## TOSHIBA BiCD Digital Silicon Monolithic Integrated Circuit

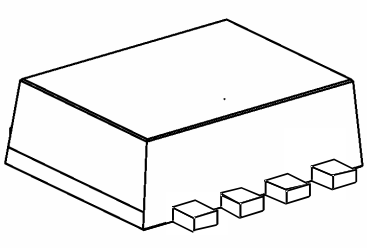
# TB62734FMG

## 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

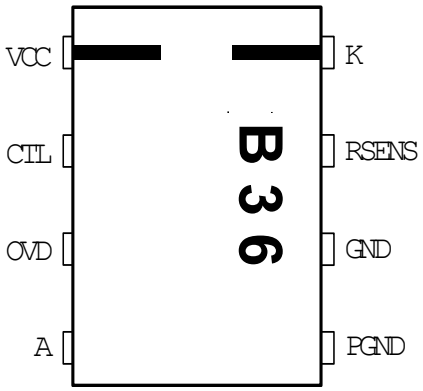


SON8-P-0.65

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

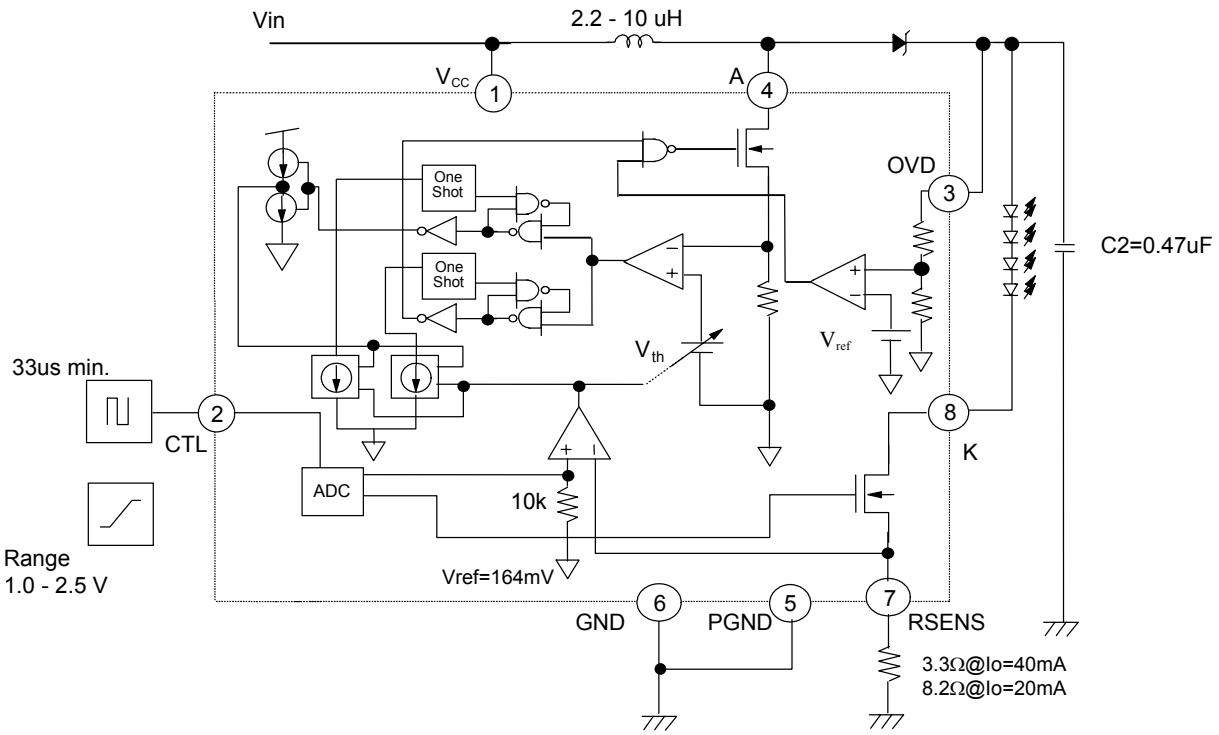
solder bath temperature = 245°C, dipping time = 5 seconds, the number of times = once, use of R-type flux

