

**HIGH VOLTAGE IGNITION COIL DRIVER
POWER IC**

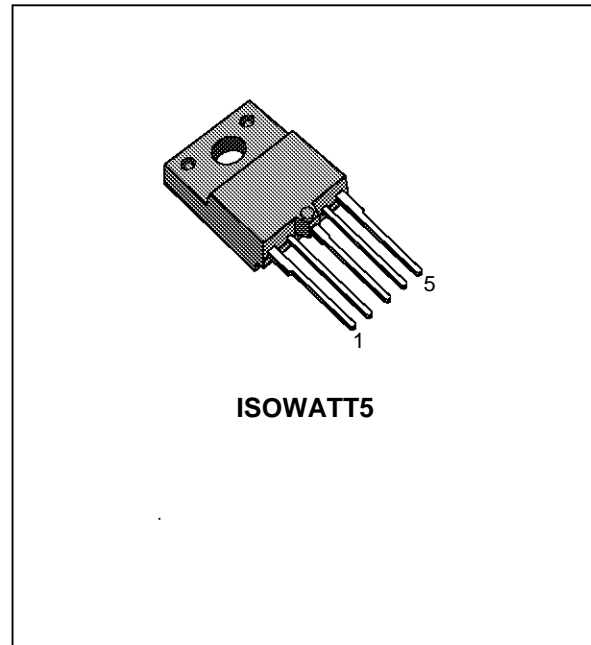
TYPE	V _{cl}	I _{cl}	I _d
VB020	400 V	6 A	150 mA

- PRIMARY COIL VOLTAGE INTERNALLY SET
- COIL CURRENT LIMIT INTERNALLY SET
- LOGIC LEVEL COMPATIBLE INPUT
- OVERVOLTAGE PROTECTION OF THE DRIVING AND CONTROL CIRCUIT

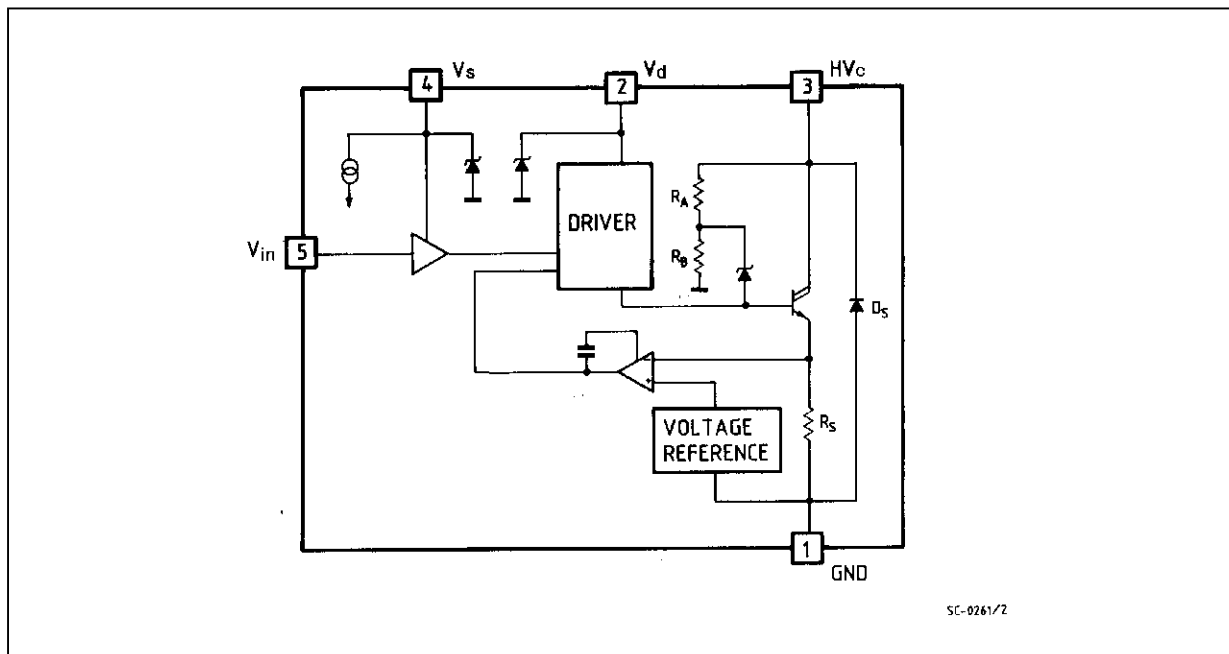
DESCRIPTION

The VB020 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 VB020 to be used as a smart, high voltage, high current interface in advanced electronic ignition systems.



