



High Power LED Driver IC

DESCRIPTION

The AP7350Q is an instant On/Off LED drive IC for high flux LED and adjustable constant-current source, easily driving loads 50mA up to 1A through an external resistor. The $\overline{\text{SHDN}}$ of the AP7350Q permits LED brightness regulation by pulse width modulation (PWM). The LED brightness can be regulated via duty cycle. And if $\overline{\text{SHDN}}$ sets high, the AP7350Q will be in sleep mode. the $\overline{\text{SHDN}}$ pin also can be used as an enable input. This integration technology eliminates individual components by combining them into a small package, which results in a significant reduction of both system cost and board space.

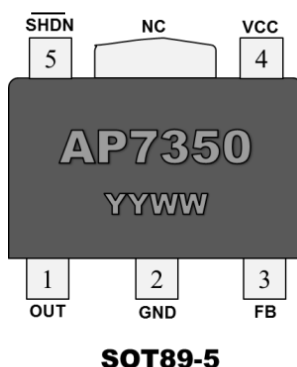
FEATURES

- Dimming control or Sleep mode by MiCOM signal
- LED drive current adjustable through external resistor (Max 1A under PWM)
- Very Simple Circuit Design and Very low cost design
- Very small package of 4.5x4.35mm SOT89-5L
- Halogen-Free Package is Available

Applications

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

Pin Connection & Marking Information





Ordering Information

Part No	Package	Packing	Finish	Halogen	REEL unit	Remark
AP7350Q	SOT-89-5	Tape & Reel	Sn	Free	1,000	MOQ 10Kp

Maximum Ratings

Characteristic	Symbol	Rating	Units
Power Supply Voltage	VCC(MAX)	25	V
Output Voltage	VOUT(MAX)	25	V
Output Sink Current	IOUT(MAX)	1	A
High Wattage Land Pattern Power Dissipation	P _D ¹⁾	1.3	W
Standard Land Pattern Power Dissipation	P _D ²⁾	0.9	W
Thermal Resistance Junction-Ambient	R _{TH(J-A)} ¹⁾	150	°C/W
Operating Temperature Range	T _{OPR}	-40 ~ 85	°C
Storage Temperature Range	T _{STG}	-55 ~ 125	°C

Note

1) Mounted on High Wattage Land Pattern Board (30mm × 30mm × 1.6mm) ----- See Page 9

2) Mounted on Standard Land Pattern Board (50mm × 50mm × 1.6mm) ----- See Page 9

Recommended operating conditions

Characteristic	Symbol	Rating		Units
		Min.	Max.	
Power Supply Voltage	VCC(MAX)	3	24	V
Output Voltage	VOUT(MAX)	1.5	Vcc	V
Output Sink Current	IOUT(MAX)	-	1	A
Shut Down Voltage	SHDN	-0.3	Vcc	V

REV. 01



Electrical Characteristics

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

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
IQ Maximum	IQ	Vcc = 3~24V, Iout = 20mA, Vout = open	-	18	24	mA
Leak Current	Ileak	Vcc = 5V, Vout = 24V	-	0.1	1	uA
Feedback Voltage	VFB	Vcc = 5V, Iout = 10mA	192	200	208	mV
Dropout Voltage	Vdrop	Vcc = 5V, Iout = 500mA	-	0.7	1.5	V
Line Regulation	ΔV_{FB1}	Vcc = 3~24V, Iout = 10mA	-	2	10	mV
Load Regulation	ΔV_{FB2}	Vcc = 5V, Iout = 10mA, Vout = Vcc	-	3	25	mV
SHDN Voltage ON	Vdis on	Vcc = 5V, Iout = 10mA, Vout = Vcc	1.5	-	-	V
SHDN Voltage Off	Vdis off	Vcc = 5V, Iout = 10mA	-	-	0.5	V
SHDN Pin Current	Idis	Vcc = 5V, SHDN = 5V	230	430	630	uA
Short Circuit Current	ISC	RFB = 0Ω	-	1.9	-	A
Thermal Shutdown	TTSD	-	-	160	-	°C

