SGS-THOMSON MICROELECTRONICS

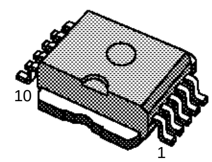
VB027SP

HIGH VOLTAGE IGNITION COIL DRIVER POWER IC

PRELIMINARY DATA

TYPE	V_{cl}	I_{cl}	I_d
VB027SP	360 V	8.5 A	80 mA

- PRIMARY COIL VOLTAGE INTERNALLY SET
- COIL CURRENT LIMIT INTERNALLY SET
- LOGIC LEVEL COMPATIBLE INPUT
- DRIVING CURRENT QUASI PROPORTIONAL TO COLLECTOR CURRENT
- DOUBLE FLAG-ON COIL CURRENT



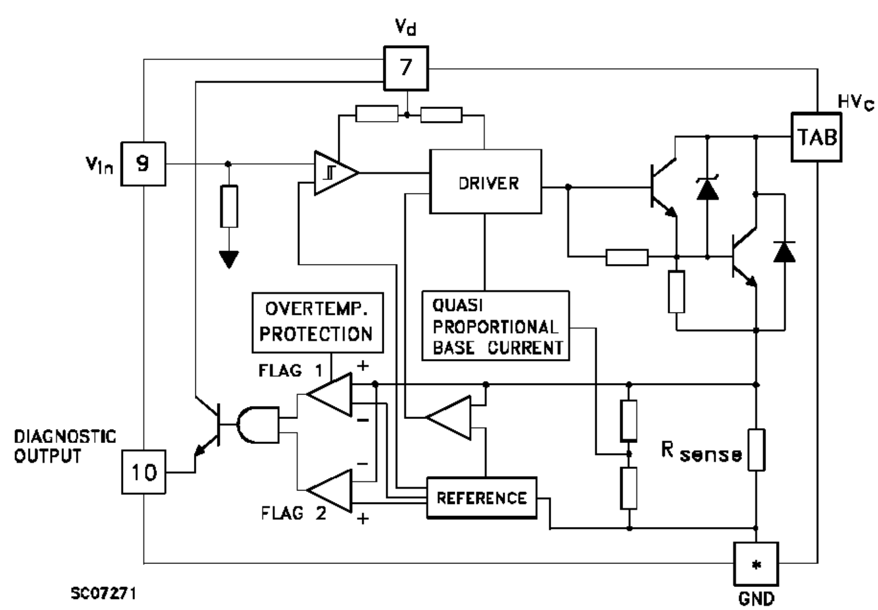
Power SO-10™

DESCRIPTION

The VB027SP is a high voltage power integrated circuit made using SGS-THOMSON Microelectronics Vertical Intelligent Power Technology, with vertical current flow power darlington and logic level compatible driving circuit.

Built-in protection circuits for coil current limiting and collector voltage clamping allows the VB027SP to be used as a smart, high voltage, high current interface in advanced electronic ignition systems.

BLOCK DIAGRAM



* PINS 1-5 = power GND, PIN 6 Signal GND, PIN 6 must be connected to PINS 1-5 externally.

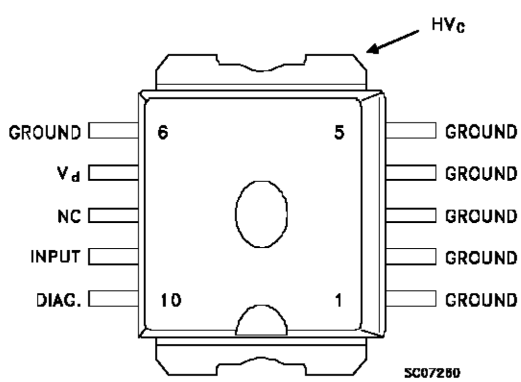
ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
HV_C	Collector Voltage	Internally Limited	V
I_C	Collector Current	Internally Limited	A
V_d	Driving Stage Supply Voltage	7	V
I_d	Driving Circuitry Supply Current	200	mA
V_{in}	Maximum Input Voltage	10	V
T_j	Operating Junction Temperature	-40 to 150	^oC
T_{stg}	Storage Temperature Range	-55 to 150	^oC

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction Case (MAX)	1.12	$^oC/W$
$R_{thj-amb}$	Thermal Resistance Junction Ambient (MAX)	62.5	$^oC/W$

CONNECTION DIAGRAM



PIN FUNCTION

No	NAME	FUNCTION
1 - 5	GND	Emitter Power Ground
6 (*)	GND	Control Ground
7	Vd	Supply Voltage For The Power Stage
TAB	HV_C	Output to The Primary Coil
9	INPUT	
10	DIAGNOSTIC	Output of a Logic Signal When Ic Is Greater Than 3 A

