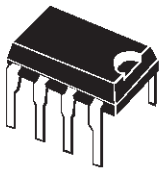
ICC03-400B2

Application Specific Discretes
A.S.D.™

IGNITION CONTROL CIRCUIT

FEATURES AND BENEFITS

- MONOLITHIC CIRCUIT FOR CAPACITANCE DISCHARGE SYSTEM CONTROL.
- DEDICATED THYRISTOR STRUCTURE FOR IGNITION OPERATION.
- APPLICATION SPECIFIC DISCRETES (ASD™).
- SURFACE AREA REDUCTION.
- DIL8 PACKAGE.



DIL8
(Plastic)

DESCRIPTION

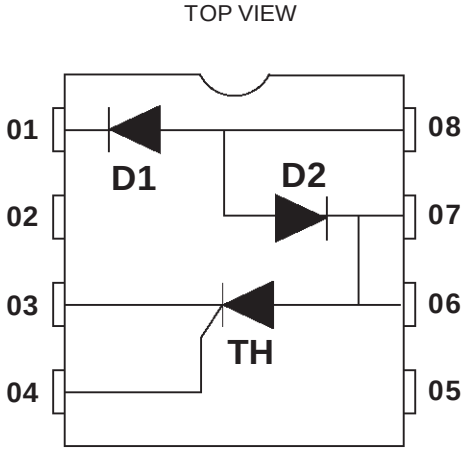
The ICC03 is a high-performance planar-diffused technology adapted to rugged environment conditions.

It has been developed especially for small engines using a capacitor discharge technique for ignition operation.
The ICC03 assumes electronics control of the ignition system.

- Pin 1 : Motor stop
- Pin 3 : Ground
- Pin 4 : Sensor
- Pin 6/7 : Ignition capacitor
- Pin 8 : Charging, winding
- Pin 2/5 : Not connected

See basic application and functionality page 4.

FUNCTIONAL DIAGRAM



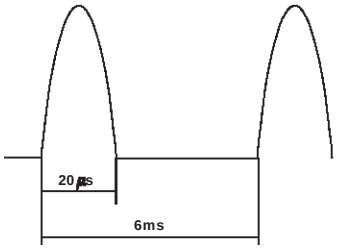
ABSOLUTE MAXIMUM RATINGS : THYRISTOR TH

Symbol	Parameter		Value	Unit
I_{TRM}	Repetitive peak on-state current (Note1)	Tl=110 °C	100	A
I_{TSM}	Non repetitive surge peak on-state current Tj initial = 25 °C	tp = 20 µs	150	A
		tp = 10 ms	5	A
V_{DRM}	Repetitive peak off-state voltage	T_j = 125°C	400	V

ABSOLUTE MAXIMUM RATINGS : DIODES

Symbol	Parameter		Value		Unit
			D1	D2	
I_{FRM}	Repetitive peak forward current (Note 1)	Tl= 110 °C	1	100	A
I_{FSM}	Non repetitive surge forward current Tj initial = 25 °C	tp = 20 µs	15	150	A
		tp = 10 ms	2	5	A
V_{RRM}	Repetitive peak off-state voltage	Tj= 125 °C	25	400	V

Note 1: Test current waveform



ABSOLUTE MAXIMUM RATINGS : FOR ALL DEVICE (ICC03)

Symbol	Parameter	Value	Unit
T_{stg} T_j	Storage temperature range Operating junction temperature range	- 40 to + 150 - 40 to + 150	°C
Tl	Maximum lead temperature for soldering during 10s	260	°C

THERMAL RESISTANCES

Symbol	Parameter	Value	Unit
Rth(j-a)	Thermal resistance junction to ambient	100	°C/W
Rth(j-l)	Thermal resistance junction to lead	15	°C/W

ELECTRICAL CHARACTERISTICS : THYRISTOR TH

Symbol	Test Conditions			Value	Unit
I_{GT}	V_D=12V (DC) R_L=33Ω	Tj= 25°C	MAX	1	mA
V_{GT}	V_D=12V (DC) R_L=33Ω	Tj= 25°C	MAX	1.5	V
V_{TM}	I_{TM}= 4A tp ≤ 1ms	Tj= 25°C	MAX	1.9	V
I_{DRM}	V_{DRM} rated	Tj= 25°C	MAX	50	µA
		Tj= 125°C	MAX	1	mA

ELECTRICAL CHARACTERISTICS : DIODE D1

Symbol	Test Conditions			Value	Unit
I_R	$V_R = V_{RRM}$	Tj= 25°C	MAX	50	µA
		Tj= 125°C	MAX	1	mA
V_F	I_F = 100 mA tp ≤ 1ms	Tj= 25°C	MAX	1.2	V

