Linear LED Driver IC

DESCRIPTION

The LED CHIP ISP7000 is an adjustable current source with accurate temperature compensation. The device is designed to provide a constant current source determined by an external sense resistor RSEN. The current is adjustable from 10mA to 150mA with less than 3% error while input changes from 3V to 24V. Also, External resistor RSEN gives users flexibility in controlling the light intensity of LEDs. The integrated EN input of the ISP7000 permits LED brightness regulation by pulse width modulation (PWM).

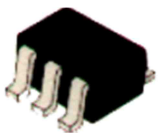
FEATURES

- Constant output current to supply and load voltage change.
- 3V to 24V supply voltage
- Up to 150mA adjustable regulated output current
- Available PWM dimming control
- Output current adjusted through an external resistor
- Smaller Surface-Mount SOT-25 (SOT23-5L) Package

Applications

- Backlighting LED Drive.
- Accent lighting
- Industrial Lamp Indicators
- Constant current source
- Automotive lighting

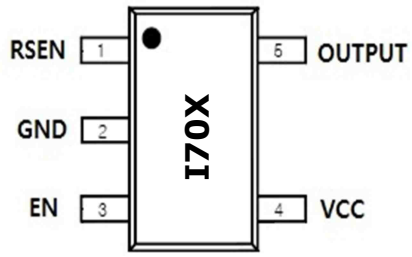
Package Information



(SOT-25)

Package	Size
SOT-25 or SOT23-5L	2.9 x1.6x 1.1(mm)

Pin Connection & Description



(SOT-25)

PIN NO	SYMBOL	DESCRIPTION
1	RSEN	Output current set input.
2	GND	Ground
3	EN	Disable On/Off /Dimming control.
4	VCC	Power Supply Voltage
5	OUTPUT	Collector Output

Ordering Information

Part No	Package	Packing	Finish	Halogen	Packing Unit	Remark
ISP7000S5	SOT-25	Tape & Reel	Sn	Free	3,000	

Maximum Ratings

Characteristic	Symbol	Rating	Units
Power Supply Voltage	$V_{CC(MAX)}$	25	V
Output Voltage	$V_{OUT(MAX)}$	25	V
Output Sink Current	$I_{OUT(MAX)}$	150	mA
Power Dissipation	Pd*	0.5	W
Junction Temperature	TJ	150	°C
Operating Temperature Range	Topr	-40 ~ 85	°C
Storage Temperature Range	Tstg	-50 ~ 150	°C

*Mounted on a glass epoxy circuit board of 30x30mm Pad dimension of 50mm^2

Recommended operating conditions

Characteristic	Symbol	Rating		Units
		Min.	Max.	
Power Supply Voltage	$V_{CC(MAX)}$	3	24	V
Output Voltage	$V_{OUT(MAX)}$	1.5	Vcc	V
Output Sink Current	$I_{OUT(MAX)}$	-	100	mA
Shut Down Voltage	SHDN	-0.3	Vcc	V
Dimming Frequency (SHDN)	F_{DIM}	-	10	KHz

