PRELIMINARY

White LED Step-Up Converter With PWM Dimming Control

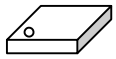
■ GENERAL DESCRIPTION

The **NJU6052** is a step-up DC/DC converter specially designed to drive white light emitting diodes (LEDs). The **NJU6052** drives four LEDs in series with an input voltage range of 3.0V to 5.5V (V_{DD}), and is interfaced to an MPU with a logic voltage range of 1.8V to 5.5V (V_{DDL}).

The **NJU6052** incorporates an LED current control that programs the LED current (I_{LED}) by use of an external resistor, a luminance sensor control, and a PWM (Pulse Width Modulation) dimming control that automatically adjusts the LEDs' brightness according to ambient luminance. The **NJU6052**'s reference voltage has temperature compensation that suppresses the characteristic degradation of the LEDs and provides the maximum performance of the LEDs at high temperatures.

In addition, the **NJU6052**'s current limit control and switching-off control permit the use of small, low-profile inductors and capacitors to minimize the footprint in space-conscious portable applications.

■ PACKAGE OUTLINE

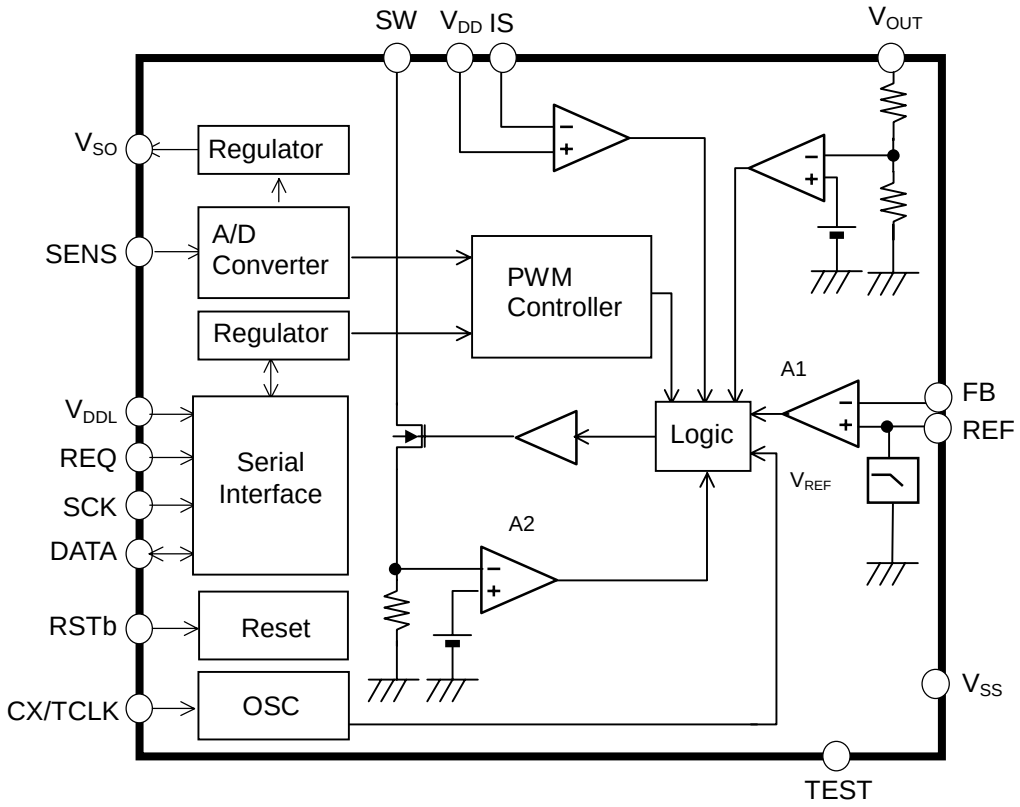


NJU6052***

■ FEATURES

- Drives up to Twelve(4 x3) LEDs(I_{OUT}=60mA Max.)
- Built-in LED Current Control
- Built-in PWM Dimming Control
- Built-in Luminance Sensor Control
- Temperature Compensation Circuit
- Uses Small Inductor and Capacitors
- 3.0V to 5.5V Operating Voltage for Step-up Circuits
- 1.8V to 5.5V Operating Voltage for Logic Circuits
- CMOS Technology
- Package : P-CSP