BLOCK DIAGRAM



VB020

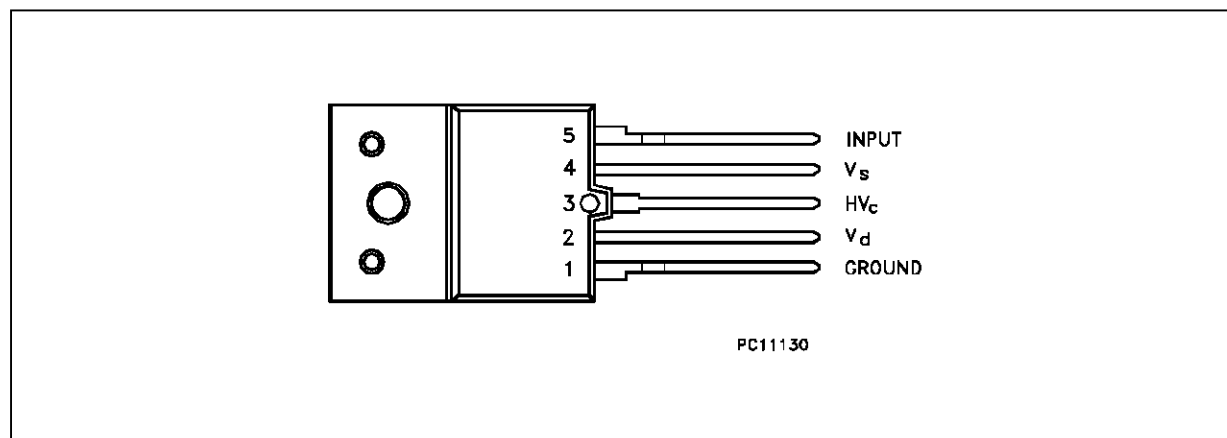
ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
HV_C	Collector Voltage	Internally Limited	V
I_c	Collector Current	Internally Limited	A
V_d	Driving Stage Supply Voltage	24	V
I_d	Driving Circuitry Supply Current	350	mA
V_{in}	Maximum Input Voltage	V_s	V
V_s	Control Circuitry Supply Voltage	24	V
I_s	Control Circuitry Supply Current	200	mA
T_j	Operating Junction Temperature	-40 to 150	°C
T_{stg}	Storage Temperature Range	-55 to 150	°C

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction Case (MAX)	2.5	°C/W
$R_{thj-amb}$	Thermal Resistance Junction Ambient (MAX)	30	°C/W

PIN CONFIGURATION



PIN FUNCTION

No	NAME	FUNCTION
1	GND	Emitter Power and Control Ground
2	V_d	Driver Stage Supply Voltage
3	HV_C	Output to The Primary Coil
4	V_s	Control Circuit Supply Voltage
5	INPUT	