Notes

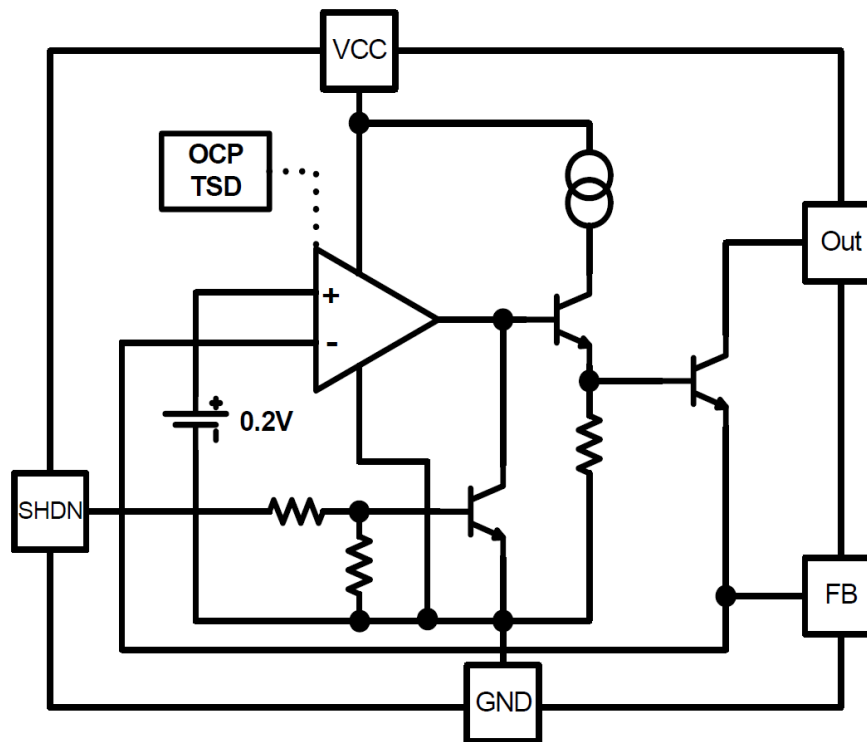
1. These parameters, although guaranteed, are not 100% tested in production.

Switching Characteristics

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Propagation Delay Time ("L" to "H")	tpLH	V _{CC} = 3.5V V _{SHDN} .H = 5V V _{SHDN} .L = GND RFB = 0.2Ω (IOUT = 1A) ROUT = 2Ω CL = 10pF	0.6	1	-	μs
Propagation Delay Time ("H" to "L")	tpHL		0.2	1	-	μs
Pulse width	tw		1			μs
Output Rise Time (turn off)	tr		0.5	1	-	μs
Output Fall Time (turn on)	tf		0.1	0.2	-	μs



