



Continental Device India Pvt. Limited

An IATF 16949, ISO9001 and ISO 14001 Certified Company



Synchronous Rectifier

CD9356F



SOP-8

SOP-8
Surface Mount
Plastic Package
RoHS compliant

GENERAL DESCRIPTION

CD9356F is a smart secondary-side switch IC designed for isolated fly-back system. The IC emulate the behavior of Schottky diode rectifier for reduce power dissipation. CD9356F works on CCM/DCM and QR operation modes. Ruggedness and noise immunity are accomplished using an advance blanking scheme and double-pulse suppression which allow reliable operation in all operating modes. CD9356F senses the build-in MOSFET drain-source voltage and output ideal drive signal with less external components. It can support wide range of system output voltage 5V~12V

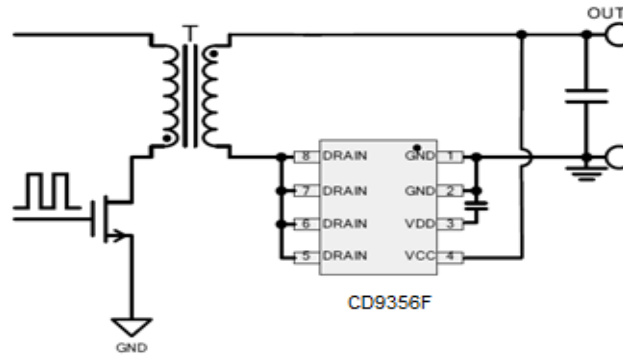
FEATURES:

1. Build-in 11mΩ 100V MOSFET
2. Low current consumption
3. Up to 150KHz operation frequency
4. 30ns turn-off propagation delay
5. VCC Operation 4.5V to 30V
6. CCM, DCM and QR operation
7. SOP8 Package

APPLICATIONS:

1. 5V/9V/12V AC-DC adaptor
2. 18W PD/QC Charger systems
3. High Energy Efficiency systems

Simplified Application Circuit



Low-side Application

Figure1. Simplified Application of CD9356F

Pin Function Description

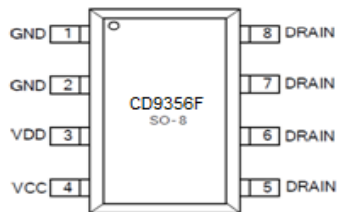


Figure 2. Pin Configuration

Pin No.	Pin Name	Description
1,2	GND	Power Ground, Return for MOSFET Source
3	VDD	Inner Power Supply, Connect Capacitor to Ground
4	VCC	Out Power Supply
5,6,7,8	DRAIN	MOSFET Drain

