Wide Input Range DC-DC Controller for LED Lighting

Features

- Low Quiescent Current of 2.3mA (Typ.)
- Operation Frequency up to 100KHz
- Current Limiting
- Output Switch Current In Excess of 1.5A
- Input Voltage is available from 3V to 30V
- No Compensation Needed

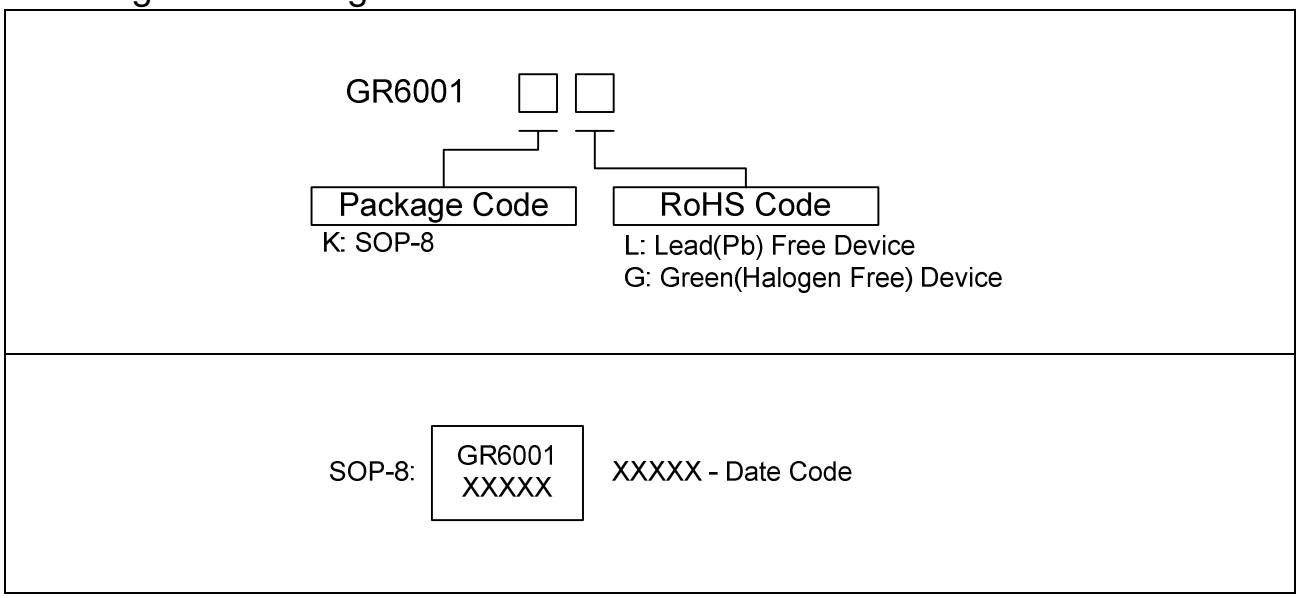
Applications

- High Brightness LED Lighting
- Flash Light

Description

The GR6001 is an integrated control circuit containing the main functions for LED lighting. This IC consists of a temperature compensated reference, comparator, controlled duty cycle oscillator with a current limit circuit, driver and high current output switch. The LED current can set by an external sensing resistor; this function allows users to adjust the LED current by their requirements. The GR6001 can operate in the wide input voltage range of 3V to 30V and apply in MR16 lamps to replace the traditional 50W halogen lamps due to the electronic transformers always generate an input voltage under 20V in the input terminal of MR16 lamps.

Ordering and Marking Information



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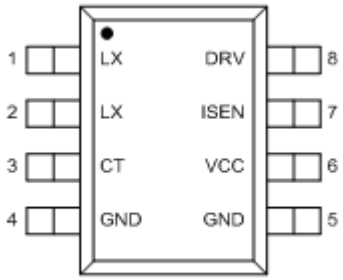
Pin Configuration

SOP-8 (TOP VIEW)



Note: The pin 1 and pin 2, pin 4 and pin 5 must be routed together in the PCB layout.

