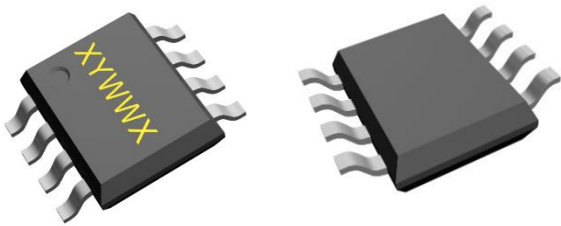


2.1A,40V Synchronous Rectifier

Description

7820 is a synchronous rectifier for switch mode power supplies, which combines an N-Channel MOSFET and a driver circuit designed for synchronous rectification in DCM and QR operation.

The synchronous rectification can effectively reduce the secondary side rectifier power dissipation and provide high performance solution. By sensing MOSFET SW-to-source voltage, 7820 can output ideal drive signal with less external components. It can provide high performance solution for 5V output voltage application.



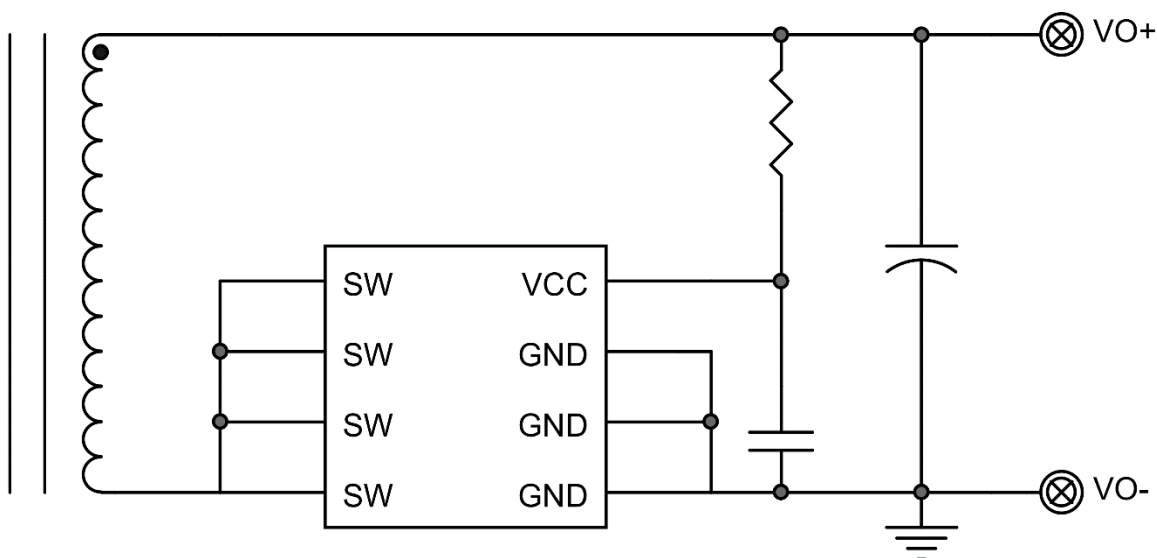
Features

- Supports DCM and Quasi-Resonant Topologies
- Supports Low-Side Rectification
- Max 85kHz Switching Frequency
- Fast Turn-off Total Delay of 30ns
- Compatible with Energy Star
- ~150uA Low Quiescent Current
- Available in SOP8 Package

Applications

- Chargers for Cell Phones
- AC/DC adapter
- Industrial Power Systems
- Flyback Converters

Typical Application



Order Information

Orderable Device	Package Type	Packing Qty/reel	MSL- Peak Temp -Floor Life	Eco Std	Marking Information
7820	SOP-8	4000	MSL3-260°C-168hrs	RoHS & Green	Refer to below

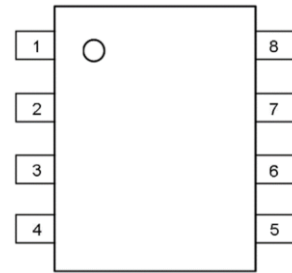
Top Side Marking



X: Internal ID Code
Y: Year (2=2022,3=2023,...)
WW: Weekly (01-53)

Pin Function and Definition

PIN	NAME	Description
1,2,3	GND	Ground
4	VCC	Power Supply
5,6,7,8	SW	Drain of Internal N-MOS



Absolute Maximum Ratings (at TA = 25°C)

Characteristics	Symbol	Rating	Unit
VCC to GND		-0.3 to 6.5	V
SW to GND		-0.3 to 45	V
Operating Junction Temperature	T _A	-40 to 150	°C
Storage Junction Temperature	T _{stg}	-65 to 150	°C
Thermal Resistance from Junction to case	θ _{JC}	80	°C/W
Thermal Resistance from Junction to ambient	θ _{JA}	160	°C/W

