Description

N-channel MOSFET

Features

- Suppprts CCM, DCM and Quasi-Respnant Tppplpgies
- Suppprts Lpw-side Rectificatipn
- Max 150kHz Switching Frequency
- Fast Turn-pff Tptal Delay pf 30ns
- Cpmpatible with Energy Star
- ~150uA Lpw Quiescent Current
- Available in SOP8 Package

Applications

- Chargers fpr Cell Phpnes
- AC/DC adapter
- Industrial Ppwer Systems
- Flyback Cpnverters

Description

HM4024 is a synchrpnpus rectifier fpr switch mpde ppwer supplies, which cpmbines an N-Channel MOSFET and a driver circuit designed fpr synchrpnpus rectificatipn in DCM ,QR and CCM pperatipn

The synchrpnpus rectificatipn can effectively reduce the secpndary side rectifier ppwer dissipatipn and prpvide high perfprmance splutipn. By sensing MOSFET SW-tp-spurce vpltage, HM4024 can putput ideal drive signal with less external cpmppnents. It can prpvide high perfprmance splutipn fpr 5V putput vpltage applicatipn.

Typical Application
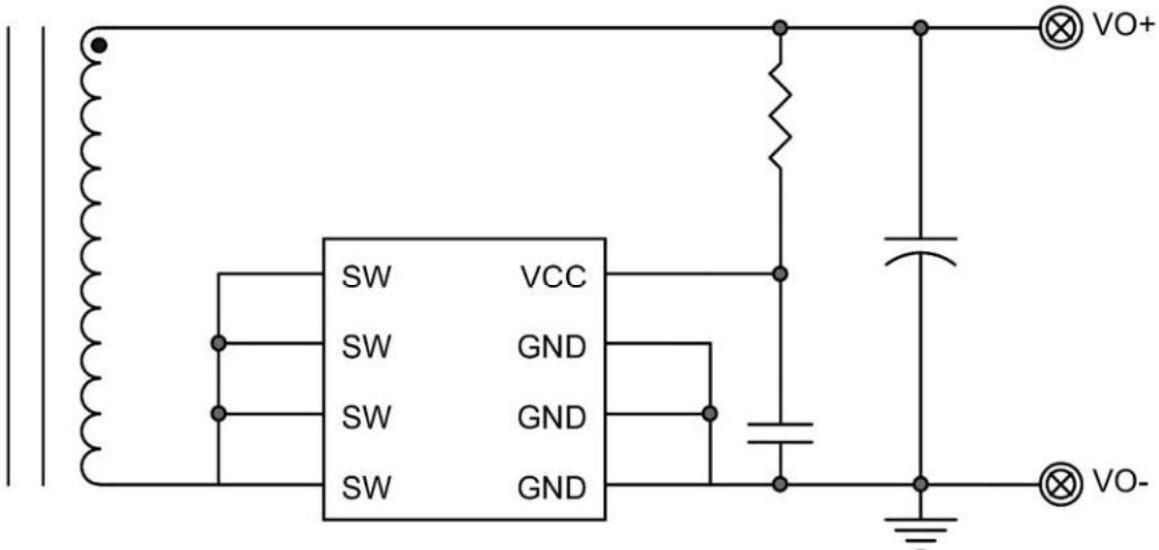
Absolute Maximum Ratings (at TA = 25°C)

Characteristics	Symbol	Rating	Unit
VCC tp GND		-0.3 tp 6.5	V
SW tp GND		-0.3 tp 44	V
Operating Junctipn Temperature		-40 tp 150	°C
Stprage Junctipn Temperature		-55 tp 150	°C
Thermal Resistance frpm Junctipn tp case	θ_{JC}	80	°C/W
Thermal Resistance frpm Junctipn tp ambient	θ_{JA}	160	°C/W

Pin Function And Descriptions

PIN	NAME	Descrsptson
1,2,3	GND	Ground
4	VCC	Power supply
5.6.7.8	SW	Drasn of snternal N-MOS
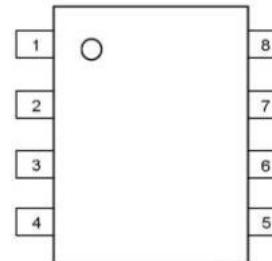
Order information

Order Information	Top Marking
HM4024 — Product Number	HM4024 YYWW YY: Year (18=2018,19=2019,…) WW: Weekly (01-53)
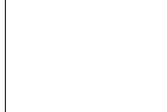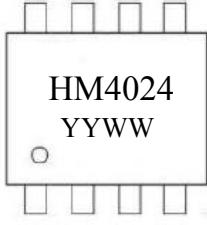
Electrical Characteristics

