

STANDARD IGBT MODULES WITH GATE DRIVERS

FEATURES:

- High Power Density
- Low Saturation Voltage ($V_{CE(SAT)}$)
- Low Thermal Resistance (R_{qJC})

INDUSTRIAL IGBT PRODUCT MAP

		I_C (Amps)		
CONFIGURATION	V_{ECS} (V)	25	50	100
Half-Bridge	600	SPM2G48-60	SPM2G65-60	SPM2G75-60 SPM2G85-60
H-Bridge	600	SPM4G48-60	-	
3-Phase Bridge	600	SPM6G48-60	SPM6G65-60 SPM6G50-60 ⁽¹⁾	

(1) This device is available with opto-isolated digital interface inputs.

STANDARD HERMETIC IGBT MODULES WITH GATE DRIVERS

HIGH SPEED IGBT DEVICES WITH FAST REVERSE RECOVERY DIODES IGBT CHARACTERISTICS

PART NUMBER	V _{CES}	Continuous Collector Current I _c @ T _c =90°C	Continuous Collector Current I _c @ T _c =25°C	Pulsed Collector Current T _c =25°C 1 ms	V _{CE(sat)} @I _c		Fall Time t _f	Maximum P _D @ T _c =25°C	R _{θJC}	Package Style & Schematic Configuration Option	
	Volts	Amps	Amps	Amps	V	A	nsec	Watts	°C/W	Package	Schematic
SPM2G48-60	600	24	48	96	2.5	24	150	162	0.77	Pkg-2	Opt-1
SPM2G65-60	600	35	65	130	2.1	50	50	200	0.55	Pkg-2	Opt-1
SPM2G75-60	600	50	75	200	2.5	50	200	357	0.35	Pkg-2	Opt-1
SPM2G85-60	600	75	85	200	2.0	70	50	357	0.35	Pkg-2	Opt-1
SPM4G48-60	600	24	48	96	2.5	24	150	162	0.77	Pkg-2	Opt-2
SPM6G48-60	600	24	48	96	2.7	24	275	162	0.77	Pkg-4	Opt-3
SPM6G65-60	600	35	65	130	2.1	50	50	200	0.55	Pkg-4	Opt-3

REVERSE DIODE CHARACTERISTICS

PART NUMBER	Current Rating I _{FavM} @ D=0.5, T _c		V _F @ I _F T _J =25°C		I _{RM} @ I _F typ T _J =25°C V _R =100V		t _{rr} @ -di/dt T _J =25°C typ		Thermal Resistance R _{θJC}
	Amps	°C	Volts	Amps	Amps	Amps	ns	A/ms	°C/W
SPM2G48-60 SPM4G48-60 SPM6G48-60	30	90	1.55	30	10	40	50	100	0.95
SPM2G65-60 SPM2G75-60 SPM2G85-60 SPM6G65-60	50	90	1.35	50	15	50	95	100	0.75

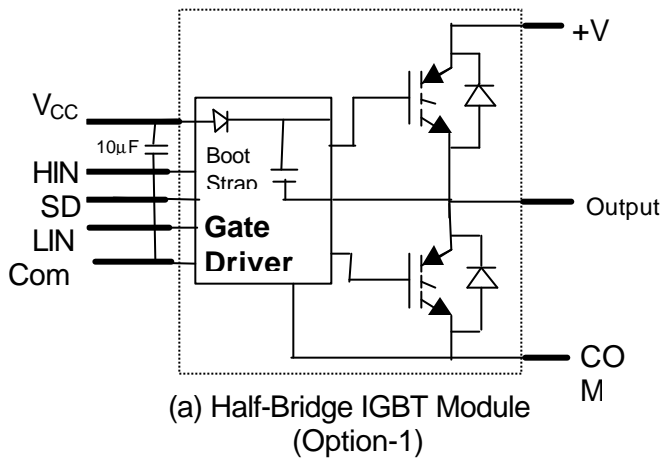
GATE DRIVER CHARACTERISTICS

Characteristic	Symbol	Min.	Typ	Max.	Unit
Logic DC Supply	V _{CC}	10	18	20	V
Under Voltage Lockout	V _{CCUV}	7		9.7	V
Logic Input Voltage (HIN & LIN)	HIN, LIN, SD	-0.3	-	V _{CC} +0.3	V

Notes:

- 1- **Bold part numbers** indicate preferred devices.
- 2- *For devices with custom ratings, please contact the factory or a Sensitron Sales Representative for details.*