Internal Block Diagram



Design Consideration

1) Calculation for RFB

- $R_{FB} = 0.2V / I_{LED}$

2) Calculation for Vdrop

- $V_{drop} = V_{CC} - V_{LED}$

3) Calculation for Power Dissipation on the AP7350Q

- $PD1 = (V_{drop} - V_{FB}) \times I_{LED}$

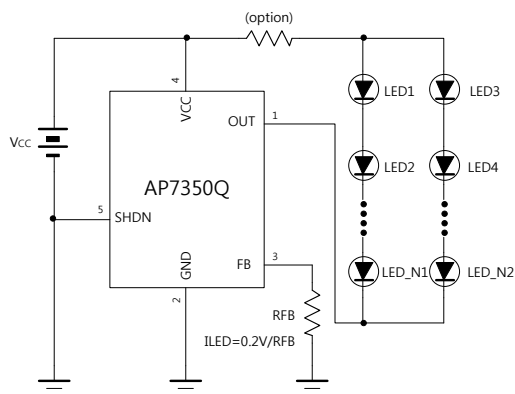
- $PD2 = V_{CC} \times I_Q$

- $PD_{(total)} = PD1 + PD2$

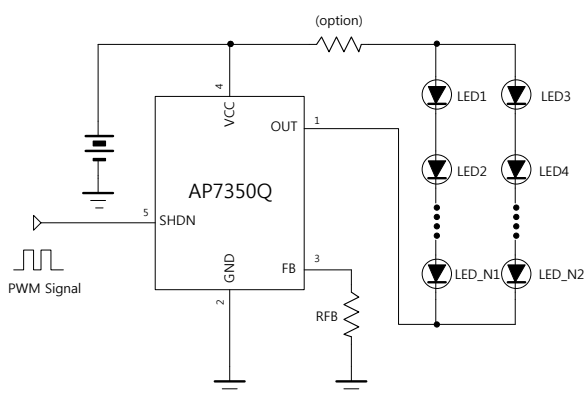
4) If does not use an Dimming function, connect SHDN Pin with the ground.



Typical Applications



<APP1. Constant Current LED Driver Circuit>



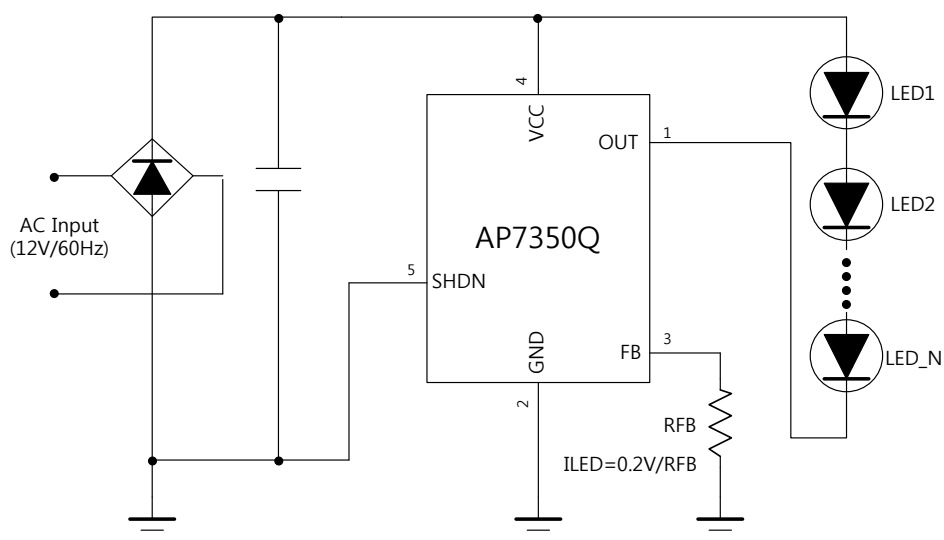
<APP2. PWM Dimming LED Driver Circuit>

※ Caution

In the case of high current application, we recommend to control the PWM using by $\overline{\text{SHDN}}$.

If user cannot use the PWM control, the application must be limited in $P_D (= V_{\text{DROP}} \times I_{\text{LED}})$.

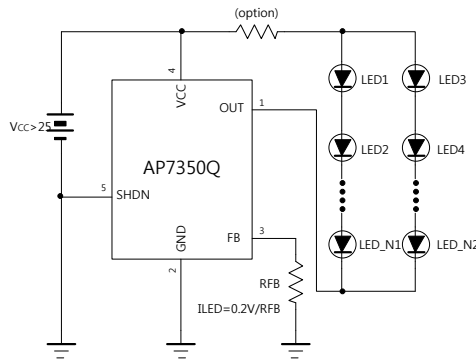
So, in this case we recommend to minimize V_{DROP} or I_{LED} . (See page 9)



