JEDEC STANDARD

Semiconductor Power Control Modules

JESD14

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JEDEC SOLID STATE TECHNOLOGY ASSOCIATION

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SEMICONDUCTOR POWER CONTROL MODULES

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SEMICONDUCTOR POWER CONTROL MODULES

(From JEDEC Council Ballot JCB-84-41, formulated under the cognizance of Committees JC-22.1 on Rectifier Diodes and Thyristors and JC-22.2 on Rectifier Diodes.)

INTRODUCTION

This JEDEC Standard is intended to supplement discrete Standards in those situations where the subassemblies or chips within the module are supplied in combinations consistent with the Scope outlined in paragraph 1.0. This Standard addresses only those additional specifications required as a result of the combining of the devices.

1.0 SCOPE

Semiconductor Power Control Modules (SPCM) are modules consisting of Thyristors or Transistors, or both, as the primary controlling elements. Other semiconductor elements such as Rectifier Diodes, Integrated Circuits and Transient Voltage Suppressors as well as complementary passive components may be included for rectification, auxiliary control and protection. Methods of manufacture of semiconductor power control modules include the assembling of individual components and the use of semiconductor hybrids or monolithic processing technologies, or both.

Semiconductor Power Control Modules are proportional control assemblies and should not be confused with the solid state relay which is a non-proportional controller.

It is not necessary that the input be electrically isolated from the output.

These modules are designed and manufactured with the intent that they will not be disassembled for repair.

2.0 CLASSES OF SEMICONDUCTOR POWER CONTROL MODULES (SPCM)

2.1 Thyristor SPCM

A control module consisting of all thyristors with the control signal(s) supplied from an external source.

2.2 Transistor SPCM

A control module consisting of all transistors with the control signal(s) supplied from an external source.

2.3 Thyristor/Diode SPCM

A control module consisting of thyristors and rectifier diodes with the control signal(s) supplied from an external source.

2.0 CLASSES OF SEMICONDUCTOR POWER CONTROL MODULES (continued)

2.4 Transistor/Diode SPCM

A control module consisting of transistors and rectifier diodes with the control signal(s) supplied from an external source.

2.5 Controlled SPCM

A control module consisting of any of the above-mentioned combinations of devices, with internal control-signal processing circuitry which may have provisions for external adjustment.

2.6 Miscellaneous SPCM

NOTE: All other combinations of the SPCM will be considered for registration.

3.0 COMMON FUNCTIONS OF INDIVIDUAL OR COMBINATIONS OF SEMICONDUCTOR POWER CONTROL MODULES

3.1 AC Controller

A proportional ac output is produced from an ac input.

3.2 DC Controller

A proportional dc output is produced from a dc input.

3.3 Single-Phase Center Tap (Bi-Phase) Converter

A variable dc output is produced from a single-phase ac input and a transformer with a center tap connection.

3.4 Single-Phase Bridge Converter

A variable dc output is produced from a single-phase ac input by means of a bridge circuit.

3.5 Three-Phase Bridge Converter

A variable dc output is produced from a three-phase ac input by means of a bridge circuit.

3.6 Single-Phase Inverter

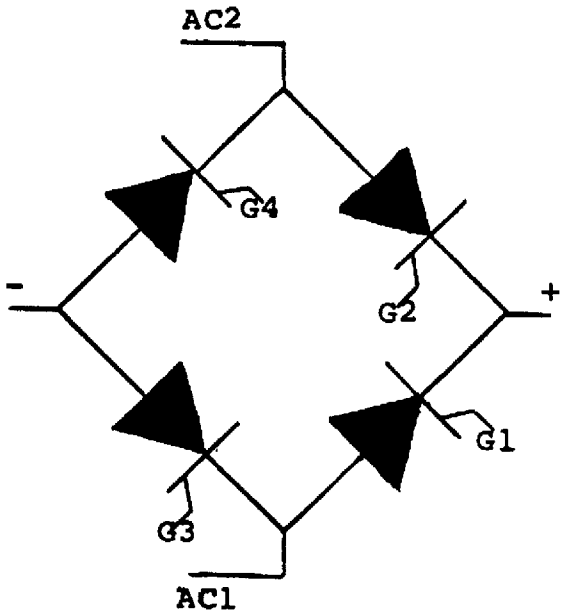
A single-phase ac output is produced from a dc input.