SCHEMATIC DIAGRAMS FOR IGBT MODULES WITH GATE DRIVERS

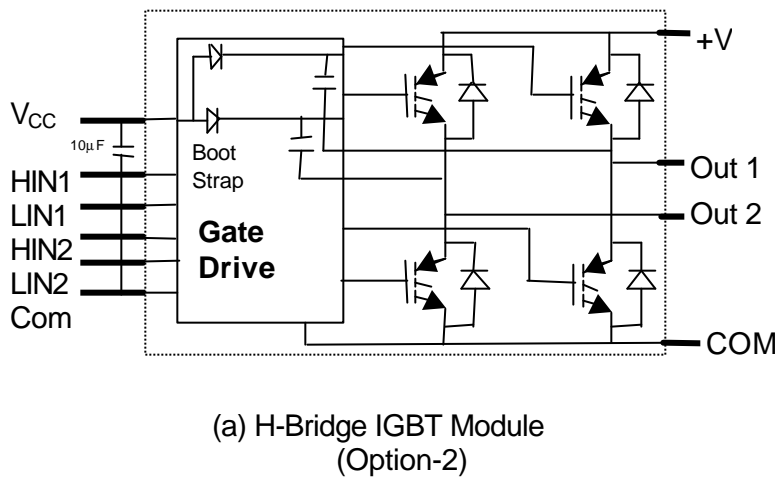


Pin Assignment
for Pkg-2

Function	Pin #
VCC	2
HIN1	3
SD1	4
LIN1	5
Com	6
+V	11,12
Out	9,10
COM	7,8

Pin Assignment
for Pkg-3

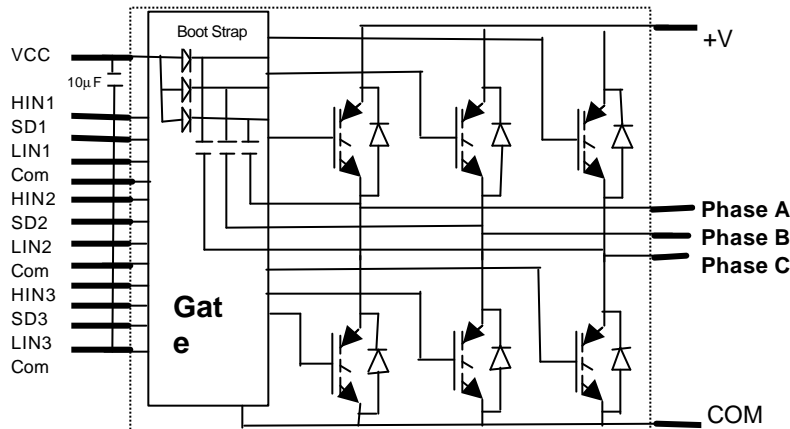
Function	Pin #
VCC	4
HIN1	5
SD1	6
LIN1	7
Com	8
+V	16,17,18
Out	13,14,15
COM	10,11,12



Pin Assignment
for Pkg-2

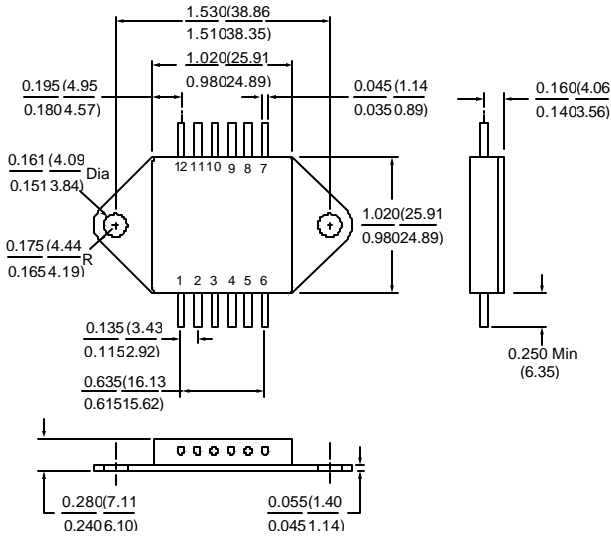
Function	Pin #
VCC	1
HIN1	2
LIN1	3
HIN2	4
LIN2	5
Com	6
+V	12
Out1	10, 11
Out2	8, 9
COM	7

