHT

DESCRIPTION

The M61016F is a semiconductor integrated circuit designed to detect quantity of light and used for cameras and illuminometers. Because a high-sensitivity SPD sensor is built in this IC, it is possible not only to reduce the space and expenses to mount it but also to conduct wide-ranging detection of light volume.

FEATURES

- A 2-channel SPD sensor is built in.(1-channel for spot and one for average)
- Wide-ranging detection of light volume.
- One output pin (thermometer output and photometry output)
- Small-sized transparent molded plastic package.

APPLICATION

Automatic exposure control for cameras,illuminometers.

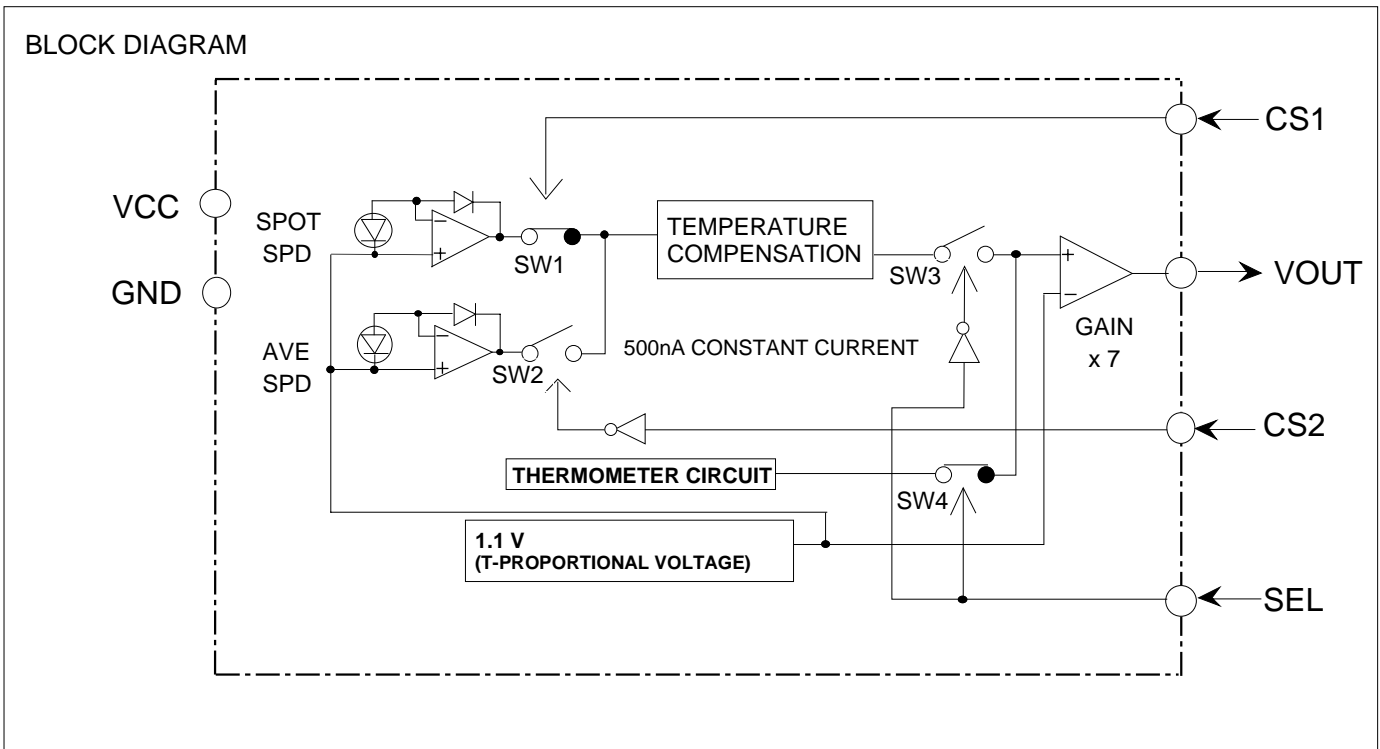
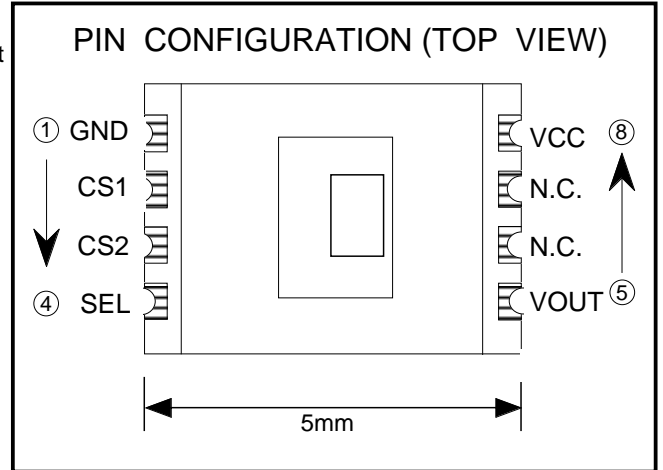
RECOMMENDED OPERATING CONDITION

