TOSHIBA BiCD Digital Silicon Monolithic Integrated Circuit

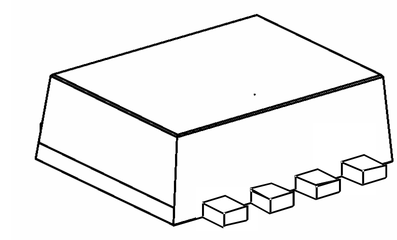
TB62734FMG

Step Up Type DC – DC Converter for White LED

Features

TB62734FMG is the high efficient STEP-UP type DC/DC converter by which the optimal design was carried out at constant current driver of white LED.
It is possible to drive 2 ~ 6 white LEDs which connected in series by the lithium ion battery. This IC contains the Nch-MOS transistor required for switching of external inductor.
The forward current of LED is set up by the external resistor. As the brightness control function, an analog voltage input and a pulse input system (PWM) are possible.
The switching frequency is fixed at around 1.0Mhz.
This IC is the most suitable as a driver of white LED back lighting of the color LCD in the PDA, the cellular phone and the handy terminal machine.

TB62734FMG

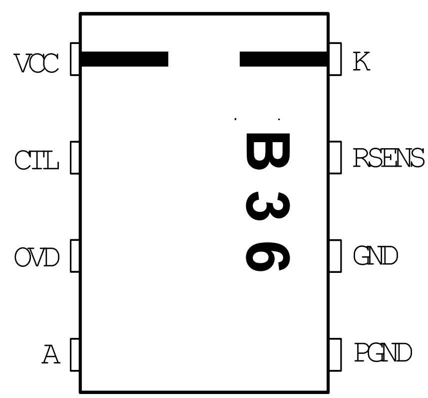


SON8-P-0.65

Weight : 0.016g (Typical)

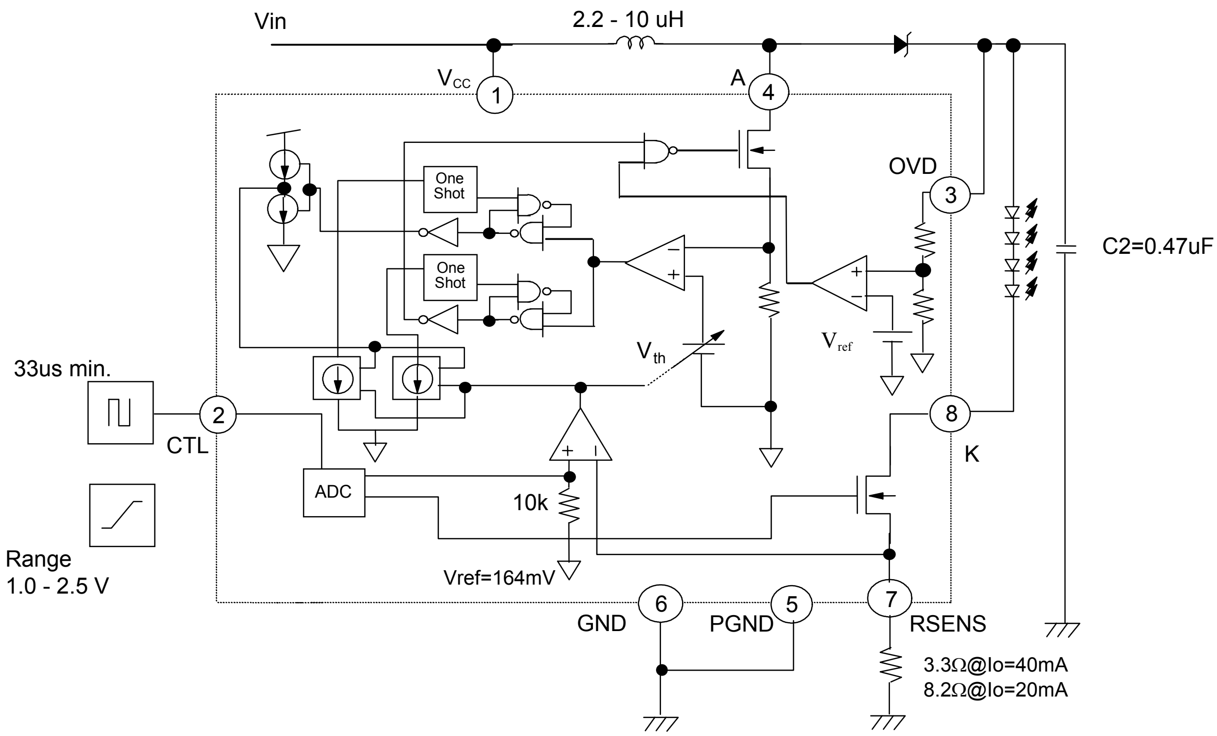
Characteristics

Brightness control function : LED forward current 30~100%
Maximum output voltage : over 26V
Variable of the LED current by external resistance
20mA(TYP.) @ RSENS=7.5Ω
Output power : 500 mW
Package : SON8-P-0.65 (Typical Height : 0.8mm)
High efficiency : 85% (Recommended parts in use)
Low resistance power MOS include
Ron=0.7Ω(TYP.) @ Vin=2.8~5.5V
Over voltage detection includes
Protection Voltage : OVD pin =20V (TYP.)



Note 1) This IC has the terminal (3 pin : HBM spec < ±1.5kV) which is marginal for ESD. The careful caution must be required for all handling stage. And also, this device must be assembled in correct position, in case of Assembled in the wrong direction, this IC might be destroyed.
Note 2) In case the control pin is open, unstable operation of the output should be caused. Therefore, this control terminal must be fixed to the certain logic level.
Note 3) About solder ability, following conditions were confirmed
•Solder ability
(1)Use of Sn-63Pd solder Bath
solder bath temperature = 230°C, dipping time = 5 seconds, the number of times = once, use of R-type flux
(2)Use of Sn-3.0Ag-0.5Cu solder Bath
solder bath temperature = 245°C, dipping time = 5 seconds, the number of times = once, use of R-type flux