Electrical Characteristics

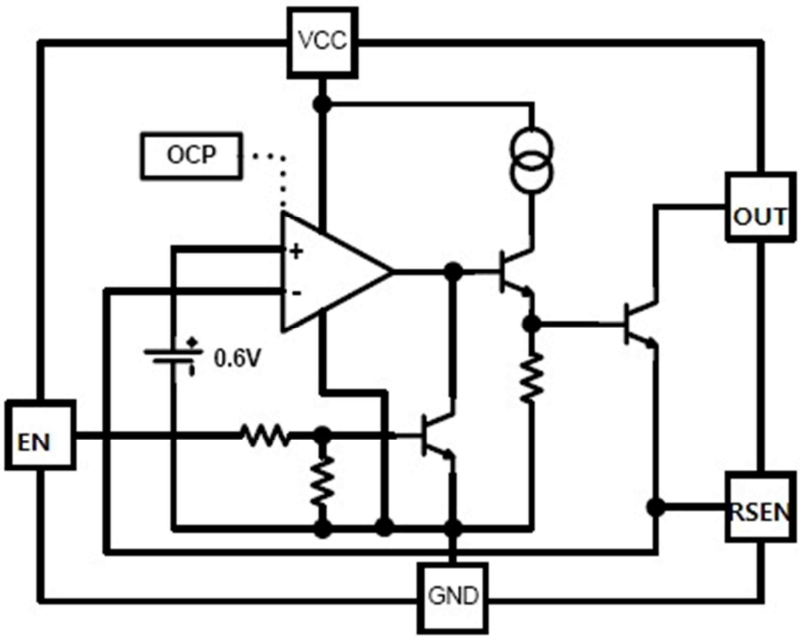
Test Conditions : Ta = 25°C, unless otherwise specified

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Supply Current 1	I_{Q1}	VCC=5V, Iout=10mA, Vout=open	-	2.0	3.0	mA
Supply Current 2	I_{Q2}	VCC=22V, Iout=10mA,Vout=open	-	2.5	3.5	mA
Line Regulation	$\triangle V_{LINE}$	VCC=3V~22V, Iout=10mA	-	3	10	mV
Load Regulation	$\triangle V_{LOAD}$	VCC=5V, Iout=1mA~100mA	-	2	10	mV
Vo Leak Current	Ileak	Vcc=5V, Vout=22V	-	0.1	1	uA
Rsen Voltage	V_{SEN}	VCC=5V, Iout=10mA	586	600	614	mV
Dropout Voltage	V_{DROP}	VCC=5V, Iout=100mA	-	0.8	1.5	V
EN Voltage On	Vdis on	VCC=5V, Iout=10mA, Vout=Vcc	1.5	-	-	V
EN Voltage Off	Vdis off	VCC=5V, Iout=10mA, Vout=Vcc	-	-	0.5	V
EN Pin Current	Idis	Vcc=5V, SHDN=5V	230	430	630	uA
Short Circuit Current	I_{SC}	RSEN=0Ω	-	250	-	mA
Dimming Frequency	Fdim		-	-	10	Khz

Notes

1. These parameters, although guaranteed, are not 100% tested in production.
2. Junction -to -case thermal resistance test environments.
   -. Pneumatic heat sink fixture.
   -. Thermal grease applied between PKG and heat sink fixture.
3. Calculation for R_{SEN} / Vdrop
   - R_S = 0.6V / I_{LED}
   - Vdrop = VCC – V_{LED}

