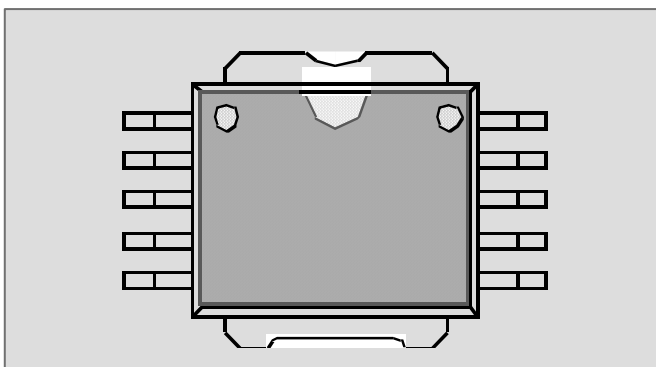


Product Information Ignition Power Switch - BIP 306



BOSCH

Invented for life



Current limiting bipolar ignition driver with diagnostic outputs and overheating protection

Customer benefits:

- ▶ Excellent system know-how
- ▶ Smart concepts for system safety
- ▶ Secured supply
- ▶ Long- term availability of manufacturing processes and products
- ▶ QS9000 and ISO/TS16949 certified

The bipolar triple stage darlington BIP306 especially developed to drive an ignition coil in automotive ignition circuits can be controlled by standard CMOS logic. The rugged bipolar process assures safe operation in automotive specific environment even under harsh conditions. The excellent quality of the concept - chip design - has been proven in the field a million times.

The BIP306 has an active voltage clamp between collector and emitter. It is temperature compensated with an accuracy of about ± 25 V in the entire temperature range. In order to protect the ECU, the wire harness, the coil and the ignition driver the collector current is limited to type. 11 A at long dwell times. Using a virtual sense concept a low saturation voltage of less than 2 V at 7 A in the entire temperature range has been obtained.

The primary voltage can be detected at a level of typical 105V to detect spark ignition. The Vflag output is an open collector stage (active low).

In order to prevent overheating and thermal damage of the device in case of excessive long dwell times the power stage is switched off internally by the integrated "Over temperature Protection" circuit (OTP) when reaching critical junction temperature. To avoid producing a spark the primary voltage is clamped on low level when thermal shut down occurs.

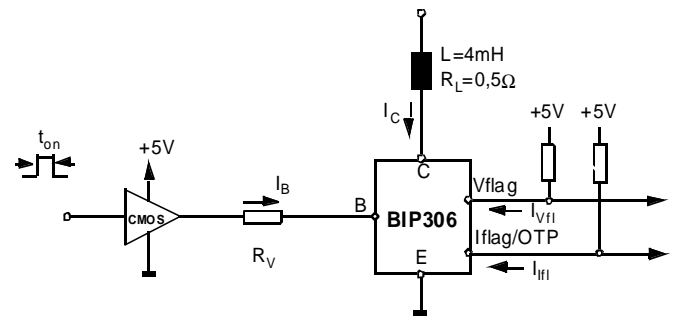
The coil current can be detected at a level of typical 2A to improve coil charging. The Iflag / OTP output is an open collector stage (active low), which is rested by a falling edge of the input signal or by activating the OTP.

The BIP306 with all the built-in protection circuits is suitable for high performance and high operation temperature automotive applications.