Block Diagram

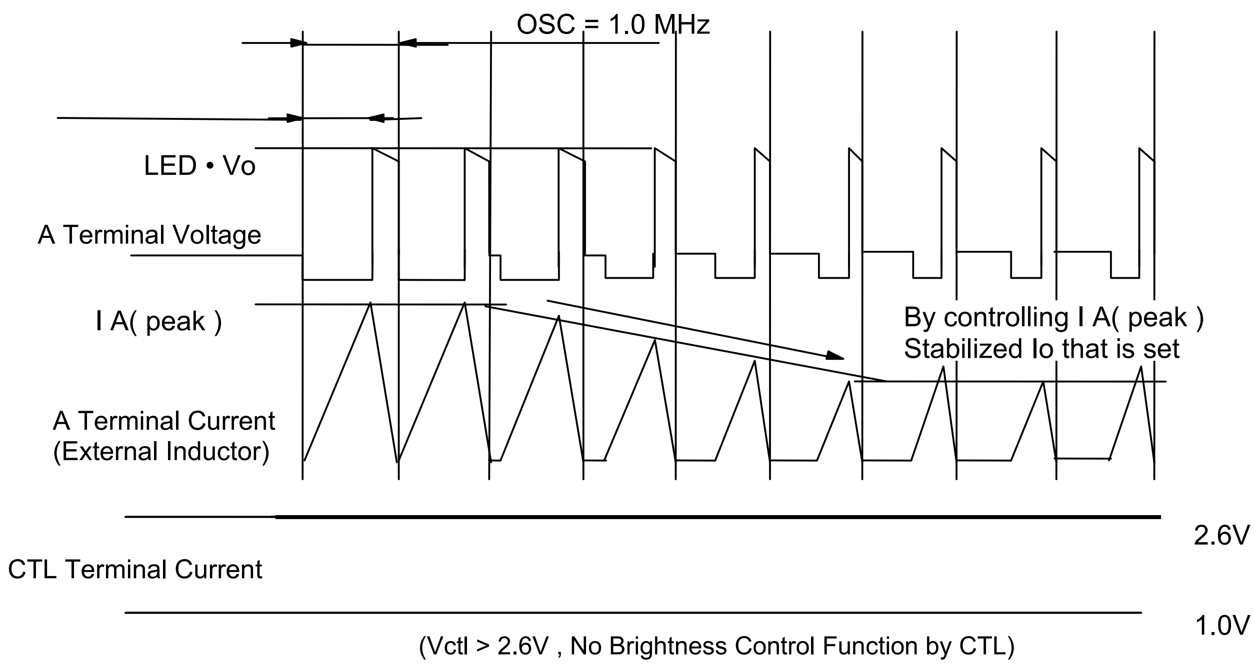


Explanation of the terminal

No	Symbol	Function
1	VCC	Supply voltage pin. Supply voltage range : 2.8V to 5.5V
2	CTL	Input pin for IC ON/OFF control and variable LED Io. 0 to 0.4V : Shutdown Mode (IC shutdown) 1.0V to 2.5V : Io = 30 to 100% Variable (Linear Control) Over 2.6V : Io = 100%
3	OVD	Feed-buck pin for output voltage
4	A	Sink driver pin for step- up DC-DC converter
5	PGND	Ground pin for power line
6	GND	Ground pin
7	RSENS	Resistance connects pin for LED Io setup.
8	K	Connected to the cathode of LED

*Please connect PGND and GND pin to the ground.

Timing Chart



Absolute Maximum Ratings (Topr = 25 °C If not specified)

Item	Symbol	Ratings	Unit
Power supply Voltage	Vcc	- 0.3 to + 6.0	V
Input Voltage	Vin	- 0.3 to + VCC + 0.3	V
Switching Terminal Voltage	Vo(A)	- 0.3 to + 24	V
OVD Voltage	V(ovd)	- 0.3 to + 18	V
Power Dissipation	Pd	0.41 (Device) 0.47 (With PCB) Note1	W
Thermal Resistance	Rth(j-a)1	300 (Device)	°C/W
	Rth(j-a)2	260 (With PCB)	
Operating Temperature range	Topr	- 40 to + 85	°C
Storage Temperature	Tstg	- 40 to + 150	
Maximum Junction Temperature	Tj	125	

Note 1 : When every time the ambient temperature gets over 25 °C with 1 °C, the allowable loss must reduce 3.8mW/°C more than maximum rated value. (When on PCB.)

Recommended Operating Condition (Topr = -40 to 85 °C If not Specified)

Item	Symbol	Measurement Condition	Min.	Typ.	Max.	Unit
Power Supply Voltage	Vcc	-	2.8	-	5.5	V
CTL Terminal H level Input Voltage	Vctl H	-	VCC -0.5	-	VCC	V
CTL Terminal L Level Input Voltage	Vctl L	-	0	-	0.4	
LED Current (Average Value)	Io1	VCC=3.6V, RSENS=7.5Ω 6 LED, Topr=25 °C,	-	20	-	mA
	Io2	VCC=3.6V, RSENS=7.5Ω 4 LED, Topr=25 °C	-	20	-	mA
	Io3	VCC=3.6V, RSENS=3.3Ω 3 LED, Topr=25 °C	-	40	-	mA

Electrical Characteristics (Topr=-40 to 85°C, Vcc=2.8 to 5.5V, If not Specified)

Item	Symbol	Measurement Condition	Min.	Typ.	Max.	Unit
Operating Consumption Current	Icc(On)	Vcc=3.6V, RSENS=8.2Ω	-	0.9	1.5	mA
Quiescent Consumption Current	Icc(Off)	Vcc=3.6V, VCTL=0V	-	0.5	1.0	uA
CTL Terminal Current	I_CTL	Vcc=3.0V, VCTL=3V	+/- 7	+/- 12	+/- 21	uA
Integrated MOS-Tr ON Resistance	Ron	Io(A)= greater than 400mA		0.7	1.5	Ω
Integrated MOS-Tr Switching Frequency	fOSC	Vcc=3.6V, Vctl=3.0V Topr=25°C	0.75	1.0	1.39	MHz
A Terminal Protection Voltage	Vo(A)	6 Series white LED are also driven	24	26	-	V
Switching Terminal Current	Io(A)	-	-	600	-	mA
Switching Terminal Leakage Current	Ioz(A)	Vo(A)=22V	-	0.5	1	uA
OVD Terminal Voltage	Vovd	-	19	21	23	V
OVD Terminal Leakage Current	Ioz(ovd)	Vovd=18V	-	0.5	1	uA
LED Current (Average Value)	Io2	VCC=3.6V, RSENS=7.5Ω Topr=25 °C, L=6.8uH	18	20	22	mA

[**Setting of capacitance of output side**]
The larger than C2=0.47(uF) should be recommended.

