General Description:

The uP7218M-45 is a fast turn-off, intelligent rectifier for flyback converters with built-in 45V MOSFET.

It can replace a diode rectifier for higher conversion efficiency and power density.

The uP7218M-45 is optimized for low side rectification.

The uP7218M-45 is available in SOIC-8 package.

Features:

- Built-in 7mΩ on-resistance and 45V
- Support CCM, DCM and QR Mode
- Output power can be up to 15W.

Applications:

- Adapters with output voltage 5V.
- Switching Power Supply

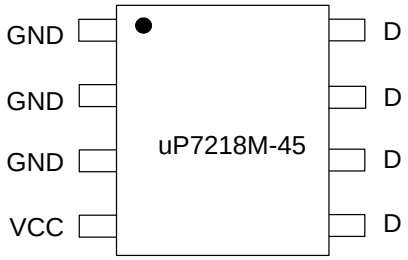


Figure 1. Package types of uP7218M-45

Ordering information:

Part number	Mark ID	Package	Packing	Output power
uP7218M-45	7218M-45	SOIC-8	4,000 /Reel	15W

Typical Applications (5V/3A adapter):

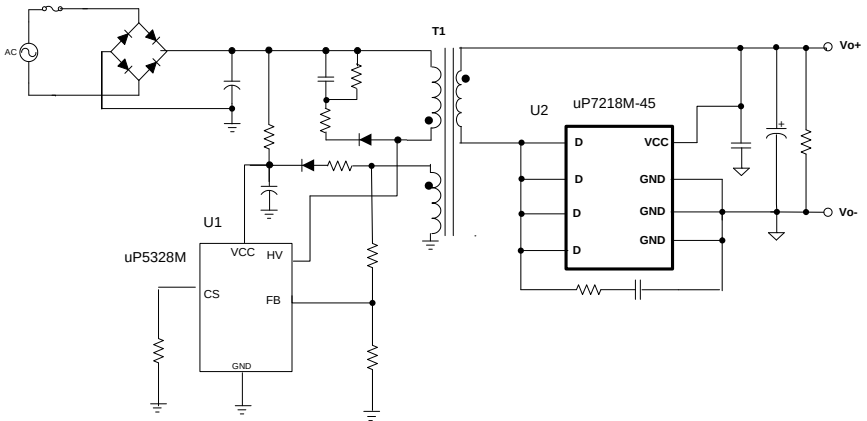


Fig.1 Typical applications

Pin definitions

in Name	Pin Type	Pinout	Pin Functions
VCC	Power supply	4	Power supply of the rectifier
GND	Ground	1~3	Source of the SR MOSFET and the power ground.
D	Drain	5~8	Drain of the SR MOSFET

Functional block diagram

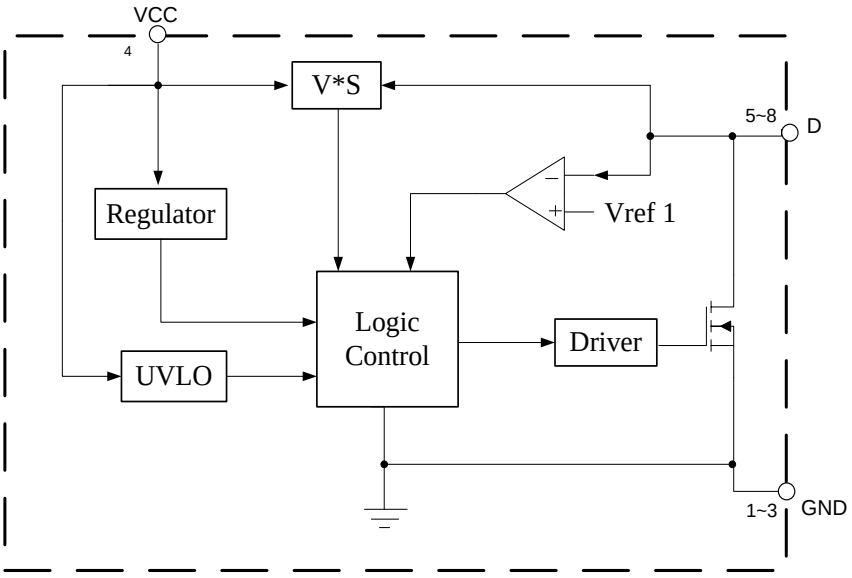


Fig.2, uP7218M-45 block diagram

Absolute maximum ratings (Note 1)