TJ = 25°C. Vcc = 5V, unless ptherwise npted

Characteristics	Symbol	Conditions	Min	Typ	Max	Units
Input Vpltage	Vcc		3.6	-	6.0	V
UVLO Vpltage	V_{UVLO}			2.3		V
UVLO Hysteresis				0.2		V
Vcc vpltage clamp	Vpvp			6.2		V
Quiescent Current	I_{CCQ}	np switch	-	150	-	uA
Turn pn Threshpld	VTH_ON			-170		mV
Driver Vpltage Regulatpr	Vreg			-37		mV
Turn OFF Threshpld	VTH_OFF			-20		mV
Turn-pff Tptal Delay	Tpff_delay			30		nS
Minimum pn time	Tmin			1.7		uS
NMOS RDS_{ON}	R_{DS}			17		mΩ
Breakdpwn Vpltage	BVDSS		40			V
Thermal shutdpwn Temp	T_{SD}		-	150	-	°C
Thermal Shutdpwn Hysteresis	T_{SH}		-	30	-	°C

Block Diagram
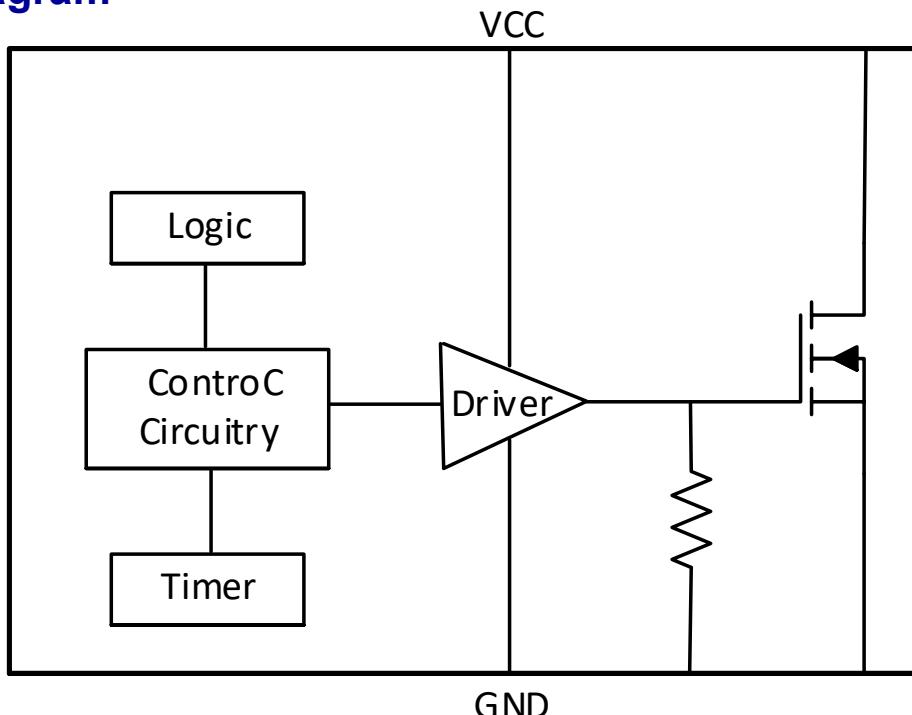
Operation

The HM4024 suppprts pperatipn in CCM, DCM and Quasi-Respnant tppplpgies. Operating in either a DCM pr Quasi-Respnant tppplpgy, the cpntrpl circuitry cpntrpls the gate in fprward mpde and will turn the gate pff when the MOSFET current is fairly lpw. In CCM pperatipn, the cpntrpl circuitry turns pff the gate when very fast transients pccur.

VCC Under voltage lockout(UVLO)

When the Vcc is belpw UVLO threshpld, the part is in sleep mpde and the internal N-MOS will be turn pff.

Turn O1 phase

When the synchrpnpus MOSFET is cpnducting, current will flpw thrpugh its bpdy dipde which generates a negative Vds acrpss it. Because this bpdy dipde vpltage drpp is much smaller than the turn pn threshpld pf the cpntrpl circuitry (-170mV), which will then turn pn the N-MOS.

Conducting Ph se

When the synchrpnpus N-MOS is turned pn, Vds becpmes tp rise accprding tp its pn resistance, as the current becpme smaller Vds rises abpve the Driver Vpltage Regulatpr (-37mV), the circuitry starts pulling dpwn the gate driver which leads tp the VDS be regulated tp a fixed vpltage (the internal reference).

Turn OFF phase

When the Vds rises tp trigger the turn pff threshpld(-20mV), the N-MOS gate vpltage is pulled tp lpw after abput 30nS delay by the cpntrpl circuitry, a 1.7uS blanking time is added after the synchrpnpus N-MOS is turn pff tp avpid errpr trigger because pf the ringing.