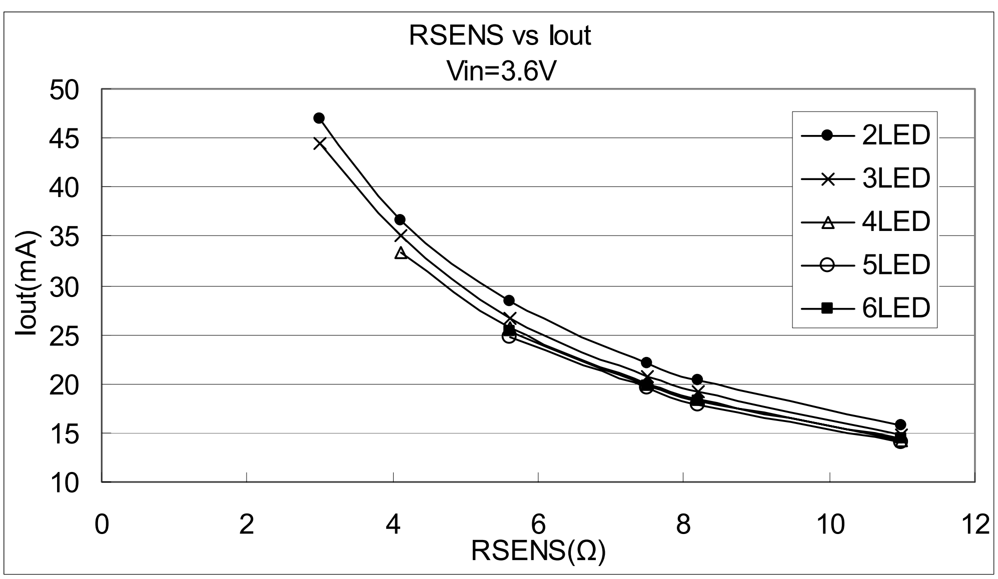
[**Setting of external Inductor size**]
Reference) According to the number of LED, the inductor size should be selected larger than the value indicated in the table.

Number of LED	Vin=2.8V	Vin=4.3V	Note
2	4.7	3.6	Io=20mA Unit : uH
3			
4	6.8	4.7	
5	8.1	6.8	
6	10	8.1	

[**Setting of Io**]
Resistance connects between RSENS pin and GND.
The resistor of RSENS (K terminal and Ground) is for setting of output current (Io).
The average current is set by this RSENS value and average current are obtained by the following equation.
(Please choose a equation according to the number of LED)

2LED : $Io = 119.16 \times Rsens^{-0.8399}$
3LED : $Io = 115.32 \times Rsens^{-0.854}$
4LED : $Io = 113.08 \times Rsens^{-0.8614}$
5LED : $Io = 108.02 \times Rsens^{-0.8534}$
6LED : $Io = 106.71 \times Rsens^{-0.836}$

It is an equation when setting up by inductor of the size which we recommend.
When different L from the size which we recommend is used, The average current cannot be computed with the above-mentioned equation.

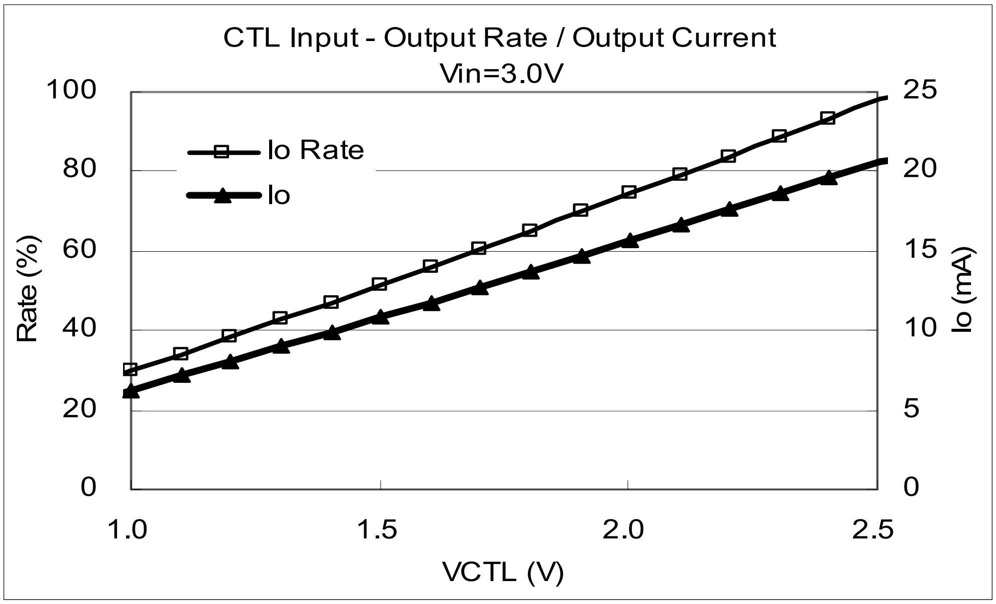


[Current control by CTL pin]

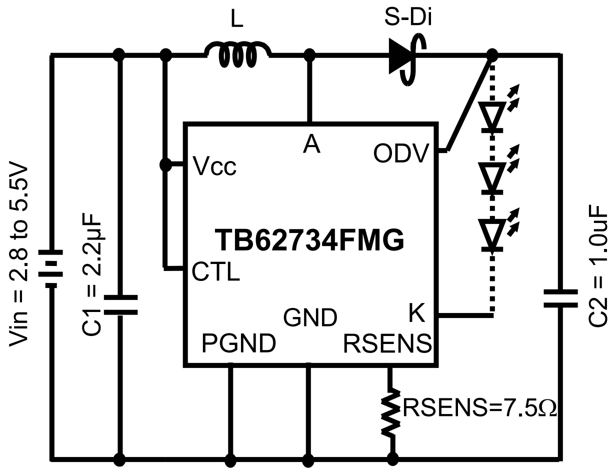
This IC can carry out variable of the Io current by external resistance.Variable range : 30 to 100%

CTL Voltage	VCTL=0V to 0.4V	VCTL=1V to2.5V	VCTL>2.5V	Note
Io Valuable Rate	0	30 - 100	100	Unit : %

The tole rance of linearity when converting V-A is expecting to be +/- 10%.

