

# Note prior to placing order

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Products or specifications on the catalog are subject to be changed without notice. Please inquire our sales agents for our latest specifications. We require an acknowledgment of specification documents for product use beyond our specifications, and conditions needing high reliability, such as nuclear reactor control, railroads, aviation, automobile, combustion, medical, amusement, Disaster prevention equipment and etc. Furthermore, we ask you to perform a swift incoming inspection for delivered products and we would also appreciate if full attention is given to the storage conditions of the product.

## 〈Warranty Period〉

The Warranty period is one year from the date of delivery. The warranty is only applicable to the product itself, not applicable to consumable products such as batteries and etc.

## 〈Warranty Coverage〉

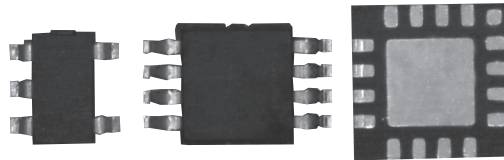
If any malfunctions should occur due to our fault, NIDEC COPAL ELECTRONICS warrants any part of our product within one year from the date of delivery by repair or replacement at free of charge. However, warranty is not applicable if the causes of defect should result from the following conditions:

- Failure or damages caused by inappropriate use, inappropriate conditions, and inappropriate handling.
- Failure or damages caused by inappropriate modifications, adjustment, or repair.
- Failure or damage caused by technically and scientifically unpredictable factors.
- Failure or damage caused by natural disaster, fire or unavoidable factors.

# W series

## WHITE LED DRIVERS

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### ■ SUMMARY

White LED driver “W series”, these are driver ICs for the purpose of activating white LEDs used for backlight illumination in LCDs found in handheld electronic devices, such as mobile phones and PDAs.

The “W Series” includes not only driver ICs used simply for lighting up white LEDs, but also includes a type that can individually activate 4 separate LEDs and a type that can divide 6 LEDs into groups and activate them, making these ideal products for powering handheld electronic devices.

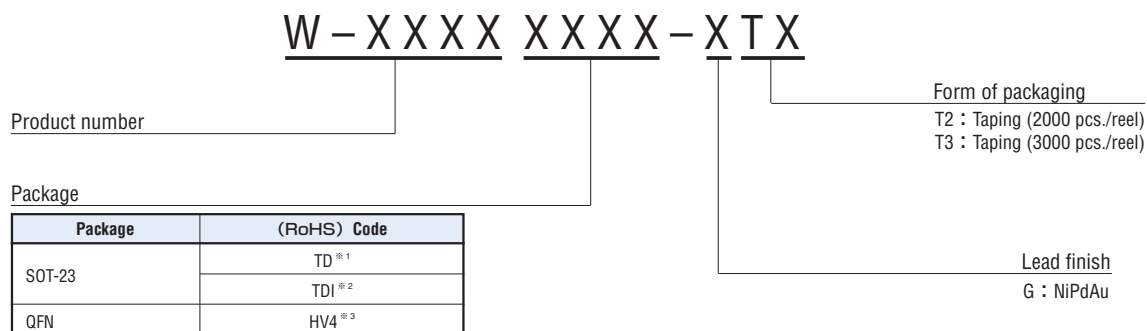
### ■ FEATURES

- Environmentally friendly “RoHS compliant” (Lead-Free and Halogen-Free)
- Low-cost
- Power efficiency greater than 80 %
- Small size and extremely low-profile package 5, 6pin SOT-23, QFN
- Compatible pinout with conventional white LED drivers LTC/SC

### ■ PRODUCT FAMILY

- LCD and keypad backlighting for handheld electronic devices  
W-52, W-6137, W-6139, W-6237, W-6238,  
W-5200-5, W-5626

### ■ PART NUMBER DESIGNATION



#### Taping code and quantity

Package	Taping quantity (pcs./reel)	
	T2	T3
SOT23		○
QFN (4x4)	○	

- ※ 1 : The relevant products are W-6137, W-6237, W-6238.
- ※ 2 : The relevant products are W-52, W-5200-5.
- ※ 3 : The relevant products are W-5626.

