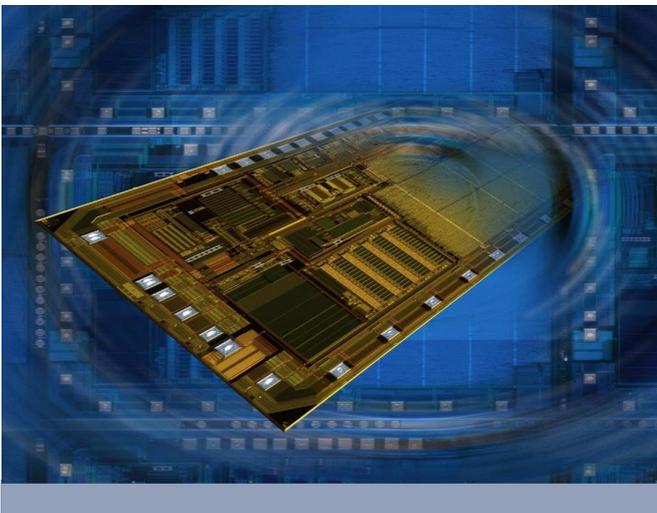


Product Information 8-Loop Firing IC – CG989



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Customer benefits:

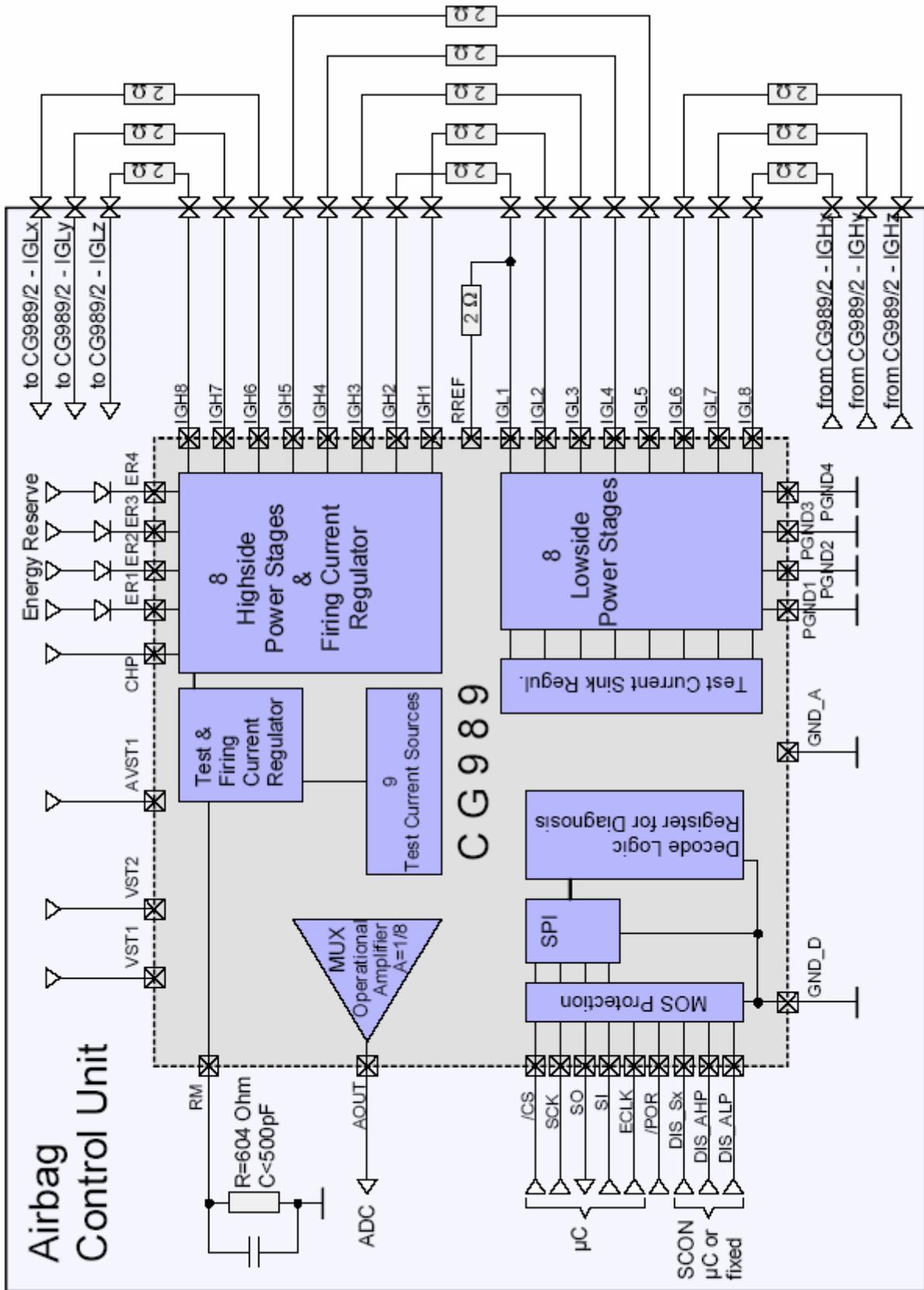
- ▶ Excellent system know-how
- ▶ Smart concepts for system safety
- ▶ Secured supply
- ▶ Long- term availability of manufacturing processes and products
- ▶ QS9000 and ISO/TS16949 certified

