Self-oscillating Half-bridge Power IC

Features

- Integrated half-bridge 440V power MOSFET
- Floating channel designed for bootstrap operation
- Noise immunity of transient voltage
- Under-voltage lockout
- Programmable oscillator frequency
- Matched propagation delay for both channels
- Ultra low startup current of 75uA
- Shutdown function turns off both channels
- Low side output in phase with R_T

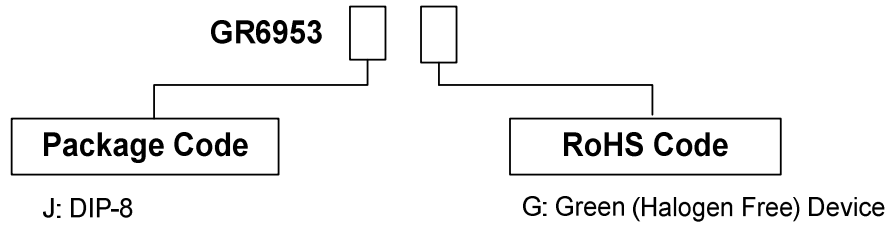
Applications

- Compact fluorescent lamps (CFL)
- Cathode compact fluorescent lamp (CCFL)

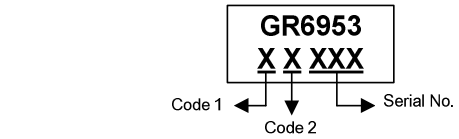
Description

GR6953 is a high voltage monolithic IC with integrated 440V half-bridge power MOSFET. Proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction. The front end features a programmable oscillator which is similar to the 555 timer. The output drivers feature a high pulse current buffer stage and an internal dead time designed for minimum driver cross-conduction. Propagation delays for the two channels are matched to simplify use in 50% duty cycle applications.

Ordering and Marking Information



DIP-8



Code 1	8	9	A	B		G	H	I	J
Year	2008	2009	2010	2011		2016	2017	2018	2019
Code 2	1	2	3	4		9	A	B	C
Month	Jan.	Feb.	Mar.	Apr.		Sep.	Oct.	Nov.	Dec.

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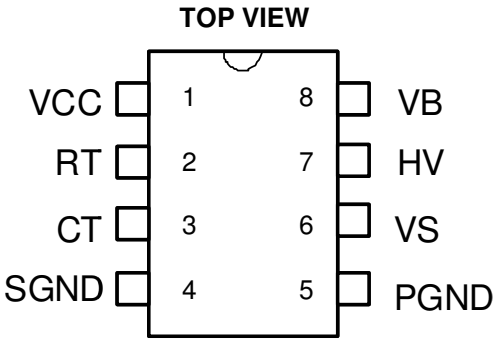
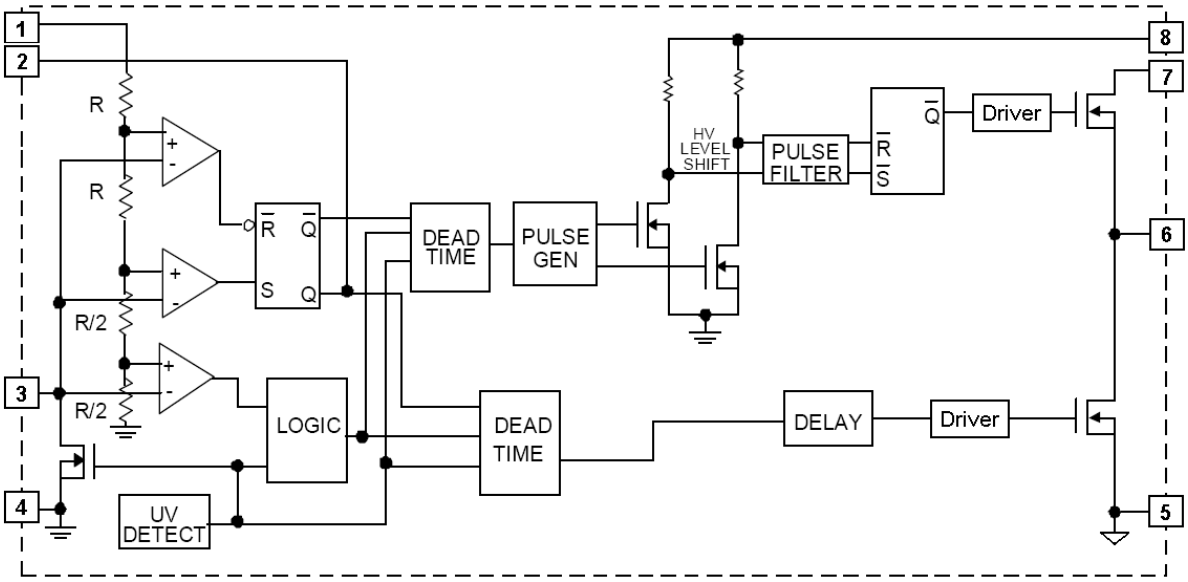
Pin Configuration