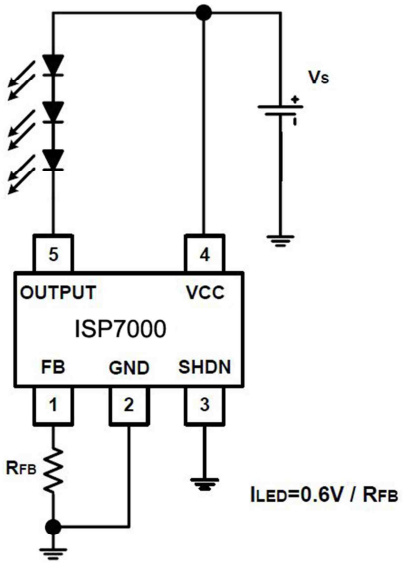
Internal Block Diagram



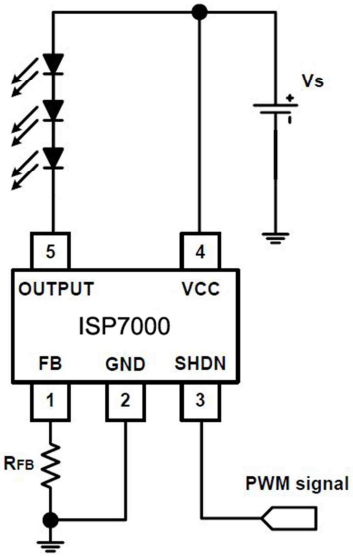
Internal Block Diagram

1) Calculation for R_{FB}
- R_{FB} = 0.6V / I_{LED}
2) Calculation for Vdrop
- Vdrop = V_{CC} – V_{LED}
3) Calculation for Power Dissipation on the ISP7000
-P_{D1} = (Vdrop – V_{FB}) x I_{LED}
-P_{D2} = V_{CC} x I_Q
-$P_{D(total)}$ = P_{D1} + P_{D2}
4) If does not use an Dimming function, connect SHDN Pin with the ground.