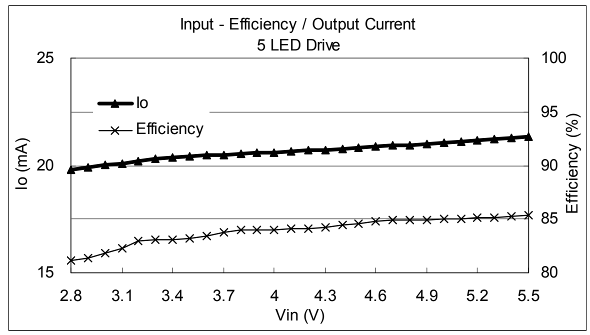


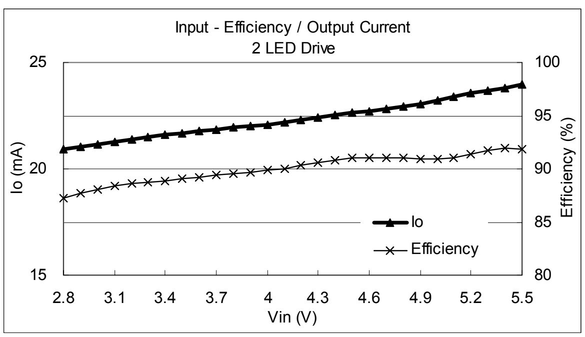
(1) The example of Application Circuit and Measurement data : Inductor 1001AS Series (Toko)

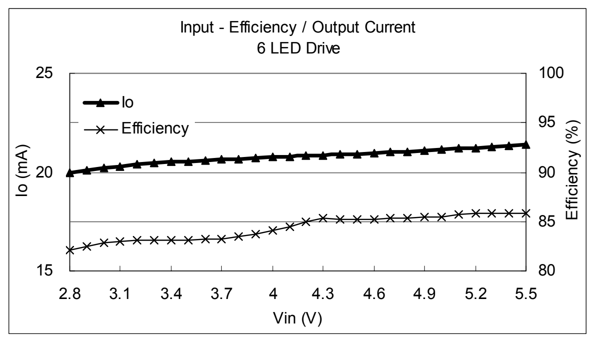


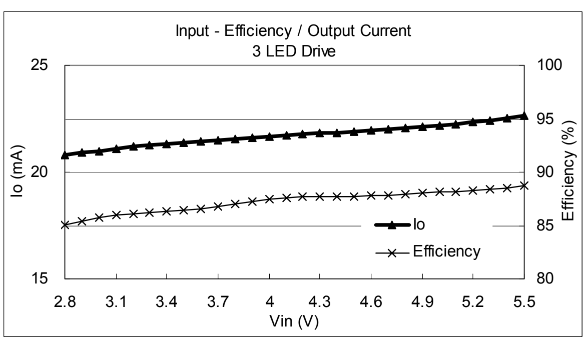
L	: 1001AS Series (Size 3.8×3.8×1.2mm)
S-Di	: CUS02 1A/30V (TOSHIBA)
LED	: NSCW215T (NICHIA)

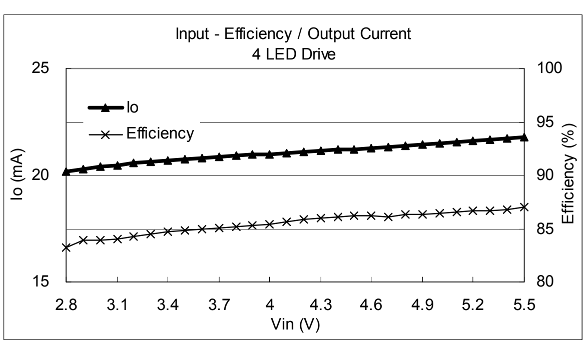
2 LED Drive	: L=4.7uH
3 to 5 LED Drive	: L=6.8uH
6 LED Drive	: L=10uH











<Measurement Data>

Efficiency in the range of Vin=2.8 to 5.5V

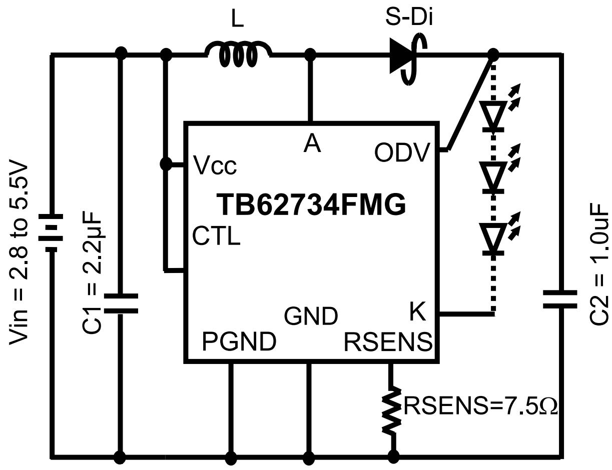
	Efficiency (%)	Average Efficiency(%)
2 LED	87.25 to 91.90	90.00
3 LED	85.04 to 88.75	87.24
4 LED	83.18 to 86.95	85.50
5 LED	81.15 to 85.36	83.93
6 LED	82.11 to 85.87	84.35

Output Current in the range of Vin=2.8 to 5.5V

	Output Current (mA)	Tolerance (%)
2 LED	20.90 to 23.96	14.65 (5.87)
3 LED	20.80 to 22.62	8.77 (3.88)
4 LED	20.18 to 21.78	7.89 (3.66)
5 LED	19.82 to 21.34	7.67 (3.47)
6 LED	19.95 to 21.40	7.26 (3.22)