Package Dissipation Rating

Package	$\theta_{JC} (^{\circ}C/W)$	$\theta_{JA} (^{\circ}C/W)$
SOP-8	50	130

Block Diagram

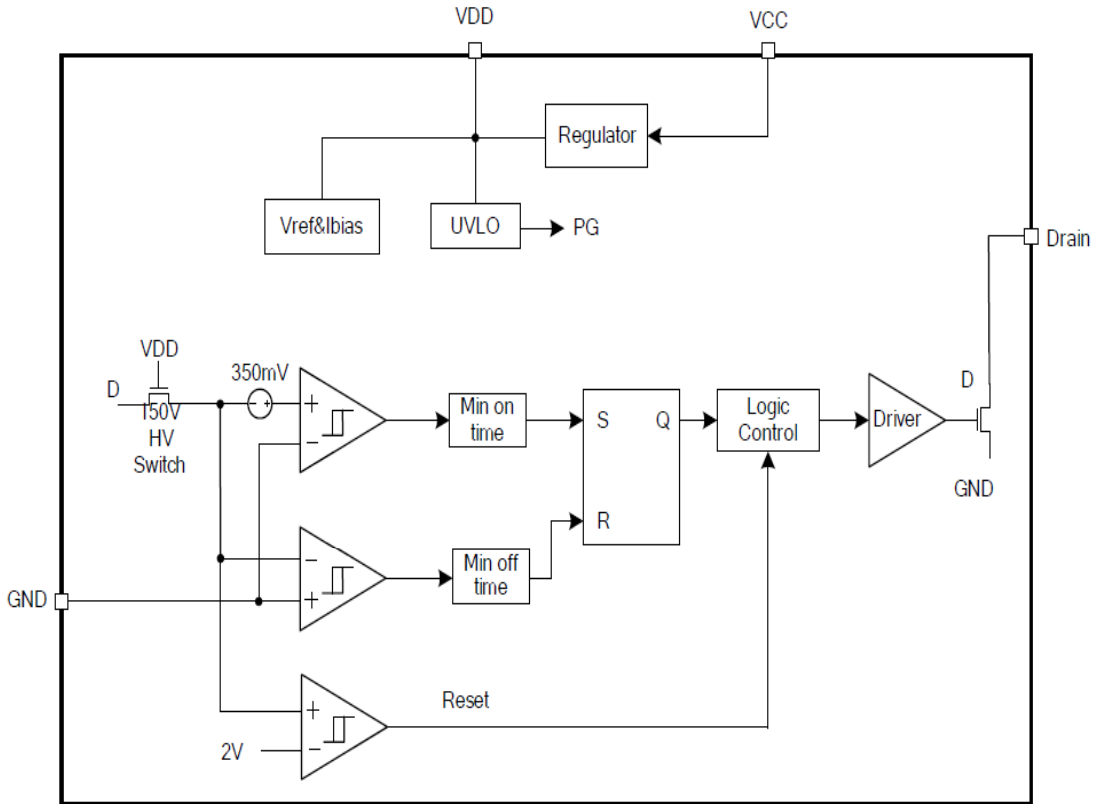


Figure 3. Block diagram of CD9356F



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ABSOLUTE MAXIMUM RATINGS ($T_A=25^{\circ}\text{C}$ Unless otherwise specified)

Parameters	Symbol	Rating	Unit
MOSFET Drain	DRAIN	-1 to 100	V
VCC Input Voltage	VCC	-0.3 to 36	V
Operating Junction Temperature	T_J	-40 to 125	°C
Min/Max Storage Temperature	T_{STG}	-55 to 150	
Lead Temperature (Soldering. 10secs)	T_L	260	

Notes:

Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions are not implied. Exposure to absolute maximum-rated conditions for extended periods may affect device reliability

Recommended Operating Conditions

Description	Symbol	Values	Unit
VCC Supply Voltage	VCC	4.5~30	V
VCC bypass capacitor	VCC	1	uF
Switch Frequency	F_{sw}	<150	KHz
MOSFET Drain Voltage	DRAIN	-0.6~100	V

ELECTRIC CHARACTERISTICS ($V_{CC} = 12\text{V}$, $T_A = +25^{\circ}\text{C}$, unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
VCC Section						
Quiescent Current	ICC		--	600	--	uA
VCC ON Voltage	V_{CC_ON}	VCC Going Up	--	4.2	--	V
VCC OFF Voltage	V_{CC_OFF}	VCC Going Down	--	3.8	--	
VCC clamp voltage	V_{CC_clamp}		--	32	--	
VDD Section						
VDD Operation Range	VDD_{RANGE}	VCC=OPEN	4.0	--	6.5	V
	VDD_{RATED}	VCC=5~15V	5.0	6.5	7	V
	I_{VDDQ}	VDD=5V, Drain=OPEN	--	600	--	uA
	VDD_{UVP}	VDD from 7V to 0V	--	3.8	--	mV
	I_{VDDC}		--	30	--	mA
MOS Section						
Static drain to source on resistance	R_{DSON}	VCC=10V	--	11	--	mΩ
	VBSS	Id=100uA	100		--	V
	T_{r}	0→20V, IO=3A	--	20	--	nS
	T_{f}	20V→0V, IO=3A	--	50	--	nS

