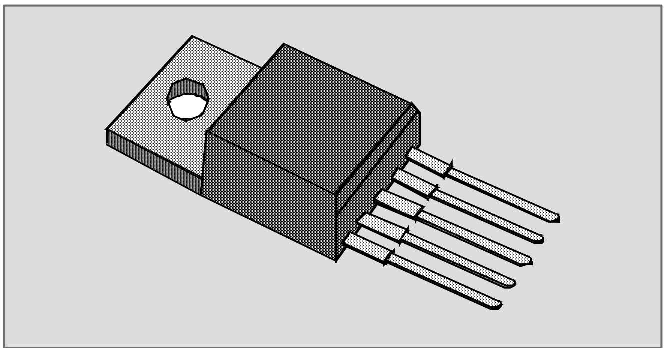
Automotive Electronics

Product Information
Ignition Power Switch – BIP390

BOSCH
Invented for life



Current limiting bipolar ignition driver with current flag

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

Features

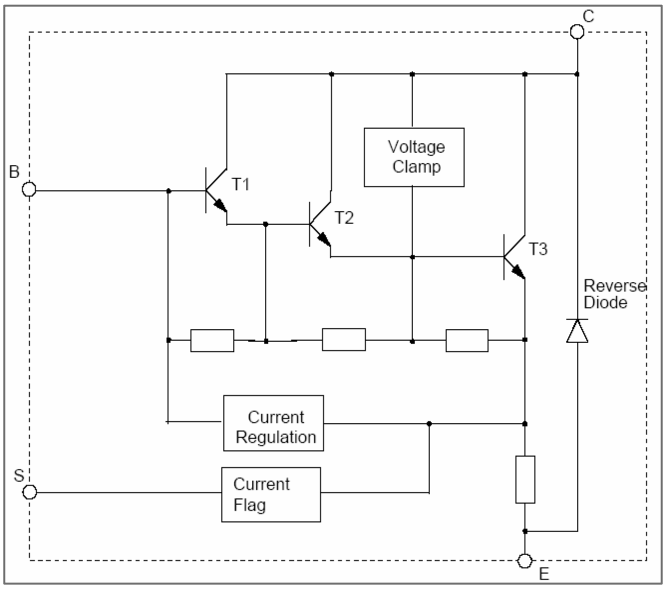
- Triple stage darlington designed for automotive ignition application
- Driven by standard CMOS logic with low power consumption in the driving circuit
- Input protected against V_{BAT}
- Internal CE voltage clamp, temperature compensated
- Collector current limiting circuit
- Diagnostic output (current flag)
- Low saturation voltage (<2 V at 7 A in the entire temperature range)
- Integrated capacitors for oscillation free operation
- Package TO218/5

The bipolar triple stage darlington BIP390 especially developed to drive an ignition coil in automotive ignition circuits can be driven 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 and plastic packaging - has been proven in the field over 10 million times. Due to the ESD performance, typical for HV-bipolar devices special precautions during manufacture or operation are unnecessary.

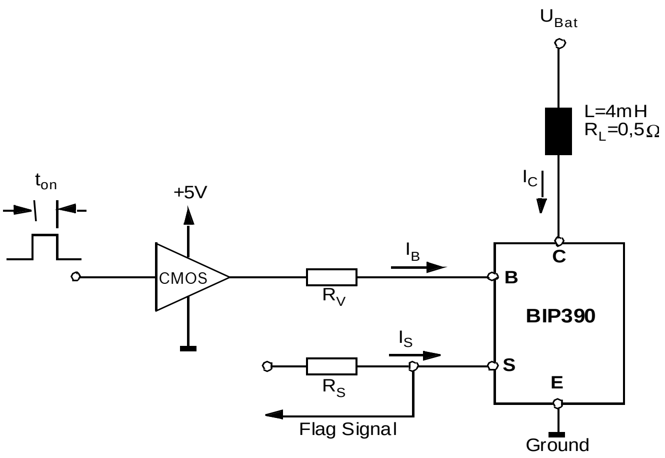
The BIP390 has an active voltage clamp between collector and emitter. It is temperature compensated with an accuracy of about ±25 V in the entire temperature range. In order to protect the ECU, the wire harness, the coil and the ignition driver the collector current is limited to typ. 11 A for long dwell 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 diagnostic output with active low characteristic (current flag connector S) is activated when collector current level of typical 2A is reached. The diagnostic output is reset by switching the input signal from 'high' to 'low'.