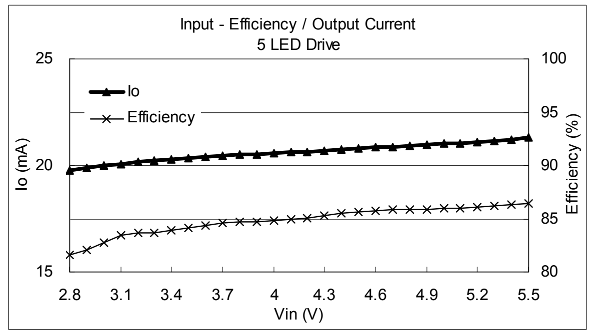
( ) : renge of Vin=3.0 to 4.3 V

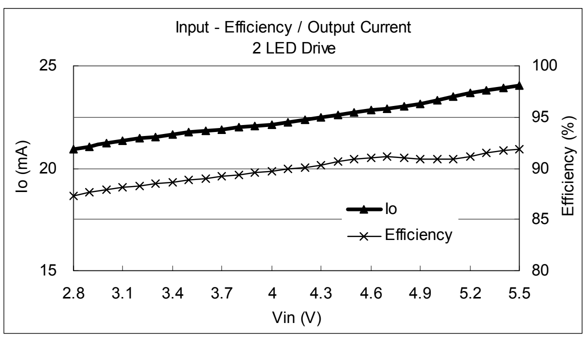
(2) example of Application Circuit and Measurement data : Inductor CXLD120 Series (Sumitomo)

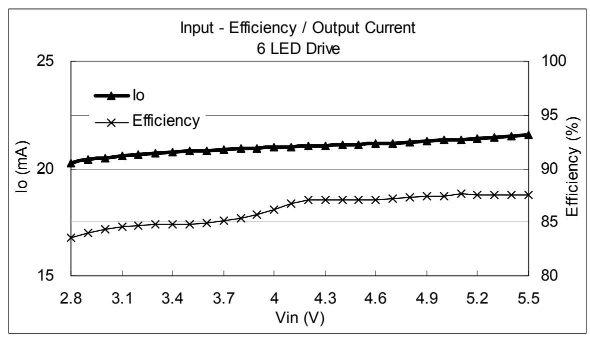


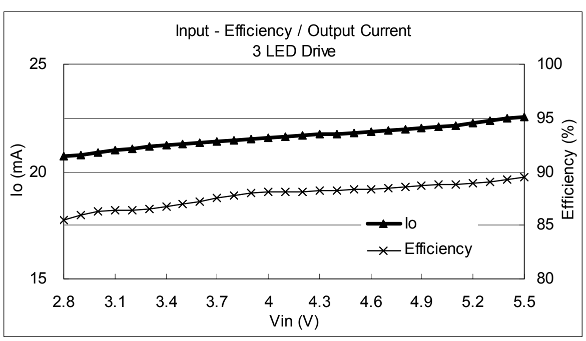
L : 1001AS Series (Size3.0×2.65×1.20mm)
S-Di : CUS02 1A/30V (TOSHIBA)
LED : NSCW215T (NICHIA)

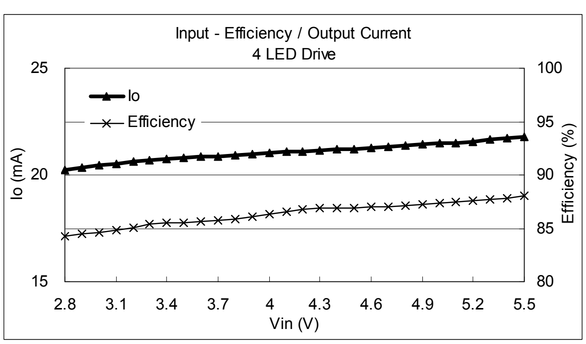
2 LED Drive : L=4.7uH
3 to 5 LED Drive : L=6.8uH
6 LED Drive : L=10uH











<Measurement Data>

Efficiency in the range of Vin=2.8 to 5.5V

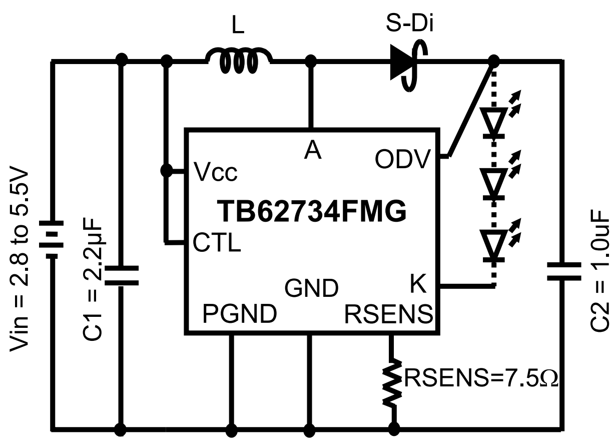
	Efficiency(%)	Average Efficiency (%)
2 LED	87.34 to 91.82	89.87
3 LED	85.46 to 89.50	87.81
4 LED	84.22 to 87.99	86.33
5 LED	81.65 to 86.49	84.84
6 LED	83.53 to 87.63	86.15

Output Current in the range of Vin=2.8 to 5.5V

	Output Current (mA)	Tolerance (%)
2 LED	20.93 to 24.06	14.95 (6.01)
3 LED	20.69 to 22.56	9.02 (3.96)
4 LED	20.22 to 21.77	7.66 (3.49)
5 LED	19.78 to 21.30	7.69 (3.51)
6 LED	20.28 to 21.55	6.28 (2.71)

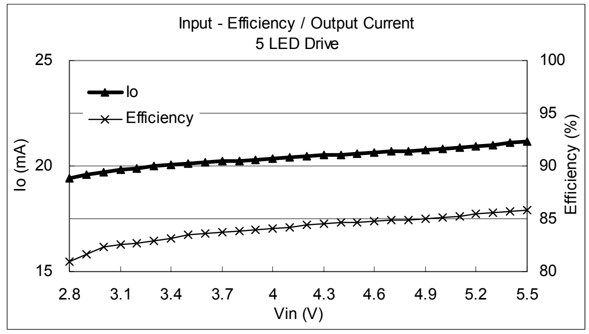
( ) : renge of Vin=3.0 to 4.3 V

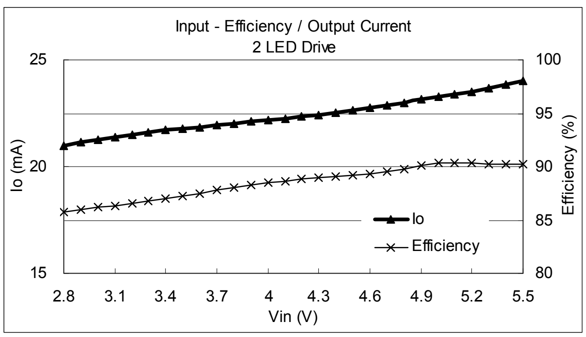
(3) The example of Application Circuit and Measurement data : Inductor VLF3010 Series (TDK)