Typical Application Example

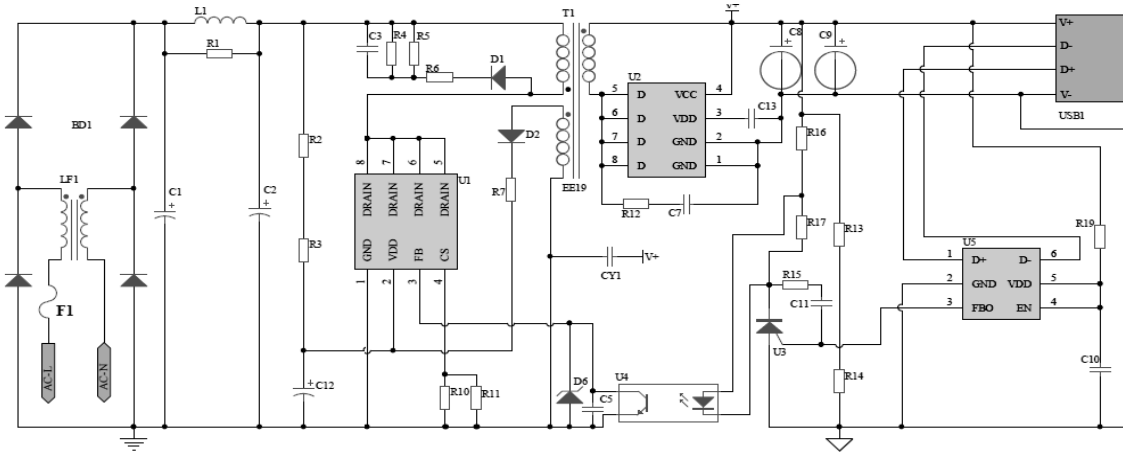


Figure.3 Schematic of Typical Application Circuit

Functional Description

CD9356F detects the internal MOSFET voltage (V_{DS}). When the drain voltage is lower than the turn-on threshold voltage (V_{THON}), it outputs a positive drive voltage after a turn-on delay time internal MOSFET will turn on and the current will transfer from the body diode into the internal channel, then lower conduction loss can be achieved. In the process of internal MOSFET decreasing linearly toward zero, the drain rises synchronically. When it rises over the turn off threshold voltage (V_{THOFF}), CD9356F internal MOSFET gate voltage to zero delay time (T_{DOFF}). See Figure.4

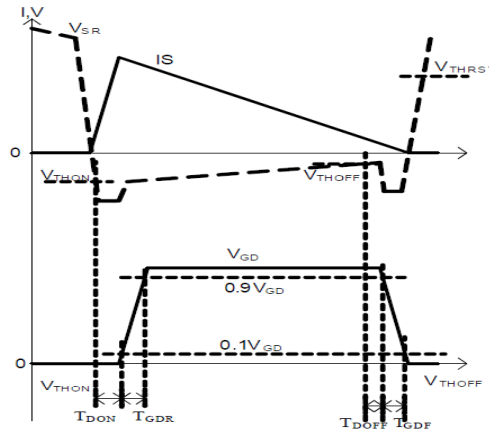


Figure 4. Typical Waveforms of CD9356F

Power Supply

The IC supply voltage is monitored by the under lockout circuit. It is possible to turn off the IC by pulling VDD pin below the minimum turn off threshold voltage, without damaging the IC. To prevent noise problems, a bypass ceramic capacitor connected to VDD and GND should be placed as close as possible to IC.

UVLO Mode

The IC remains in the UVLO condition until the voltage on the VDD pin exceeds the VDD turn on threshold voltage V_{DD_ON} . During the time the IC remains in the UVLO state, the gate drive circuit is inactive and the IC draws a quiescent current of I_{CC_START} . The UVLO mode is accessible from any other state of operation whenever the IC supply voltage condition of $V_{DD} < V_{DD_OFF}$ occurs.

Drain Voltage Inner Sense

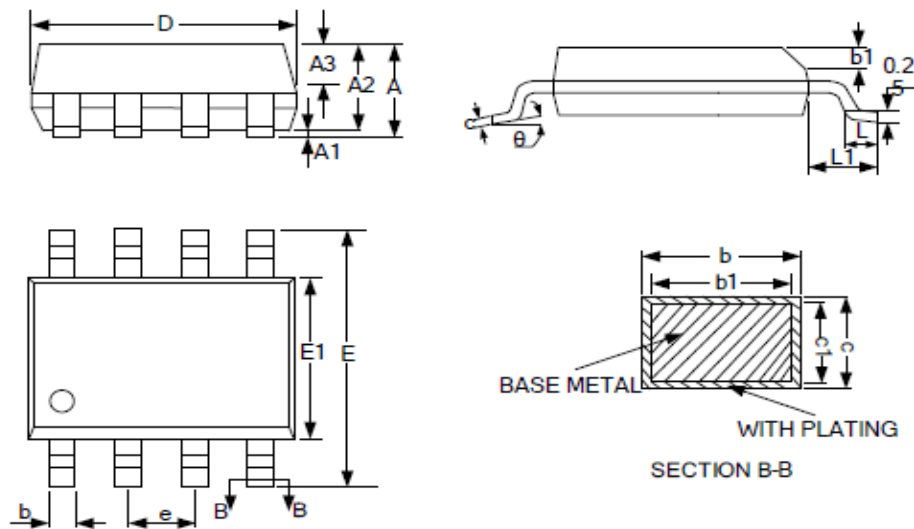
DRAIN pin is used to sense the internal MOSFET Drain voltage. This is a high voltage pin and particular care must be taken in properly routing the connection to the internal MOSFET drain side.