ELECTRICAL CHARACTERISTICS : DIODE D2

Symbol	Test Conditions			Value	Unit
I_R	$V_R = V_{RRM}$	Tj= 25°C	MAX	50	µA
		Tj= 125°C	MAX	1	mA
V_F	I_F = 4 A tp ≤ 1ms	Tj= 25°C	MAX	1.9	V

ORDERING INFORMATION

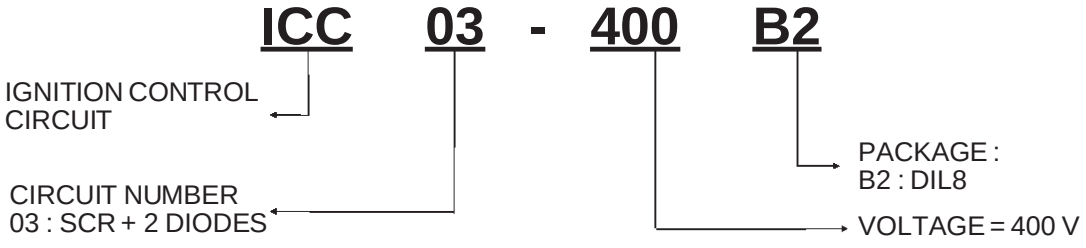


Fig.1 : Relative variation of gate trigger current versus junction temperature.

