

Photoflash Charge IC with a built-in IGBT driver

Monolithic IC MM3456

Outline

This IC is a photoflash charge IC with a built-in IGBT driver, which has functions to charge photoflash capacitors and flash xenon tubes of digital still cameras and cell phones.

High efficient charging is achieved due to built-in switching FET with 40V withstanding voltage and low ON resistance ($R_{on} = 0.25\Omega$).

Moreover, the primary peak current limitation up to 2A makes fast charging to the photoflash capacitor possible.

Furthermore, this IC contains functions such as double protection for battery full-charge detection at the primary and secondary sides, thermal shutdown, and in addition to the IGBT driver.

This IC uses small SSON-10 package.

Features

1. High efficiency charging due to built-in switching FET with 40V withstanding voltage and low ON resistance ($R_{on} = 0.25\Omega$)
2. Peak current at the primary side of the transformer is programmable up to 1.0-2.0A (3 levels, 2 ranks), fast charging
3. Built-in IGBT driver
4. High accuracy output voltage control ($\pm 1\%$)
5. Input voltage : 2.5V - 6.0V
6. Protective functions
 - Thermal shutdown
 - Maximum ON time
 - Double protection for battery full-charge detection
7. Small SSON-10 package
(2.5mm×2.7mm×0.6mm MAX)