Pin Description

Pin No.	Name	Function
1	VCC	Low side and logic fixed supply
2	RT	Oscillator timing resistor input, in phase with HO for normal IC operation
3	CT	Oscillator timing capacitor input, the oscillator frequency according to the following equation: f = 0.7213 / (RT x CT)
4	SGND	Signal ground
5	PGND	Low side MOSFET source
6	VS	High side floating supply return and power output
7	HV	High side MOSFET drain
8	VB	High side floating supply

Block Diagram



Absolute Maximum Ratings

Supply voltage VCC ---------- 19V

VB ---------- −0.3V ~ 440V

VS ---------- VB-25V ~ VB+0.3V

HV ---------- VS-0.3V ~ VB+0.3V

RT, CT ---------- −0.3V ~ VCC+0.3V

Junction temperature ---------- 150℃

Operating ambient temperature ---------- −20℃ ~ 85℃

Storage temperature range ---------- −65℃ ~ 150℃

DIP-8 package thermal resistance ---------- 100℃/W

Power dissipation (DIP-8, at ambient temperature = 85℃) ---------- 650mW

Lead temperature (All Pb free packages, soldering, 10sec) ---------- 260℃

ESD voltage protection, human body model ---------- 2KV

ESD voltage protection, machine model ---------- 200V

Recommended Operating Conditions

Item	Min.	Max.	Unit
Supply voltage VCC	10	18	V
Supply voltage VBS	VCC-0.7	18	V
Supply voltage HV		400	V
CFL (Input power)		23	W

Electrical Characteristics

(VCC = 12V, HV = 12V, Cboot = 0.1uF, CL = 1nF, CT = 1nF, Dboot is a ultra fast diode, and Ta = 25℃, unless otherwise specified. The VIN, VTH and IIN parameters are referenced to SGND = PGND = 0V)

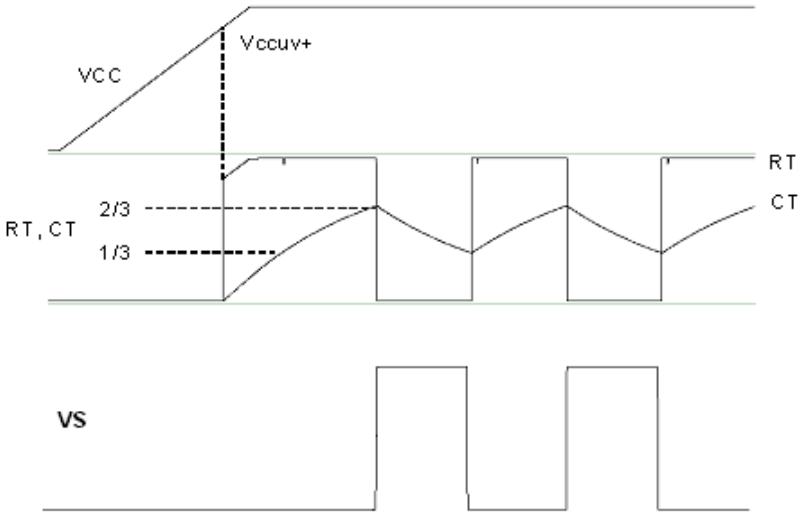
Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
LOW VOLTAGE SUPPLY CHARACTERISTICS						
Rising VCC under-voltage lockout threshold		V_{CCUV+}	8.1	9.0	9.9	V
Falling VCC under-voltage lockout threshold		V_{CCUV-}	7.2	8.0	8.8	V
VCC under-voltage lockout Hysteresis		V_{CCUVH}	0.5	1.0	1.5	V
Micropower startup VCC supply current	$V_{CC} \le V_{CCUV}$	I_{QCCUV}	—	50	100	μA
Quiescent VCC supply current		I_{QCC}	—	160	300	μA
VCC operating voltage		Vop	10	12	18	V
OSCILLATOR I/O CHARACTERISTICS						
Oscillator frequency (CT=1nF)	RT = 36k	f_{osc}	19.4	20	20.6	kHz
	RT = 7.2k		94	100	106	kHz
RT pin duty cycle	f_{osc}<100kHz	d	48	50	52	%
CT pin current		I_{CT}	—	0.001	1.0	uA
UV-mode CT pin pulldown current	V_{CC} = 7V	I_{CTUV}	0.25	0.30	0.5	mA
Upper CT ramp voltage threshold		V_{CT+}	—	8.0	—	V
Lower CT ramp voltage threshold		V_{CT-}	—	4.0	—	V
CT voltage shutdown threshold		V_{CTSD}	4.0	4.1	4.2	V
High-level RT output voltage, VCC - VRT	I_{RT} = 100uA	V_{RT+}	—	10	50	mV
	I_{RT} = 1mA		—	100	300	mV
Low-level RT output voltage	I_{RT} = 100uA	V_{RT-}	—	10	50	mV
	I_{RT} = 1mA		—	100	300	mV
UV-mode RT output voltage	$V_{CC} \le V_{CCUV}$	V_{RTUV}	—	0	100	mV
SD-Mode RT output voltage, VCC - VRT	I_{RT} = 100uA	V_{RTSD}	—	10	50	mV
	V_{CT} = 0V					mV
	I_{RT} = 1mA		—	100	300	mV
	V_{CT} = 0V					mV