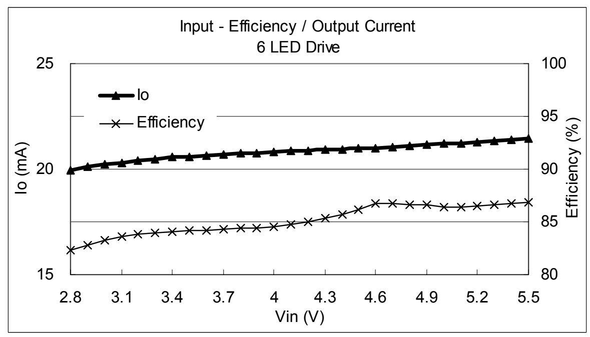


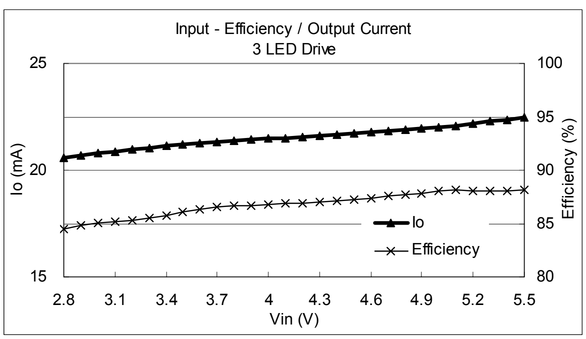
2 LEDDrive : L=4.7uH
3 to 5 LED Drive : L=6.8uH
6 LED Drive : L=10uH

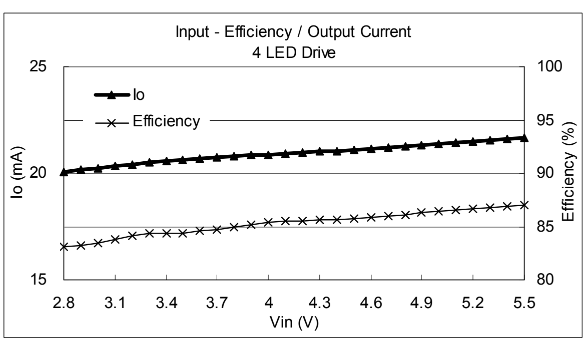
L : VLF3010 Series (Size3.0×3.0×1.0mm)
S-Di : CUS02 1A/30V (TOSHIBA)
LED : NSCW215T (NICHIA)











<Measurement Data>

Efficiency in the range of Vin=2.8 to 5.5V

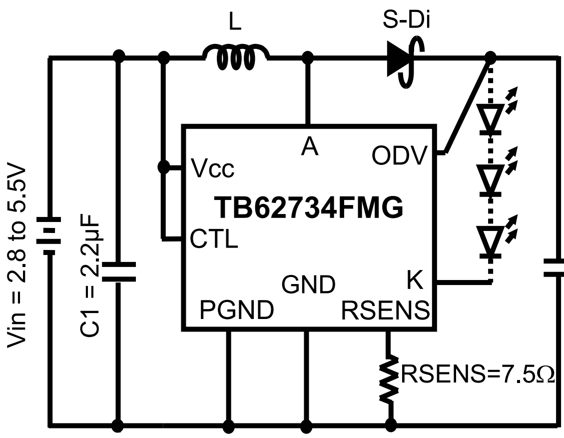
	Efficiency(%)	Average Efficiency (%)
2 LED	85.70 to 90.39	88.47
3 LED	84.51 to 88.15	86.76
4 LED	83.06 to 86.97	85.30
5 LED	80.94 to 85.78	84.07
6 LED	82.28 to 86.85	85.11

Output Current in the range of Vin=2.8 to 5.5V

	Output Current (mA)	Tolerance (%)
2 LED	21.00 to 24.01	14.35 (5.53)
3 LED	20.57 to 22.48	9.27 (4.06)
4 LED	20.03 to 21.69	8.24 (3.74)
5 LED	19.44 to 21.14	8.75 (4.07)
6 LED	19.96 to 21.46	7.52 (3.40)

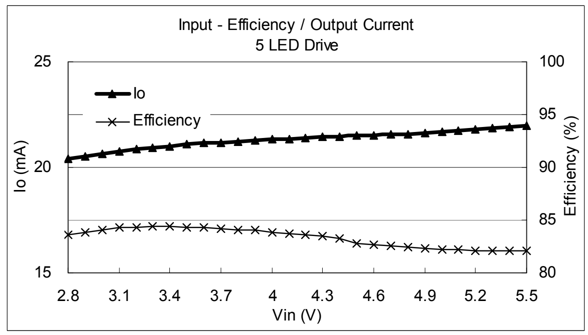
( ) : renge of Vin=3.0 to 4.3 V

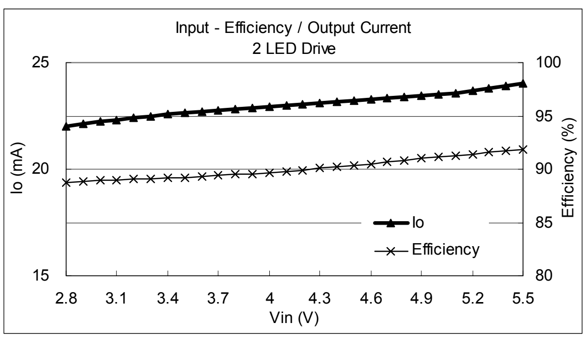
(3) The example of Application Circuit and Measurement data : Inductor CXML322509-150 (Sumitomo)