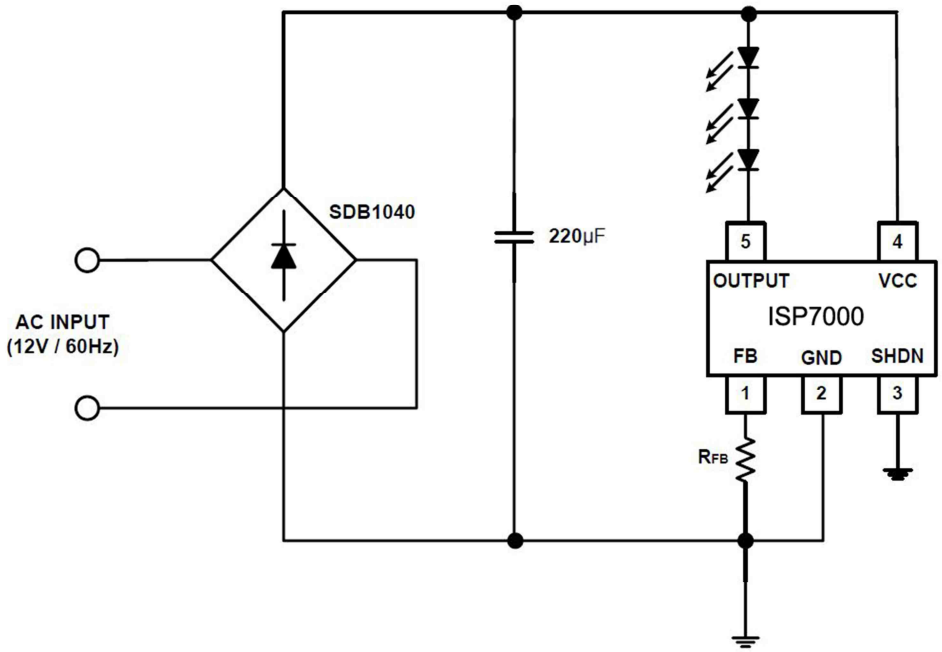
Typical Applications



<APP1. Constant Current LED Driver Circuit>

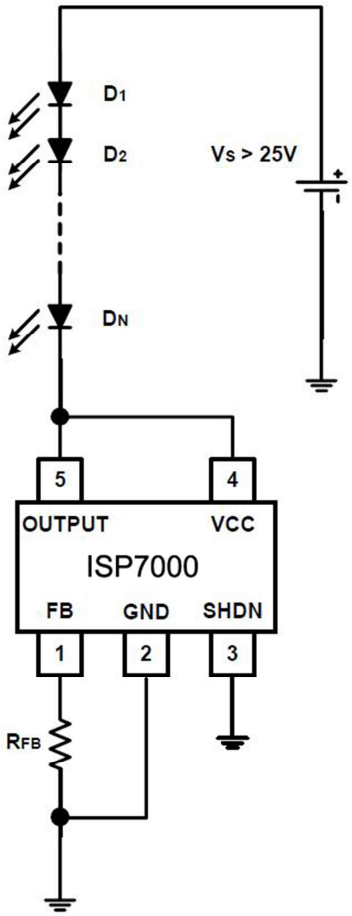


<APP2. PWM Dimming LED Driver Circuit>

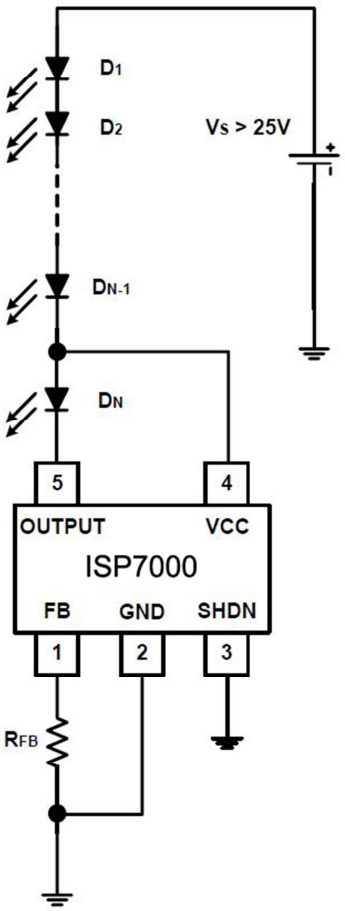


<APP3. V_{AC} Landscape Lighting Application Circuit>

Typical Applications



<APP4. High Voltage Operation of ISP7000 (1) >

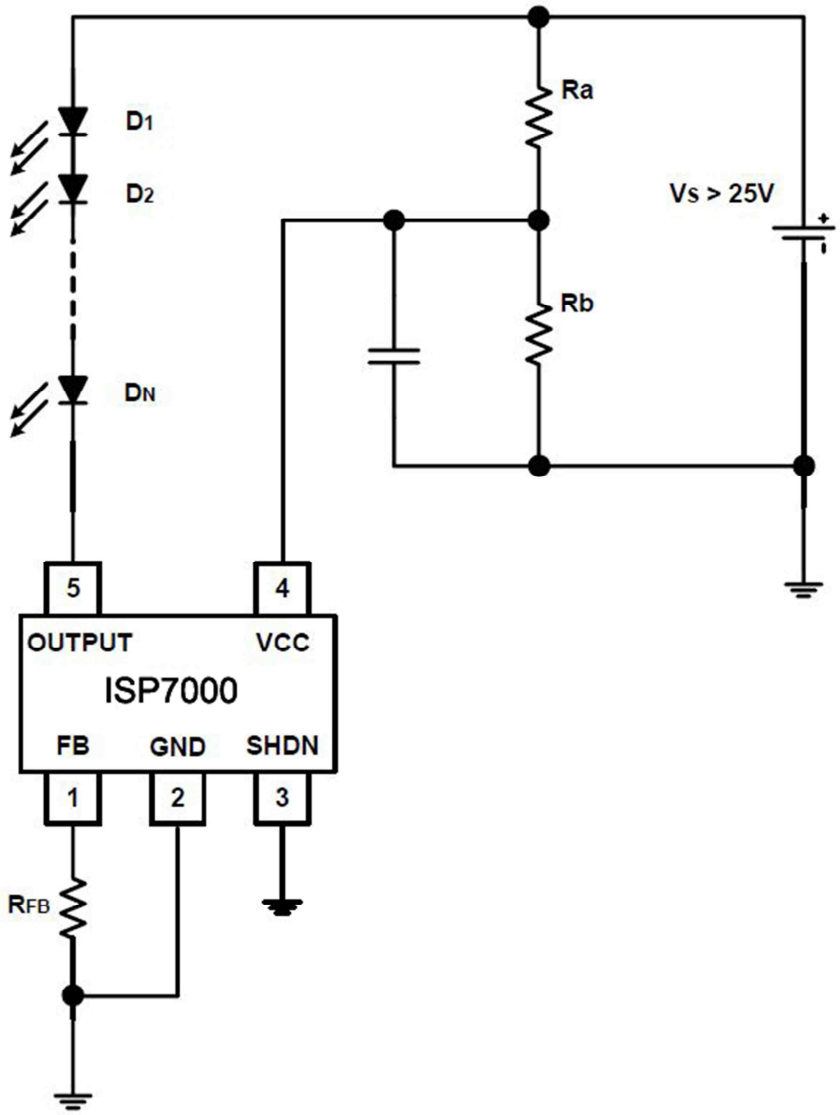


<APP5. High Voltage Operation of ISP7000 (2) >

For operation in excess of ISP7000 specified maximum voltage (V_{CC} & V_{OUT}) of 25V, one way is to connect a sufficient number of LEDs between the power supply voltage and the DC input of the V_{CC}&V_{OUT} (pin 4, 5) such that the voltage seen at pin 4, 5 is less than 25V.
That is to say, use additional LEDs to drop the voltage fed to the ISP7000 below its maximum rating, in the usual way. Refer to **APP4,5** Note that the exact number of diodes required will depend on the supply voltage V_{CC} and output voltage V_{OUT} ,the voltage drops across the particular LEDs being used. (Red, Blue and White LEDs have different forward voltage drop.)
Use enought LEDs such that voltage at pin4,5 of ISP7000 is < 25V

※ Attention : When V_S uses to exceed 25V, Dimming functions the use is impossible.