3.7 Three-Phase Inverter

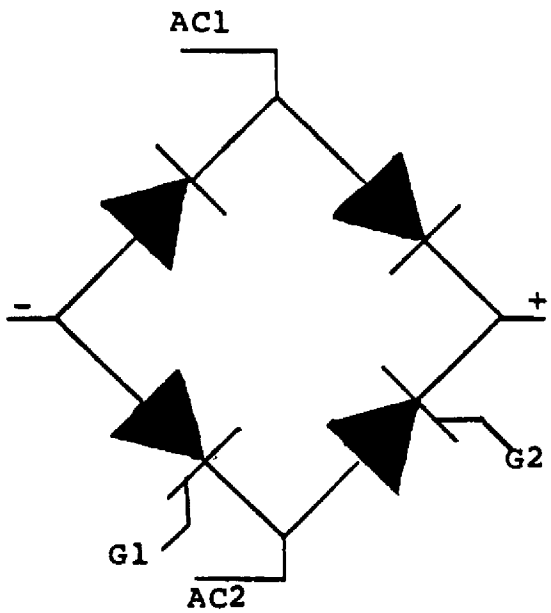
A three-phase ac output is produced from a dc input.

4.0 COMMON SPCM CIRCUITS

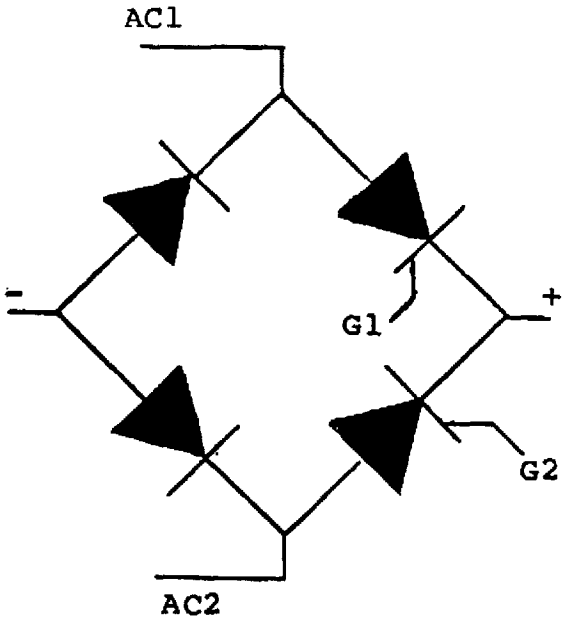
4.1 Thyristor SPCM Circuits



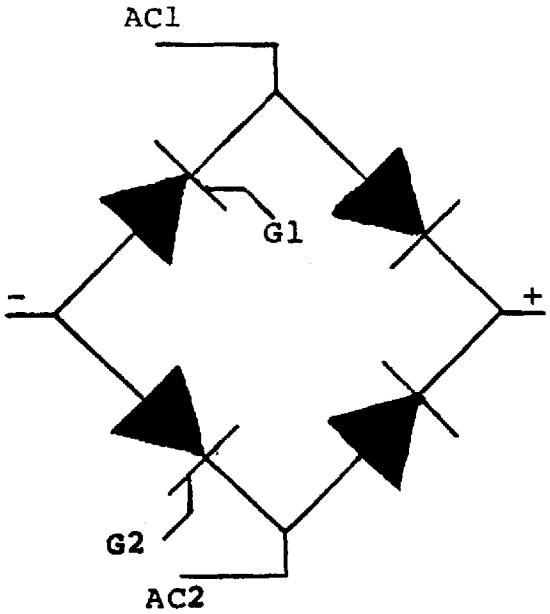
Full-Wave Full-Controlled Bridge



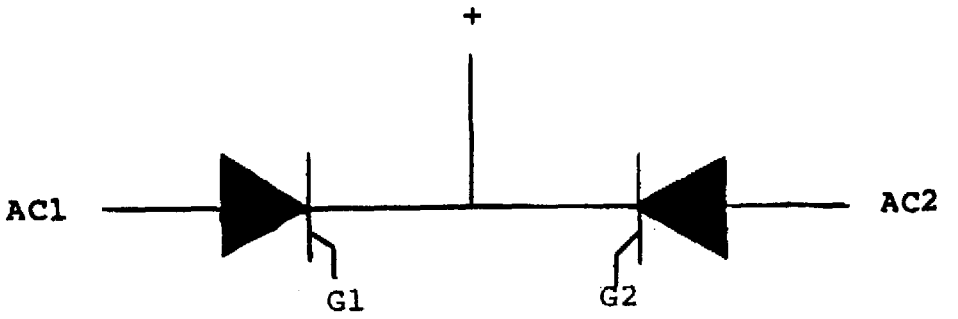