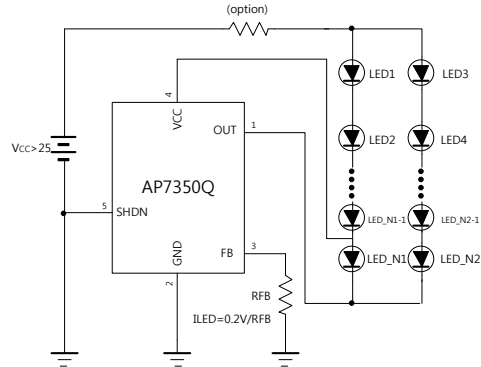
<APP3. VAC Landscape Lightning Application Circuit>



Typical Applications



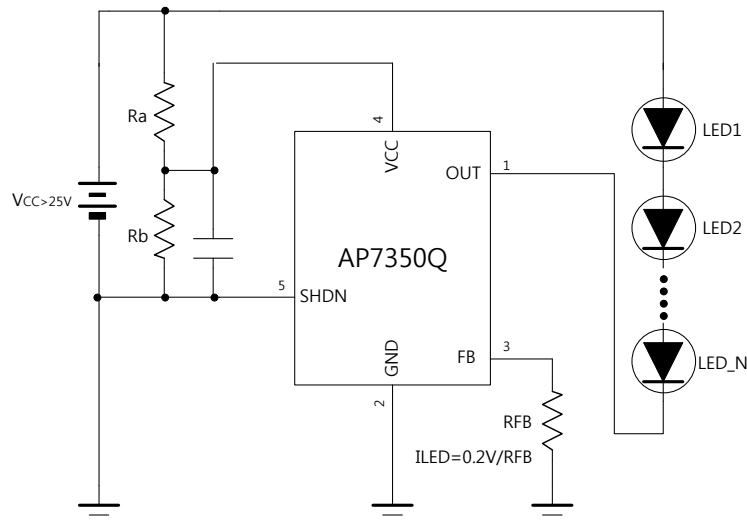
<APP4. High Voltage Operation of AP7305Q (1)>



<APP5. High Voltage Operation of AP7305Q (2)>

For operation in excess of AP7350Q 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} such that the voltage seen at pin(V_{CC} & V_{OUT}) is less than 25V. That is to say, use additional LEDs to drop the voltage fed to the AP7350Q 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 enough LEDs such that voltage at pin(V_{CC} & V_{OUT}) of AP7350Q is $< 25V$.

※ Caution : When V_{CC} uses to exceed 25V, Dimming functions the use is impossible.