Typical Applications



<APP6. Power Supply Where Separates Operation of ISP7000 >

Electrical Characteristic Curves

Fig.1 V_{FB} vs T_A

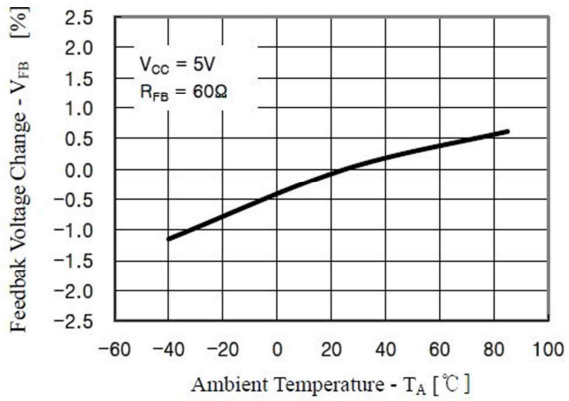


Fig.2 Line Regulation vs T_A

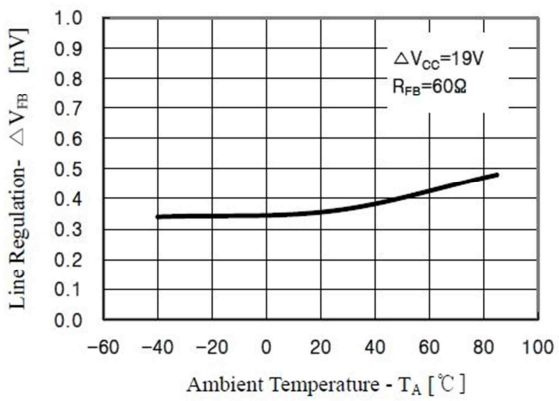


Fig.3 Load Regulation vs T_A

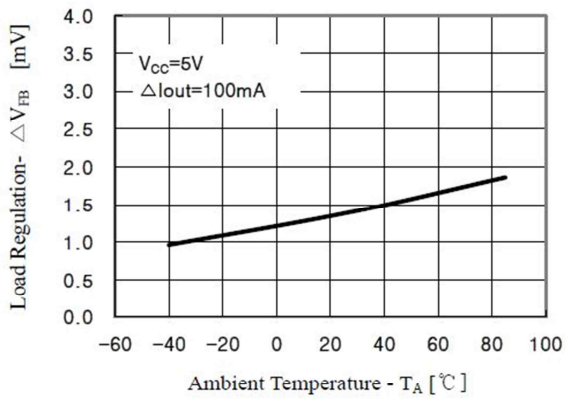


Fig.4 Quiescent Current vs T_A

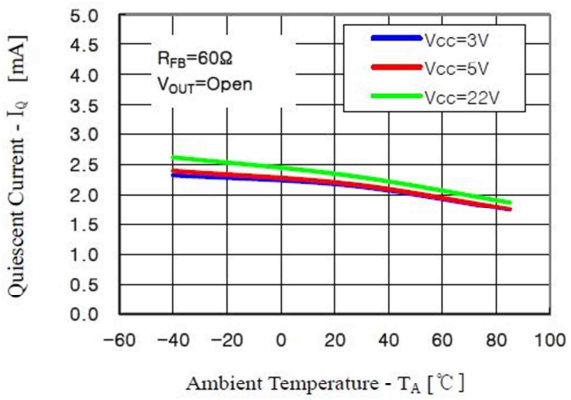


Fig.5 Dropout Voltage vs T_A

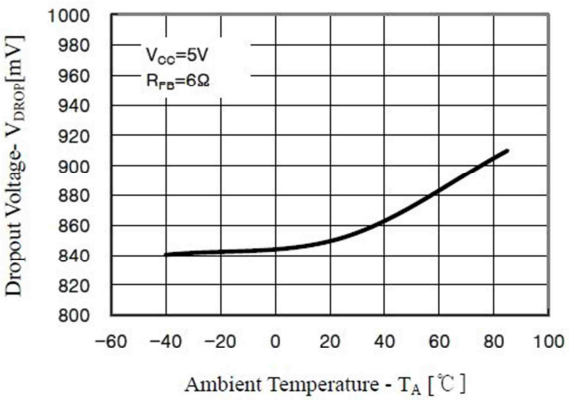
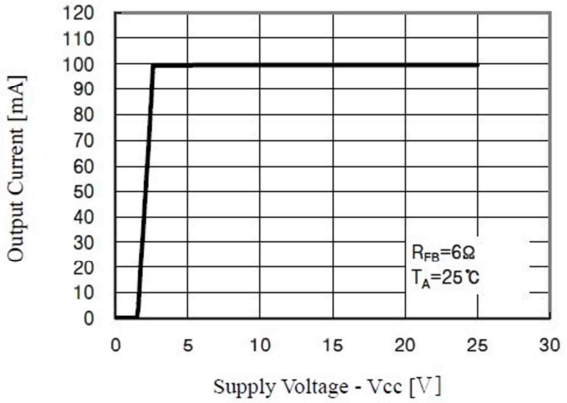
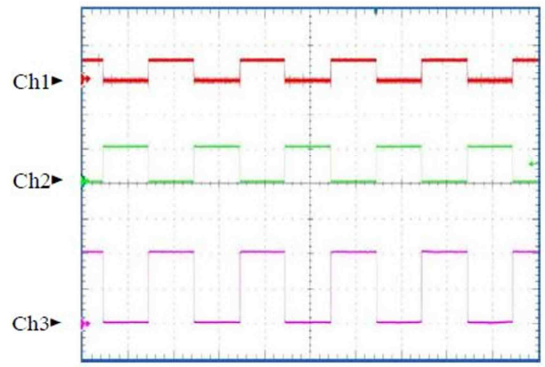