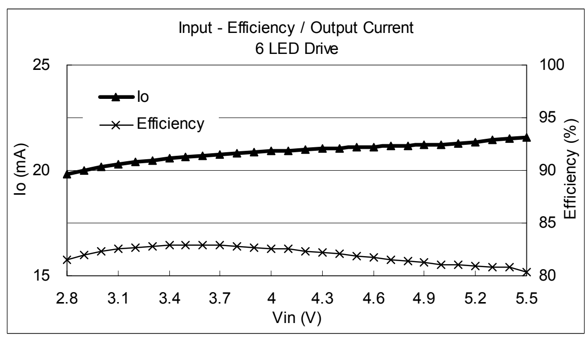


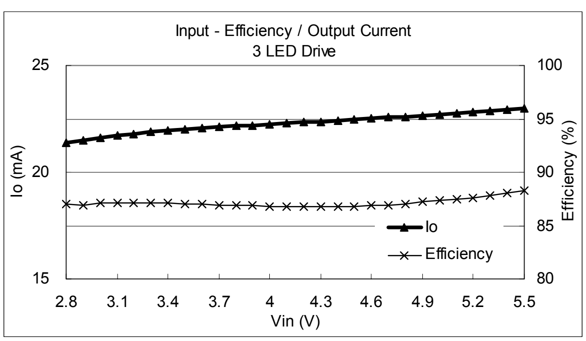
2 to 6 LED Drive : L=15uH

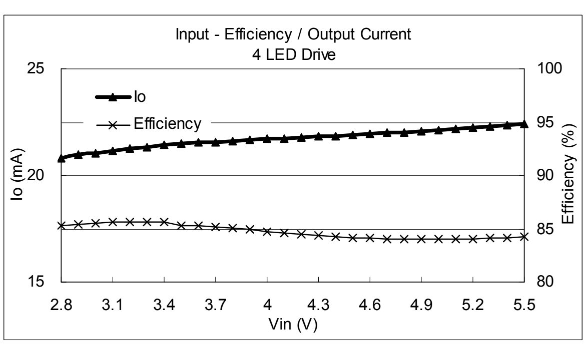
L : CXML322509-150 (Size3.2×2.5×0.9mm)
S-Di : CUS02 1A/30V (TOSHIBA)
LED : NSCW215T (NICHIA)











<Measurement Data>

Efficiency in the range of Vin=2.8 to 5.5V

	Efficiency(%)	Average Efficiency (%)
2 LED	88.75 to 91.85	90.07
3 LED	86.77 to 88.22	87.13
4 LED	84.00 to 85.65	84.71
5 LED	82.13 to 84.38	83.34
6 LED	80.39 to 82.92	81.98

Output Current in the range of Vin=2.8 to 5.5V

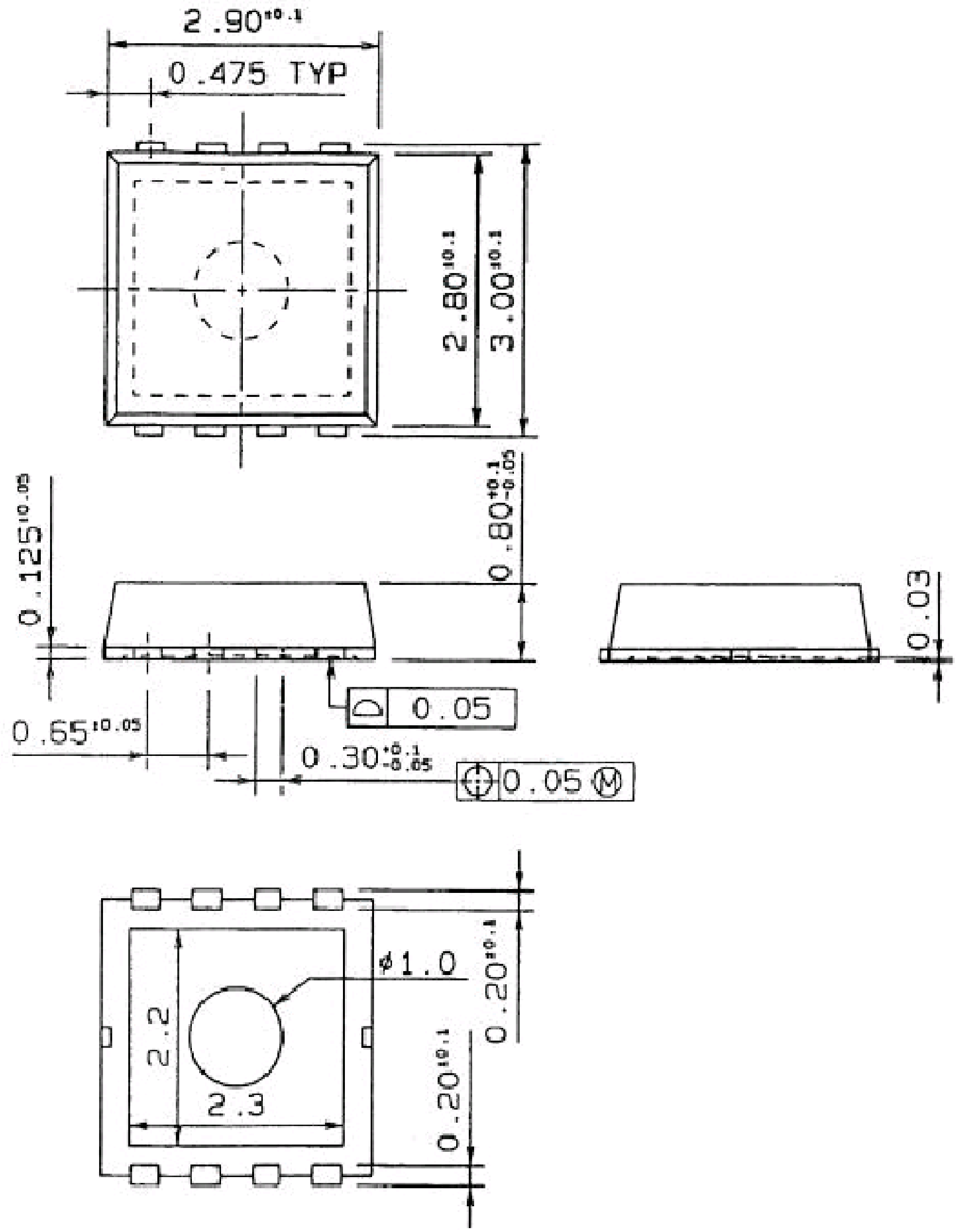
	Output Current (mA)	Tolerance (%)
2 LED	22.00 to 24.04	9.30 (3.85)
3 LED	21.39 to 23.00	7.49 (3.56)
4 LED	20.82 to 22.41	7.61 (3.65)
5 LED	20.39 to 21.99	7.82 (3.75)
6 LED	19.84 to 21.57	8.69 (4.26)