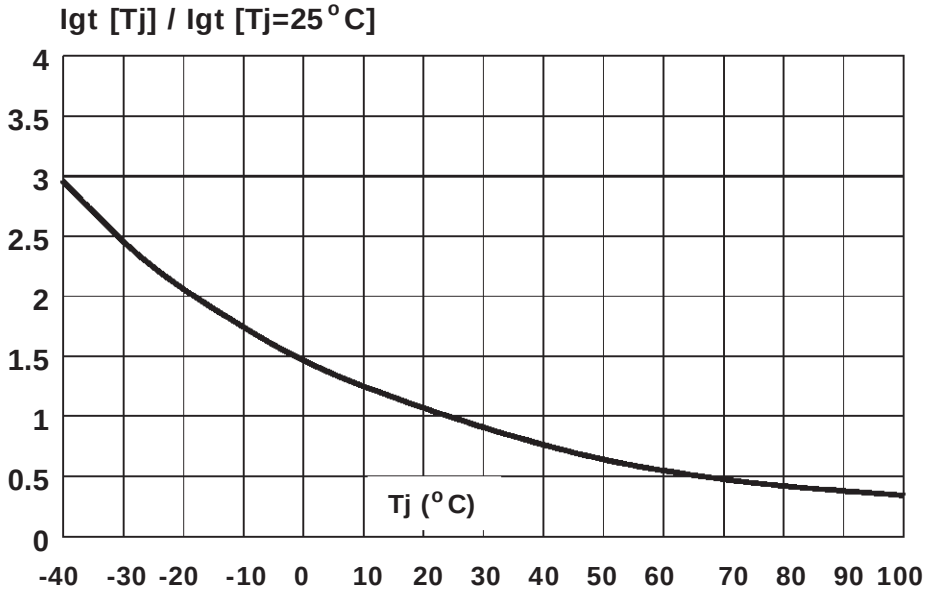
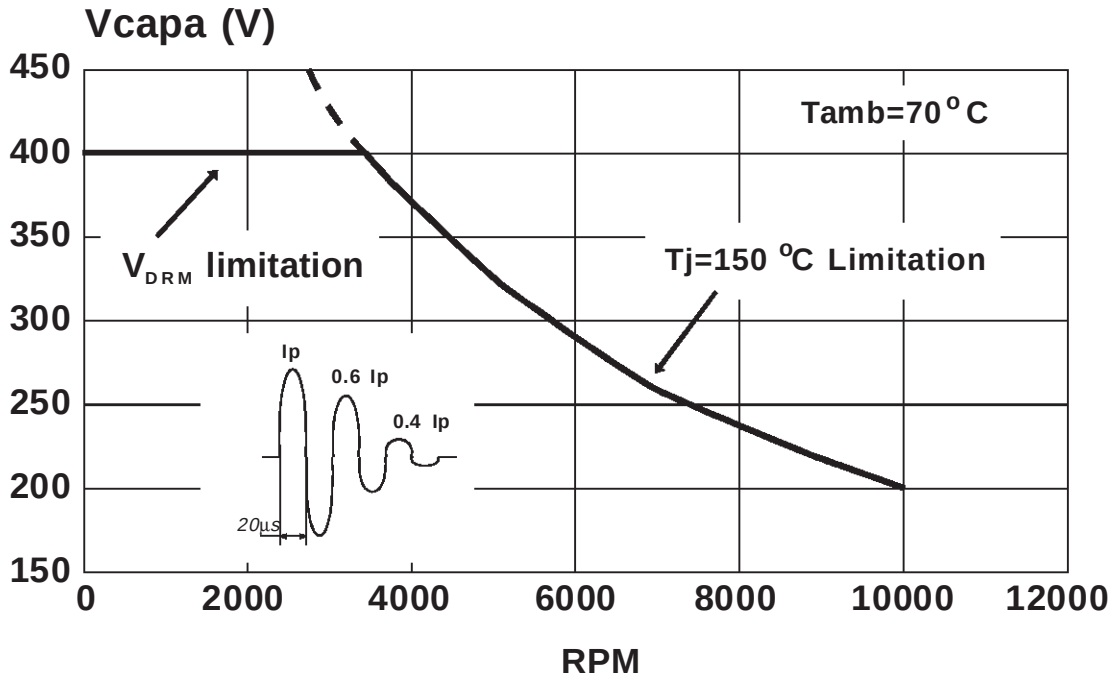
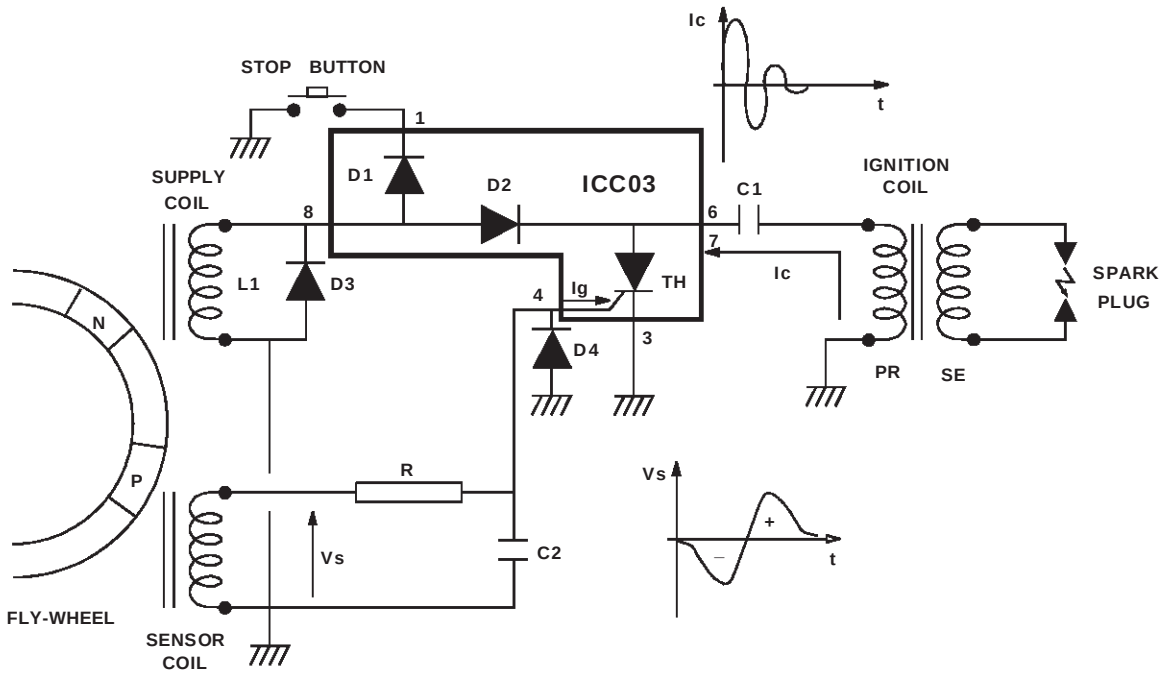


Fig.2 : Safety limitation curve of the capacitor voltage variation versus RPM @ tp=20µs.



BASIC APPLICATION



see functional diagram page 1

The applications using the capacitive ignition system (CDI) operate in 3 phases.

PHASE 1
Storage of the energy in the capacitor C1

PHASE 2
Discharge of the capacitor C1 and spark generation to the ignition coil.

PHASE 3
Engine stop.

1) ENERGY STORAGE IN C1

The coil L1 generates an alternative voltage. Its positive part charges the capacitor C1 through the diode D2.

The negative waves are clamped by the diode D3.

2) SPARK GENERATION

For each fly-wheel revolution the sensor coil produces a bidirectional pulse Vs and triggers the ignition coil.

The negative sinewave generated is clamped by D4 while the positive sinewave initiates a current I_G through the thyristor gate (Th)

The firing of the SCR causes an alternating discharge current Ic through the capacitor C1.