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## Block Diagram

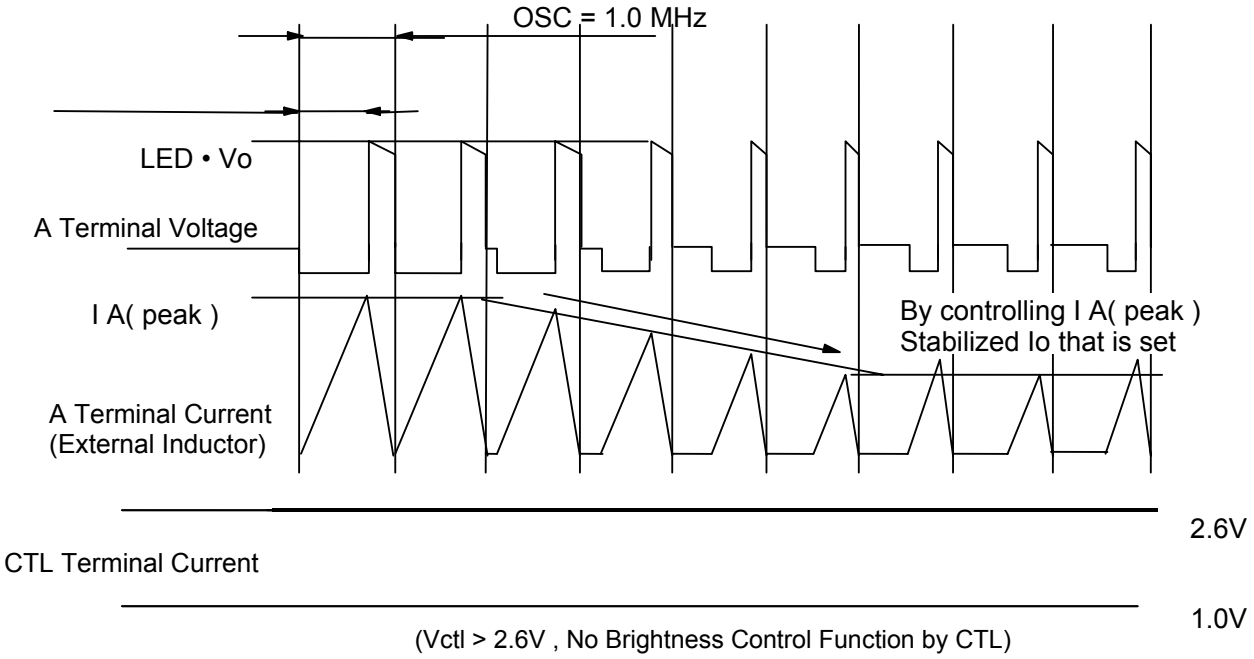



## Explanation of the terminal

| 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.<br>0 to 0.4V : Shutdown Mode (IC shutdown)<br>1.0V to 2.5V : Io = 30 to 100% Variable (Linear Control)<br>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)<br>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.

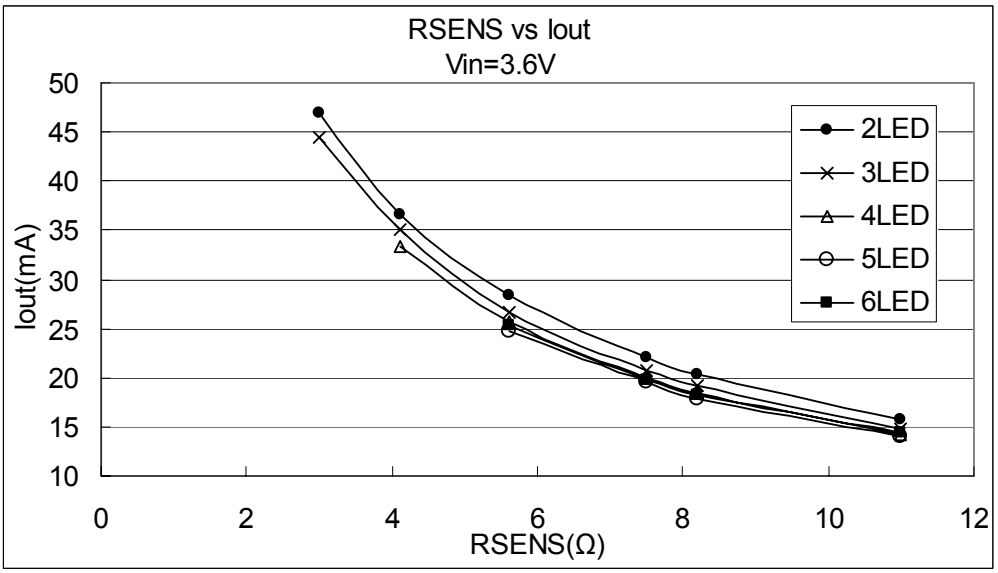
**[Setting of external Inductor size]**
Reference) According to the number of LED, the inductor size should be selected larger than the value indicated in the table.

| Number of LED | Vin=2.8V | Vin=4.3V | Note |
|---|---|---|---|
| 2 | 4.7 | 3.6 | Io=20mA<br>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.