Pin Description

Pin	Symbol	Description
1, 2	LX	The switching point. An internally switch in this pin will pull low at on time period
3	CT	This pin will connect a capacitor to decide the switching frequency
4, 5	GND	The ground of internal control circuit
6	VCC	Power rail of the IC
7	ISEN	Current sense input, a sensing resistor located from ISEN to VCC will sense the input current
8	DRV	Connect a resistor in this pin can set the driving ability of the internal switch. The setting resistor must locate from DRV to VCC

Absolute Maximum Ratings

DC Supply Voltage, V_{CC} ---------- (-0.3V) ~32V

Driving Ability Setting Voltage, V_{DRV} ---------- (-0.3V) ~ 32V

Switching Voltage, V_{LX} ---------- (-0.3V) ~ 32V

Frequency Setting Voltage, V_{CT} ---------- (-0.3V) ~ 10V

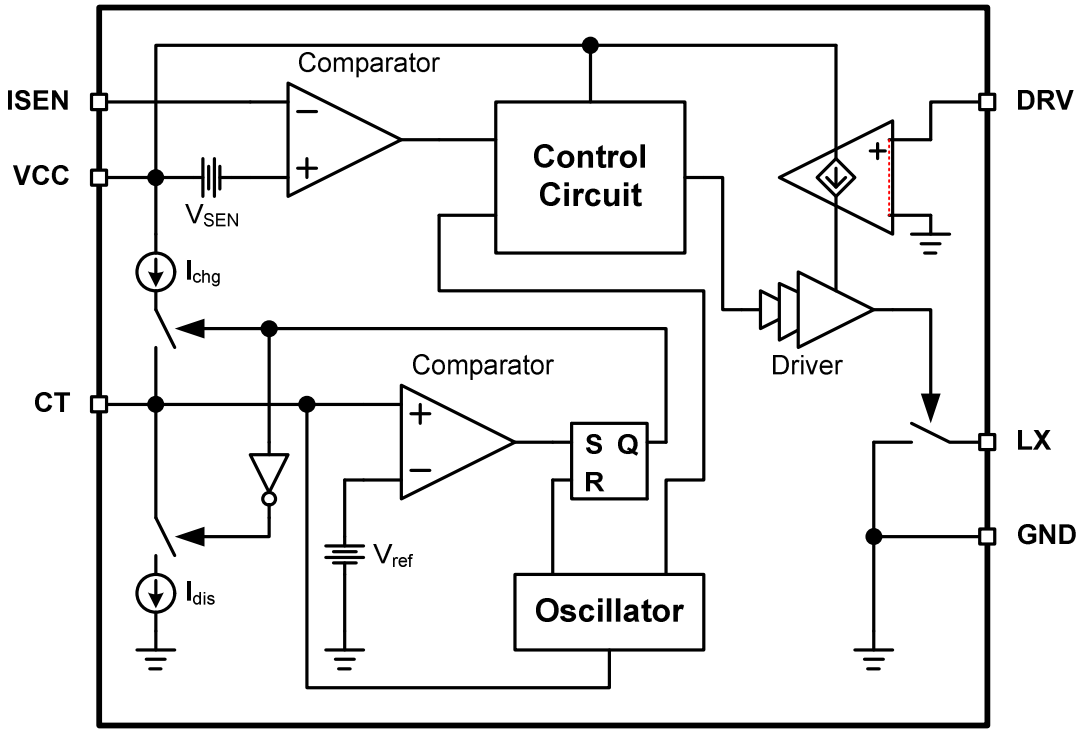
Current Sensing Voltage, V_{ISEN} ---------- (-0.3V) ~ 32V

Switching Current, I_{LX} ---------- 1.5A

Junction Temperature, T_{MJ} ---------- 150℃

Storage Temperature Range, T_{ST} ---------- (-65℃) ~ 150℃

Block Diagram



Electrical Characteristics (Vcc = 5V, TA = 25℃.)