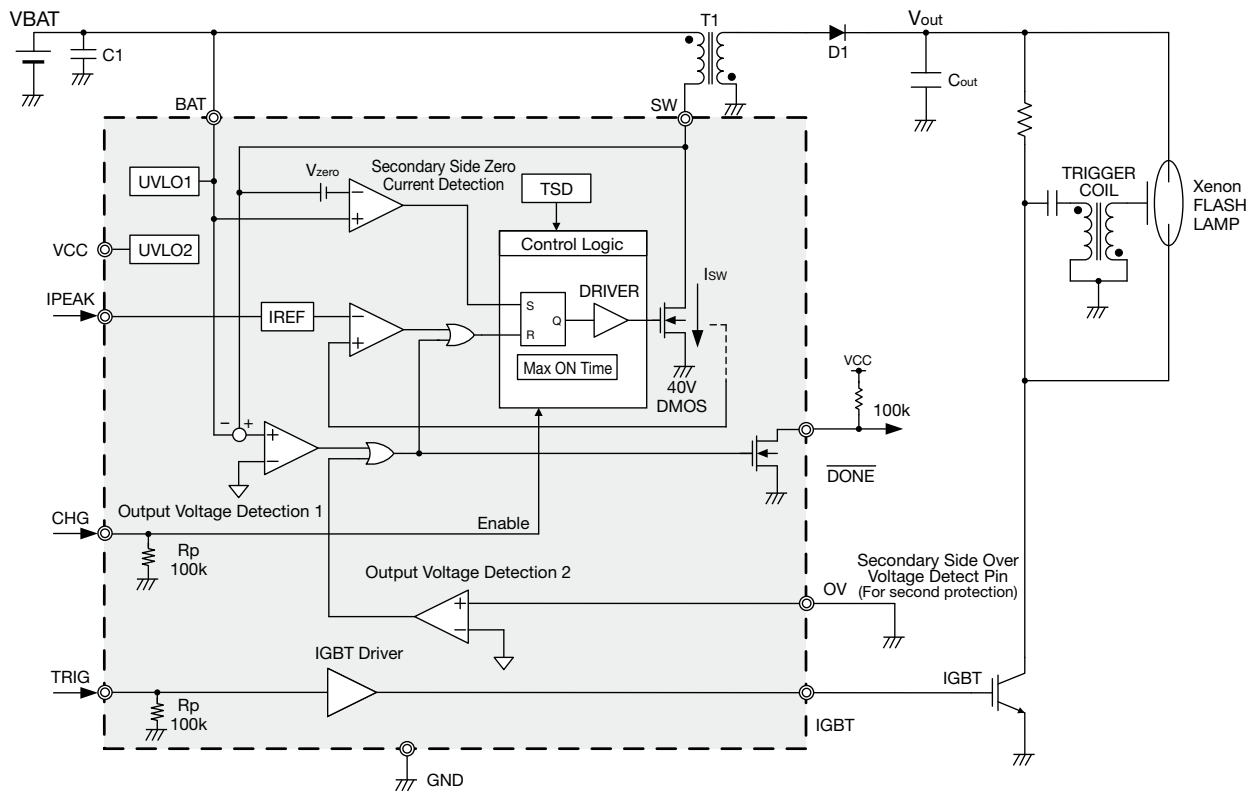
Package

SSON-10

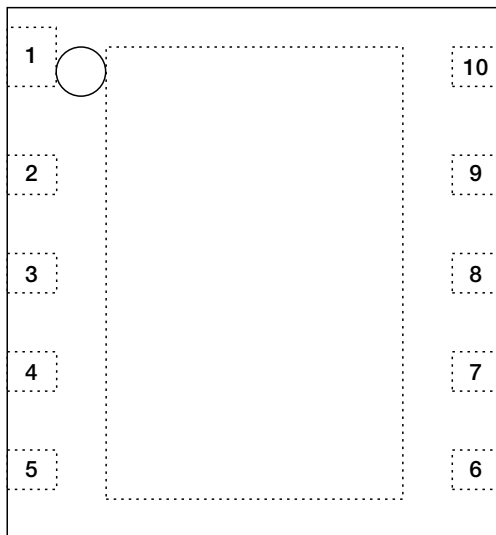
Applications

1. Digital still cameras
2. Camera phones
3. PDAs

Block Diagram



Pin Assignment



SSON-10
(TOP VIEW)

1	SW
2	BAT
3	$\overline{\text{DONE}}$
4	VCC
5	IGBT
6	OV
7	IPEAK
8	TRIG
9	CHG
10	GND

Pin Description

Pin No.	Pin name	Pin description
1	SW	Built-in DMOS power FET drain pin. Connect to primary side of the transformer.
2	BAT	Battery voltage input pin. Connect to + side of the battery pack.
3	$\overline{\text{DONE}}$	Charge completion signal output pin (Nch open drain output). L : Charge completion, H : Charge non-completion.
4	VCC	Power supply input pin.
5	IGBT	IGBT gate drive output pin. Connect to the gate of IGBT.
6	OV	Secondary side overvoltage detection pin. (For second protection) * Please connect to the GND when the input pin unused. (Cf. applied circuit example)
7	IPEAK	Primary side peak current setting pin. Can set 3 phases of electric currents by GND or VCC connection or opening.
8	TRIG	Flash signal input pin.
9	CHG	Charge enable input terminal. H : Charge ON, L : Charge OFF.
10	GND	Ground pin.

Absolute Maximum Ratings

Item	Symbol	Ratings	Units
Storage Temperature	T_{stg}	-55~+150	°C
BAT, IPEAK, CHG, \overline{DONE} , TRIG, IGBT, OV, VCC Pin Input Voltage	V_{in}	-0.3~+7.0	V
SW Pin Voltage	V_{sw}	-0.3~+40 (Note1)	V
Power dissipation	P_d	2.25 (Note2)	W

Note1 : When in use, make sure that the voltage exceeding the maximum rating is not applied even momentarily.

Note2 : When mounted on a 40×40×1.6tmm(Copper foil area 50%, FR4) PC bord.

Recommended Operating Conditions

Item	Symbol	Ratings	Units
Operating Temperature	T_{opr}	-40~+85	°C
VCC Operating Voltage	V_{ccop}	2.5~6.0	V
BAT Operating Voltage	V_{batop}	1.6~6.0	V

Electrical Characteristics

(Except where noted otherwise Ta=25°C, VCC=3.3V, VBAT=3.6V)