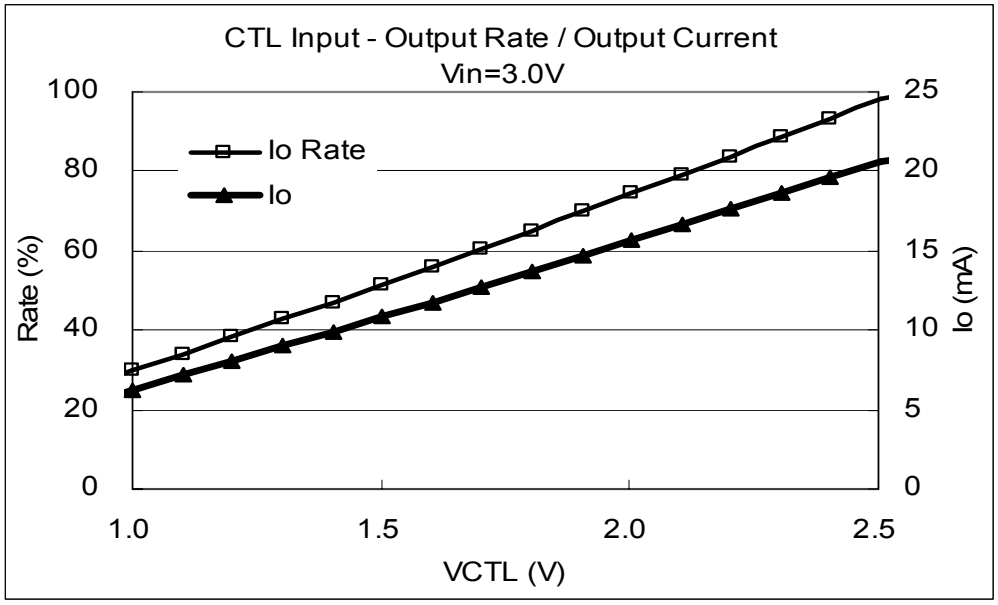


**[Current control by CTL pin]**

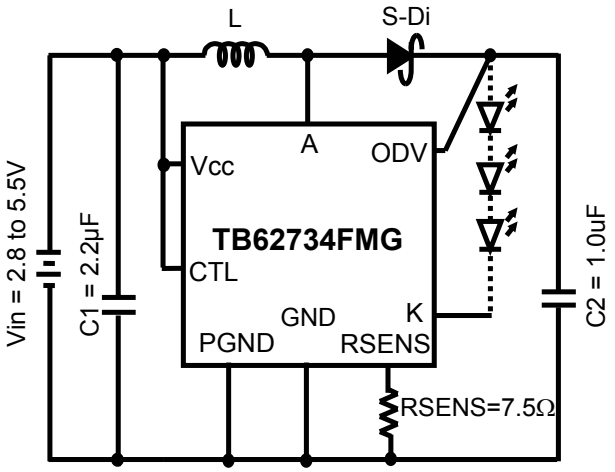
This IC can carry out variable of the Io current by external resistance.Variable range : 30 to 100%

| 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%.

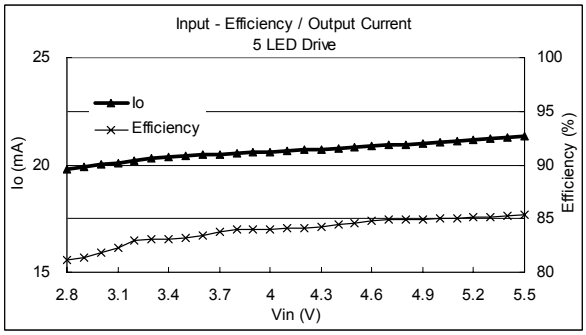


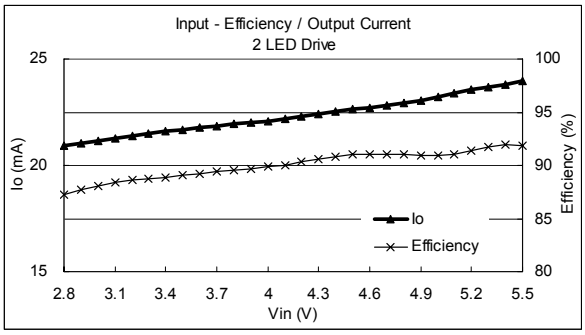
**(1) The example of Application Circuit and Measurement data : Inductor 1001AS Series (Toko)**