Supply voltage range 4.0 to 6.5V

Rated supply voltage 5V

* Light input range SPOT 2 to 100000 lux
 AVE 0.125 to 12500 lux

* Decide after confirmation of real power



ABSOLUTE MAXIMUM RATINGS (Ta=25°C, unless otherwise noted)

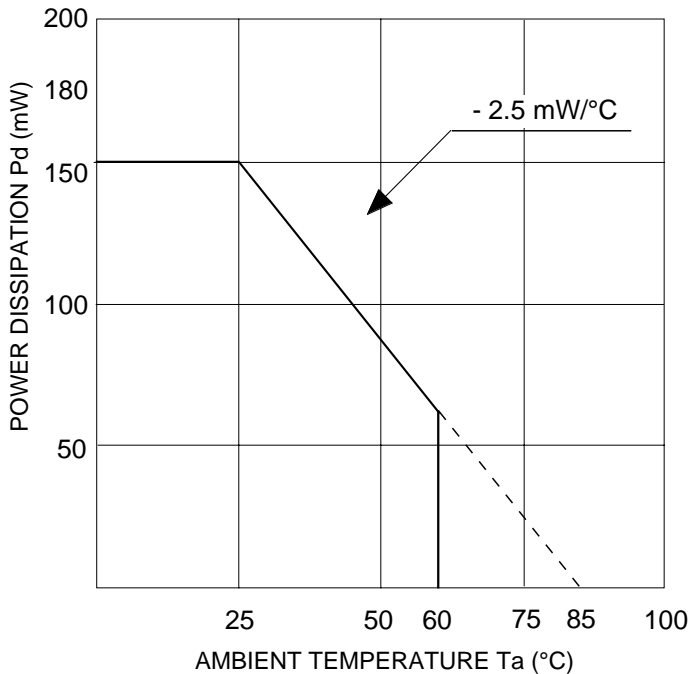
Symbol	Parameter	Conditions	Ratings	Unit
VCC	Supply voltage		-0.3 to 7.0	V
Pd	Power dissipation		150	mW
VIN	Input voltage		-0.3 to VCC+0.3	V
IO(max)	Output current	Pin VOUT	0.2	mA
Topr	Operating temperature		-10 to 50	°C
Tstg	Storage temperature		-30 to 85	°C
Kθ	Thermal derating		-2.5	mW/°C

RECOMMENDED OPERATING CONDITION (Ta=25°C, unless otherwise noted)

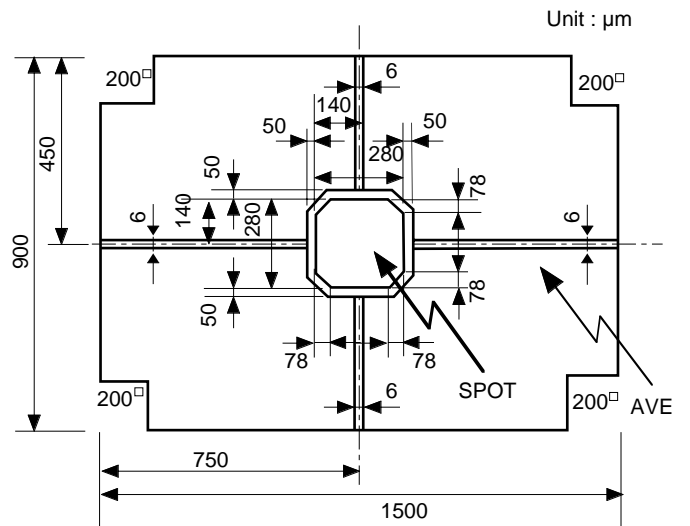
Symbol	Parameter	Test Conditions	Limits			Unit
			Min	Typ	Max	
VCC	Supply voltage		4.0	5.0	6.5	V
* Lopr1	Operating illuminance " SP "	2 to 100000				lux
* Lopr2	Operating illuminance " AVE "	0.125 to 12500				lux