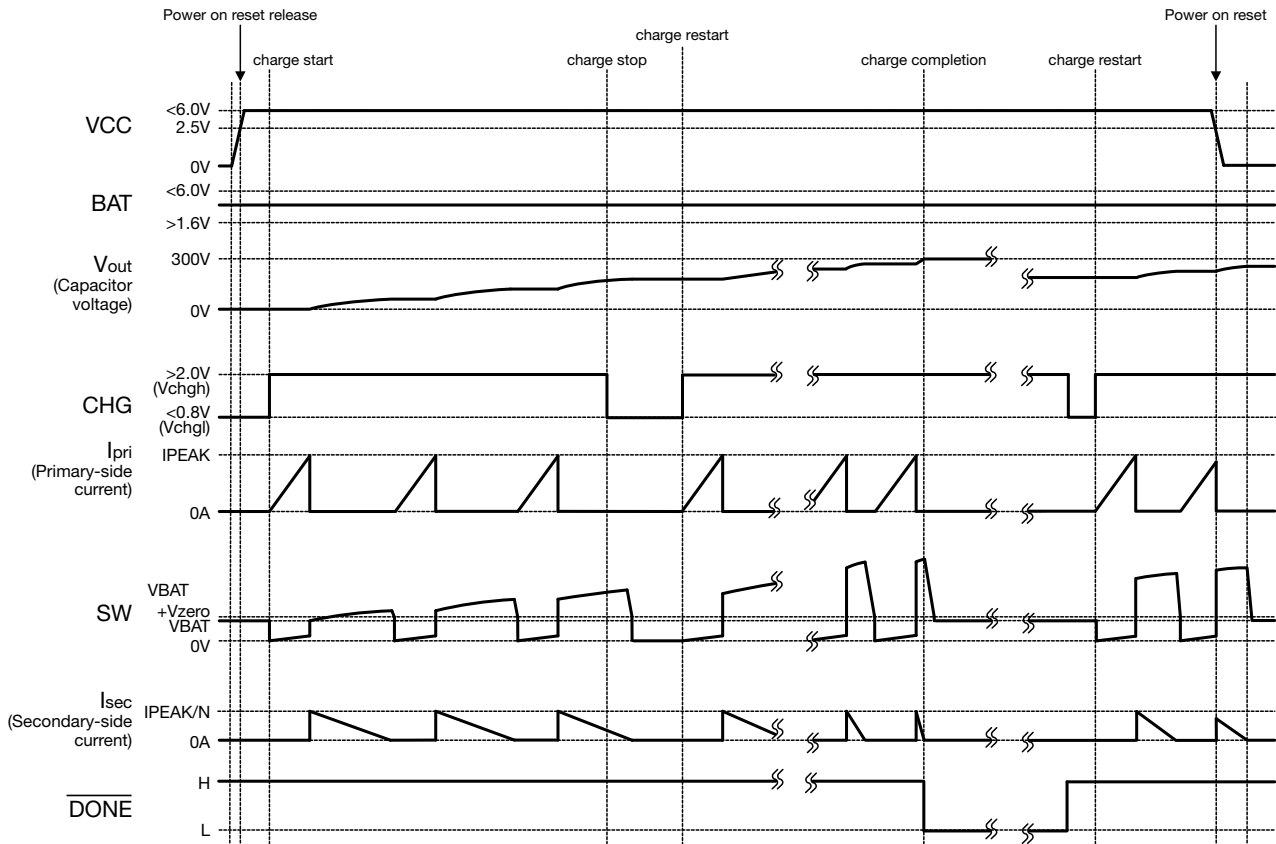
Item	Symbol	Measurement conditions	Min.	Typ.	Max.	Units	
VCC Supply Current 1	I _{cc1}	Charging (CHG=3.3V)		1.3	5	mA	
VCC Supply Current 2	I _{cc2}	Full-charge		1	10	μA	
VCC Supply Current 3	I _{cc3}	Shutdown (CHG=0V)			1	μA	
BAT Supply Current 1	I _{bat1}	Charging (CHG=3.3V)		20	35	μA	
BAT Supply Current 2	I _{bat2}	Shutdown (CHG=0V)			1	μA	
UVLO1 Detection Voltage (VCC)	V _{uvlo1}		2.2	2.3	2.4	V	
UVLO1 hysteresis	V _{uvlo1hys}			100		mV	
UVLO2 Detection Voltage (BAT)	V _{uvlo2}			1.2		V	
SW Peak Current 1	I _{peak1}	VIPEAK=0V	Arank	0.9	1.0	1.1	A
			Brank	1.5	1.6	1.7	
SW Peak Current 2	I _{peak2}	VIPEAK=open	Arank	1.1	1.2	1.3	A
			Brank	1.68	1.80	1.92	
SW Peak Current 3	I _{peak3}	VIPEAK=3.3V	Arank	1.3	1.4	1.5	A
			Brank	1.85	2.0	2.15	
SW Leakage Current	I _{swleak}	V _{sw} =35V			1	μA	
SW On Resistance	R _{on}	I _{sw} =0.8A		0.25	0.45	Ω	
Zero Current Detection	V _{zero}	V _{SW} -V _{BAT}		50	100	mV	
Full-charge Detection 1 (V _{sw})	V _{cp1}		21.78	22	22.22	V	
Full-charge Detection 2 (V _{ov})	V _{cp2}		1.182	1.200	1.218	V	
OV Input Current	I _{ov}				0.1	μA	
CHG Input Voltage L	V _{chgl}				0.8	V	
CHG Input Voltage H	V _{chgh}		2.0			V	
CHG Input Resistance	R _{chg}	CHG-GND Resistance		100k		Ω	
DONE Output Voltage L	V _{done}	VCC=3.3V, R _{pullup} =100kΩ			0.1	V	
DONE SW Leakage Current	I _{idleak}	V _{done} =3.3V			1	μA	
TRIG Input Voltage L	V _{tril}				0.8	V	
TRIG Input Voltage H	V _{trih}		2.0			V	
TRIG Input Resistance	R _{tri}	TRIG-GND Resistance		100k		Ω	
IGBT Pull-up Resistance	R _{pu}	IGBT=0V		5	9	Ω	
IGBT Pull-down Resistance	R _{pd}	IGBT=3.3V		6	11	Ω	
Max On Time	t _{max}			100		μs	
Thermal shutdown temperature (Note3)	t _{sd}			150		°C	