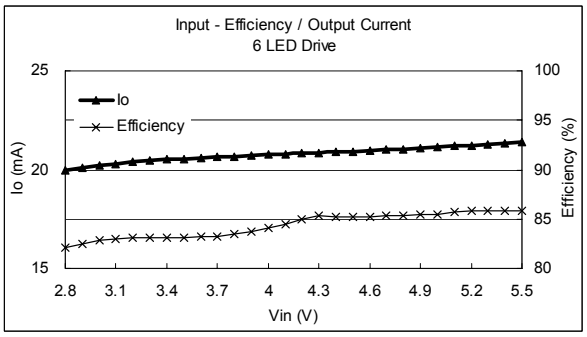


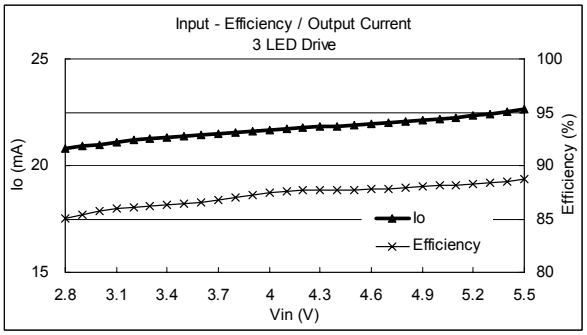

2 LED Drive : L=4.7uH
3 to 5 LED Drive : L=6.8uH
6 LED Drive : L=10uH

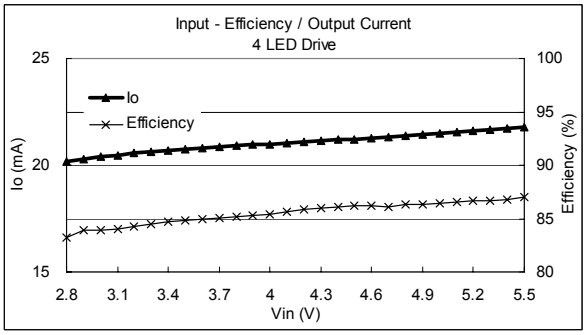
L : 1001AS Series (Size 3.8×3.8×1.2mm)
S-Di : CUS02 1A/30V (TOSHIBA)
LED : NSCW215T (NICHIA)




<Measurement Data>
Efficiency in the range of Vin=2.8 to 5.5V

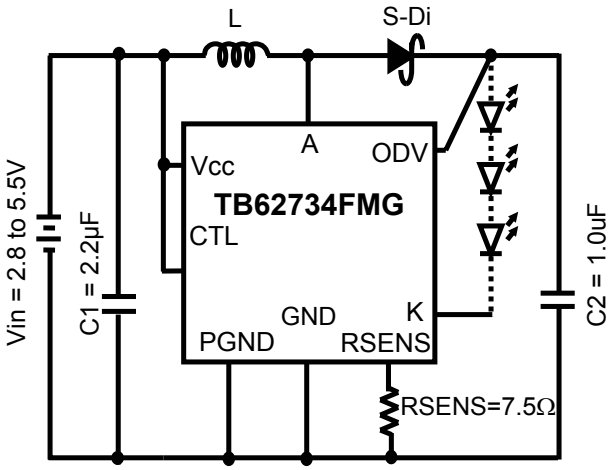
| | Efficiency (%) | Average Efficiency(%) |
|---|---|---|
| 2 LED | 87.25 to 91.90 | 90.00 |
| 3 LED | 85.04 to 88.75 | 87.24 |
| 4 LED | 83.18 to 86.95 | 85.50 |
| 5 LED | 81.15 to 85.36 | 83.93 |
| 6 LED | 82.11 to 85.87 | 84.35 |

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) |

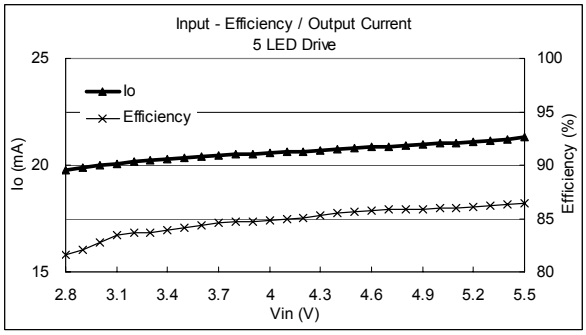
( ) : renge of Vin=3.0 to 4.3 V

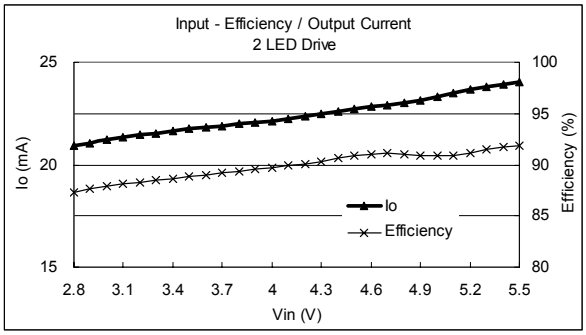
**(2) example of Application Circuit and Measurement data : Inductor CXLD120 Series (Sumitomo)**