* Decide after confirmation of real power

THERMAL DERATING (MAXIMUM RATING)



SENSOR FORM



Area ratio
SPOT : AVE = 1 : 16

BUILT-IN 2-CHANNEL SPD SENSOR DETECT AMOUNT OF LIGHT

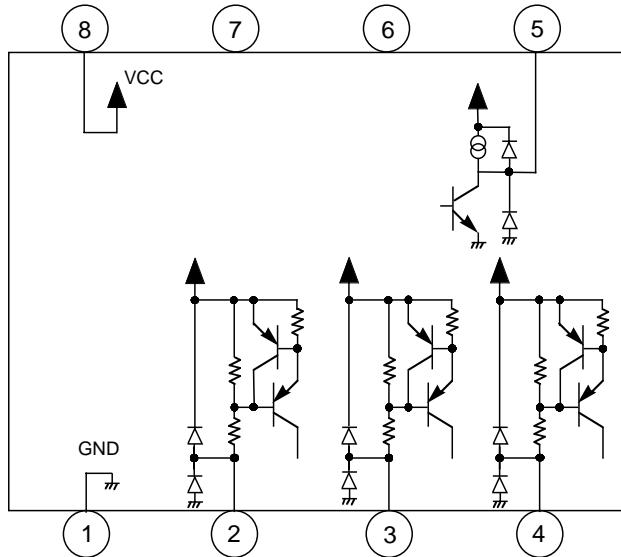
ELECTRICAL CHARACTERISTICS

(Ta=25°C, light source 4500°K, illuminance: measured after transmitting products through CM 500 filter, unless otherwise noted)

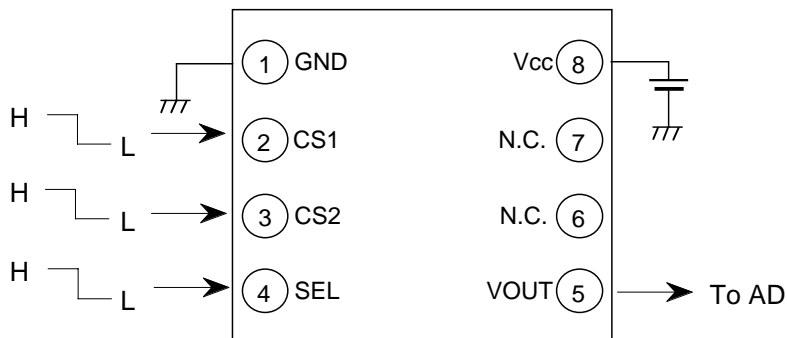
Block	Symbol	Parameter	Test Conditions	Limits			Unit
				Min	Typ	Max	
	ICC	Circuit current	illuminance: 200 lux	-	4	6	mA
I / F	VTHCS1	Threshold voltage 1	CS1 input pin	VCC-2.2	VCC-1.5	VCC-0.8	V
	CS1I	Ground current 1	Current of between CS1pin to GND VCC = 5V	-150	-50	-16	μA
	VTHCS2	Threshold voltage 2	CS2 input pin	VCC-2.2	VCC-1.5	VCC-0.8	V
	CS2I	Ground current 2	Current of between CS2pin to GND VCC = 5V	-150	-50	-16	μA
	VHSEL	Threshold voltage 3	SEL input pin	VCC-2.2	VCC-1.5	VCC-0.8	V
	SELI	Ground current 3	Current of between SELpin to GND VCC = 5V	-150	-50	-16	μA
Thermo -meter	VTE	Absolute value of thermometer output		960	1200	1440	mV
	dVTE1	Thermometer supply voltage variance 1	Output voltage variance at VCC=5V+1V	-45	-	45	
	dVTE2	Thermometer supply voltage variance 2	Output voltage variance at VCC=5V-1V	-45	-	45	
	dVTE3	Thermometer output voltage load variance	Load current : - 0.2mA	-20	-	20	
	dVTE4	Variance of thermometer output		-24.3	-22.1	-19.9	mV/°C
SPOT	VOS	Absolute value of photometry output	SP side , illuminance 8 lux	2120	2440	2760	mV
	dVOS1	Photometry output supply voltage variance 1	SP side ,Output voltage variance at VCC=5V+1V	-45	-	45	
	dVOS2	Photometry output supply voltage variance 2	SP side ,Output voltage variance at VCC=5V-1V	-45	-	45	
	dEVS1	Variance per level (1EV)	SP side ,Variance when illuminance changes from 8 to 32	-134	-125	-116	EV
	dEVS2	Photometry output linearity 1	SP side ,illuminance 4 to * lux	-0.3	-	0.3	
	dEVS3	Photometry output linearity 2	SP side ,illuminance 2 to 4 lux	-0.5	-	0.5	
AVE	VOA	Absolute value of photometry output	AVE side ,illuminance 8 lux	1680	1940	2200	mV
	dVOA1	Photometry output supply voltage variance 1	AVE side ,Output voltage variance at VCC=5V+1V	-45	-	45	
	dVOA2	Photometry output supply voltage variance 2	AVE side ,Output voltage variance at VCC=5V-1V	-45	-	45	
	dEVA1	Variance per level (1EV)	AVE side ,Variance when illuminance changes from 8 to 32	-134	-125	-116	EV
	dEVA2	Photometry output linearity 1	AVE side ,illuminance 0.25 to * lux	-0.3	-	0.3	
	dEVA3	Photometry output linearity 2	AVE side ,illuminance 0.125 to 0.25 lux	-0.5	-	0.5	
Response	trs	Power supply response 1	SP side , illuminance 2 lux	-	5	20	ms
	tra	Power supply response 2	AVE side , illuminance 0.5 lux	-	20	50	
	trc1	Switching response 1	SP→AVE , illuminance 0.125 to 12500 lux	-	10	3000	μS
	trc2	Switching response 2	AVE→SP , illuminance 2 to 100000 lux	-	10	3000	

