

FCOG61HV



Features:

Industry Standard
ASIC-Based Design

Reliable Triggering of
Thyristors with Mains
up to 2000 Vac

Increased Gate Drive

High Isolation Voltage

Phase Loss and
Power-On Reset
Protection

Applications:

Plating Rectifiers

Battery Chargers

Wind Turbine
Controllers

DC Drives

Semiconverters

High Current/ High Voltage
UPS Systems

Transformer
Primary
Controllers

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

FCOG61HV High Voltage Three-Phase Six SCR Firing Board

Description

The FCOG61HV is based on the industry-standard FCOG6100 three-phase firing board with higher output pulse transformers and increased creepage distances for reliable triggering of large diameter (50mm or larger) SCRs at mains voltages up to 2000 V. The board features six isolated gate drives, independently configurable soft-start and soft-stop control inputs, and an analog delay angle command input configurable for a variety of common voltage or current ranges.



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.

Enhanced Frequency Insensitivity: An improved frequency 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.

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

High Current Picket Fence Gate Drive: The transformer-isolated gate drive circuits provide a hard firing (0.9 A/ μ S) initial pulse followed by sustaining "back porch" pulses. The gate pulse burst frequency is 384 times the mains voltage frequency.

Enhanced Gate Drive Isolation: Larger ferrite cores and three-flange bobbins in the dual pulse modules provide higher isolation while a larger pulse module package gives enhanced creepage distance (20 mm) between the ac mains and the low voltage control electronics.

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 $\pm 1^\circ$

Flexible Control Power Options: The FCOG61HV is powered from an external 30 VDC or 24 VAC source.

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).

Product Datasheet	
Maximum Ratings	
AC mains voltage	2000 Vac (Low dust and humidity)
Pulse transformer hipot	4000 Vac (60 seconds)
Operating temperature range	-5 C to 85 C
Board ac supply voltage	34 Vac (24 Vac nominal)
Board dc supply voltage	40 V (30 V nominal)
12 V regulator output current	20 mA (Note 1)
5 V reference output current	5 mA (Note 1)
Auxiliary control power available from 24 Vac and 30 V outputs	10 W
Delay angle range	$10^\circ \leq \alpha \leq 170^\circ$
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 k Ω
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	$\pm 1^\circ$ (max)
Delay angle variance	$\Delta(\alpha)/\Delta(f) = 0.5^\circ/\text{Hz}$
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
Gate pulse width, 50 Hz	24-29 μs
Gate pulse width, 60 Hz	20-24 μs
Gate Drive Pulse Module Characteristics	EP1025 EP1026
Initial gate pulse open circuit voltage	30 V 15 V (Note 1)
Sustaining gate pulse open circuit voltage	17 V 7.0 V (Note 1)
Initial gate drive short circuit current	1.3 A 1.8 A (Note 1, 2)
Sustaining gate drive short circuit current	0.6 A 1.0 A (Note 1, 2)
Short-circuit gate drive current rise time	0.9 A/ μs 0.9 A/ μs (Note 1, 2)
Board dimensions	191 x 152 x 35 mm (L x W x D)
Minimum creepage distance to ac mains	20 mm
Conformal Coating	per MIL-1-46058, Type UR
NOTES	
1 Assumes nominal 30 V control power is applied to board	
2 Assumes a purely resistive gate load of 1.0 Ω	

Ordering Guide		
Parameter	Description	Code
<i>SCR Circuit Type</i>	AC CONTROLLERS	
	1 Six-SCR	
	2 Parallel SCR	
	DC CONVERTERS	
3 Two-quadrant, Parallel SCR		
4 Two-quadrant Six-SCR		
<i>Parallel SCRs/ Auxilliary Firing Board</i>	0 No	
	1 Yes (Note 1)	
<i>Mains Frequency</i>	50 50Hz	
	60 60Hz	
	5/6 50/60Hz	
	XX Other - Specify (Note 2)	
<i>Command Signal</i>	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)	
<i>Regulator Board</i>	0 No	
	1 Horizontal header	
	2 Vertical header	
<i>SCR Mains Voltage</i>	XX Specify (Note 3)	
<i>Phase References</i>	1 On Board	
	2 External via J9 (Note 4)	
<i>Inductive Load</i>	0 No	
	1 Yes (Note 5)	
Notes:		
1. Auxiliary firing board required for parallel SCRs.		
2. Specify desired mains frequency divided by 10. (Example: 400Hz / 10 = 40)		
3. Specify code as mains voltage divided by 10 (Example: 480 V / 10 = 48)		
4. Connect attenuated ac mains via J9 to provide the proper phase reference.		
5. EP1026 Pulse Modules used for systems with highly inductive loads. For non-inductive loads, use EP-1025 Pulse Modules		

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