Parameter	Symbol & Condition	Min.	Typ.	Max.	Unit
Start-up Voltage	$V_{ST;}$ C_{CT} = 0.18nF.	-	2.6	-	V
Supply Current	$I_{CC;}$ V_{CC} = 5V to 30V, C_{CT}=0.18nF.	-	2.3	4	mA
Frequency	$f_{OSC;}$ C_{CT}=0.18nF.	64	86	108	KHz
Charge Current	$I_{chg;}$ V_{CC}=5V to 30V. V_{CT}=0V.	24	33	42	μA
Discharge Current	$I_{dis;}$ V_{CC}=5V to 30V. V_{CT}=1.5V.	140	200	260	μA
Discharge to Charge Current Ratio	I_{dis} / $I_{chg;}$ T_A=25℃.	5.2	6.2	7.5	-
Current Limit Sense Voltage	$V_{SEN;}$ I_{DRV}=20mA. I_{DRV}=50mA to 0mA. V_{CT}=0V.	0.335	0.40	0.465	V
Switching Voltage	$V_{LX;}$ V_{CT} =0V, I_{DRV}=20mA, I_{LX}=0.35A.	-	200	-	mV
Leakage Current of Power Switch	$I_{LX\_LKG;}$ V_{LX} =30V. I_{DRV}=0mA.	-	0.1	10	μA

Typical Application Circuit

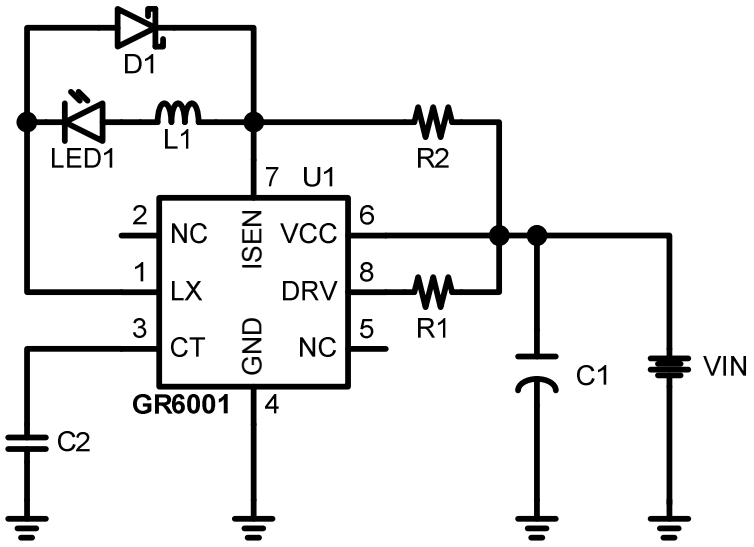


Figure 1.The LED lighting application circuit of 1LED.

BOM of Figure 1.

Designator	Description
U1	Buck Controller
R1	0.75Ω
R2	510Ω
D1	1A/20V Schottky Diode
C1	47μF/25V
C2	180pF/X5R
L1	47μH
LED	350mA

Typical Application Circuit (Cont.)