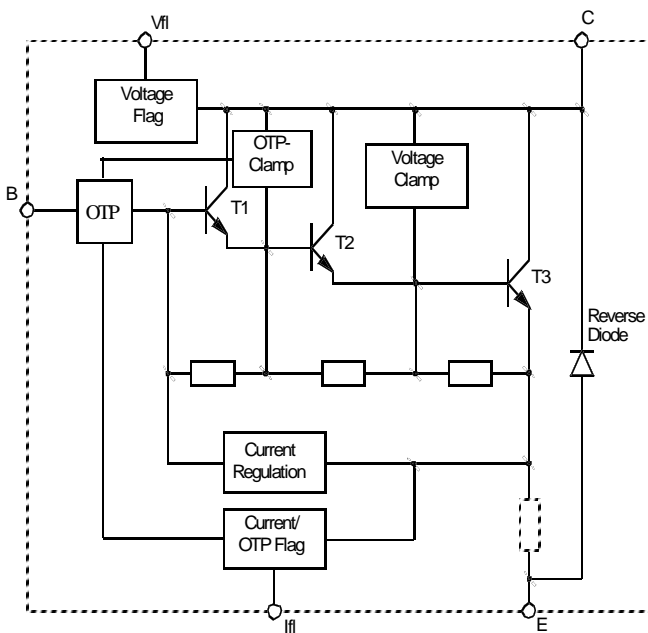
Features

- ▶ Triple stage darlington designed for automotive ignition application
- ▶ Driven by standard CMOS logic with very low power consumption in the driving circuit
- ▶ Thermal shut down, sparkles
- ▶ Input protected against V_{BAT}
- ▶ Internal CE voltage clamp, temperature compensated
- ▶ Collector current limiting circuit
- ▶ Low saturation voltage ($< 2\text{ V}$ at 7 A in the entire temperature range)
- ▶ Integrated capacitors for oscillation free operational Diagnostic output for high voltage
- ▶ Diagnostic output for coil current / over temperature protection
- ▶ Package: Power-SO10

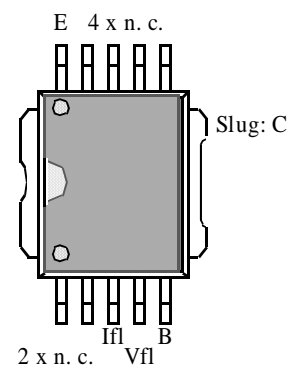
Application example



Block diagram

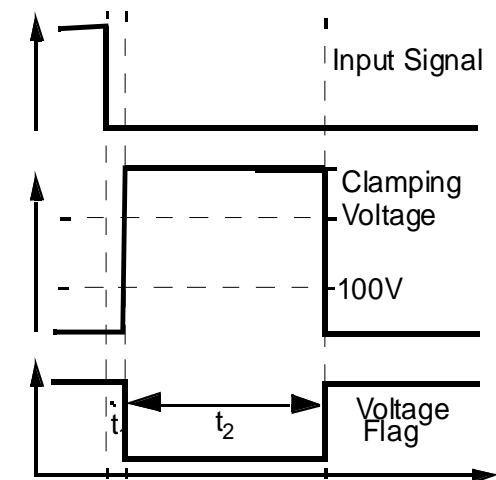
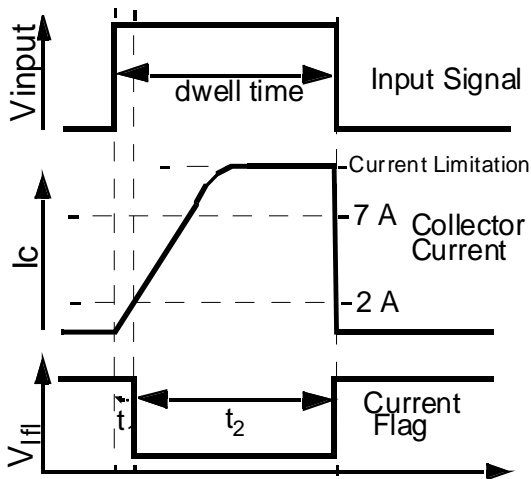


PIN configuration



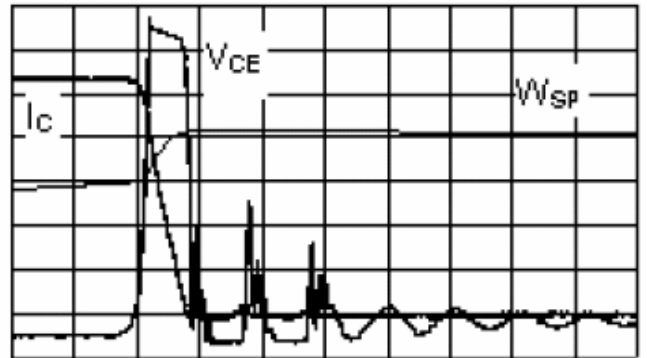
Maximum ratings

Parameter	Symb.	Value	Unit
Collector emitter breakdown voltage at 25mA (limited internally)	VCE	400	V
Collector base breakdown voltage	VCB	400	V
Collector current (limited internally)	ICL	15	A
Reverse diode forward current	IEC	10	A
Input voltage Tcase < 40°C, t < 60s	VBE	14	V
Input current	IB	200	mA
Input signal rise time	dVBE/dt	0.1	V/ns
Current at diagnostic output (Vfl)	IVfl	10	mA
Current at Diagnostic output (IfI)	IIfI	10	mA
Power dissipation total at T=25°C	Ptot	90	W
Inductive load switching avalanche energy (L=4 mH)	WL	450	mJ
Operating and storage junction temperature range	Tj	-40... 150	°C
AC-operating temperature (<1% of total operating time)		175	