(*) PIN 6 must be connected to PINS 1 - 5 externally

ELECTRICAL CHARACTERISTICS (V_b = 13.5 V; V_d = 5 V; T_j = 25 ^oC; R_{coil} = 510 mΩ; L_{coil} = 2.85 mH; unless otherwise specified)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{cl}	High Voltage Clamp	V_{in} = 0.4 V -40 $^oC \leq T_j \leq$ 125 ^oC I_{coil} = 6 A	300	360	400	V
$V_{ce(sat)}$	Saturation Voltage of The Power Stage	I_c = 6A; I_d = 80 mA; V_{in} = 4V		1.5		V
$V_{ce(sat)dt}$	Saturation Voltage of The Power Stage Derating in Temperature	I_c = 6A; I_d = 85 mA; V_{in} = 4V -40 $^oC \leq T_j \leq$ 125 ^oC			2	V
$I_{d(stdby)}$	Stand-by Supply Current	V_{in} = 0.4 V			8	mA
$I_{d(on)}$	Power On Supply Current	V_{in} = 4 V I_d = 6 A -40 $^oC \leq T_j \leq$ 125 ^oC			130	mA
V_d	Driver Stage Supply Voltage		4.5		5.5	V
I_{cl}	Coil Current Limit	V_{in} = 4 V (see note 1)	8	8.5	9	A
$I_{cl(td)}$	Coil Current Limit Drift With Temperature	See figure 3				
V_{inH}	High Level Input Voltage	HV_c < 2 V	4		5.5	V
V_{inL}	Low Level Input Voltage	I_c < 2 mA $HV_c = V_b$	0		0.8	V
I_{inH}	High Level Input Current	V_{in} = 4 V	40		200	µA
V_{diagH}	High Level Diagnostic Output Voltage	R_{EXT} = 22 KΩ (see fig. 1)	3.5	*	V_d	V
V_{diagL}	Low Level Diagnostic Output Voltage	R_{EXT} = 22 KΩ (see fig. 1)			0.5	V
$I_{diagTH1}$	Diagnostic Current First Threshold		4.25	4.5	4.75	A
$I_{diagTD1}$	Diagnostic Current First Threshold Drift With Temperature	See figure 4				
$I_{diagTH2}$	Diagnostic Current Second Threshold		5.45	5.8	6.15	A
$I_{diagTD2}$	Diagnostic Current Second Threshold Drift With Temperature	See figure 5				
t_{dlc}	Delay Time Coil Current	I_c = 5.5 A		25		µs
t_{flc}	Fall Time Coil Current	I_c = 5.5 A		8		µs
$t_{d(diag)}$	Delay Time Diagnostic Current	R_{EXT} = 22 KΩ (see fig. 1)		1		µs
$t_{r(diag)}$	Rise Time Diagnostic Current	R_{EXT} = 22 KΩ (see fig. 1)		1		µs
$t_{f(diag)}$	Fall Time Diagnostic Current	R_{EXT} = 22 KΩ (see fig. 1)		1		µs

Note 1: The primary coil current value Icl must be measured 1 ms afterdesaturation of the power stage.

* V_d - $V_{be(on)}$

PRINCIPLE OF OPERATION

The VB027 is mainly intended as a high voltage power switch device driven by a logic level input and interfaces directly to a high energy electronic ignition coil.

The input Vin of the VB027 is fed from a low power signal generated by an external controller that determines both dwell time and ignition point.

During Vin high (≥ 4V) the VB027 increases current in the coil to the desired, internally set current level.

After reaching this level, the coil current remains constant until the ignition point, that corresponds to the transition of Vin from high to low (typ. 1.9V threshold).

During the coil current switch-off, the primary voltage HVc is clamped at an internally set value Vcl, typically 360V.

The transition from saturation to desaturation, coil current limiting phase, must have the ability to accomodate an overvoltage. A maximum overshoot of 20V is allowed.

FEEDBACK

When the collector current exceeds 4.5A, the feedback signal is turned high and it remains so, until the load current reaches 5.8A (second threshold), at that value, the feedback signal is turned low.