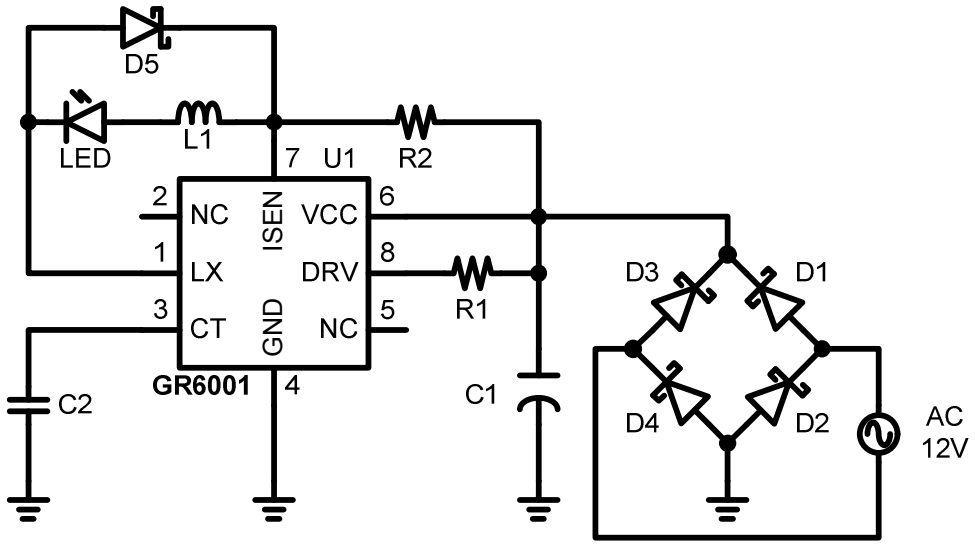


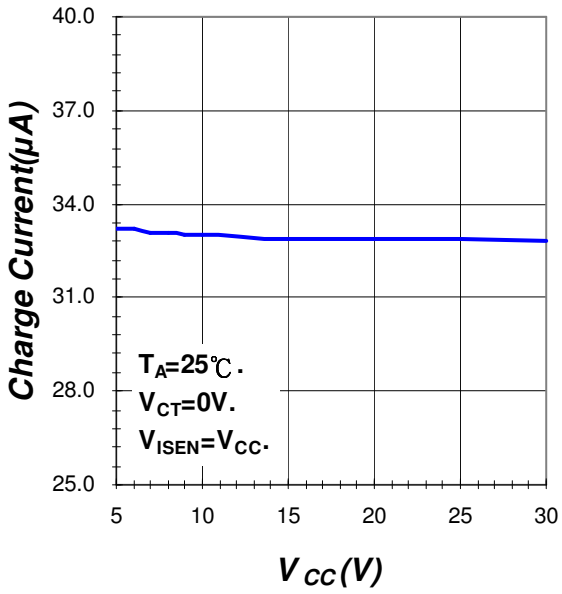
Figure 2.The LED lighting application circuit of MR16.

BOM of Figure 2.

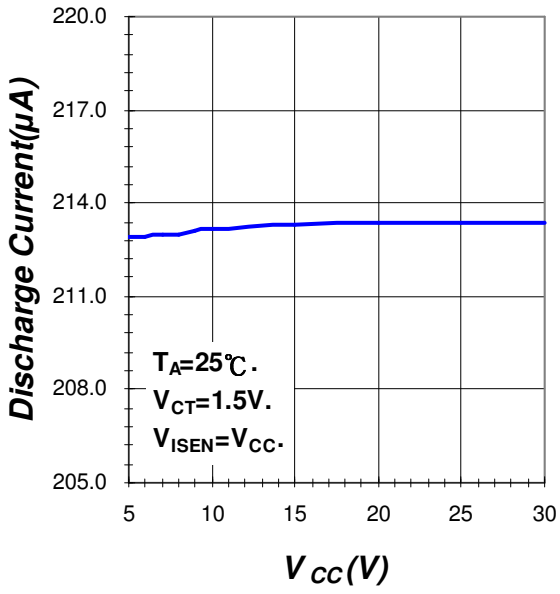
Designator	Description
U1	Buck Controller
R1	0.75Ω
R2	510Ω
D1, D2, D3, D4, D5	1A/20V Schottky Diode
C1	47μF/25V
C2	180pF/X5R
L1	47μH
LED	350mA