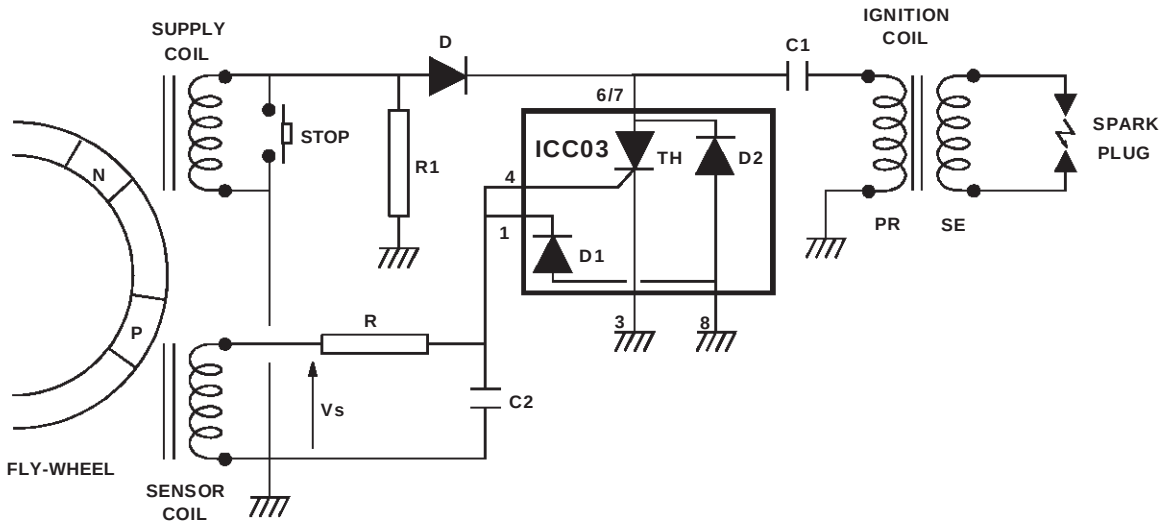
The positive parts of this current flow in the loop C1, Th and the primary of the ignition coil PR.

The negative parts flow through C1, PR and both diodes D3 and D2.

3) ENGINE STOP

The engine stop is obtained by short circuiting the supply coil L1 (stop button). The diode D1 avoids the accidental connection of battery voltage.

ALTERNATIVE APPLICATION



see functional diagram page 1

With this type of alternative application, the operation phases will be the same but the topology of component integration is different. This topology is adapted to applications using the diode D2 in anti-parallel with the thyristor.
In this case the rectifier diode D must withstand a reversed voltage up to 1500V following the value of R1.

With this configuration the current Ic oscillates, and its positive part flows through thyristor TH, while diode D2 assumes the conduction of the negative parts.

R RESISTOR CALCULATION

The purpose of the resistor R is to limit the current I_G through the thyristor gate. Its maximum value can be calculated as follow :
R max = (Vs min - V_{GT} max) / 2 I_{GT} max

POWER LOSSES (For 20µs - see note 1)

The following equations can be used to evaluate power losses :

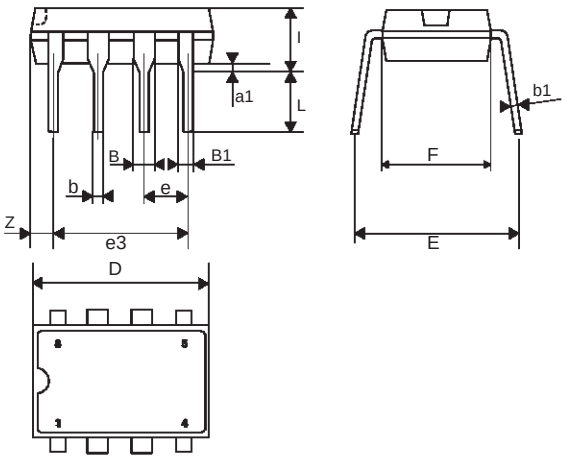
For TH V_{TO} = 2.65V Rt = 0.110 Ω
For D2 V_{FO} = 1.73V Rd = 0.075 Ω

PROTECTION AGAINST PARASITIC SPIKES

The capacitor C2 in relation with R acts as a filter and avoids the unexpected firing of the thyristor due to parasitic spikes. Good results have been obtained with 10nF capacitance.

PACKAGE MECHANICAL DATA

DIL8 (Plastic)



REF.	DIMENSIONS					
	Millimetres			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.70			0.027		
B	1.39		1.65	0.055		0.065
B1	0.91		1.04	0.036		0.041
b		0.5			0.020	
b1	0.38		0.50	0.015		0.020
D			9.80			0.385
E		8.8			0.346	
e		2.54			0.100	
e3		7.62			0.300	
F			7.1			0.280
I			4.8			0.189
L		3.3			0.130	
Z	0.44		1.60	0.017		0.063

Marking : ICC3-400
Weight : 0.59 g