MOT Protection Mode

If the secondary current conduction time is shorter than the MOT (Minimum On driver output is disabled). This function can avoid reverse current that occurs when the system works at very low duty-cycles or at very light/no load conditions and reduce system standby power consumption by disabling GATE outputs. The Cycle by Cycle MOT Check circuit is always activated under Normal Mode and MOT that the IC can automatically resume normal operation once the load increases to a level current conduction time is longer than MOT.

Package Details

SOP-8 Surface Mount Plastic Package



SYMBOL	MILLIMETER			SYMBOL	MILLIMETER		
	MIN	NOM	MAX		MIN	NOM	MAX
A	—	—	1.75	D	4.70	4.90	5.10
A1	0.05	—	0.15	E	5.80	6.00	6.20
A2	1.30	1.40	1.50	E1	3.70	3.90	4.10
A3	0.60	0.65	0.70	e	1.27BSC		
b	0.39	—	0.48	h	0.25	—	0.50
b1	0.38	0.41	0.43	L	0.50	—	0.80
c	0.21	—	0.26	L1	1.05BSC		
c1	0.19	0.20	0.21	θ	0	—	8°

Ordering and Marking Information

Part Number	Package Description
CD9356F	SOP-8



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Recommended Product Storage Environment for Discrete Semiconductor Devices

This storage environment assumes that the Diodes and transistors are packed properly inside the original packing supplied by CDIL.

- Temperature 5 °C to 30 °C
- Humidity between 40 to 70 %RH
- Air should be clean.
- Avoid harmful gas or dust.
- Avoid outdoor exposure or storage in areas subject to rain or water spraying .
 - Avoid storage in areas subject to corrosive gas or dust. Product shall not be stored in areas exposed to direct sunlight.
- Avoid rapid change of temperature.
- Avoid condensation.
- Mechanical stress such as vibration and impact shall be avoided.
- The product shall not be placed directly on the floor.
 - The product shall be stored on a plane area. They should not be turned upside down. They should not be placed against the wall.

Shelf Life of CDIL Products

The shelf life of products is the period from product manufacture to shipment to customers. The product can be unconditionally shipped within this period. The period is defined as 2 years.

If products are stored longer than the shelf life of 2 years the products shall be subjected to quality check as per CDIL quality procedure.

The products are further warranted for another one year after the date of shipment subject to the above conditions in CDIL original packing.

Floor Life of CDIL Products and MSL Level

When the products are opened from the original packing, the floor life will start.

For this, the following JEDEC table may be referred:

JEDEC MSL Level		
Level	Time	Condition
1	Unlimited	≤30 °C / 85% RH
2	1 Year	≤30 °C / 60% RH
2a	4 Weeks	≤30 °C / 60% RH
3	168 Hours	≤30 °C / 60% RH
4	72 Hours	≤30 °C / 60% RH
5	48 Hours	≤30 °C / 60% RH
5a	24 Hours	≤30 °C / 60% RH
6	Time on Label(TOL)	≤30 °C / 60% RH



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Customer Notes

Component Disposal Instructions

1. CDIL Semiconductor Devices are RoHS compliant, customers are requested to please dispose as per prevailing Environmental Legislation of their Country.
2. In Europe, please dispose as per EU Directive 2002/96/EC on Waste Electrical and Electronic Equipment (WEEE).

Disclaimer

The product information and the selection guides facilitate selection of the CDIL's Semiconductor Device(s) best suited for application in your product(s) as per your requirement. It is recommended that you completely review our Data Sheet(s) so as to confirm that the Device(s) meet functionality parameters for your application. The information furnished in the Data Sheet and on the CDIL Web Site/CD are believed to be accurate and reliable. CDIL however, does not assume responsibility for inaccuracies or incomplete information. Furthermore, CDIL does not assume liability whatsoever, arising out of the application or use of any CDIL product; neither does it convey any license under its patent rights nor rights of others. These products are not designed for use in life saving/support appliances or systems. CDIL customers selling these products (either as individual Semiconductor Devices or incorporated in their end products), in any life saving/support appliances or systems or applications do so at their own risk and CDIL will not be responsible for any damages resulting from such sale(s).

CDIL strives for continuous improvement and reserves the right to change the specifications of its products without prior notice.



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