Electrical Characteristics (Cont.)

BUILT-IN MOSFET CHARACTERISTICS

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Drain – source break down voltage	V_{GS} = 0V, I_D =250uA	BV_{DSS}	440			V
Peak drain current @ V_{GS}=10V	Ta = 25℃	I_D			1.5	A
Drain - source on state resistance	V_{GS} =10V, ID=0.2A	Rds(on)		3.0	3.5	Ω
Drain – source leakage current	V_{DS} = 400V, V_{GS} = 0V, Tj = 25 °C	I_{DSS}			25	uA
	V_{DS} = 400V, V_{GS} = 0V, Tj = 125°C				250	
Gate threshold voltage	VDS = VGS, ID = 250uA	V_{TH}	2	3	4	V
Diode forward voltage	VDS = 0V, ID = 0.3A	V_{SD}			1.0	V

Input / Output Timing Diagram



f_{osc} = 0.7213 / (RT x CT) (kHz)

Typical Performance Characteristics

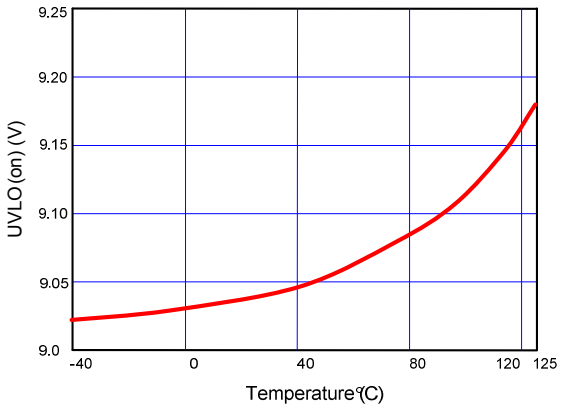


Fig. 1 UVLO(on) vs. Temperature

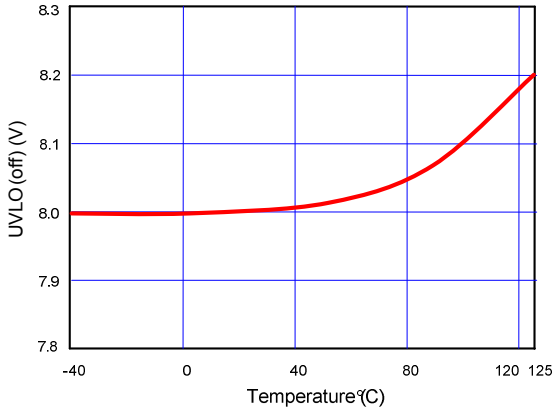


Fig. 2 UVLO(off) vs. Temperature

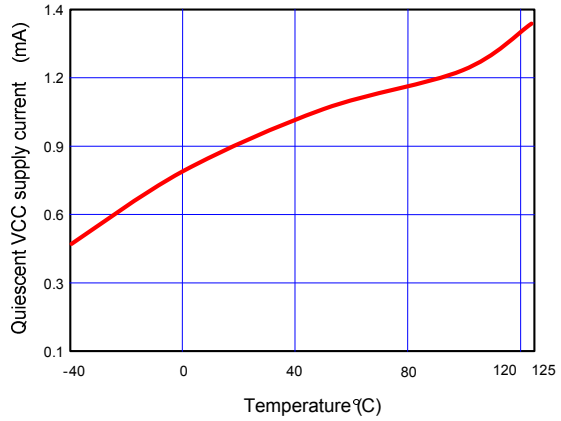


Fig.3 Quiescent VCC supply currentvs. Temperature

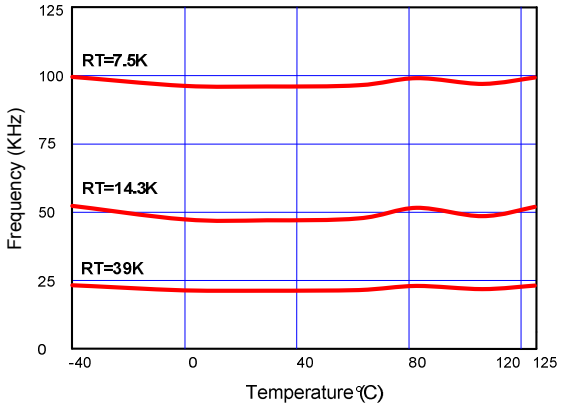


Fig.4 Frequency vs. Temperature

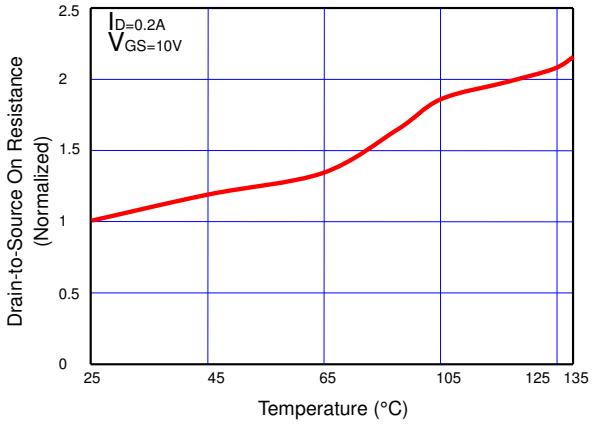
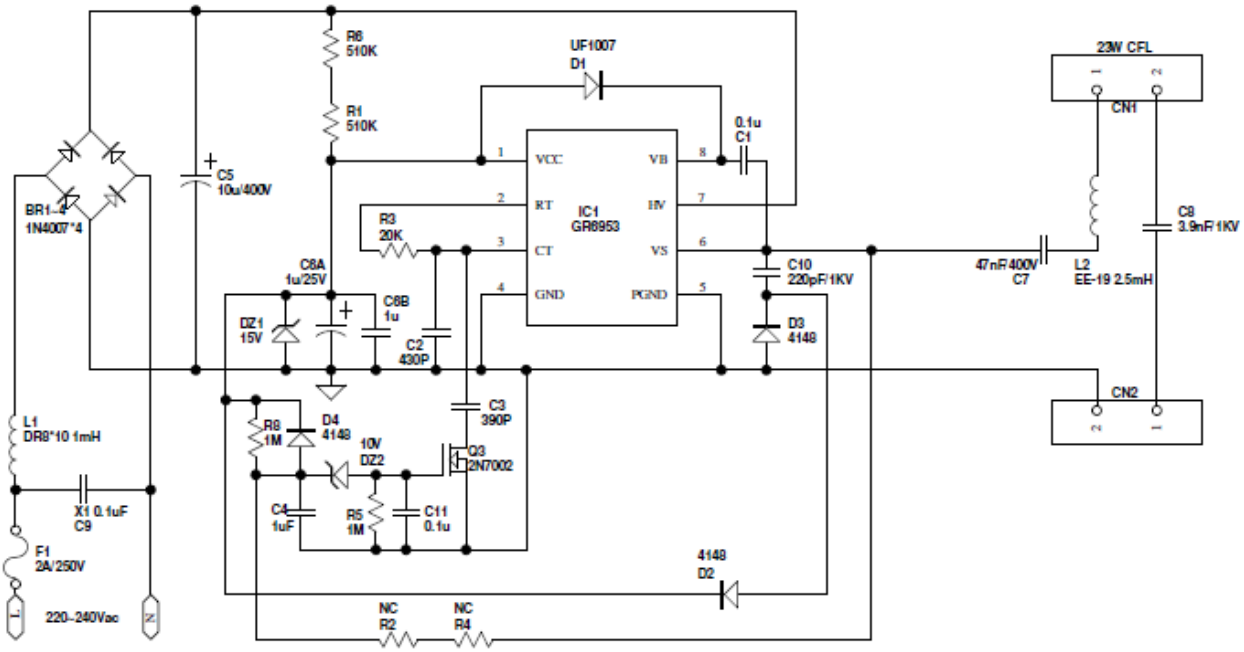
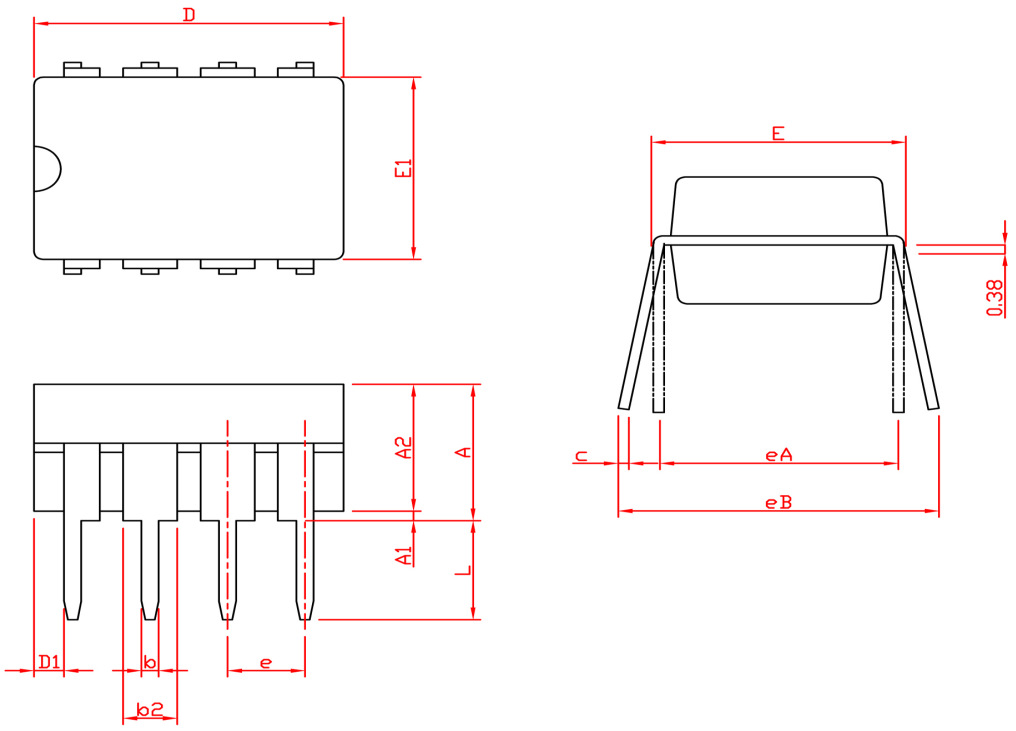


Fig. 5 Rds(on) vs. Temperature

Typical Application Circuit (220~240Vac 23W CFL)



Package Information



SYMBOL	DIP-8			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A		5.33		0.210
A1	0.38		0.015	
A2	2.92	4.95	0.115	0.195
b	0.36	0.56	0.014	0.022
b2	1.14	1.78	0.045	0.070
c	0.20	0.35	0.008	0.014
D	9.01	10.16	0.355	0.400
D1	0.13		0.005	
E	7.62	8.26	0.300	0.325
E1	6.10	7.11	0.240	0.280
e	2.54 BSC		0.100 BSC	
eA	7.62 BSC		0.300 BSC	
eB		10.92		0.430
L	2.92	3.81	0.115	0.150

Note : 1. Followed from JEDEC MS-001 BA

2. Dimension D, D1 and E1 do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 10 mil.