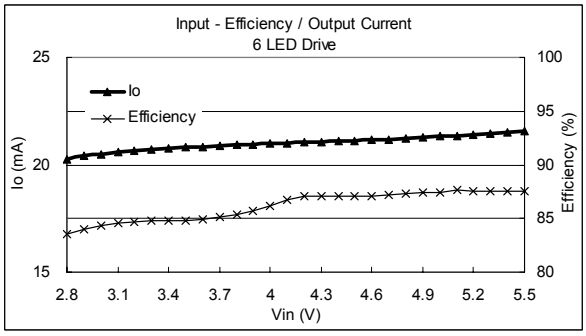


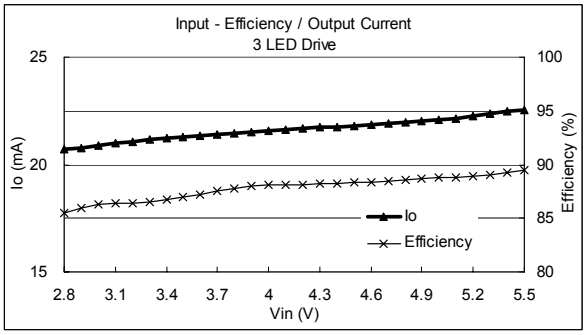

2 LED Drive : L=4.7uH
3 to 5 LED Drive : L=6.8uH
6 LED Drive : L=10uH

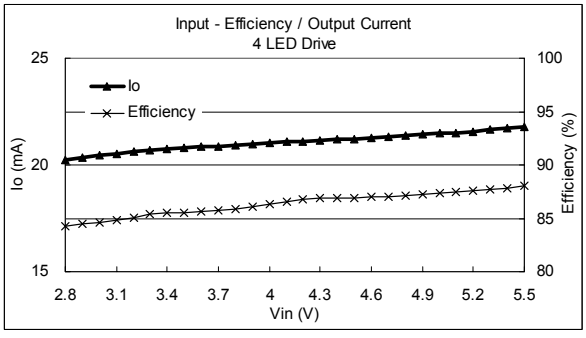
L : 1001AS Series (Size3.0×2.65×1.20mm)
S-Di : CUS02 1A/30V (TOSHIBA)
LED : NSCW215T (NICHIA)




<Measurement Data>
Efficiency in the range of Vin=2.8 to 5.5V

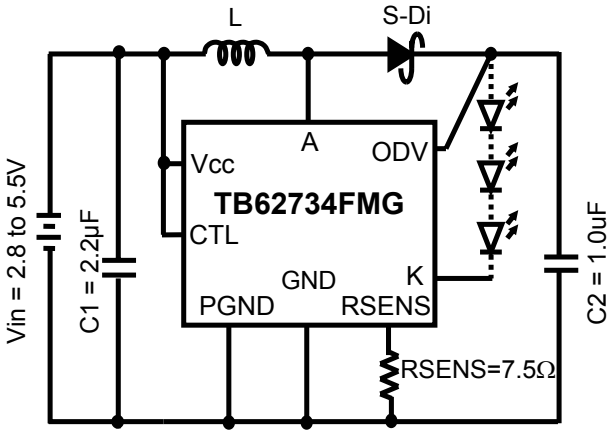
| | Efficiency(%) | Average Efficiency (%) |
|---|---|---|
| 2 LED | 87.34 to 91.82 | 89.87 |
| 3 LED | 85.46 to 89.50 | 87.81 |
| 4 LED | 84.22 to 87.99 | 86.33 |
| 5 LED | 81.65 to 86.49 | 84.84 |
| 6 LED | 83.53 to 87.63 | 86.15 |

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) |

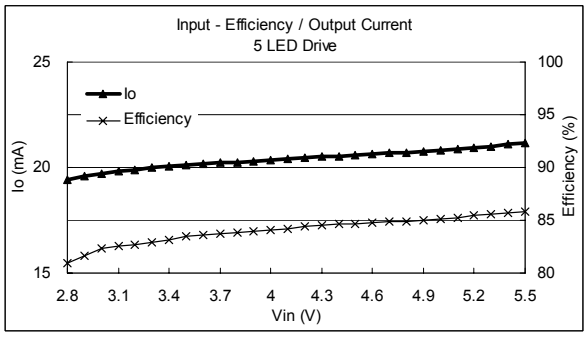
( ) : renge of Vin=3.0 to 4.3 V

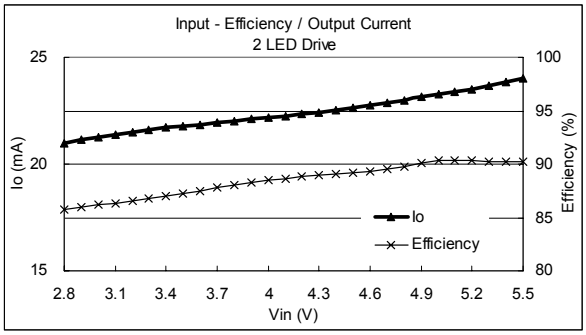
**(3) The example of Application Circuit and Measurement data : Inductor VLF3010 Series (TDK)**