### ■ LIST OF PART NUMBERS

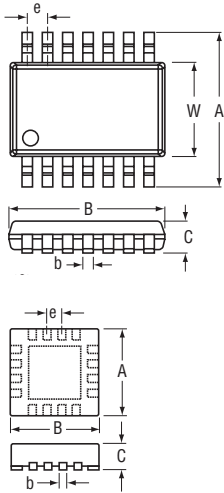
Type for boosting	Product number	Maximum no. of LEDs	Input voltage (V)	Output current (mA)	Efficiency (%)	Package
Boost regulator	W-52	4	2.0 - 7.0	40	83	6-SOT-23
	W-6137	5	2.2 - 5.5	30	87	5-SOT23
	W-6139	27	2.8 - 5.5	180	87	5-SOT23
	W-6237	8	2.8 - 5.5	40	87	5-SOT23
	W-6238	10	- 5.5	30	87	5-SOT23
Charge pump regulator	W-5200-5	6	2.7 - 4.5	100	80	6-SOT23
	W-5626	6	3.0 - 5.5	32/ch	91	QFN16 (4x4)

# W series

## WHITE LED DRIVERS

### PACKAGE DIMENSIONS

(Unit : mm)



#### ● MSOP/SOT-23/SOIC

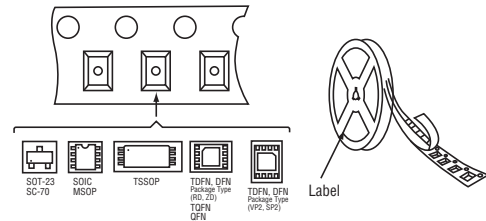
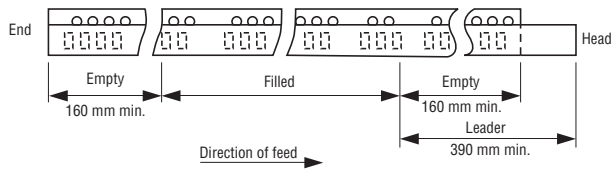
Package	No. of pins	A (Max./Min.)	B (Max./Min.)	W (Max./Min.)	C (Max./Min.)	b (Max./Min.)	e
SOT-23	5	2.80 (Typ.*)	2.90 (Typ.*)	1.60 (Typ.*)	1.0 (max)	0.45/0.30	0.95
	6						

\* Typ. = Typical

#### ● TDFN/QFN

Package	No. of pins	A (Max./Min.)	B (Max./Min.)	W (Max./Min.)	C (Max./Min.)	b (Max./Min.)	e
QFN16 (4x4)	16	4.10/3.90	4.10/3.90	—	0.80/0.70	0.35/0.25	0.65

### TAPING PACKAGING SPECIFICATIONS



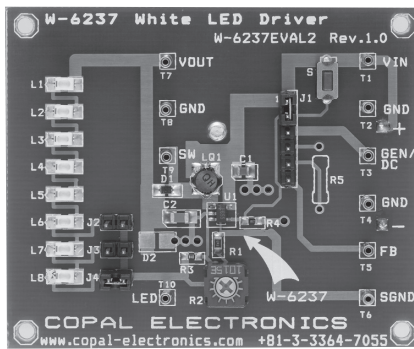
### EVALUATION BOARDS

Below are the evaluation boards and demonstration boards that enable the evaluation of various devices in your design phase.

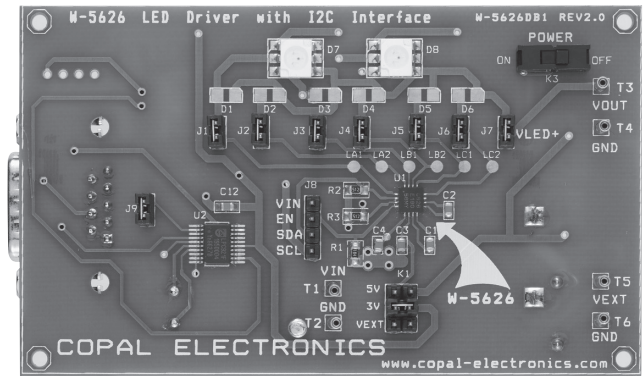
By using these boards, the time that our customers spend on development evaluations may be shortened.