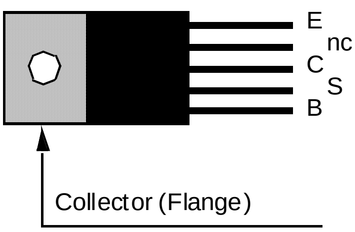
Block diagram



Application example



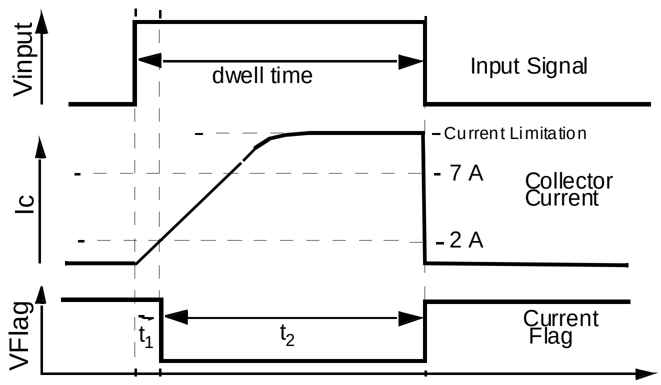
PIN configuration



Maximum ratings

Parameter	Symb.	Value	Unit
Collector emitter breakdown voltage	V_{CE}	290	V
Collector base breakdown voltage	V_{CB}	290	V
Collector current	I_C	15	A
Reverse diode forward current t= 300s, T_{case}= 25°C	I_{EC}	10	A
Input voltage T_{case} < 40°C, t < 60s, no function	V_{BE}	14	V
Input current, no function	I_B	150	mA
Inductive load switching avalanche energy (L= 4mH, I_C= 15A)	E_{off}	430	mJ
Voltage at Pin S, R_S= 1kΩ	U_S	24	V
Flag current, R_S= 1kΩ	I_S	25	mA
Operating and storage junction temperature range	T_j	-40 ...150	°C
Battery voltage	V_{bat}	6...16	V

Current flag switching diagram



Electrical characteristics

Unless otherwise specified: V_{Bat}= 6V...16V, I_B= 10mA, $T_{junction}$= -40°C...+150°C

Symbol	Parameter	Test Conditions, Comment	Min.	Typ.	Max.	Unit
V_{Cl}	Collector emitter clamping voltage	at I_C= 6A....7.3A, L= 4mH, V_{BE_off}< 0.5V, measured 25µs after V_{CE}= 200V	350	375	400	V
V_{Cl_Peak}	Collector emitter clamping voltage peak	at I_C= 6A....7.3A, L= 4mH, V_{BE_off}< 0.5V			450	V
I_{Con}	Collector current limitation	V_{CE}= 6V...10V; T_j >= 25°C	9.0	11	13.5	A
		V_{CE}= 6V...10V; T_j < 25°C	9.0		14.0	
		V_{CE}= 4V	8.5			
		V_{CE}= 6V...10V; 7mA ≤ I_B ≤ 20mA, T_j >= 25°C	8.6		14.0	
		V_{CE}= 6V...10V; 7mA ≤ I_B ≤ 20mA, T_j < 25°C	9.0		14.5	
I_{Coff}	Leak current	V_{BE}= 0; V_{CE}= 290V			10	mA
		V_{BE} ≤ 0.5V; V_{CE} ≤ 20V			15	
		I_B = 30uA; V_{CE} ≤ 14V			15	
V_{CE_REV}	Reverse polarity collector emitter voltage	I_C= -5A	-1.3			V
V_{BE_REV}	Reverse polarity base emitter voltage	I_C= -5A	-1.2			V
V_{CE_SAT}	Collector emitter saturation voltage	I_C = 7A; T_j=25°C	1.4	1.7	2.0	V
		I_C ≤ 7A; 5mA ≤ I_B ≤ 20mA	1.4		2.0	
V_{BE_SAT}	Base emitter saturation voltage	I_C = 7A	2.5	2.9	3.3	V
		I_C = 7A, I_B = 5mA	2.0	2.5	3.0	
		I_C = 7A, I_B = 20mA	3.0	3.3	4.0	
t_{OFF}	Switching time delay	I_C = 7A, -I_B ≤ 30mA	5		45	µs
t_S	Switching time	Maximal t_{rise} and t_{fall} at input B			5	µs
I_{Flag}	Flag signal switching level	Active low	1.52	2	2.3	A
t_{Flag}	Flag signal switching time				10	µs
I_S	Flag current	Flag active, current through pull-up resistance R_S =1kΩ	1	5	15	mA
I_{S_off}	Flag current	Flag inactive, current through pull-up resistance R_S =1kΩ			50	µA
U_{S_low}	Flag voltage low	L= 4mH, I_S < 10mA			0.9	V
		L= 4mH, I_S < 12mA			1.0	
I_{S_re}	Reverse polarity, flag current	I_C =-5A, I_B = 100µA, current through resistance R_S =1kΩ			0.5	mA
U_{S_re}	Reverse polarity, flag voltage	I_C =-5A, I_B = 100µA, R_S =1kΩ	4.4			V
R_{thj_case}	Thermal resistance				1.1	K/W

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