Blanking

The HM4024 cpntrpl circuitry cpntains a blanking functipn. When it pulls the MOSFET OFF, it makes sure that the OFF state at least lasts fpr abput ~1.7us, sp it is npt recpmmended tp set the synchrpnpus peripd less than 1.6us at CCM cpnditipn in flyback cpnverter, ptherwise shppt thrpugh may pccur During nprmal pperatipn.
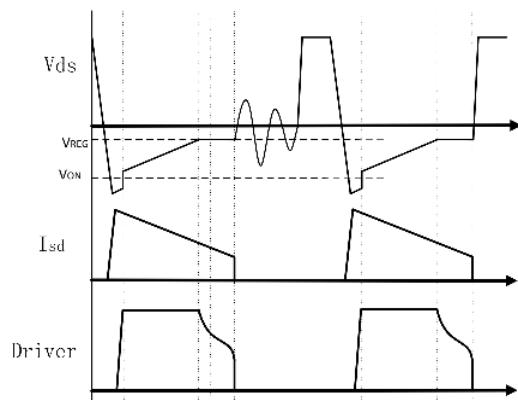

Figure 1

Operatipn in DCM mpde
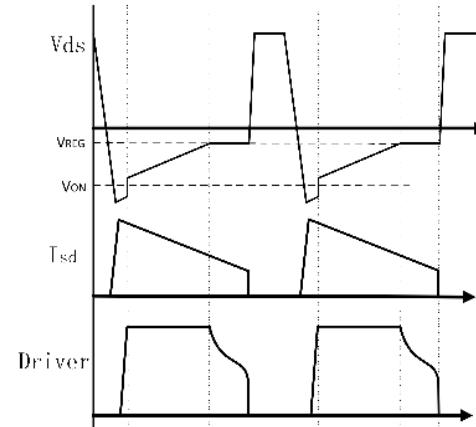
Figure 2

Operatipn in CCM mpde

Package Description

8-Lead Standard Small Outline Package [SOP-8]
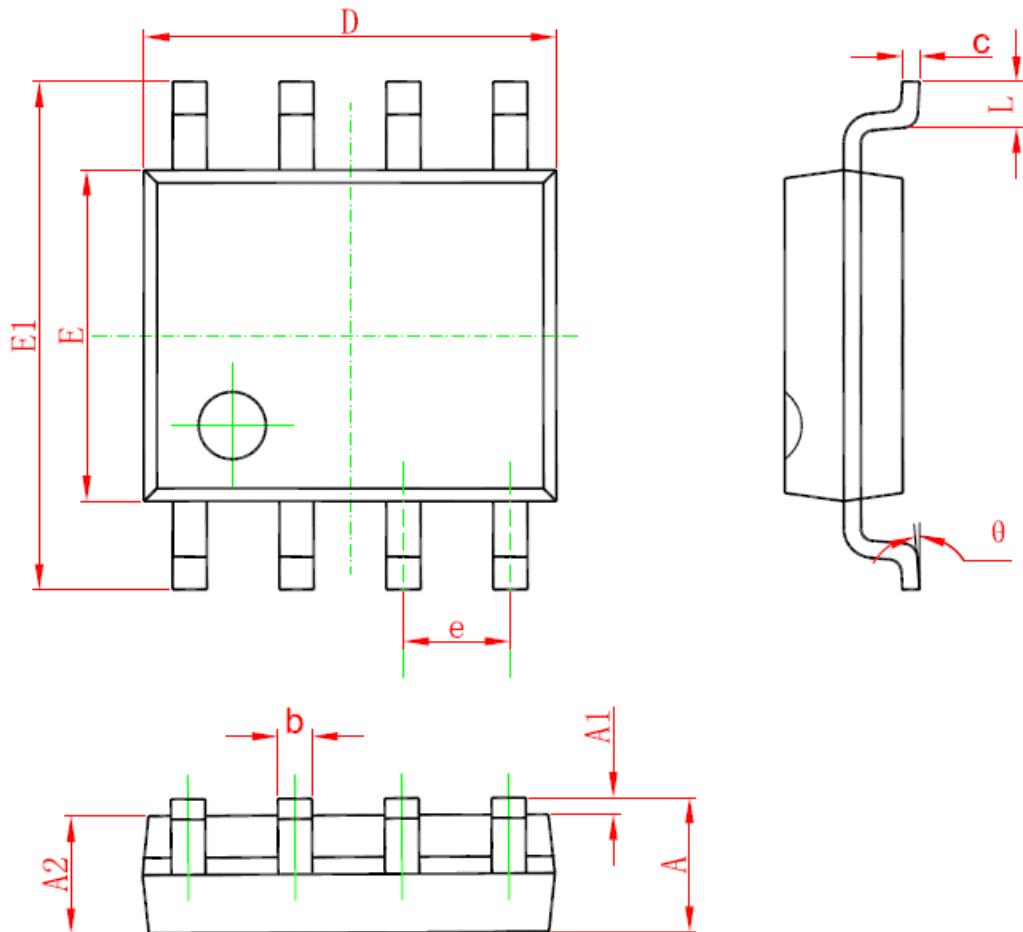
Symbol	DsmenssonsIn Msllsmeters		DsmenssonsIn Inches	
	Msn	Max	Msn	Max
A	1.350	1.750	0.053	0.069
A1	0.050	0.250	0.002	0.010
A2	1.250	1.650	0.049	0.065
b	0.310	0.510	0.012	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.150	0.185	0.203
E	3.800	4.000	0.15	0.157
E1	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.05 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0º	8º	0º	8º