ELECTRICAL CHARACTERISTICS ($V_b = V_{CC} = 12\text{ V}$; $T_{amb} = 25\text{ }^\circ\text{C}$; $V_{in} = 0.4\text{ V}$; $R_S = 300\text{ }\Omega$; $R_D = 50\text{ }\Omega$; $R_{coil} = 500\text{ m}\Omega$; $L_{coil} = 6\text{ mH}$ unless otherwise specified, see figure 1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_{cl}	High Voltage Clamp	Functional Test see figs. 3 e 4	320		460	V
$V_{ce(sat)}$	Saturation Voltage of The Power Stage	$I_c = 5\text{ A}$; $I_d = 40\text{ mA}$; $V_{in} = 5\text{ V}$ pulsed $t_{on} = 300\text{ }\mu\text{s}$ $f_{osc} = 1\text{ Hz}$		1.5	2	V
$I_{s(on)}$	Control Circuit Supply Current	$V_{in} = 4\text{ V}$		10	25	mA
$I_{s(stand-by)}$	Control Circuit Stand-by Current	$V_{in} = 0.4\text{ V}$		5	15	mA
V_s	Control Circuit Supply Voltage		5.6		8.5	V
$I_{d(on)}$	Driver Stage Supply Current	$V_{in} = 4\text{ V}$		150	350	mA
$I_{d(stand-by)}$	Driver Stage Stand-by Current	$V_{in} = 0.4\text{ V}$			1	mA
V_d	Driver Stage Supply Voltage		5		17	V
I_{cl}	Coil Current Limit	Functional Test see figs. 3 e 4	5.5	6	6.5	A
V_{inH}	High Level Input Voltage	$I_c = 5\text{ A}$	2.4		V_s	V
V_{inL}	Low Level Input Voltage	$I_c < 2\text{ mA}$ $HV_c = V_b$	0		0.8	V
I_{inH}	High Level Input Current	$V_{in} = 2.4\text{ V}$			100	μA
t_s	Storage Time	$I_c = 6\text{ A}$ see figs. 1 e 2		20	30	μs
t_f	Fall Time	$I_c = 6\text{ A}$ see figs. 1 e 2 & Note 1			12	μs
$E_{s/b}$	Second Breakdown Energy Clamped	$I_c = 6\text{ A}$ $V_{CC} = 12\text{ V}$	300			mJ

Note 1: $V_{clamp} = 300\text{ V}$ externally set

PRINCIPLE OF OPERATION

The VB020 is a high voltage, power integrated circuit with a logic level compatible input.

This part is intended for use in ignition modules or integrated into an ignition coil assembly.

The input, V_{in} , of the VB020 is fed with a logic level signal generated by an external controller or processor that determines both dwell time and ignition point. When V_{in} is high ($>2.4\text{ V}$) the VB020 power output transistor conducts and a current controlled by the IC logic flows in the ignition coil.

The current is held constant at a level set internally by the P.I.C. until the ignition point, when V_{in} is driven low. During the turn-off of the transistor, the primary voltage is clamped at an

internally set value, V_{cl} . typically 400V, in case accidental secondary open circuit conditions occur.

The transition from saturation to desaturation coil current limiting phase implies a maximum overshoot of 0.85 times the supply voltage without requiring an external RC network for frequency compensation.

OVERVOLTAGE

The VB020 can withstand the following transient on the battery line:

-120V/2msec ($R_i = 10\text{ }\Omega$)

100V/1msec ($R_i = 10\text{ }\Omega$)

50V/400msec ($R_i = 2\text{ }\Omega$, $V_{in} = 3\text{ V}$)

Figure 1 : Test Circuit.

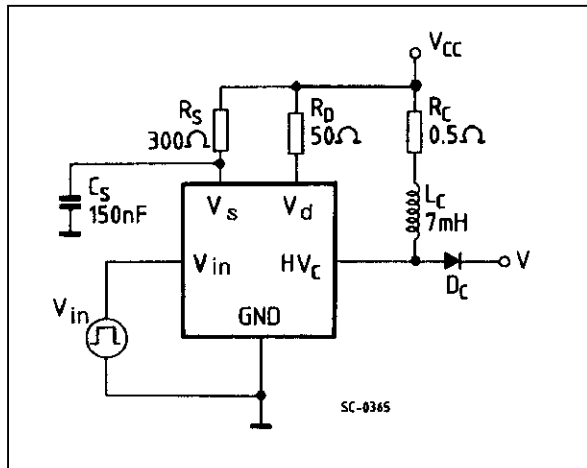


Figure 2 : Resistive Switching Waveform.