Full-Wave Half-Controlled Bridge



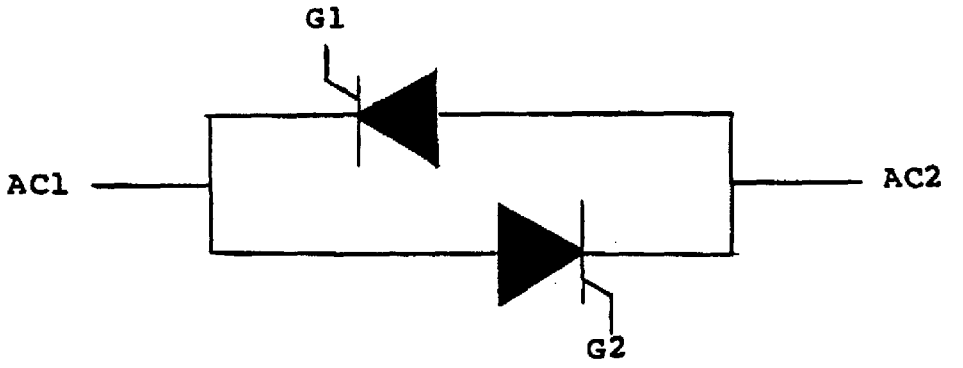
Full-Wave Half-Controlled Bridge,
Common SCR Cathodes



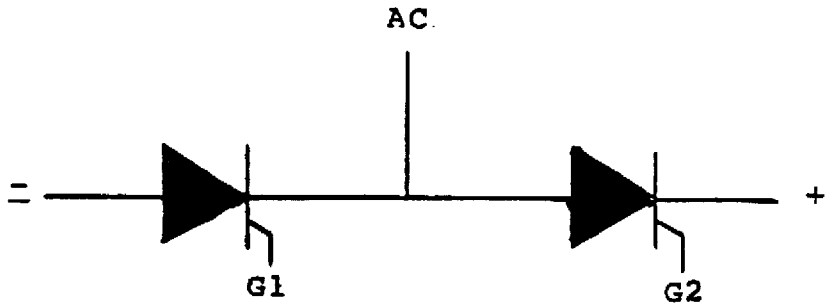
Full-Wave Half-Controlled Bridge,
Common SCR Anodes



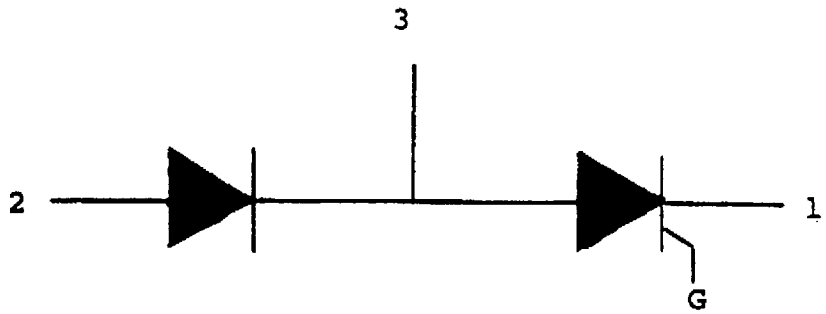
Full-Wave Center Tap,
Common SCR Cathode
(Common SCR Anode also possible.)