Characteristic Curves

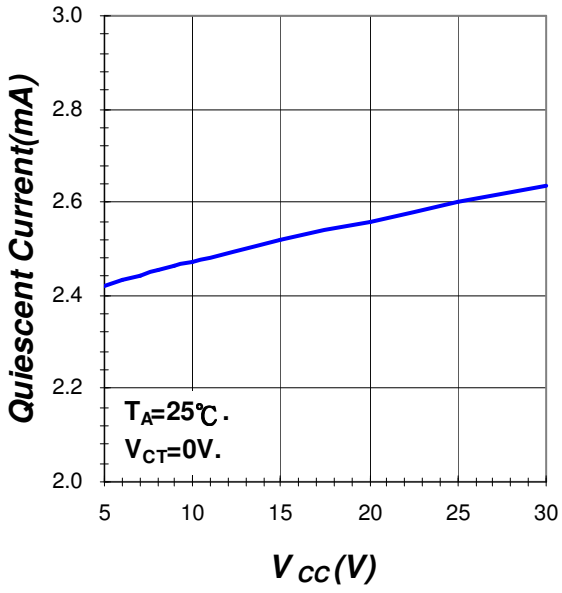
Charge Current vs. V_{CC}



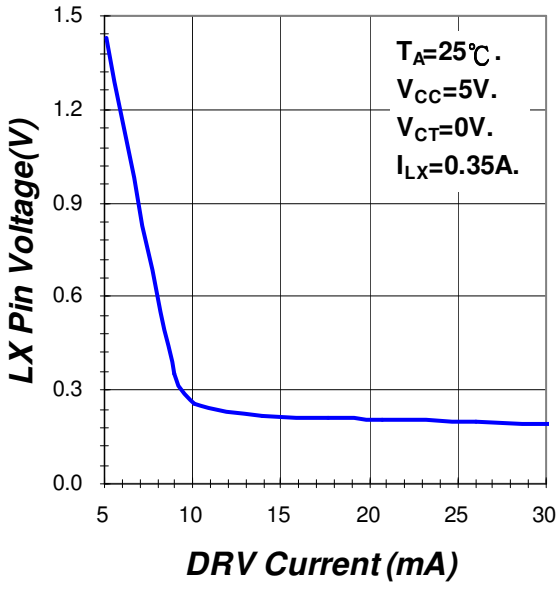
Discharge Current vs. V_{CC}



Quiescent Current vs. V_{CC}

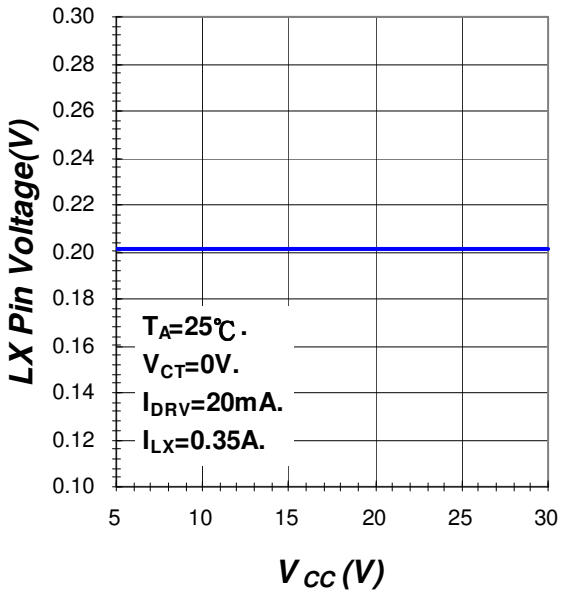


V_{LX} vs. I_{DRV}

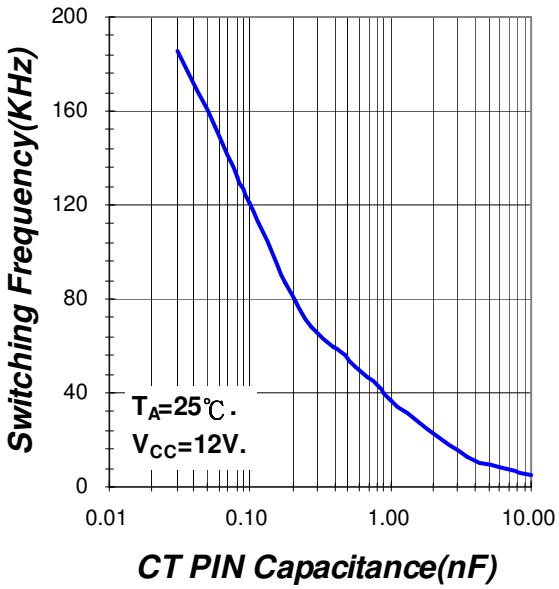


Characteristic Curves (Cont.)