#### Evaluation boards

W-6237EVAL2



W-5626DB1



#### Application Notes, Design Notes

No.	Title
AN14	W-52 Evaluation board for white LED drivers W-52EVAL1
AN24	W-6237 Evaluation board for high voltage white LED drivers : W-6237EVAL2
AN26	W-6137 Evaluation board for white LED drivers : W-6137EVAL1
AN30	W-5626 Evaluation and demo board for 6-channel LED drivers : W-5626DB1
AN32	W-6238 Evaluation board for 10-LED boost converter : W-6238EVAL1
DN9	W-52 White LED Driver Efficiency and Inductor value Tradeoffs

# BASIC CIRCUITRY METHOD AND FEATURES

## WHITE LED DRIVERS

### 1. Boost regulator Type [using coil]

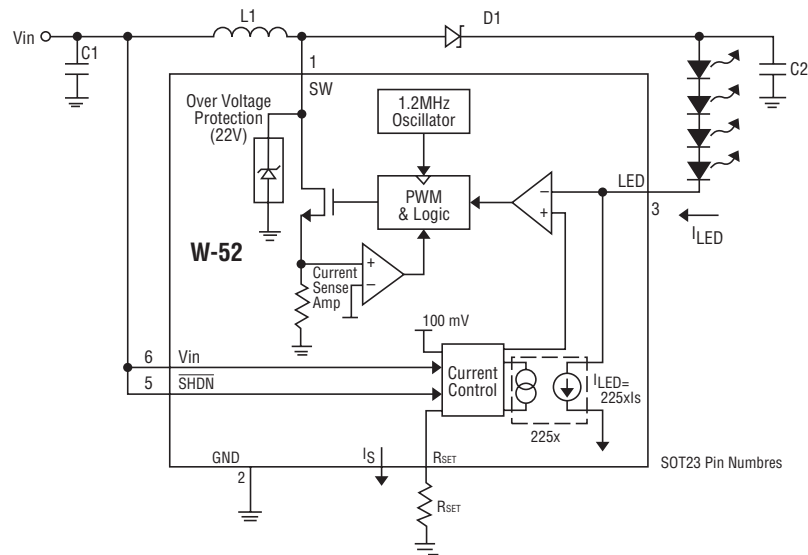


Figure 1: W-52 Block Diagram

### FEATURES

- Designed for driving LEDs in series configuration
- High output voltage, high efficiency (over 80%)

### Circuitry structure and operation

This will be explained by using W-52 as an example.

It is composed of a PWM modulator for activating switch transistor SW and a oscillator which are inside the IC, as well as current sensor circuitry Current Control and error amplifier for detecting the current flowing through the LED and diode Over Voltage Protection for guarding against excessive voltage.

It operates by setting the LED current (5mA to 40mA) to 225 times the current flowing through the R<sub>SET</sub> pin. An error signal travels to the PWM modulator so that the current flowing through the LED connected to the output equalizes with the set value, and the switching circuitry, comprised of an external inductor and switch transistor, varies within an ON/OFF range and regulates the (PWM) output current in order to provide a constant amount of current. In irregular circumstances, such as when the output terminal is open, a diode guarding against excessive voltage will prevent the voltage from rising and protect the circuitry.

### 2. Charge pump regulator Type [using condenser]

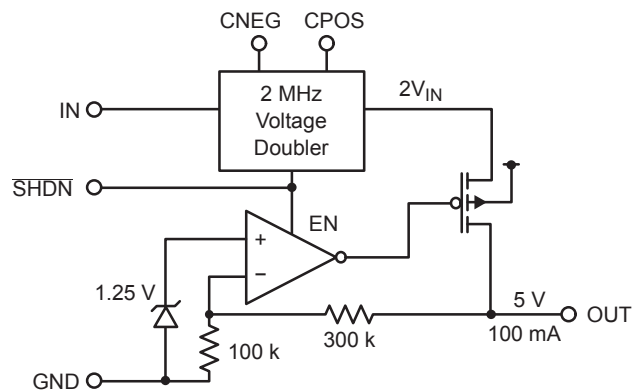


Figure 2

### FEATURES

- Designed for driving LEDs in parallel configuration
- Low noise

### Circuitry structure and operation

The W-5200-5 uses a switched capacitor charge pump to boost the voltage at IN to a regulated output voltage. Regulation is achieved by sensing the output voltage through an internal resistor divider and modulating the charge pump output current based on the error signal. A 2-phase non-overlapping clock activates the charge pump switches. The external flying capacitor is charged from the IN voltage on the first phase of the clock. On the second phase of the clock it is stacked in series with the input voltage and connected to OUT. The charging and discharging of the flying capacitor continues at a free running frequency of typically 2 MHz.