Following the successful implementation of the CG685/CG687 Quad- and Dual Firing Loop ICs, Bosch Automotive Electronics will move along with the introduction of a highly integrated version of a firing IC with 8 fully integrated squib driver channels for DC firing. The CG989 is being designed by utilizing leading-edge automotive ASIC processes with 0.8µm feature size. The superior performance with respect to precision and reliability and the well-proven safety concept of its predecessors will be combined with a variety of new

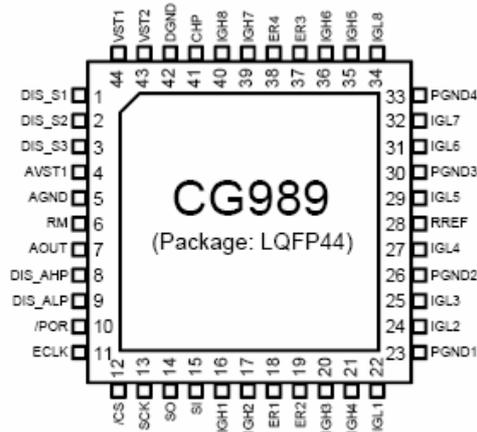
Features

- ▶ Firing current adjustable by SPI command:
 - 1.2 A for 2ms
 - 1.75A for 500i s
- ▶ Precise regulated firing current: over all tolerances better than 15 percent
- ▶ Energy reserve voltage up to 35V
- ▶ Full cross coupling capability (highside and lowside drivers placed on different ASICs)
- ▶ Firing current counter, 4 bit per firing loop
- ▶ High precision firing loop diagnostics (shorts, leakage, squib resistance)
- ▶ 26 channel analog multiplexer with tristate mode to monitor squib pins and supply voltages
- ▶ Sophisticated safety concept (power-on reset, disable pins for highside and for lowside stages, redundant firing path circuitry)
- ▶ 3 safety disable pins to lock groups of up to 8 firing-loops
- ▶ All functions controlled via 8MHz, 16 bit bi-directional SPI
- ▶ 5V/3.3V systems compatibility
- ▶ QFP44 package

(Example for cross coupling of firing loops 6-8 shown)



SCON: Safety Controller



PIN description

No	Name	Class.	Description	Comments / Recommended Circuit
1	DIS_S1	In	Special disable of firing loops 1-8, Group 1	μC or fixed
2	DIS_S2	In	Special disable of firing loops 1-8, Group 2	μC or fixed
3	DIS_S3	In	Special disable of firing loops 1-8, Group 3	μC or fixed
4	AVST1	Supply	Analog stabilised voltage input	5V
5	AGND	Supply	Analog ground	GND
6	RM	In	Test current adjust	604Ω± 1%, C<500pF
7	AOUT	Out	Analog multiplexer output	μC, A/D
8	DIS_AHP	In	Disable all highside power stages	μC
9	DIS_ALP	In	Disable all lowside power stages	μC
10	/POR	In	Power on reset, active low	RESET circuit
11	ECLK	In	External clock, 2 MHz	μC, Clock 2MHz
12	/CS	In	Chip select	μC, SPI
13	SCK	In	Serial clock, 8MHz	μC, SPI, Clock 8MHz max.
14	SO	Out	Slave out	μC, SPI
15	SI	In	Slave in	μC, SPI
16	IGH1	Out	Igniter loop high, channel 1	Squib loop 1, highside
17	IGH2	Out	Igniter loop high, channel 2	Squib loop 2, highside
18	ER1	Supply	Energy reserve voltage firing loop 1,2	25V, energy reserve
19	ER2	Supply	Energy reserve voltage firing loop 3,4	25V, energy reserve
20	IGH3	Out	Igniter loop high, channel 3	Squib loop 3, highside
21	IGH4	Out	Igniter loop high, channel 4	Squib loop 4, highside
22	IGL1	In	Igniter loop low, channel 1	Squib loop 1, lowside
23	PGND1	Supply	Power ground firing loop 1,2	GND
24	IGL2	In	Igniter loop low, channel 2	Squib loop 2, lowside
25	IGL3	In	Igniter loop low, channel 3	Squib loop 3, lowside
26	PGND2	Supply	Power ground firing loop 3,4	GND
27	IGL4	In	Igniter loop low, channel 4	Squib loop 4, lowside
28	RREF	Out	Reference resistor	Expected total firing loop resistance
29	IGL5	In	Igniter loop low, channel 5	Squib loop 5, lowside
30	PGND3	Supply	Power Ground Firing Loop 5,6	GND
31	IGL6	In	Igniter loop low, channel 6	Squib loop 6, lowside
32	IGL7	In	Igniter loop low, channel 7	Squib loop 7, lowside
33	PGND4	Supply	Power ground riring loop 7,8	GND
34	IGL8	In	Igniter loop low, channel 8	Squib loop 8, lowside
35	IGH5	Out	Igniter loop high, channel 5	Squib loop 5, highside
36	IGH6	Out	Igniter loop high, Channel 6	Squib loop 6, highside
37	ER3	Supply	Energy reserve voltage firing Loop 5,6	25V, energy reserve
38	ER4	Supply	Energy reserve voltage firing Loop 7,8	25V, energy reserve
39	IGH7	Out	Igniter loop high, channel 7	Squib Loop 7, highside
40	IGH8	Out	Igniter loop high, channel 8	Squib Loop 8, highside
41	CHP	Supply	Charge pump voltage	VERx+7V
42	DGND	Supply	Digital ground	GND
43	VST2	Supply	Digital 3.3V/5V stabilized voltage input	3.3V/5V (according to μC)
44	VST1	Supply	Digital 5V stabilized voltage input	5V