Note3 : The parameter is guaranteed by design

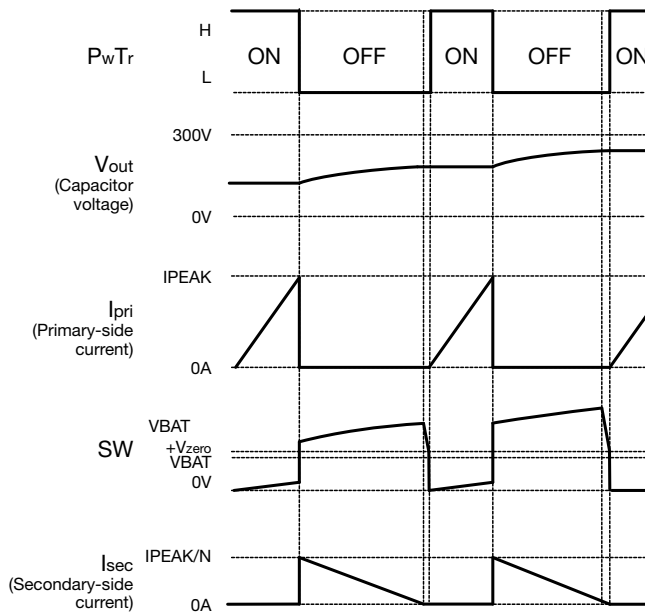
Timing Chart

(1) Normal Charge start → Charge completion

* All typ numeric value.