<APP6. Power Supply Where Separates Operation of AP7350Q>



Electrical Characteristic Curves

Fig.1 V_{FB} vs T_A

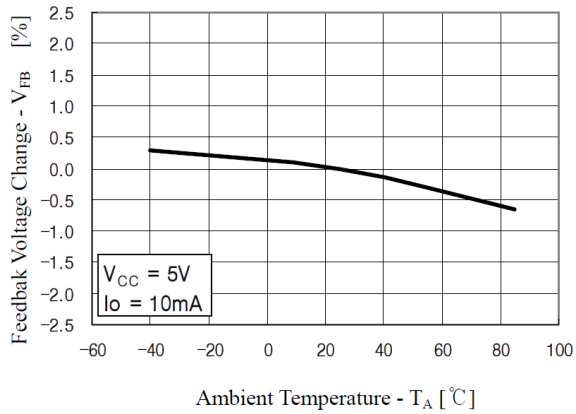


Fig.2 Line Regulation vs T_A

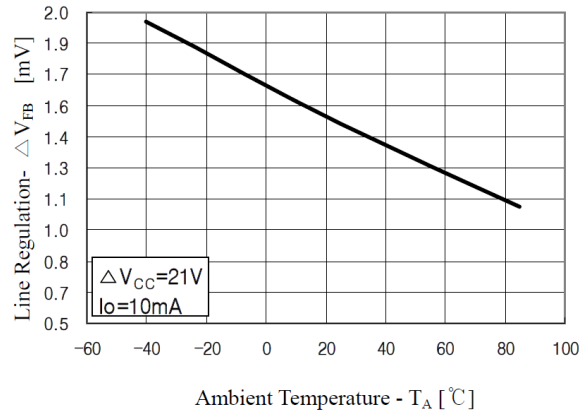


Fig.3 Load Regulation vs T_A

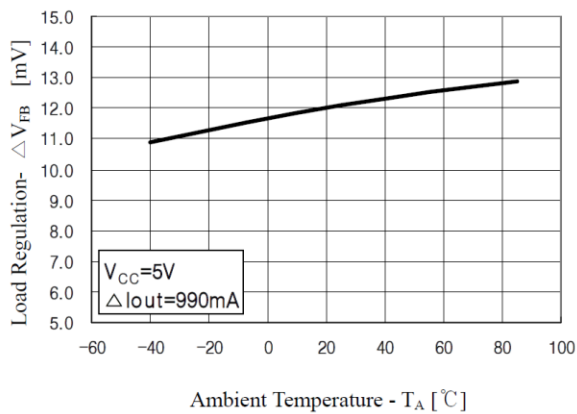


Fig.4 Quiescent Current vs T_A

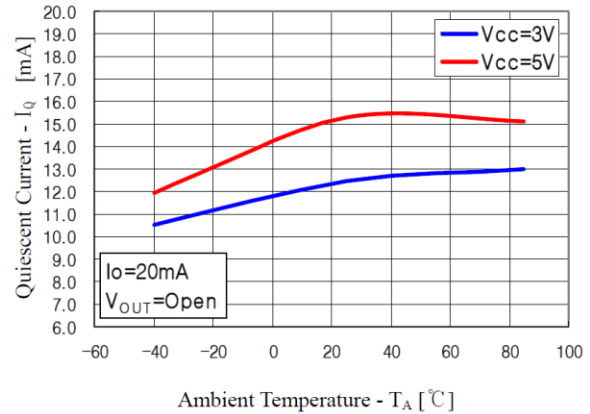


Fig.5 Dropout Voltage vs T_A

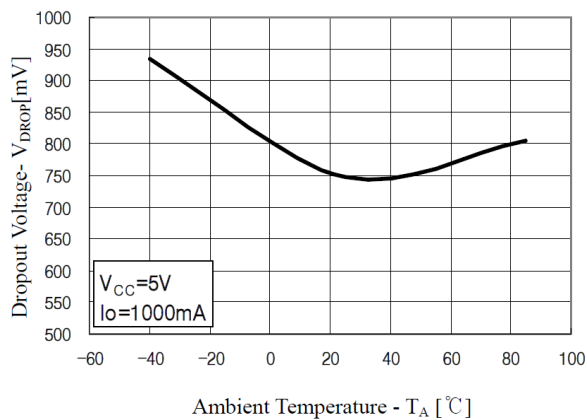
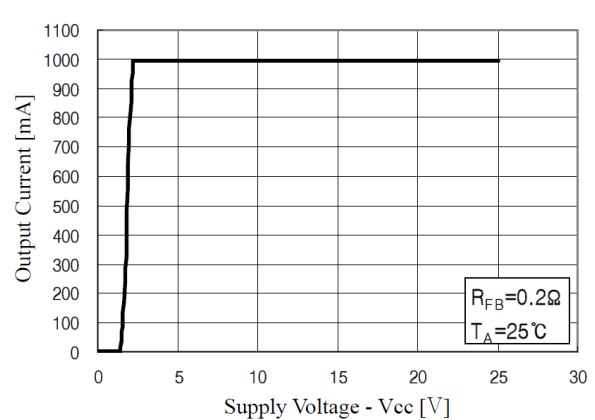