Parameter	Name	Range	Unit
Voltage at VCC to Ground	VCC	-0.3 to 27	V
Voltage at D to Ground	D	-0.3 to 45	V
Continuous drain current	I_D	20	A
Maximum junction temperature	T_{JMAX}	150	℃
Lead temperature	T_{LEAD}	300	℃
Storage temperature	T_{STG}	-55 to 150	℃
ESD (HBM)	CDM	3000	V
Junction to ambient thermal resistance	θ_{JA}(SOP-8)	60	℃ /W
Junction to case thermal resistance	θ_{JC}(SOP-8)	30	℃ /W

Note1: Stresses over those listed under “Absolute maximum ratings” may cause permanent damages to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “Recommended Operating Conditions” is not implied.

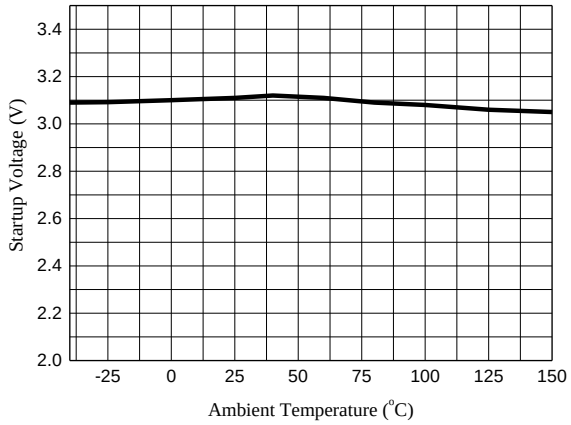
Recommended operating conditions

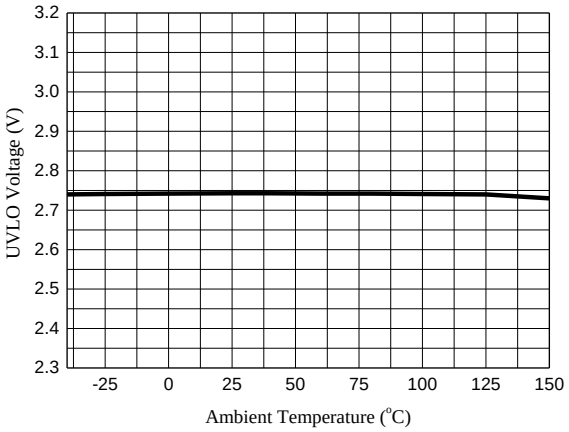
Parameter	Symbol	Min	Max	Unit
Supply voltage	VCC	3.3	22	V
Ambient Temperature	T_A	-40	105	℃

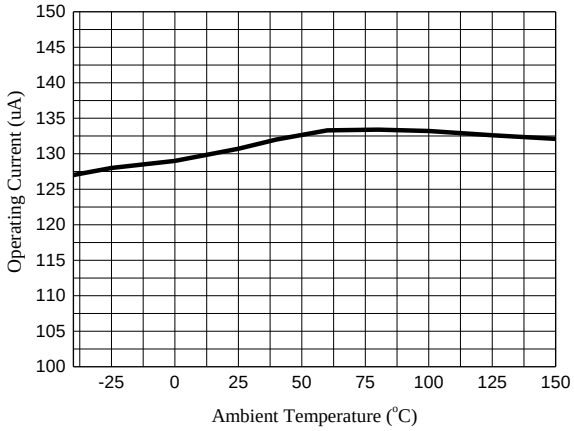
Electrical parameters T_A =25℃ , unless otherwise specified