* Decide after confirmation of real power

I/O SYSTEM

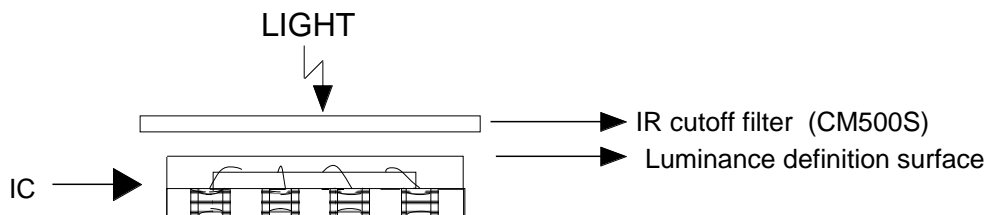


EXAMPLE



Light condition at electric characteristics

IR cutoff filter : CM500S(Glass filter)
 Light source color temperature : 4500°K



PIN EXPLANATION

Input Pin 2PIN : CS1pin
 3PIN : CS2pin
 Photo sensor ,AVE and SPOT is switched by CS1,2.
 4PIN : SELpin
 Photometry output and thermometer output is switched.

Switching Function

Input			Select output	
CS1 (2PIN)	CS2 (3PIN)	SEL (4PIN)	VOUT (5PIN)	
H	H	H	Thermometer output	
L	H	H		
H	L	H		
L	L	H		
H	H	L	SPOT	Photometry output
L	H	L	Prohibition of inputting	
H	L	L		
L	L	L	AVE	

note : Prohibiting to select SPOT and AVE at once

VOUTpin / output switching thermometer output and photometry output voltage.

Thermometer output Thermometer output voltage 1200mV (at 25°C TYP)

Photometry output Variance of 1EV = - 125mVTYP (Variance when illuminance is two times and half times)

$$VOUT = \text{gain} * \{ (VT * \ln(Is \text{ cancel} / ISP D)) + VK \} \dots\dots (At \text{ photometry output mode})$$

$$VOUT = \text{gain} * \{ Vin - (273 + Ta) / 298 * VK \} \dots\dots (At \text{ thermometer output mode})$$

$$VK = 1100mV \text{ (VK amp.output voltage / Absolute temperature proportional)}$$

$$Vin = 1150mV \dots\dots (Absolute \text{ temperature constant})$$

$$VT = 25.7mV \text{ at } 25^\circ C \dots\dots (Absolute \text{ temperature proportional})$$