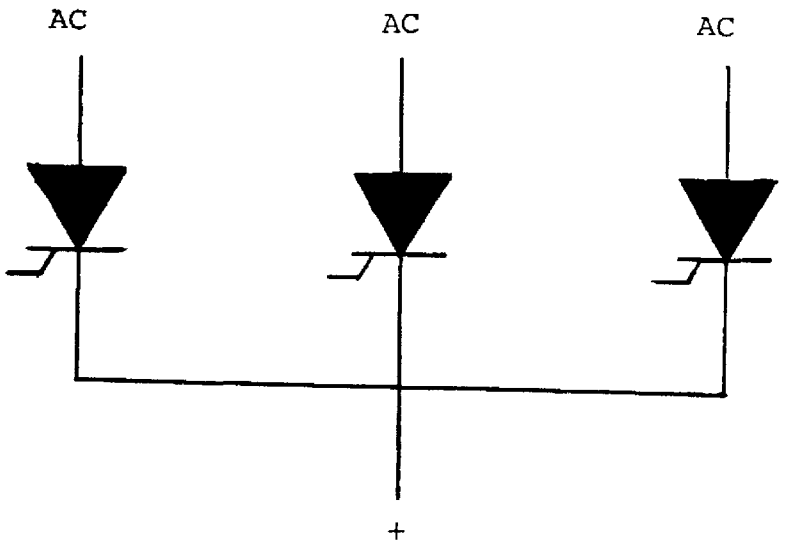
AC Proportional Controller, Inverse Parallel



Two Series-Connected SCRs (Doubler)



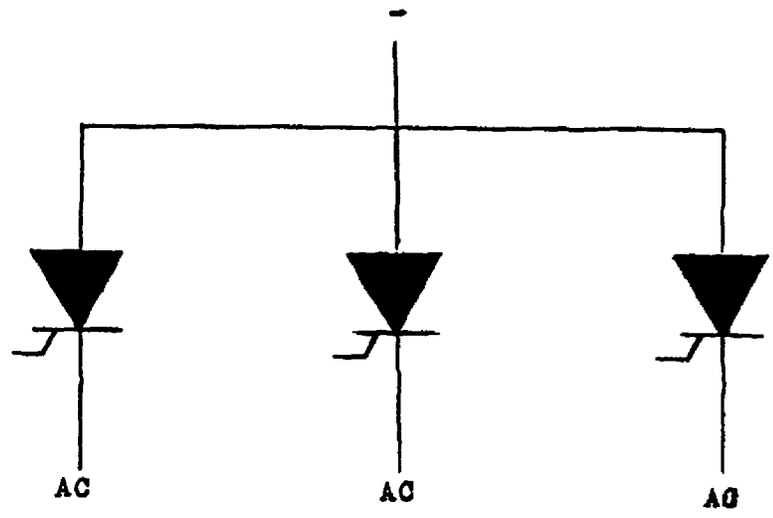
Series-Connected Diode and SCR (Doubler)
(SCR Cathode to Diode - Anode also possible.)



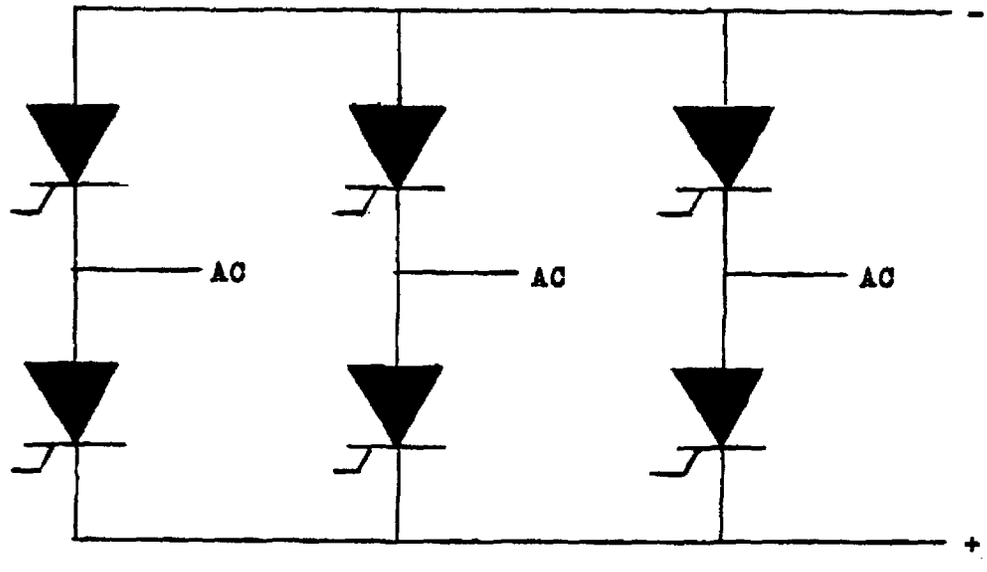
Three-Phase Half-Wave
Common Cathodes

4.2 Transistor SPCM

In circuits shown in paragraph 4.2, the SCR's may be replaced in whole or in part, with transistors.