( ) : renge of Vin=3.0 to 4.3 V

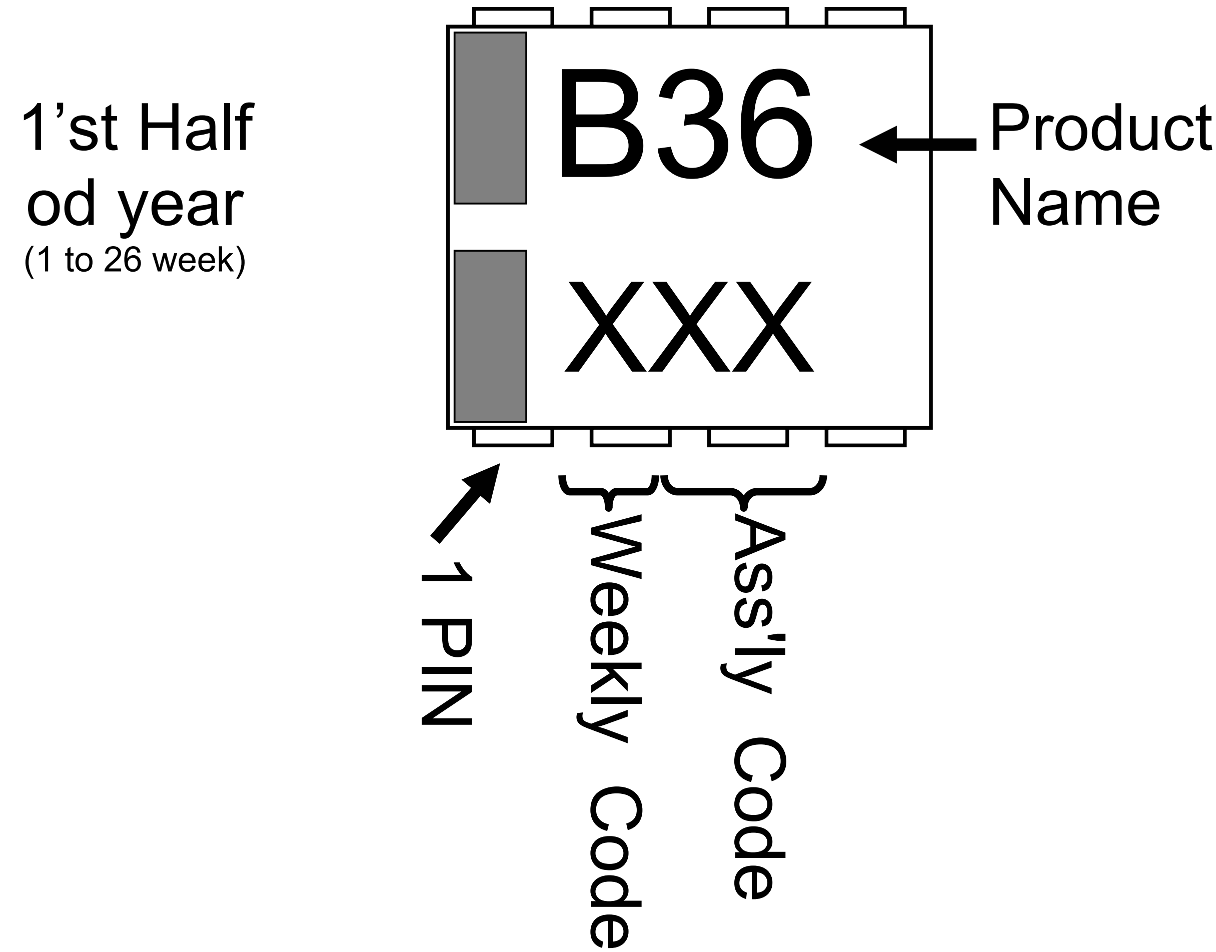
Package (Dimensions)

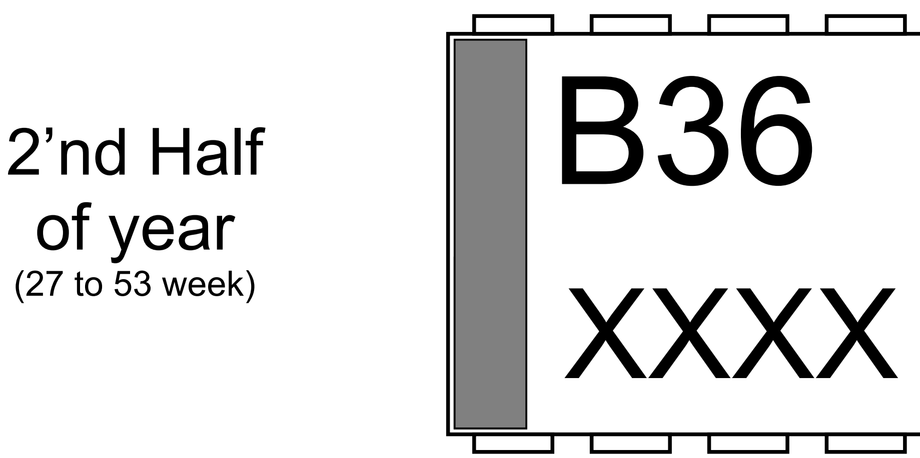
SON8-P-0.65

Unit : mm



Marking


1’st Half
od year
(1 to 26 week)
B36
XXX
Product
Name
1 PIN
Weekly Code
Ass'ly Code


2’nd Half
of year
(27 to 53 week)
B36
XXXX

RESTRICTIONS ON PRODUCT USE

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