■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUMN RATINGS

Ta=25°C

PARAMETERS	SYMBOL	CONDITIONS	RATINGS	UNIT
VDD Power Supply	V_{DD}		-0.3 to +6	V
Input Voltage	VI		-0.3 to V_{DDL}+0.3	V
VDD Input Voltage	V_{DD}		-0.3 to V_{DD}+0.3	V
VDDL Power Supply	V_{DDL}		-0.3 to V_{DD}	V
Switch Voltage	V_{SW}		-0.3 to +20	V
Output Voltage	V_{OUT}		-0.3 to +20	V
Feedback Voltage	V_{FB}		-0.3 to V_{DD}+0.3	V
Power Dissipation	PD		T.B.D.	mW
Operating Temperature	T_{opr}		-40 to +85	°C
Storage Temperature	T_{stg}		-55 to +125	°C

Note) The maximum voltage in the system is V_{SW} (V_{OUT}+V_F). VF is the forward voltage of diode D1.

■ DC ELECTRICAL CHARACTERISTICS

V_{DD}=3.0 to 5.5V, Ta=-40 to 85°C

PARAMETERS	SYMBOL	CONDITIONS	RATINGS			Unit
			MIN.	TYP.	MAX.	
V_{DD} Power Supply	V_{DD}		3.0		5.5	V
V_{DDL} Power Supply	V_{DDL}		1.8		V_{DD}	V
Output Current	I_{OUT}	RLED=22Ω		60		mA
Output Voltage	V_{OUT}	C2=1uF		18.0		V
Reference Voltage	V_{REF}	Ta=25°C	0.42	0.44	0.46	V
Operating Current	I_{OP}	fosc=350kHz		T.B.D.		uA
Standby Current	I_{STBY}			T.B.D.		uA
V_{SO} Power Supply	V_{SO}		2.32	2.40	2.48	V
Sense Voltage range	V_{SENS}	SENS terminal	0		V_{DD}	V
Duty Change Voltage 1	V_{D1}	SENS terminal, REV=0 PWMREGSTER6 to 7	0.72V_{SO}	0.8V_{SO}	0.88V_{SO}	V
Duty Change Voltage 2	V_{D2}	SENS terminal, REV=0 PWMREGSTER5 to 6	0.36V_{SO}	0.4V_{SO}	0.44V_{SO}	V
Duty Change Voltage 3	V_{D3}	SENS terminal, REV=0 PWMREGSTER4 to 5	0.18V_{SO}	0.2V_{SO}	0.22V_{SO}	V
Duty Change Voltage 4	V_{D4}	SENS terminal, REV=0 PWMREGSTER3 to 4	0.09V_{SO}	0.1V_{SO}	0.11V_{SO}	V
Duty Change Voltage 5	V_{D5}	SENS terminal, REV=0 PWMREGSTER2 to 3	0.045 VSO	0.05V_{SO}	0.055 V_{SO}	V
Duty Change Voltage 6	V_{D6}	SENS terminal, REV=0 PWMREGSTER1 to 2	0.0225 V_{SO}	0.025 V_{SO}	0.0275 V_{SO}	V
Duty Change Voltage 7	V_{D7}	SENS terminal, REV=0 PWMREGSTER0 to 1	0.01125 V_{SO}	0.0125 V_{SO}	0.01375 V_{SO}	V
Input “L” Level	V_{IL}	SCK, DATA, REQ, RSTB, TCLK terminals	0		0.2V_{DDL}	V
Input “H” Level	V_{IH}	SCK, DATA, REQ, RSTB, TCLK terminals	0.8V_{DDL}		V_{DDL}	V
Output “L” Level	V_{OL}	DATA terminals V_{DDL}=1.8V, I_{OL}=0.4mA			0.2V_{DDL}	V
Output “H” Level	V_{OH}	DATA terminals V_{DDL}=1.8V, I_{OH}=-0.04mA	0.8V_{DDL}			V
Oscillation Frequency	f_{OSC}	V_{DD}=3V, CX=68pF	300	350	400	kHz
Oscillation Duty	DOSC	V_{DD}=3V, CX=68pF		80		%

■ APPLICATION CIRCUIT