Fig.6 Output Current vs Supply Voltage





Electrical Characteristic Curves

Fig.7 Dimming Curve

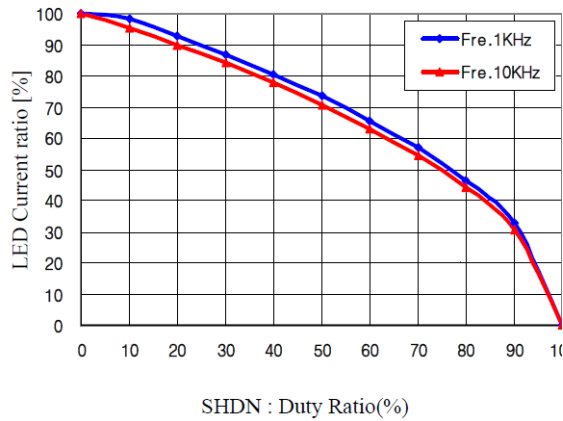


Fig.8 Power Dissipation vs TA

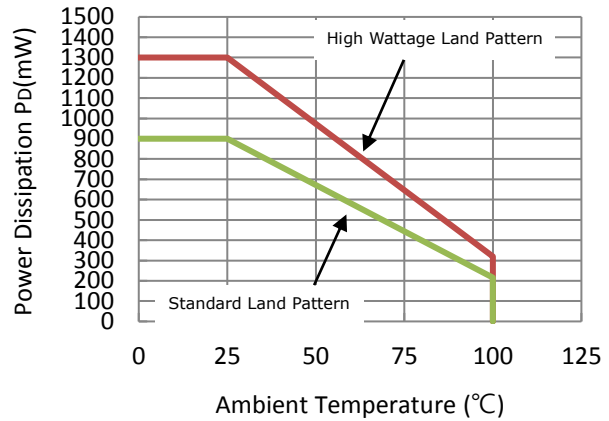
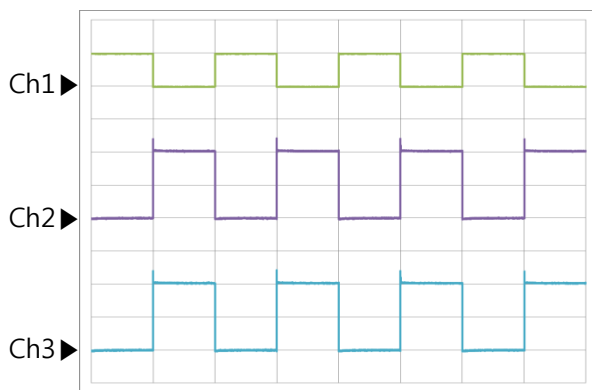
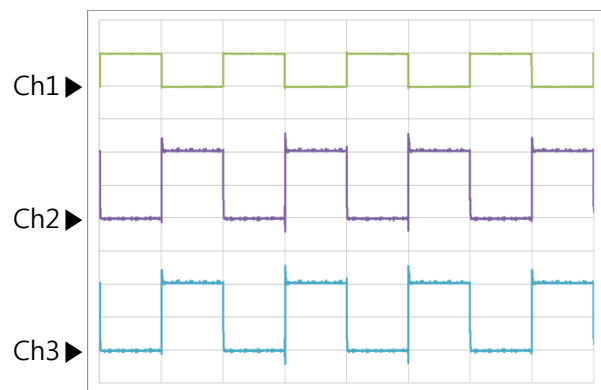


Fig.9 Dimming Waveform [1kHz]