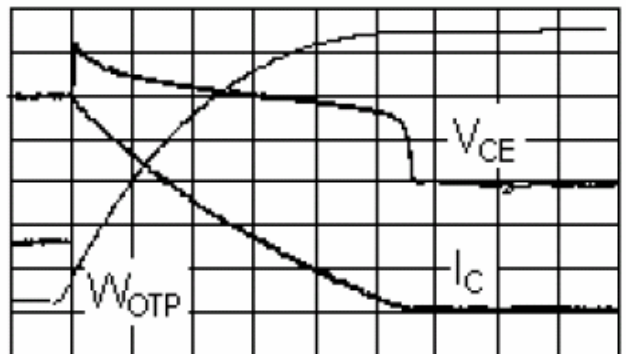
Typ. switch off characteristics

Normal operation



t = 20 μs/Div; V = 50V/Div; I = 2A/Div; W = 20mJ/Div

Thermal shut down



t = 0.5ms/Div; V = 5V/Div; I = 2A/Div; W = 50mJ/Div

Electrical characteristics

Unless otherwise specified: $V_{Bat} = 6V...16V$, $I_B = 5mA...12mA$, $T_{Junction} = -40^{\circ}C...+150^{\circ}C$

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{Cl}	Collector emitter clamping voltage	at $I_C=6A...7.3A$ measured 25 μs after $V_{CE}=200V$	350	375	400	V
V_{ClPeak}	Collector emitter clamping voltage peak	at $I_C=6A...7.3A$			450	V
I_{CLim}	Collector current limitation	$V_{CE}=6V...10V$	8.5		14.5	A
$V_{CE_{SAT}}$	Collector emitter saturation voltage	$I_C \leq 7 A$	1.4		2.0	V
$V_{BE_{SAT}}$	Input voltage (high)	$I_C = 7A, I_B = 5mA$ $I_C = 7A, I_B = 12mA$	2.55 3.35		3.75 4.35	V
$V_{BE_{Low}}$	Input voltage (low)	$I_C \leq 15 mA, V_{CE} \leq 20V$			0.7	V
$V_{CE_{REV}}$	Reverse diode forward voltage	$I_C=-5A$	-1.3	-1.0		V
$V_{BE_{REV}}$	Reverse polarity base emitter voltage	$I_C=-5A$	-1.2			V
t_{OFF}	Switching time	$I_C = 7A$			40	μs
$I_{C_{ifl}}$	Current flag threshold	$V_{Vfl} < 0.5V$	1.7	2.0	2.3	A
t_{ifl}	Delay time current/OTP flag	$R_{ifl} = 10k\Omega$ to +5V, $C_{ifl} = 50pF$, falling edge			5	μs
$U_{CE_{Vfl}}$	Voltage flag threshold	$V_{Vfl} < 0.5V$	95	105	145	V
t_{Vfl}	Delay time voltage flag	$R_{Vfl} = 10k\Omega$ to +5V, $C_{Vfl} = 50pF$, falling edge			2	μs
V_{Vflsat}, V_{Vflsat}	Flag saturation voltage	active low, $I_{ifl} = I_{Vfl} = 2mA$			0.45	V
I_{iflL}, I_{Vfl} Leakage	Flag leakage current	<u>not</u> active high, $V_{ifl} = V_{Vfl} = 5V$			10	μA
T_{OTP}	Thermal shut down	active heating $T_{OTP} = T_{Junction}$	180	195	210	$^{\circ}C$
$V_{Cl_{OTP}}$	OTP Collector emitter clamping voltage	Thermal shut down	25		t.b.d.	V
$R_{thj-case}$	Thermal resistance			1.2	1.3	K/W

Contact

Robert Bosch GmbH
Sales Semiconductors
Postbox 13 42
72703 Reutlingen
Germany
Tel.: +49 7121 35-2979
Fax: +49 7121 35-2170

Robert Bosch Corporation
Component Sales
38000 Hills Tech Drive
Farmington Hills, MI 48331
USA
Tel.: +1 248 876-7441
Fax: +1 248 848-2818

Robert Bosch K.K.
Component Sales
9-1, Ushikubo 3-chome
Tsuzuki-ku, Yokohama 224
Japan
Tel.: +81 45 9 12-83 01
Fax: +81 45 9 12-95 73

E-Mail: bosch.semiconductors@de.bosch.com

Internet: www.bosch-semiconductors.de

© 02/2006 All rights reserved by Robert Bosch GmbH including the right to file industrial property rights

Robert Bosch GmbH retains the sole powers of distribution, such as reproduction, copying and distribution.

For any use of products outside the released application, specified environments or installation conditions no warranty shall apply and Bosch shall not be liable for such products or any damage caused by such products.