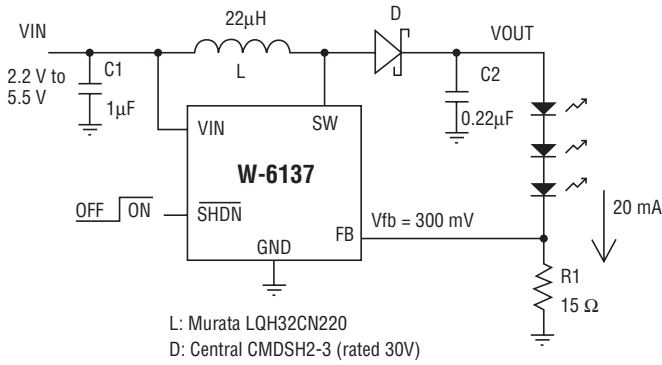
# BASIC CIRCUITRY METHOD AND FEATURES

## WHITE LED DRIVERS

### Example of application in circuitry

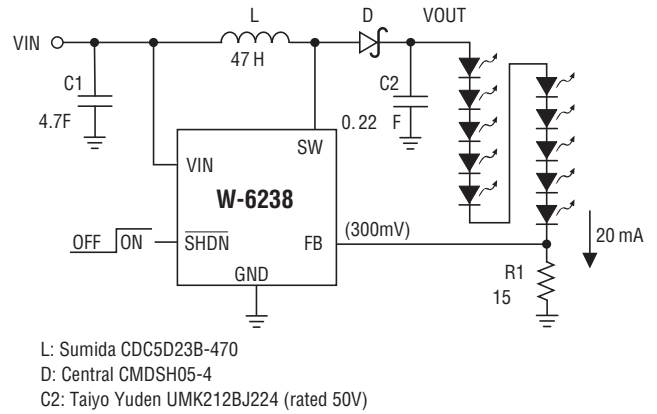
#### W-6137

Driver to Five (Max.) High-Brightness white LEDs

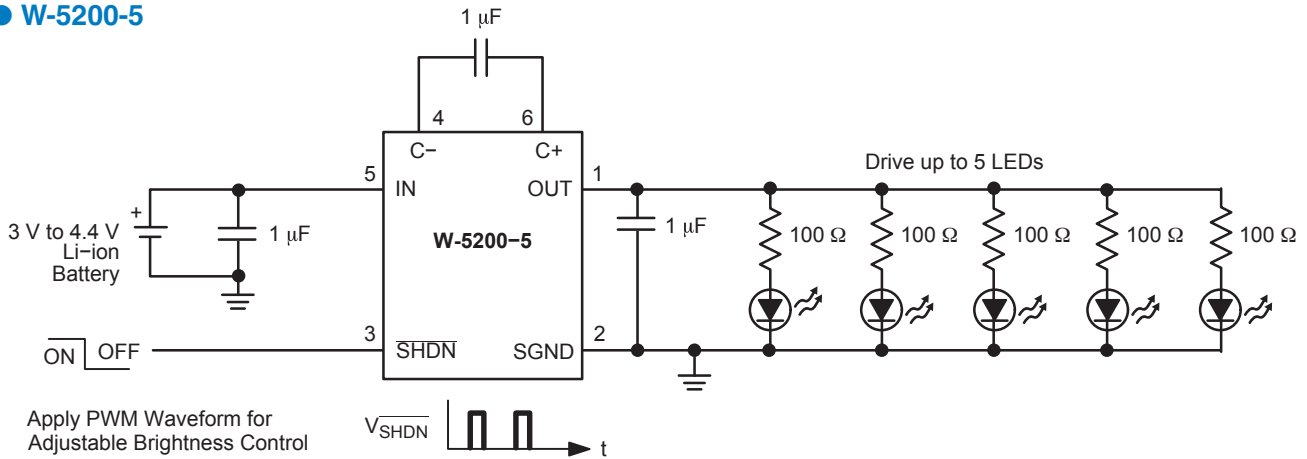


#### W-6238

Driver to Ten (Max.) High-Brightness white LEDs



#### W-5200-5



#### W-5626

Driver to Six High-Brightness White LEDs (I2C control)