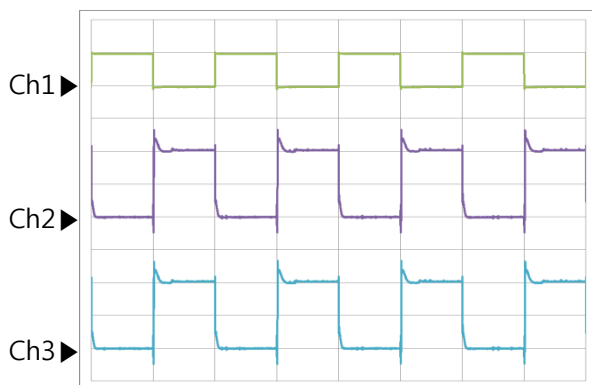
Ch1 : V_{SHDN} , 5V/Div
Ch2 : V_{FB} , 100mV/Div
Ch3 : I_{FB} , 5mA/Div

Fig.10 Dimming Waveform [10kHz]



Ch1 : V_{SHDN} , 5V/Div
Ch2 : V_{FB} , 100mV/Div
Ch3 : I_{FB} , 5mA/Div

Fig.11 Dimming Waveform [50kHz]

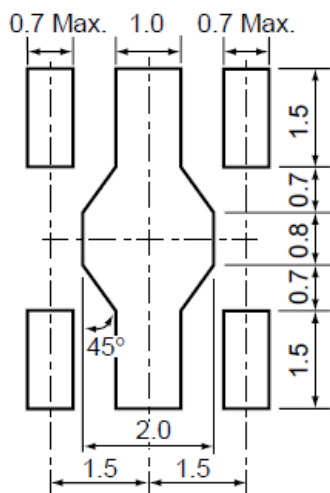


Ch1 : V_{SHDN} , 5V/Div
Ch2 : V_{FB} , 100mV/Div
Ch3 : I_{FB} , 5mA/Div



Recommend PCB solder land

Unit : mm



Power Dissipation

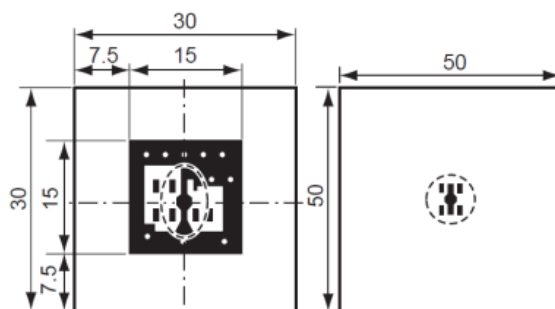
<Table 1. PCB Condition>

	High Wattage Land Pattern	Standard Land Pattern
Environment	Mounting on Board (Wind velocity = 0m/s)	Mounting on Board (Wind velocity = 0m/s)
Board Material	Glass cloth epoxy plastic (Double sided)	Glass cloth epoxy plastic (Double sided)
Board Dimension	30mm × 30mm × 1.6mm	50mm × 50mm × 1.6mm
Copper Ratio	Top side : Approx. 20% , Back side : Approx. 100%	Top side : Approx. 10% , Back side : Approx. 100%
Through-holes	Φ0.85mm × 10pcs	-

<Table 2. Power Dissipation of Land Patterns>

	High Wattage Land Pattern	Standard Land Pattern
Power Dissipation	1300mW	900mW
Thermal Resistance	77°C/W	111°C/W

(Topt=25°C, Tjmax=125°C)



**High Wattage Standard
Measurement Board Pattern**

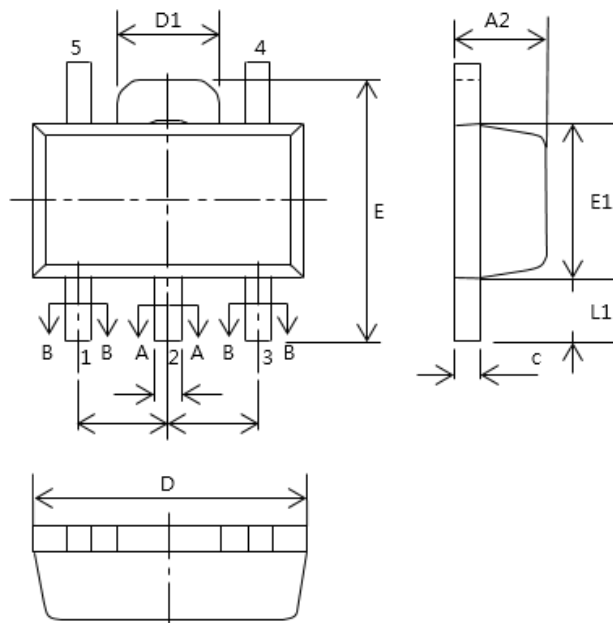
○ IC Mount Area (Unit: mm)