Notes:

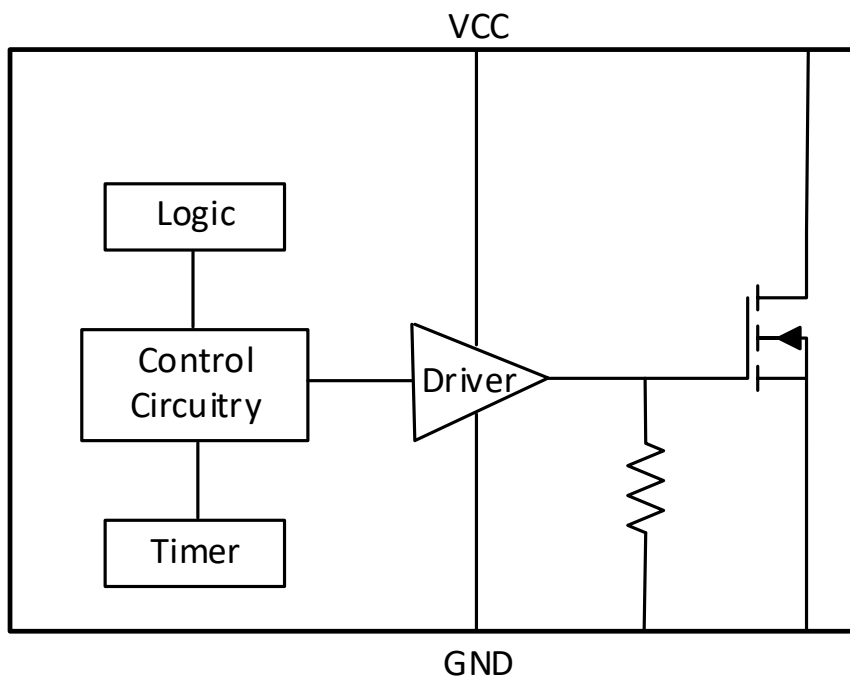
Stresses at or above those listed under Absolute Maximum Ratings may cause permanent damage to the product. This is a stress rating only; functional operation of the product at these or any other conditions above those indicated in the operational section of this specification is not implied. Operation beyond the maximum operating conditions for extended periods may affect product reliability.

Electrical Characteristics

$T_J = 25^{\circ}\text{C}$, $V_{IN} = 12\text{V}$, unless otherwise noted.

Characteristics	Symbol	Conditions	Min	Typ	Max	Units
Input Voltage	V_{CC}		3.6	-	6.0	V
UVLO OFF Voltage	V_{UVLO_OFF}	V_{CC} Rising		2.3		V
UVLO ON Voltage	V_{ON}	V_{CC} Falling		2.1		V
V_{CC} Voltage Clamp	V_{OVP}			6.2		V
Quiescent Current	I_{CCQ}	No Switch	-	150	-	μA
Turn ON Threshold	V_{TH_ON}			-170		mV
Driver Voltage Regulator	V_{REG}			-37		mV
Turn OFF Threshold	V_{TH_OFF}			-20		mV
Turn OFF Total Delay	T_{OFF_DELAY}			30		nS
Minimum on Time	T_{MIN}			1.7		μS
NMOS R_{DS_ON}	R_{DS_ON}			28		$\text{m}\Omega$
Breakdown Voltage	BV_{DSS}		40			V
Thermal Shutdown Temperature	T_{SD}		-	150	-	$^{\circ}\text{C}$
Thermal Shutdown Hysteresis Temperature	T_{SH}		-	30	-	$^{\circ}\text{C}$

Block Diagram



Operational Description

The 7820 supports operation in DCM and Quasi-Resonant topologies. Operating in either a DCM or Quasi-Resonant topology, the control circuitry controls the gate in forward mode and will turn the gate off when the MOSFET current is low.

VCC Under Voltage Lockout (UVLO)

When the V_{CC} is below UVLO threshold, the part is in sleep mode and the internal N-MOS will be turn off.

Turn ON Phase

When the synchronous MOSFET is conducting, current will flow through its body diode which generates a negative V_{DS} across it. Because this body diode voltage drop is much smaller than the turn on threshold of the control circuitry (-170mV), which will then turn on the N-MOS.

Conducting Phase

When the synchronous N-MOS is turned on, V_{DS} becomes to rise according to its on resistance, as the current become smaller V_{DS} rises above the Driver Voltage Regulator (-37mV), the circuitry starts pulling down the gate driver which leads to the V_{DS} be regulated to a fixed voltage (the internal reference).

Turn OFF Phase

When the V_{DS} rises to trigger the turn off threshold (-20mV), the N-MOS gate voltage is pulled to low after about 30nS delay by the control circuitry, a $1.7\mu\text{s}$ blanking time is added after the synchronous N-MOS is turn off to avoid error trigger because of the ringing.