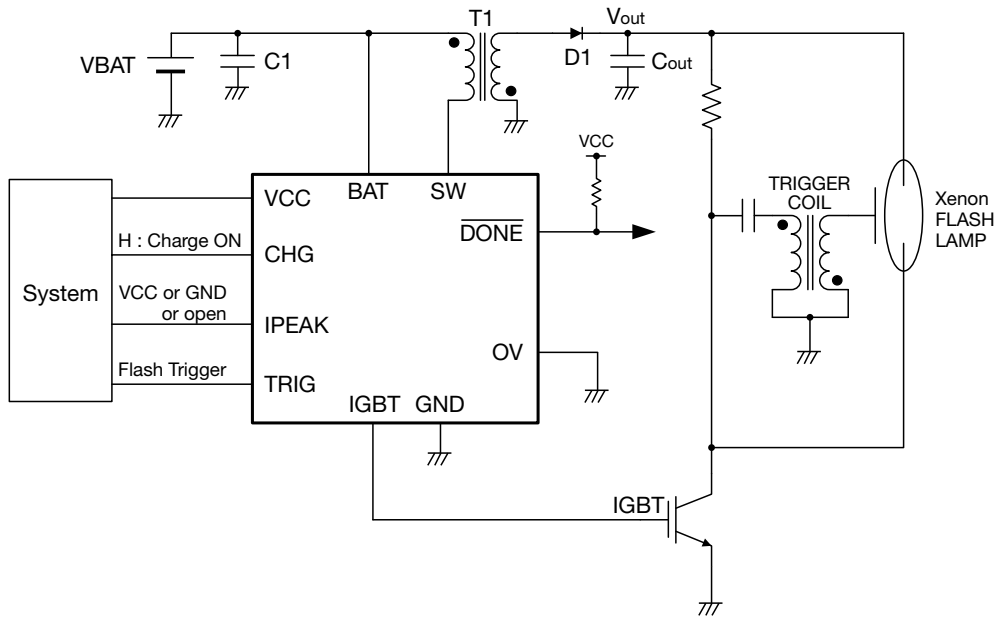


(2) Switching cycle

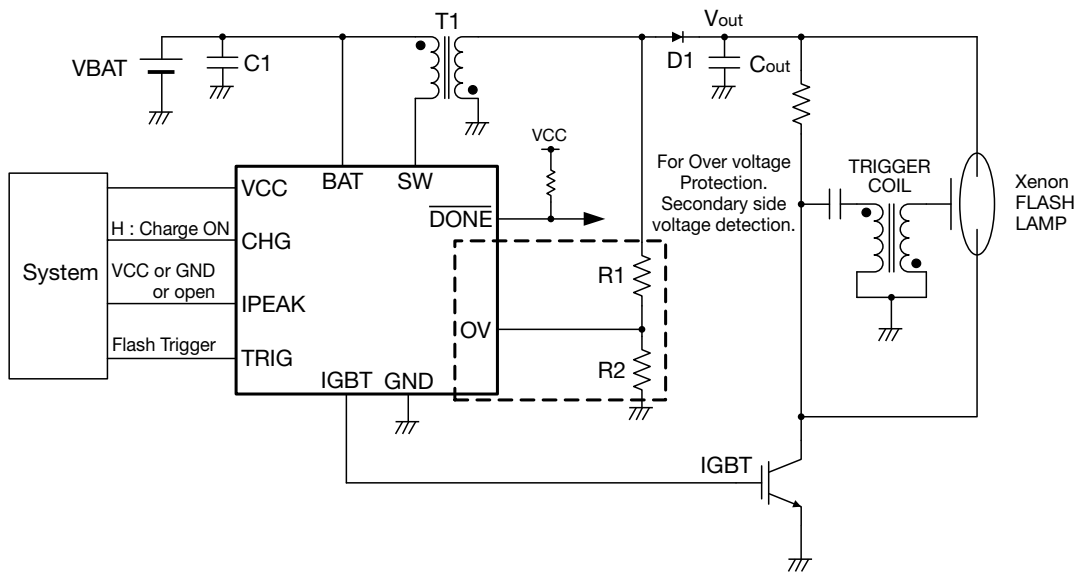


Application Circuit

(1) Application Circuit Example 1 : Normal



(2) Application Circuit Example 2 : OV Pin (Overvoltage Protection) use



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