REV. 01



Package Dimension

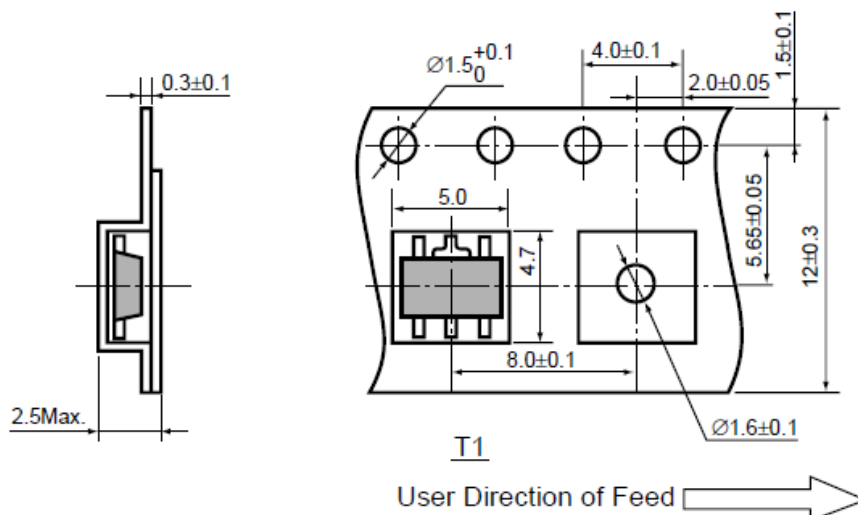
Unit : mm



SOT-89-5L unit : mm			
DIM	MIN	NOM	MAX
A2	1.40	1.50	1.60
D	4.30	4.50	4.70
D1	1.83REF		
E	3.95	-	4.25
E1	2.30	2.50	2.70
e	1.50BSC		
L1	0.89	-	1.20

Taping Specification

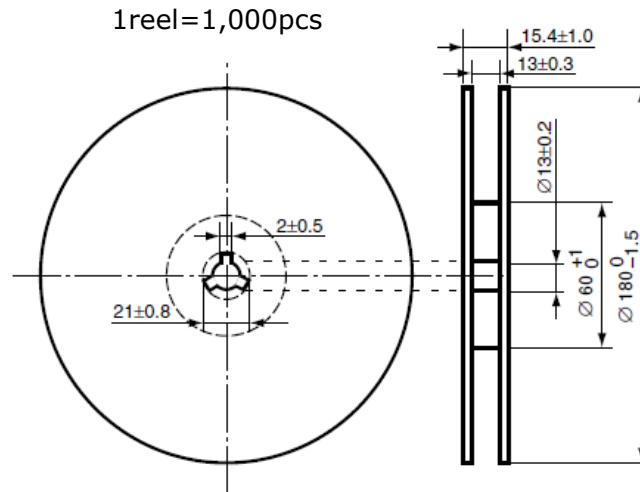
Unit : mm





Reel Specification

Unit : mm





Revision History

No	Date	Contents
00	2015-12-30	Initial Brief Datasheet Release
01	2016-04-01	Addition switching characteristics

<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

© 2015 AP semiconductor Co., Ltd. – Printed in KOREA – All Rights Reserved.