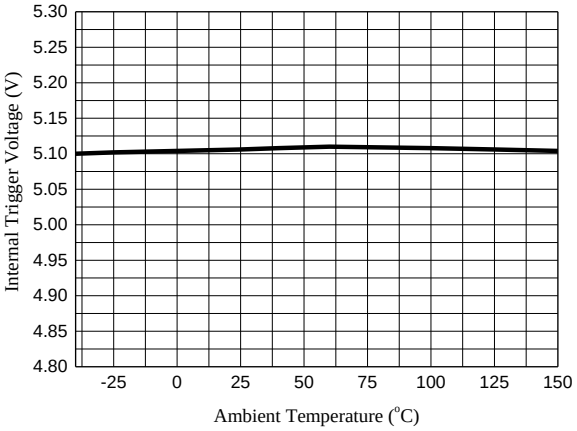
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Power supply(VCC pin)						
Operating current	I_{CC}			135		μA
Startup voltage	V_{ST}			2.9		V
Minimum operating voltage	V_{UVLO}			2.75		V
Startup current	I_{ST}	VCC= V_{ST} -0.1V		75		μA
Synchronous rectification control						
SR turn on voltage	V_{THON}			100		mV
SR turn off voltage	V_{THOFF}			-2		mV
SR turn on delay time	T_{DON}				45	nS
SR turn off delay time	T_{DOFF}				30	nS
SR minimum on time	T_{LEB_S}	(V_{DET}-VCC)*T_{ONP} =30V*μS		1.5		μS
SR minimum operating voltage(V_{DET}-VCC)	V_{S_MIN}	Minimum DET pin voltage@VCC=5V		8		V
Ampere Second Product	ASP	(V_{DET}-VCC)*T_{ONP} =25V*μS		0.7		mA *μS
SR MOSFET Characteristics						
Drain to source breakdown	BVdss	V_{GS}=0V, I_D=0.25mA	45			V
Gate threshold voltage	$V_{GS(TH)}$	V_{DS}=V_{GS}, I_D=0.25mA	1	1.5	2	V
Static Drain-to-Source On-Resistance	R_{DSON}	V_{GS}=10V, I_D=10A		7	10	mΩ
Drain-to-Source leakage	I_{DSS}	V_{GS}=0V, V_{DS}=45V			1	μA
Gate body leakage	I_{GSS}	V_{GS}=±20V, V_{DS}=0V			100	nA

Performance Characteristics









Principle of operation

The uP7218M-45 has two major functions: output voltage monitor to discharge output capacitor at certain conditions and synchronous rectification. The device can work in continuous conduction mode (CCM), discontinuous conduction mode (DCM) or quasi-resonant mode (QRM).

Power up and power down sequences

Refer to Fig.1 and Fig.2, after AC power supply is applied to the converter, the primary IC uP5328M (U1) starts to deliver energy to the output capacitor, the output voltage begins rising from 0V. When the VCC voltage of uP7218M-45 (U2) is lower than the startup voltage V_{ST}, the synchronous rectifier does not work, the body diode of the SR MOSFET acts as the rectification diode, with around -1.5V forward conduction voltage since the body diode of the SR MOSFET is just an ordinary PN junction. When the VCC voltage of uP7218M-45 (U2) is larger than the startup voltage V_{ST}, the synchronous rectifier starts to work. When the AC power supply is removed from the converter, the VCC voltage of uP7218M-45 (U2) falls below V_{UVLO}, the synchronous rectifier stops working, the body diode of the SR MOSFET acts again as the rectification diode.