Three-Phase Half-Wave,
Common Anodes



Three-Phase Full-Wave Full-Controlled Bridge
(Half-Controlled Common SCR Anode and
Half-Controlled Common SCR Cathjode are also possible.)

5.0 PHYSICAL STRUCTURE

5.1 AC Terminals

The terminals which are to be connected to the ac circuit.

5.2 DC Terminals

The terminals which are to be connected to the dc circuit.

NOTE: The dc and ac terminals can function as either input or output terminals.

5.3 Control Terminals

The terminals to which the external control signal is applied.

5.4 Auxiliary Terminals

The terminals other than those specified above that may be provided for specified purposes.

6.0 RATINGS AND CHARACTERISTICS

NOTE: These ratings apply only to those functional characteristics of the device combinations as defined in the Introductory statement and in paragraph 1.0, Scope. Wherever it is possible to test discrete elements of the SPCM in isolation from combinational electrical effects, these elements should be tested in accordance with exsisting device type Standards such as EIA Recommended Standards RS-282 "Standards for Silicon Rectifier Diodes and Stacks", RS-397 "Recommended Standards for Thyristors" and JEDEC Standard No. 10 "Low Frequency Power Transistors".

6.1 Input Voltage
The voltage at the input terminals.

6.2 Input Current
The current at the input terminals.

6.3 Output Voltage
The voltage at the output terminals.

6.4 Output Current
The current at the output terminals.

6.5 Voltage Difference
The voltage between specified terminals.

6.0 RATINGS AND CHARACTERISTICS (continued)

6.6 Control Voltage

The voltage at the control terminals.

6.7 Control Current

Current at the control terminals.

6.8 Thermal Resistance

The resistance to heat transfer between each junction and specified reference point(s) on the case.

6.9 I^2t

The product of the square of the rms current and the time for an on-state (or forward) non-repetitive surge current of time duration not exceeding 10 ms for a single discrete element.

6.10 Isolation Voltage

The rms ac or dc voltage which may be applied continuously between the mounting surface and all of the terminals and also between terminals of isolated circuits.

6.11 Creepage Distance

The shortest distance over the surface between specified terminals or a mounting surface.

6.12 Strike Distance

The shortest distance in air between specified terminals or between a specified terminal and a mounting surface.

6.13 Isolation Withstand Voltage

The rms ac or dc voltage used for short-time testing of the insulation between the mounting surface and all of the terminals and also between terminals of isolated circuits.

TABLE I

SPCM LETTER SYMBOLS

	INST	AVG	RMS	PEAK(REP)	PEAK (NON-REP)	DC
Input Voltage	v_I	$V_{I(AV)}$	$V_{I(RMS)}$	V_{IRM}	V_{ISM}	V_I
Input Current	i_I	$I_{I(AV)}$	$I_{I(RMS)}$	I_{IRM}	I_{ISM}	I_I
Output Voltage	v_o	$V_{O(AV)}$	$V_{O(RMS)}$	V_{ORM}	V_{OSM}	V_O
Output Current	i_o	$I_{O(AV)}$	$I_{O(RMS)}$	I_{ORM}	I_{OSM}	I_O
Control Voltage	v_c	$V_{C(AV)}$	$V_{C(RMS)}$	V_{CRM}	V_{CSM}	V_C
Control Current	i_c	$I_{C(AV)}$	$I_{C(RMS)}$	I_{CRM}	I_{CMS}	I_C
Voltage Difference	v_{xy}	$V_{XY(AV)}$	$V_{XY(RMS)}$	V_{XYRM}	V_{XYSM}	V_{XY}

Thermal Resistance - R_{thJC} ($R_{\theta JC}$)

I^2t ---------- I^2t

Isolation Voltage ---------- V_{ISO}

Creepage Distance ------- d_c

Strike Distance ---------- d_s

Isolation Withstand Voltage V_{ISOL}

NOTE:
This Table covers only the functional symbols of the SPCM. The discrete symbols of their respective Standards such as RS-282 and RS-397 shall be used where discrete device measurements are to be made.

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The purpose of this form is to provide the Technical Committees of JEDEC with input from the industry regarding usage of the subject standard. Individuals or companies are invited to submit comments to JEDEC. All comments will be collected and dispersed to the appropriate committee(s).

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☐ Other _____

2. Recommendations for correction:

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3. Other suggestions for document improvement:

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