OVERVOLTAGE

The VB027 can withstand the following transients of the battery line:

-100V/2msec (R_i = 10 Ω)

+100V/0.2msec (R_i = 10 Ω)

+50V/400msec (R_i = 4.2 Ω, with V_{IN} = 3 V)

FIGURE1: Application Circuit

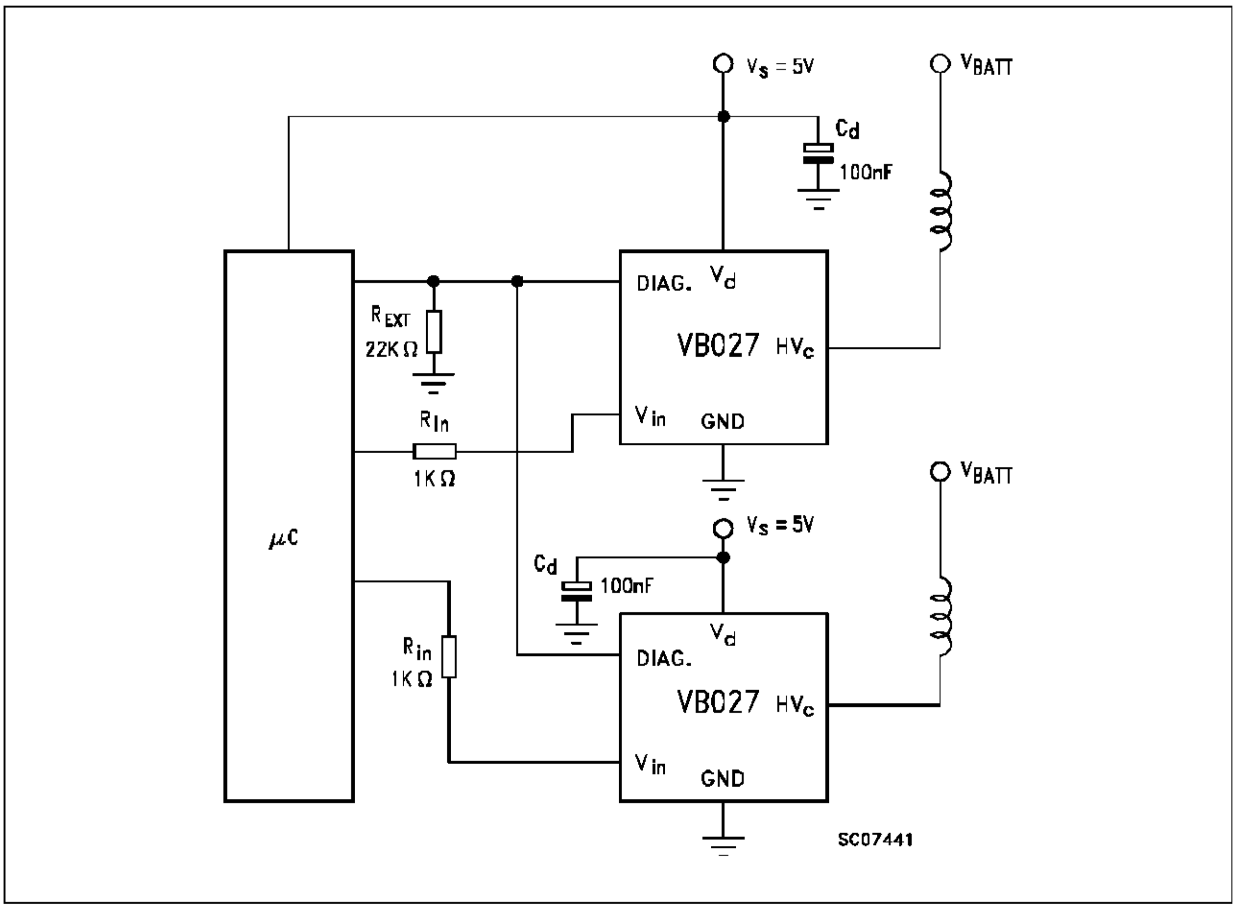


FIGURE 2: Switching Waveform

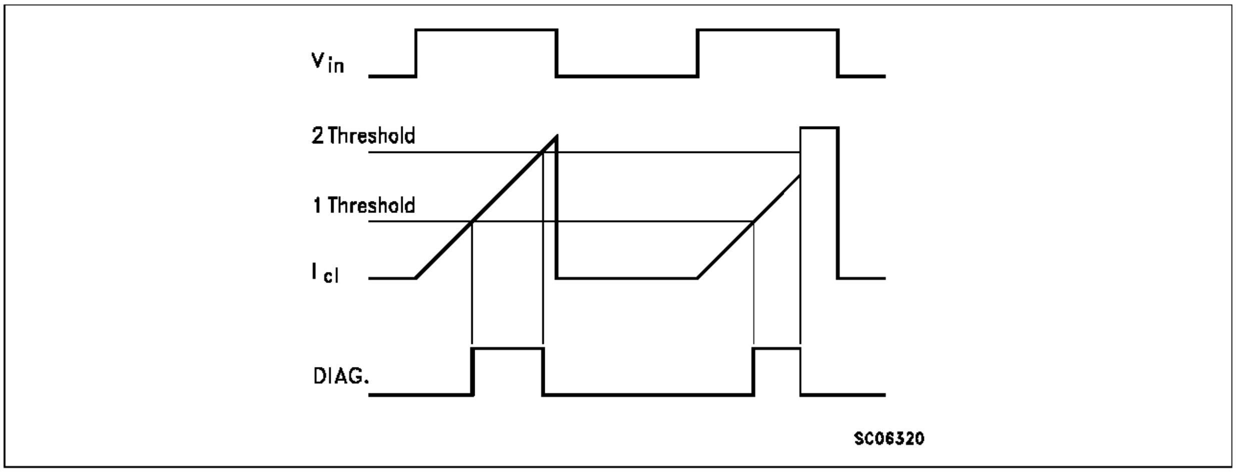


FIGURE 3: Maximum I_{cl} Versus Temperature

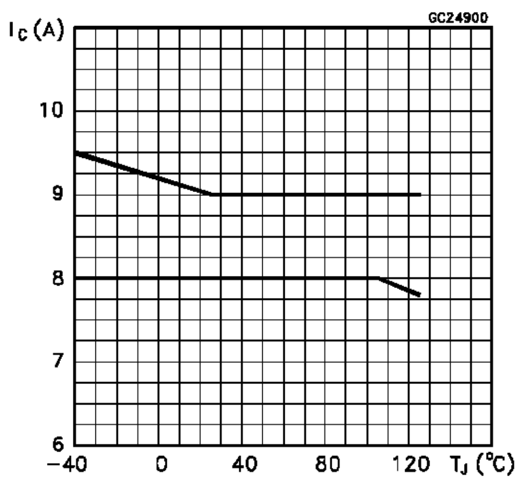


FIGURE 4: I_{flag1} Versus Temperature

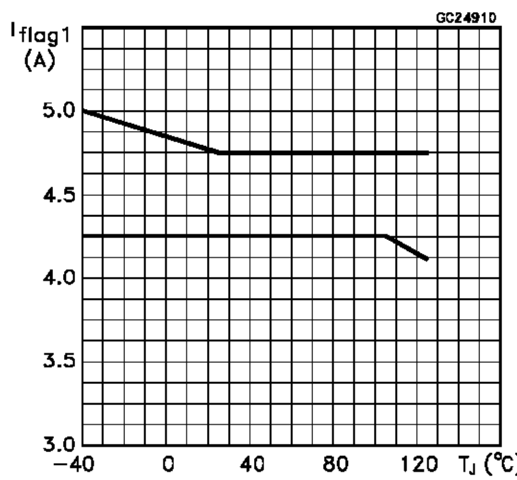
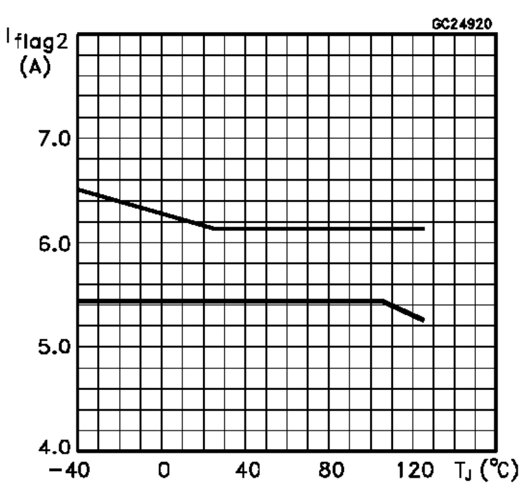


FIGURE 5: I_{flag2} Versus Temperature



Power SO-10 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	3.45	3.5	3.55	0.135	0.137	0.140
B		1.28	1.30		0.050	0.051
C			0.15			0.006
D	9.40	9.50	9.60	0.370	0.374	0.378
E	4.98	5.08	5.48	0.196	0.200	0.216
E1	0.40	0.45	0.60	0.016	0.018	0.024
E2	1.17	1.27	1.37	0.046	0.050	0.054
F	9.30	9.40	9.50	0.366	0.370	0.374
F1	7.95	8.00	8.15	0.313	0.315	0.321
G	7.40	7.50	7.60	0.291	0.295	0.299
H	6.80	6.90	7.00	0.267	0.417	0.421
I		0.10			0.004	
K	13.80	14.10	14.40	0.543	0.555	0.567
L		0.40	0.50		0.016	0.020
M	1.60	1.67	1.80	0.063	0.066	0.071
N	0.60	0.08	1.00	0.024	0.031	0.039