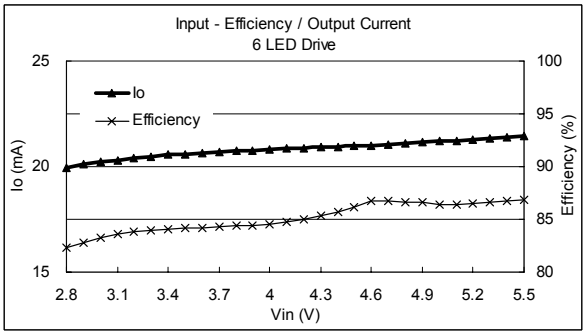


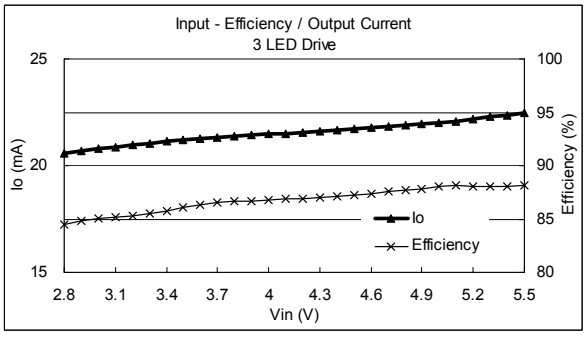

2 LEDDrive : L=4.7uH
3 to 5 LED Drive : L=6.8uH
6 LED Drive : L=10uH

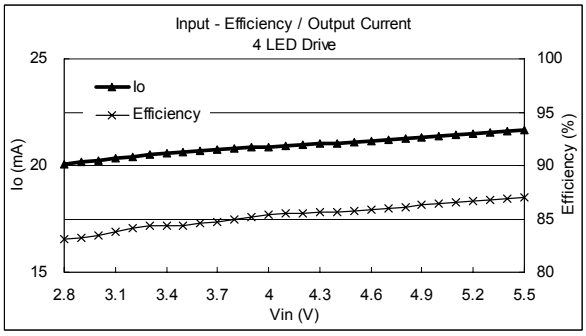
L : VLF3010 Series (Size3.0×3.0×1.0mm)
S-Di : CUS02 1A/30V (TOSHIBA)
LED : NSCW215T (NICHIA)




<Measurement Data>
Efficiency in the range of Vin=2.8 to 5.5V

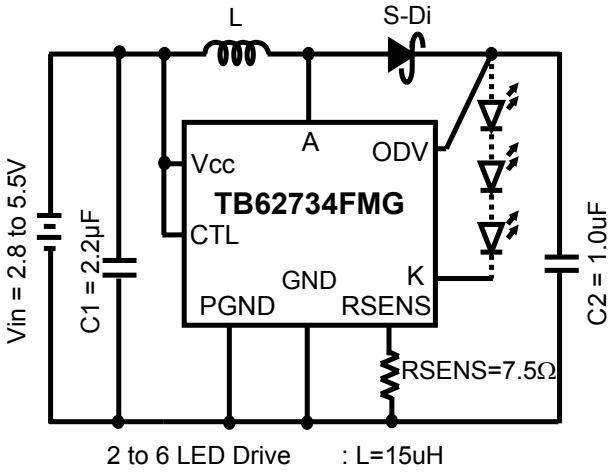
| | Efficiency(%) | Average Efficiency (%) |
|---|---|---|
| 2 LED | 85.70 to 90.39 | 88.47 |
| 3 LED | 84.51 to 88.15 | 86.76 |
| 4 LED | 83.06 to 86.97 | 85.30 |
| 5 LED | 80.94 to 85.78 | 84.07 |
| 6 LED | 82.28 to 86.85 | 85.11 |

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) |

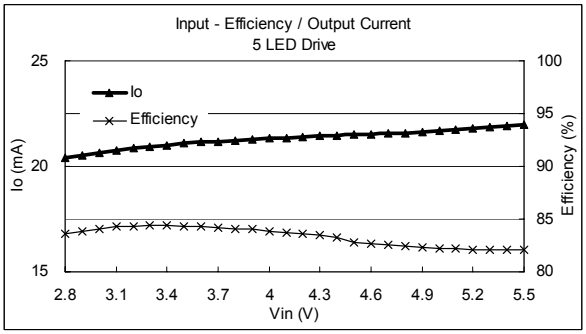
( ) : renge of Vin=3.0 to 4.3 V

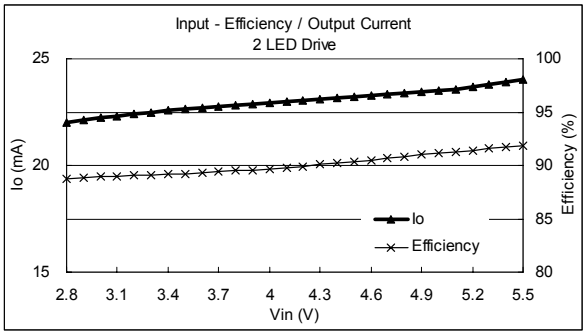
**(3) The example of Application Circuit and Measurement data : Inductor CXML322509-150 (Sumitomo)**