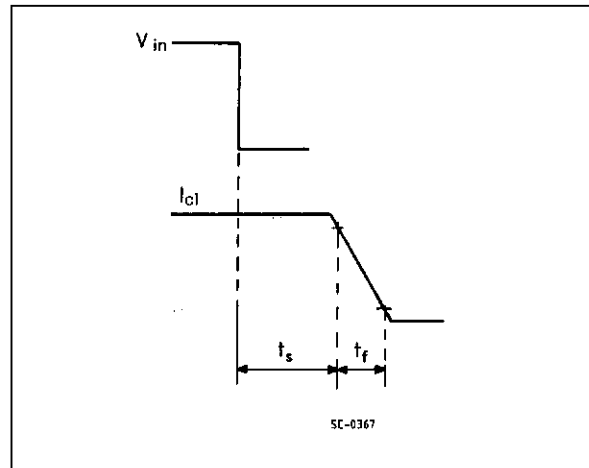
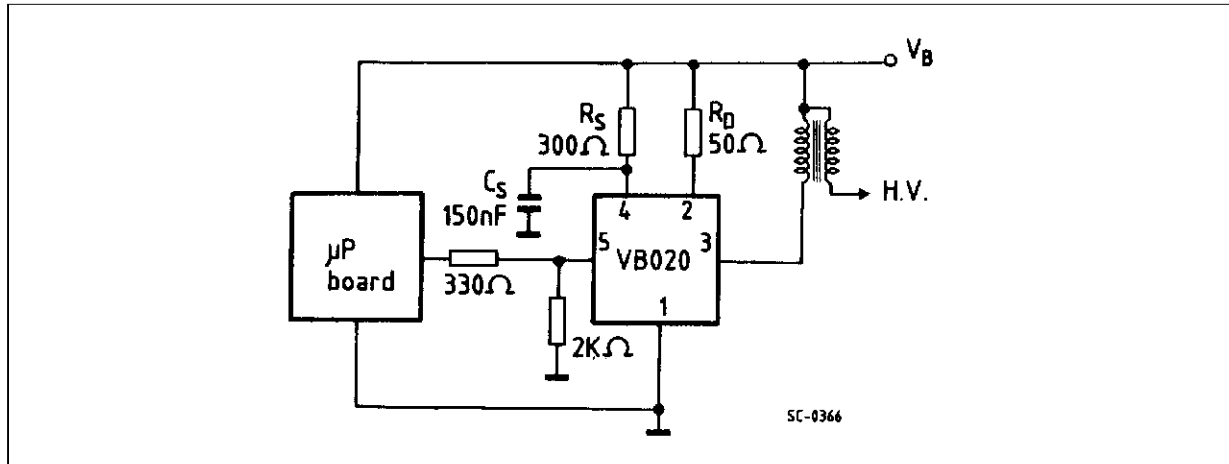
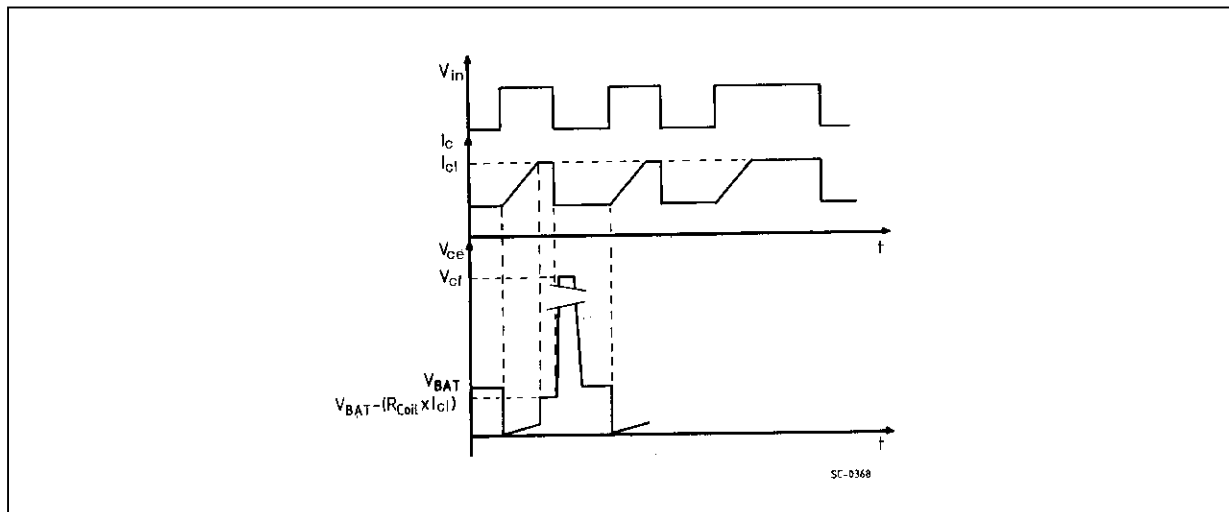


Figure 3 : Application Circuit.