Maximum ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltages	V _{ER1-2}	-0.3		36	V
	V _{CHP}	-0.3		36	V
	V _{VST1}	-0.3		7	V
	V _{AVST1}	-0.3		7	V
	V _{VST2}	-0.3		7	V
Power ground	V _{PGND1..2}	-0.3		0.3	V
Digital ground	V _{DGND}	-0.3		0.3	V
Firing loops, static	V _{IGH1..4}	-0.3		36	V
	V _{IGL1..4}	-0.3		36	V
	V _{RREF}	-0.3		36	V
Junction temperature	T _j	-40		150	°C
Operating temperature	T _{amb}	-40		105	°C
ESD classification - Human body model, C=100pF, R=1.5kΩ	V _{HBM}	-2000		2000	V

Electrical characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltages	V _{ER1-4}	5.2		35	V
	V _{CHP}	V _{ERmin} +7		35	V
	V _{VST1}	4.7	4.9	5.1	V
	V _{AVST1}	4.7	4.9	5.1	V
	V _{VST2}	3.1/4.7*	3.3/4.9*	3.5/5.1*	V
	R _{RM}	-1%	604	+1%	Ω
Current reference (AVST1=4.9V)	I _{RM}	-4%	2	+4%	mA
	I _{RM}	-4%	2	4%	mA
Test current source					
Ratio test/ reference current, I _{RM} =2mA	I _{RREF} /I _{RM}	18.5	20	21	
Tracking of test current source, 0 • V _{IGH} • 0.5V	I _{IGHx} /I _{IGHy}	0.99	1.00	1.01	
Test current sink					
Saturation voltage, I _{IGL} =40mA	V _{IGL}	15	30	60	mV
Current limitation, V _{IGL} <18V, t<3ms	I _{IGL}	70	120	180	mA
Voltage divider at IGLx, IGHx					
Pull up resistor for leakage tests	R _{IGHx} , R _{IGLx}	6	12	18	KΩ
Pull down resistor for leakage tests	R _{IGHx} , R _{IGLx}	3	6	9	KΩ
Quiescent potential	V _{IGHx} , V _{IGLx}	-5%	AVST1/3	+5%	V
Pull down resistor for high leakage tests	R _{IGHx} , R _{IGLx}	1	2	3.5	KΩ

Parameter	Symbol	Min.	Typ.	Max.	Unit
Highside power stage					
Firing current					
t _{ON} = 0.5ms, V _{ER} • 35V (ASIC controlled)	-I _{IGHx}	1.75	2.05	2.4	A
t _{ON} • 2ms, V _{ER} • 25V	-I _{IGHx}	1.2	1.4	1.6	A
Drain-source on-state resistance (T _J • 105°C, I _{DS} =0.5A)	R _{DS(on)}		0.6	1	Ω
Lowside power stage					
Firing current (t_{ON} • 2ms, V_{ER} • 35V)					
Current load capacity (T _J • 105°C)	I _{IGLx}	2.5			A
Drain-source on-state resistance (T _J • 105°C, I _{DS} =0.5A)	R _{DS(on)}		0.8	1.2	Ω
Firing current detection level @ 1.75A V _{ER} -V _{IGH} >3V	I _{FDET}	1.2		I _{REG}	A

*V_{ST2} in 5V System environment

Compatibility

The Airbag 8-loop firing IC CG989 is pin compatible to the Airbag 8-loop firing IC CG988.

The Airbag 8-loop firing IC CG989 is pin compatible to the Airbag 4-loop firing IC's CG984 and CG985.

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

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