Blanking

The 7820 control circuitry contains a blanking function. When it pulls the MOSFET OFF, it makes sure that the OFF state at least lasts for about $1.7\mu\text{s}$, so it is not recommended to set the synchronous period less than $1.6\mu\text{s}$ in flyback converter, otherwise shoot through may occur During normal operation.

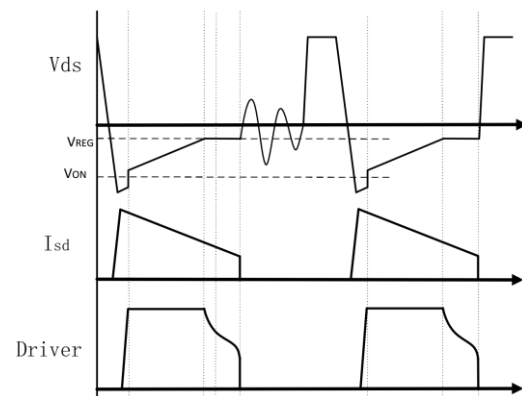
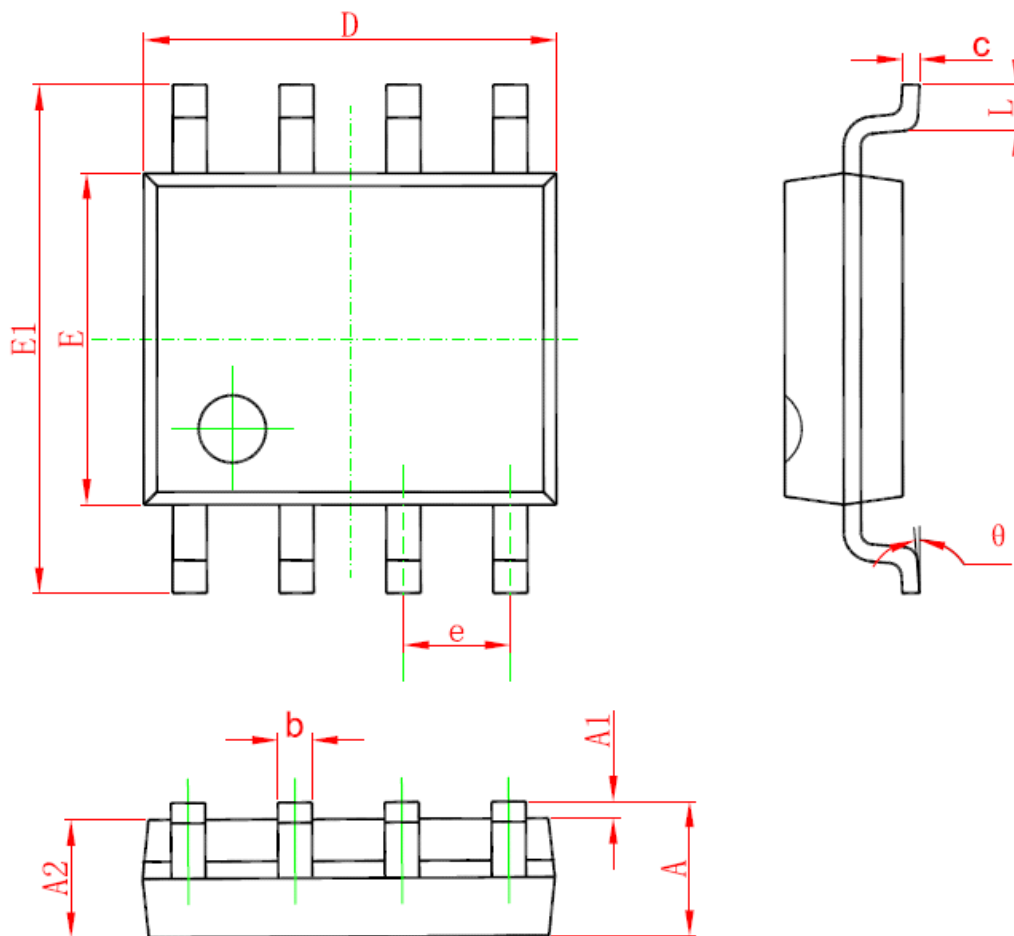


Figure 1 Operation in DCM mode

Package Outline Drawing

8-Lead Standard Small Outline Package [SOP-8]



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	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	0°	8°	0°	8°

Notes

1. Use millimeters as the primary measurement
2. Dimensioning and tolerances conform to ASME Y14.5M. – 1994
3. These dimensions do not include mold flash or protrusions.
4. Mold flash or protrusions shall not exceed 0.15mm