V_{LX} vs. V_{CC}

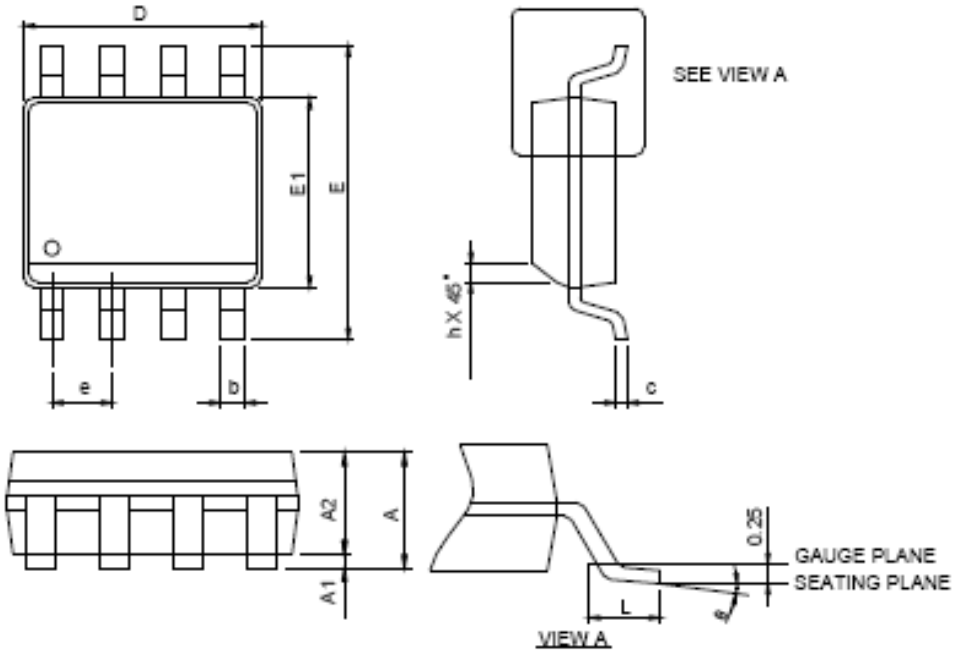


Switching Frequency vs. C_{CT}



Package Information

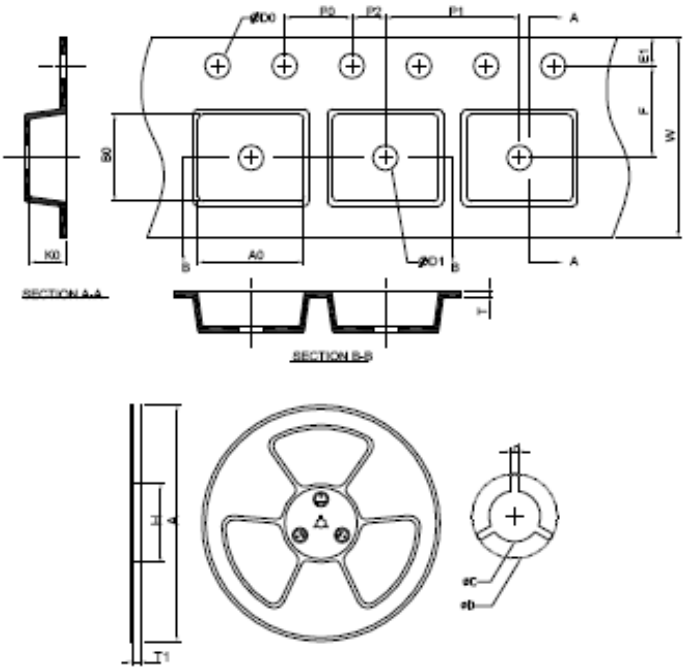
SOP-8



SYMBOL	SOP-8			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A		1.75		0.069
A1	0.10	0.25	0.004	0.010
A2	1.25		0.049	
b	0.31	0.51	0.012	0.020
c	0.17	0.25	0.007	0.010
D	4.80	5.00	0.189	0.197
E	5.80	6.20	0.228	0.244
E1	3.80	4.00	0.150	0.157
e	1.27 BSC		0.050 BSC	
h	0.25	0.50	0.010	0.020
L	0.40	1.27	0.016	0.050
θ	0°	8°	0°	8°

Carrier Tape & Reel Dimension

SOP- 8



Application	A	H	T1	C	d	D	W	E1	F
SOP- 8	330.0±2.00	50 MIN.	12.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	12.0±0.30	1.75±0.10	5.5±0.05
	P0	P1	P2	D0	D1	T	A0	B0	K0
	4.0±0.10	8.0±0.10	2.0±0.05	1.5+0.10 -0.00	1.5 MIN.	0.6+0.00 -0.40	6.40±0.20	5.20±0.20	2.10±0.20

(mm)

Devices Per Unit

Package Type	Unit	Quantity
SOP-8	Tape & Reel	2500

Revision History

Ver.	Date	Change Notice
1.0	08/04/23	Initial