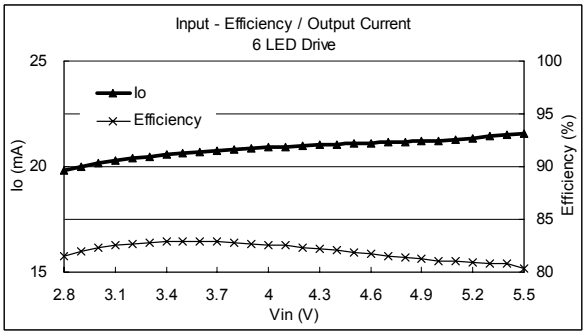


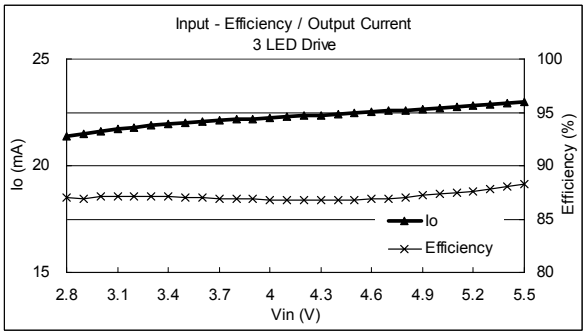

2 to 6 LED Drive : L=15uH

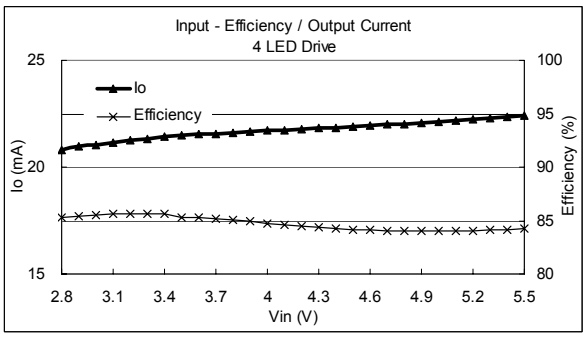
L : CXML322509-150 (Size3.2×2.5×0.9mm)
S-Di : CUS02 1A/30V (TOSHIBA)
LED : NSCW215T (NICHIA)




<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

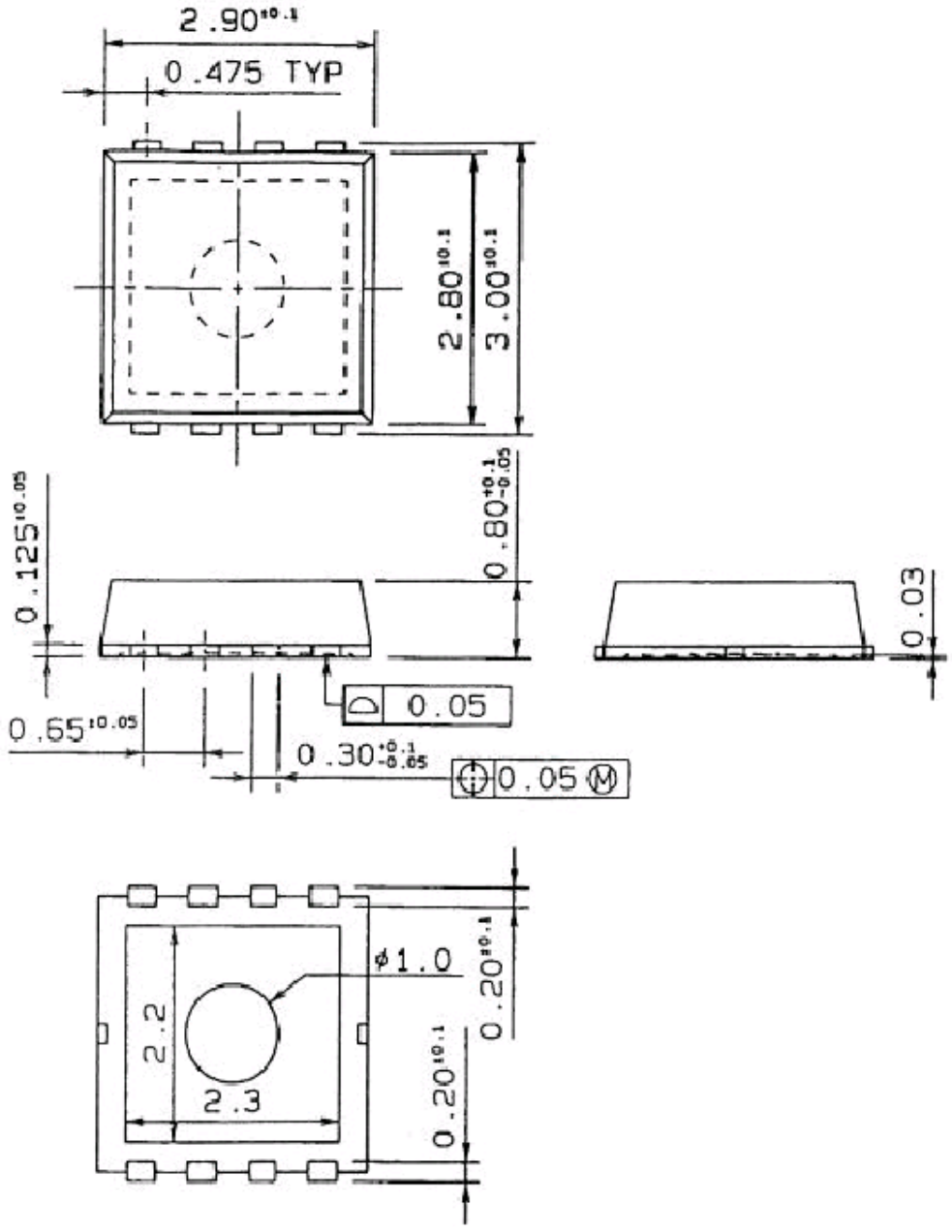
| | Output Current (mA) | Tolerance (%) |
|---|---|---|
| 2 LED | 22.00 to 24.04 | 9.30 (3.85) |
| 3 LED | 21.39 to 23.00 | 7.49 (3.56) |
| 4 LED | 20.82 to 22.41 | 7.61 (3.65) |
| 5 LED | 20.39 to 21.99 | 7.82 (3.75) |
| 6 LED | 19.84 to 21.57 | 8.69 (4.26) |