$$Is \text{ cancel} = 500nA$$

$$\text{gain} = x 7$$

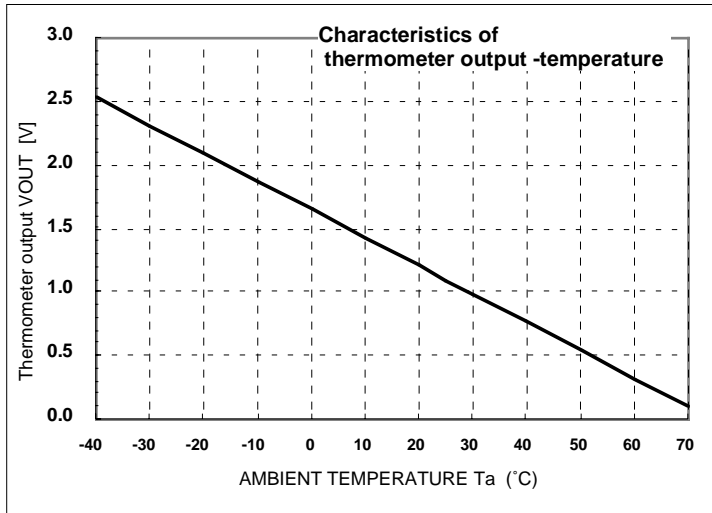
$$ISP D = \text{Sensor current} = 55nA/mm^2 \text{ at } 100 \text{ lux (At equipping with IR filter)}$$

$$1EV = -125mV$$

$$Ta = \text{Ambient temperature } (^{\circ}C)$$

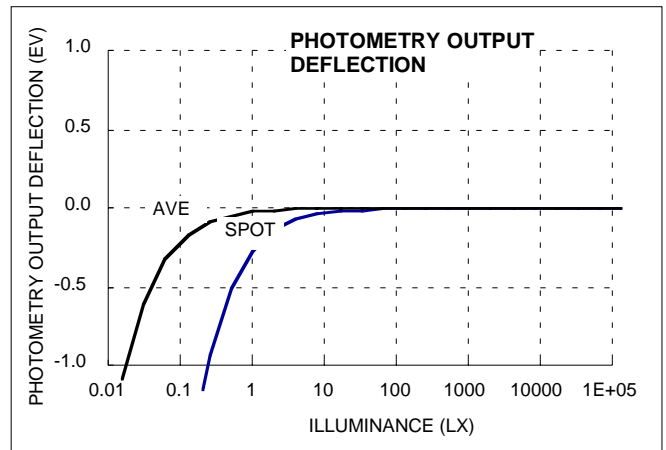
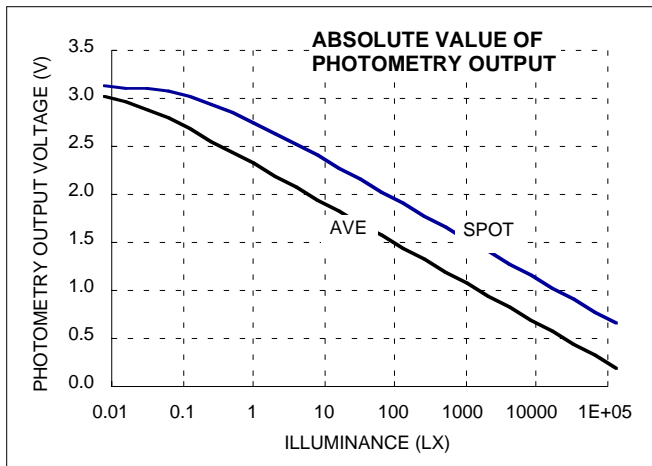
OUTPUT CHARACTERISTICS

THERMOMETER OUTPUT MODE



Absolute value
 $V_{out}=1.2V$ (at $T_a=25^{\circ}C$)
Slope
 $-22\text{ mV}/^{\circ}C$

PHOTOMETRY OUTPUT MODE



PHOTOMETRY OUTPUT VOLTAGE

- Photometry output voltage is proportioned to absolute temperature.
- Photometry output voltage is converted into 25°C.
- Ambient temperature : Ta (°K) Photometry output voltage at ambient temperature: set VO

Conversion formula

$$\text{Photometry output voltage of conversion at } 25^{\circ}\text{C} = \frac{V_o}{T_a} \times 298^{\circ}\text{K}$$

Conversion error range $\pm 0.4\text{EV}$ (-15 to 40°C)

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