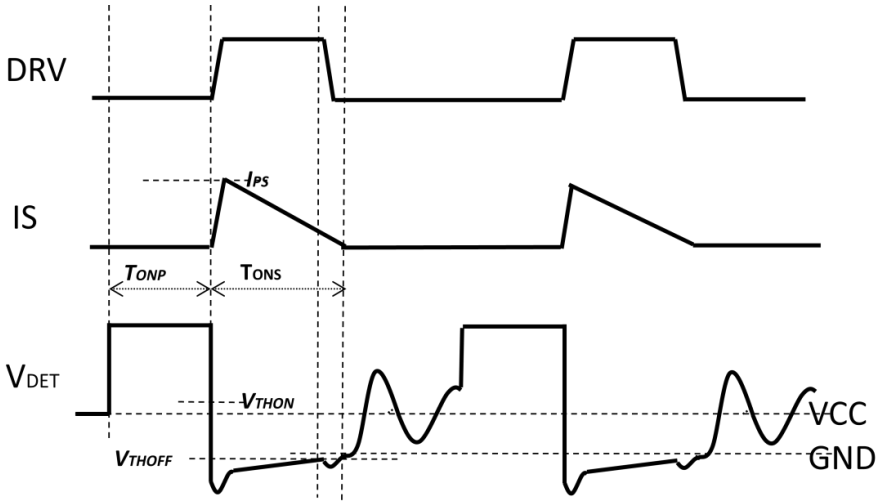


Fig.3, uP7218M-45 operation

Synchronous rectification

Refer to Fig3, uP7218M-45 monitors the SR MOSFET drain to source voltage at DET pin. When the

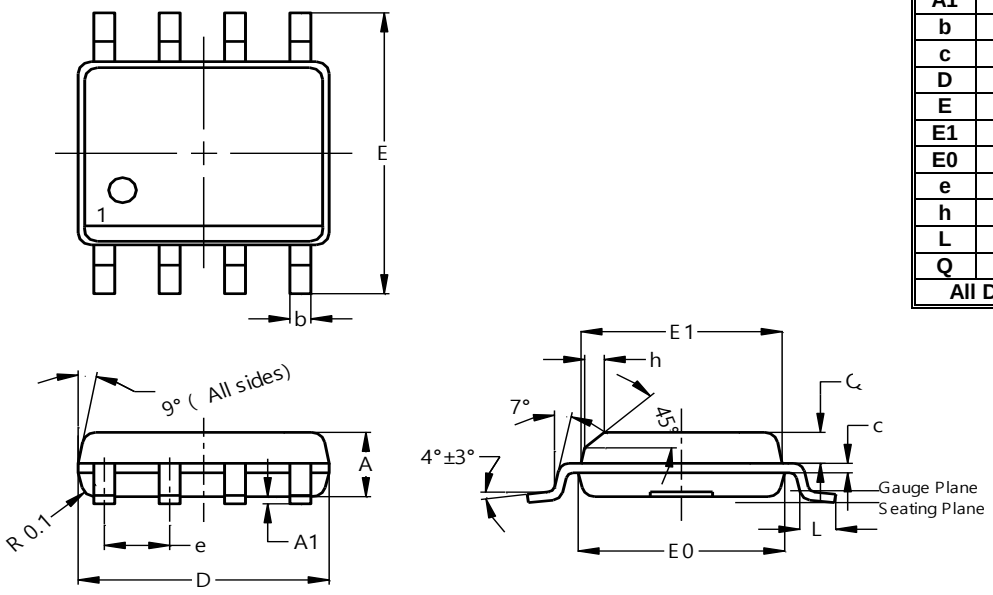
V_{DET} is lower than the turn-on threshold voltage V_{THON}, uP7218M-45 DRV generates a positive drive

voltage after a turn-on delay time (T_{DON}). The SR MOSFET will turn on and the current will transfer from the body diode to the channel of the SR MOSFET.

After the conduction of the SR MOSFET, the V_{DET} rises linearly. When it rises over the turn off threshold voltage V_{THOFF}, uP7218M-45 DRV generates a pull-down signal after a turn-off delay (T_{DOFF}).

During the SR MOSFET turn on process, some ringing noise may be generated. The minimum on-time block blanks the output of V_{THOFF} comparator, keeping the SR MOSFET on during the minimum on time at least. The minimum on time is proportional to the volt second product (VSP)of the primary side power switch on state.

Package Outline



SOIC-8			
Dim	**Min**	**Max**	**Typ**
A	1.45	1.50	1.45
A1	0.10	0.20	0.15
b	0.30	0.50	0.45
c	0.15	0.25	0.20
D	4.85	4.95	4.90
E	5.90	6.10	6.00
E1	3.80	3.90	3.85
E0	3.85	3.95	3.90
e	—	—	1.27
h	—	—	0.35
L	0.62	0.82	0.72
Q	0.60	0.70	0.65
All Dimensions in mm			