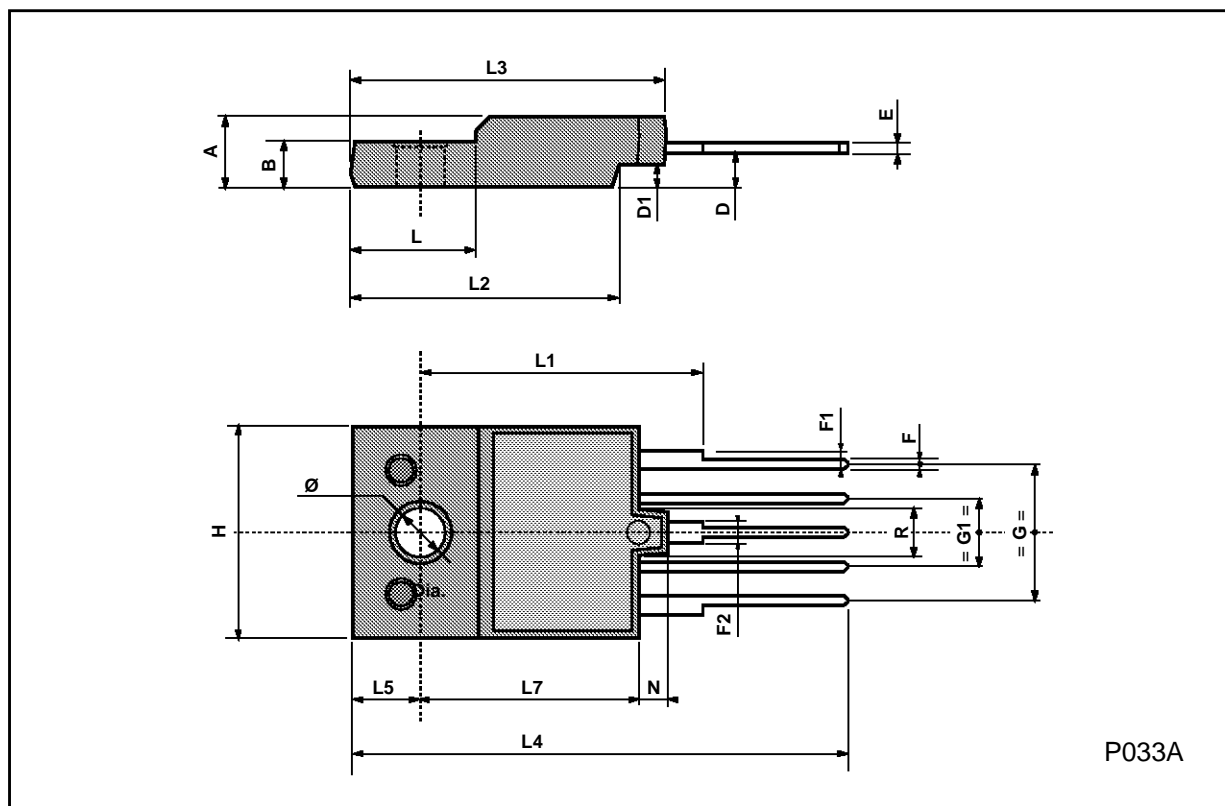
Coil data: primary resistance $R_c = 0.4 - 0.5$ ohm.
 primary inductance $L_c = 6 - 8$ mH.

Figure 4: Input Voltage and Output Current Waveform.



ISOWATT5 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	5.35		5.65	0.210		0.222
B	3.3		3.8	0.130		0.149
D	2.95		3.1	0.116		0.122
D1	1.88		2.08	0.074		0.081
E	0.45		1	0.017		0.039
F	0.75		1	0.029		0.039
F1		1.5			0.059	
F2		1.3			0.051	
G		10.16			0.400	
G1		5.08			0.200	
H	15.8		16.2	0.622		0.637
L		9			0.354	
L1	20.25		20.75	0.797		0.817
L2	19.10		19.9	0.751		0.783
L3	22.8		23.6	0.897		0.929
L4	34.9		36.9	1.374		1.452
L5	4.85		5.25	0.190		0.206
L7		16			0.630	
N	2.1		2.3	0.082		0.090
R		3.1			0.122	
∅	3.5		3.7	0.138		0.145



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