Fig.6 Output Current vs Supply Voltage



Electrical Characteristic Curves

Fig.7 Dimming Waveform

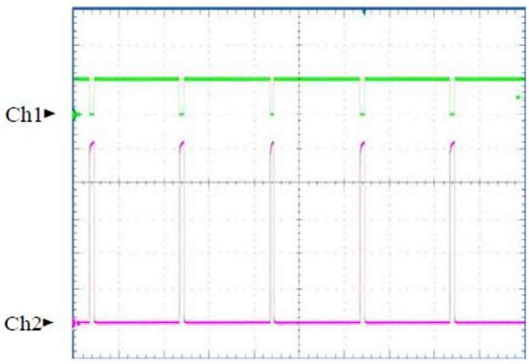


Ch1 : V_{FB}, 1V/Div

Ch2 : SHDN, 5V/Div

Ch3 : I_{OUT}, 5mA/Div

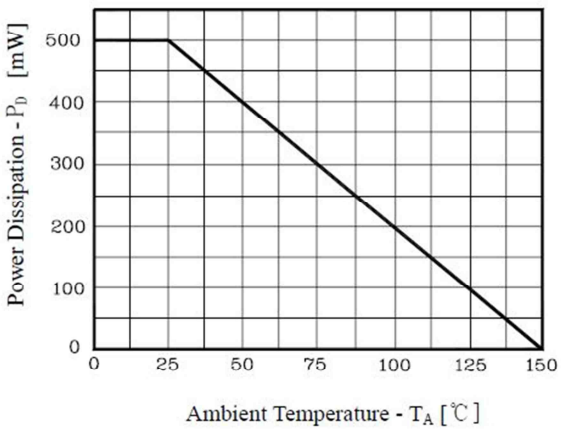
Fig.8 Short Circuit Current



Ch1 : SHDN, 5V/Div

Ch2 : I_{OUT}, 50mA/Div

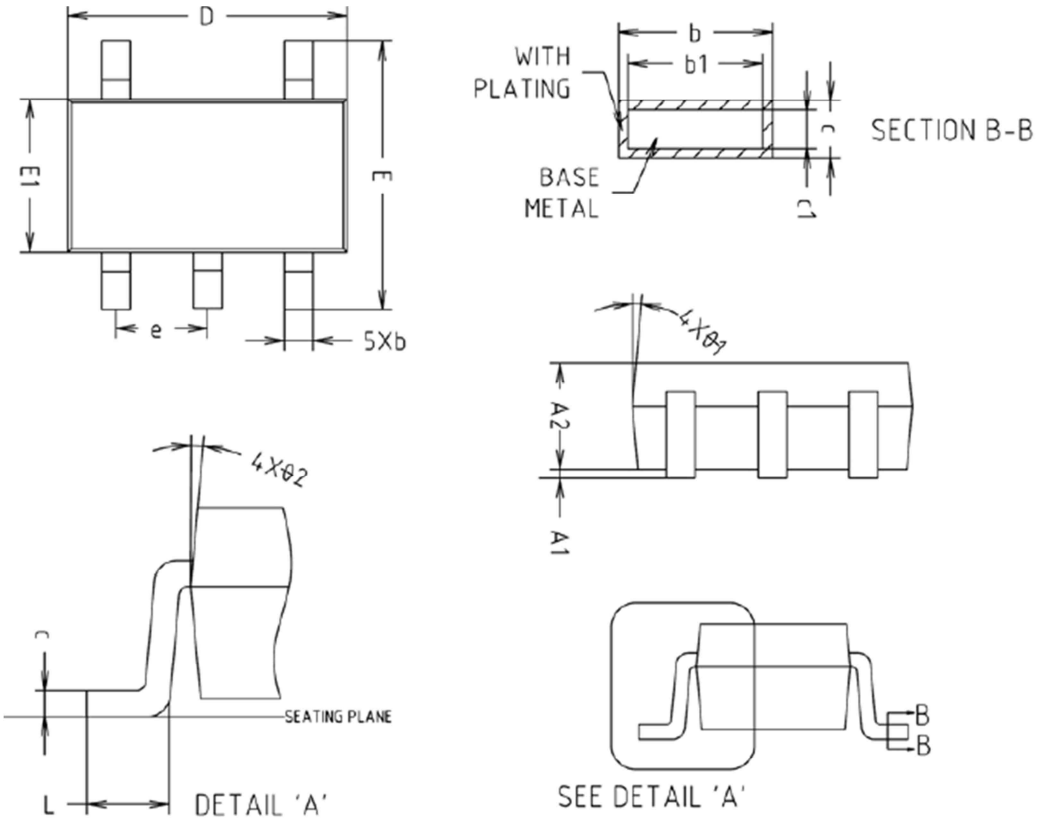
Fig.9 Power Dissipation vs T_A



Package Dimension

(SOT-25)

