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Find the *Enerpro FCOG6100* at our website: ***Click HERE***

FCOG6100

Features:

Industry Standard ASIC-Based Design

Fully Connectorized

Independently Configurable Soft-Start and Soft-Stop

Isolated Gate Drive Circuitry

Phase Loss and Power-On Reset Protection

Applications:

Plating Rectifiers

Battery Chargers

Wind Turbine Controllers

DC Drives

Semiconverters

UPS Systems

Transformer Primary Controllers

FCOG6100 Standard Three-Phase SixSCR Firing Board

Description

The FCOG6100 provides economical and reliable phase-angle control of SCR AC controllers and DC converters operated from three-phase mains. The board features six isolated gate drives, independently configurable soft start/soft stop control inputs, and an analog delay angle command input configurable for a variety of common voltage or current ranges. A variety of current and voltage regulator boards are available in addition to auxiliary firing boards for remote or parallel SCR arrangements.



Operational Features

Analog Delay Angle Command Signal (SIG HI): Users may choose a variety of DC control signal ranges including 0-5 V, 0-10 V, 4-20 mA, or custom ranges.

Power-On Reset: A special circuit prevents unintentional SCR gating upon board power-up.

Soft-Start and Soft-Stop: Upon soft-start, SCR firing is enabled and the delay angle command ramps from the maximum value to the setpoint value determined by the SIG HI command signal. Upon soft-stop, the delay angle ramps from the setpoint value to the maximum value after which SCR firing is inhibited.

Phase Loss Inhibit: A phase loss circuit instantly inhibits SCR firing if a loss of one or more phases or gross phase imbalance is sensed on the AC line. Firing will soft-start when such a fault is cleared.

Instant Enable and Inhibit: A contact closure (relay, switch, transistor) instantly enables or inhibits SCR firing at the delay angle commanded by the SIG HI delay angle command signal.

Phase Sequence Insensitivity: SCR gating is unaffected by mains voltage phase sequence.

Enhanced Frequency Insensitivity: A new compensation circuit reduces delay angle variance with respect to frequency. The gate drive angle decreases approximately 5° for a frequency change from 60 to 50 Hz, whereas the delay angle of previous configurations decreased 12.5° over the same frequency range.

High Current Picket Fence Gate Drive: The transformer-isolated gate drive circuits provide a hard firing initial 15 V open circuit/1.8 A short circuit firing pulse followed by sustaining "back porch" pulses at 7 V open circuit/0.5 A short circuit. The gate pulse burst frequency is 384 times the mains voltage frequency.

Analog Delay Determinator Circuit: Enerpro's gate delay determinator circuit is based on the Ainsworth three-phase PLL circuit and implemented with a proprietary ASIC. This circuit adjusts the gate delay firing angle in negative proportion to the SIG HI command. Gate drive phase balance is typically less than ±1°

Flexible Control Power Options: The FCOG6100 may be powered from an external 30 VDC or 24 VAC source. With the addition of an onboard transformer, the board may be powered from a 120 V, 240 V, 380 V, or 480 V external source. Board power may also be obtained directly from the connections to the SCR cathodes.

Board Construction: All circuit boards are assembled at the Enerpro plant in Goleta, California and are manufactured by a UL-approved fabricator from 2.4 mm thick FR4 fire resistant fiberglass epoxy laminate. All boards are conformal coated (MIL-1-46058, Type UR).

***Enerpro** applications engineers are available by e-mail or fax for applications assistance.*

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FCOG6100

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Product Datasheet

Maximum Ratings	
AC mains voltage	600 Vac
Pulse transformer hipot	3500 Vac (60 seconds)
Operating temperature range	-5 C to 85 C
Board ac supply voltage	28 Vac (24 Vac nominal)
12 V regulator output current	20 mA (Note 1)
5 V reference output current	5 mA (Note 1)
Auxiliary control power available from 30 V output	10 W
Delay angle range	$10° \leq \alpha \leq 170°$
Characteristics	
Delay angle command signal (SIG HI)	0-5, 0.85-5.85, 0-10, 1-2 V 4-20 mA Or as specified
Delay angle reference phase shift	0 or -30° (application-specific)
Control signal isolation from ground	653 kΩ
Gate delay steady-state transfer function	Delay angle inversely proportional to delay angle command SIG HI
Gate delay dynamic transfer function bandwidth	-3 dB at 119 Hz, phase shift -45° at 68 Hz
Gate drive phase balance	±1° (max)
Delay angle variance	$\Delta(\alpha)/\Delta(f) = 0.2°/Hz$
Lock acquisition time	30 ms (typ)
Soft-start/stop time	0.05 - 20.0 s, independently configurable
Phase rotation effect	None
Phase loss inhibit	Automatic
Power-on inhibit	Automatic
Instant/soft inhibit/enable inputs	Dry contact
SCR gate pulse waveform	120° burst or 2-30° bursts, 30° spaced
Gate pulse burst frequency	384 times line frequency
Initial gate pulse open circuit voltage	15 V (Note 1)
Sustaining gate pulse open circuit voltage	7.0 V (Note 1)
Initial gate drive short circuit current	2.0 A (Note 1 and 2)
Sustaining gate drive short circuit current	0.5 A (Note 1 and 2
Short-circuit gate drive current rise time	1.0 A/μs (Note 1 and 2)
Board dimensions	191 x 152 x 35 mm (L x W x D)
Minimum creepage distance to ac mains **With onboard phase references** **With phase references entering on J5**	 13 mm 5.0 mm
Conformal Coating	per MIL-1-46058, Type UR

NOTES
1 Assumes nominal 30 V control power
2 Assumes a purely resistive gate load of 1.0 Ω

Ordering Guide

Parameter	***Description***	***Code***
SCR Circuit Type	*ACControllers* **01** Six-SCR **02** Parallel SCR *DC Converters* **03** Two-quadrant, Parallel SCR **04** Two-quadrant, Six- SCR	
Parallel SCRs	**0** No **1** Yes (Note 1)	
Mains Frequency	**5/6** 50/60 Hz **XX** Specify (Note 2)	
Command Signal	**1** 0 - 5 V **2** 0.85 - 5.85 V **3** 0 - 10 V **4** 1 - 2 V **5** 4 - 20 mA **6** Other - Specify	
Used with Regulator Board	**0** No **1** Horizontal Header **2** Vertical Header	
SCR Mains Voltage	**XX** Specify (Note 3)	
On-Board Transformer Primary Voltage	**0** Omit Transformer *(Note 4)* **1** 120-240 Vac **2** 240-480 Vac **3** 350 Vac **4** 380 Vac	
On-Board Transformer Power	**0** Not Installed **1** External Source **2** SCR Cathodes	
Phase References	**1** On-board **2** External via J5, R6, R7 and R8 *(Note 5)*	

Notes
1 Auxiliary firing board required for parallel SCRs
2 Specify code as mains frequency divided by 10. Example: 400 Hz / 10 = 40
3 Specify code as mains voltage divided by 10. Example: 480 V / 10 = 48
4 Customer must supply 24 Vac or 30VDC for board control power
5 Connect ac mains via J5 (to be attenuated by R6, R7, and R8) to provide phase out references

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