( ) : renge of Vin=3.0 to 4.3 V

**Package (Dimensions)**

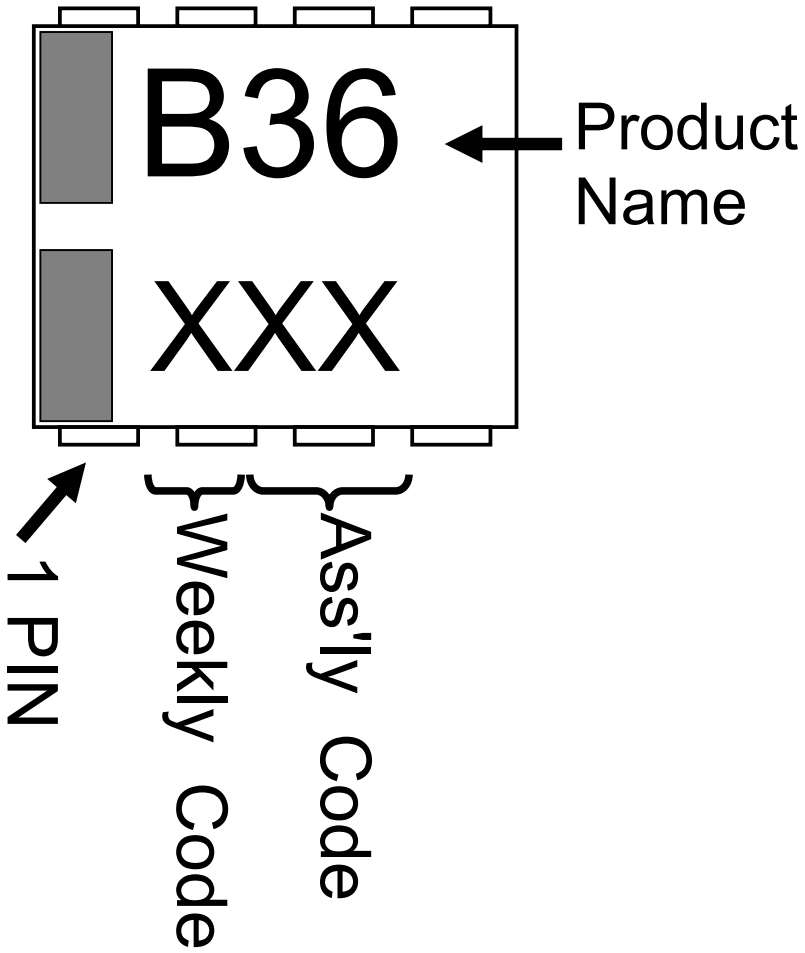
SON8-P-0.65

Unit : mm

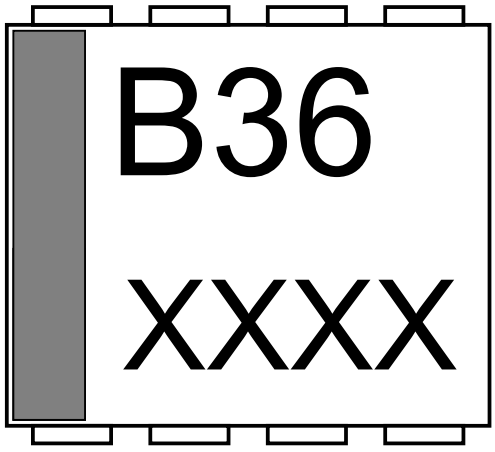


**Marking**

1’st Half
od year
(1 to 26 week)




2’nd Half
of year
(27 to 53 week)



## RESTRICTIONS ON PRODUCT USE

000707EBA

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