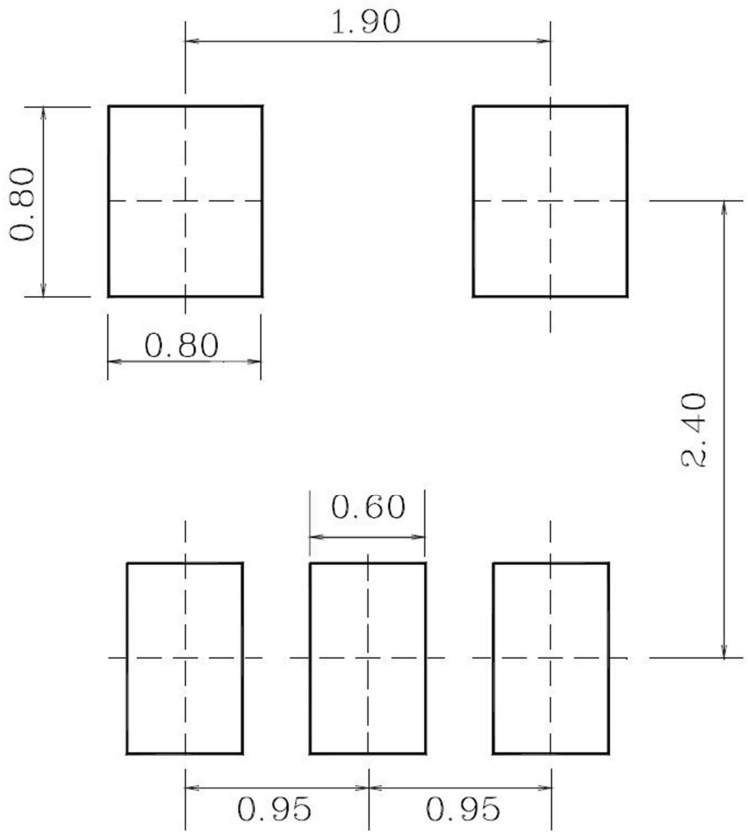
Unit : mm



SYMBOL	MILLIMETERS			NOTE
	MINIMUM	NOMINAL	MAXIMUM	
A1	0.000	0.050	0.100	
A2	1.000	1.100	1.200	
b	-	0.400	0.450	
b1	-	0.375	0.425	
c	0.110	0.150	0.190	
c1	0.085	0.125	0.165	
D	2.800	2.900	3.000	
E	2.600	2.800	3.000	
E1	1.500	1.600	1.700	
e	0.930	0.950	0.970	
L	0.400	-	-	
θ1	5° REF			
θ2	5° REF			

Recommend PCB solder land

Unit : mm



Revision History

No	Date	Contents
1	2015-01-30	Initial Brief Datasheet Release

http://www.apsemi.com

IMPORTANT NOTICE

AP Semiconductor co, Ltd reserves the right to make changes without further notice to any products or specifications herein. AP Semiconductor co, Ltd does not assume any responsibility for use of any its products for any particular purpose, nor does AP Semiconductor co, Ltd assume any liability arising out of the application or use of any its products or circuits. AP Semiconductor co, Ltd does not convey any license under its patent rights or other rights nor the rights of others.

AP Semiconductor Co., Ltd

Contact. Tel 82.70.4693.2299 FAX 82.70.4000.4009

E-mail: sales@apsemi.com