Pin Assignment
for Pkg-4

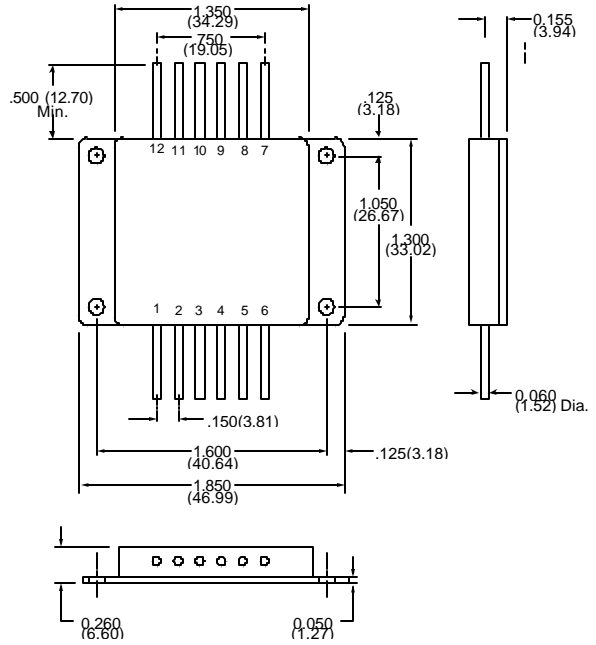


Function	Pin #
VCC	1
HIN1	2
SD1	3
LIN1	4
Com	5
HIN2	6
SD2	7
LIN2	8
Com	9
HIN3	10
SD3	11
LIN3	12
Com	13
+V	24,25,26
PhA	22,23
PhB	19,20
PhC	17,18

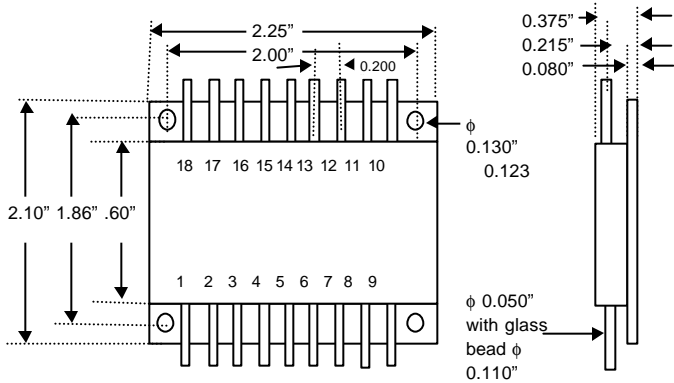
PACKAGE OPTIONS FOR IGBT & MOSFET MODULES WITH GATE DRIVERS



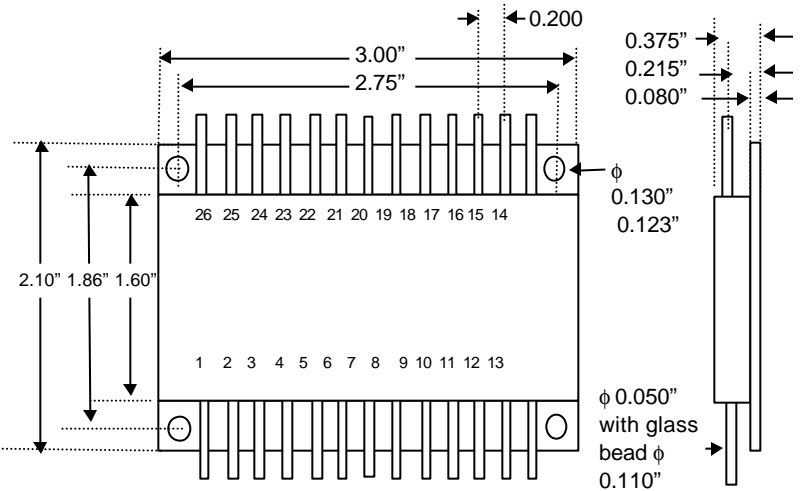
**(a) Package-1
(Pkg-1)**



**(b) Package-2
(Pkg-2)**



**(c) Package-1
(Pkg-3)**



**(d) Package-2
(Pkg-4)**

**TECHNICAL DATA
DATA SHEET 687, REV. -**

**Three-Phase IGBT Bridge
600 VOLT, 50 Amp**

ELECTRICAL CHARACTERISTICS PER IGBT DEVICE ($T_j=25^{\circ}\text{C}$ UNLESS OTHERWISE SPECIFIED)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
IGBT SPECIFICATIONS					
Collector to Emitter Breakdown Voltage $I_C = 250 \mu\text{A}, V_{GE} = 0\text{V}$	BV_{CES}	600	-		V
Continuous Collector Current $T_C = 25^{\circ}\text{C}$ $T_C = 90^{\circ}\text{C}$	I_C	-	-	50 40	A
Pulsed Collector Current, 1mS	I_{CM}			130	A
Short Circuit time, $V_{GE} = 15\text{V}, V_{CE} = 500\text{V}, T_j = 125^{\circ}\text{C}$ $di/dt < 300 \text{ A/?sec}, I_C < 300\text{A}$	t_{sc}			10	?sec
Gate to Emitter Voltage	V_{GE}	-	-	+/-20	V
Gate-Emitter Leakage Current , $V_{GE} = +/-20\text{V}$	I_{GES}			+/- 100	nA
Gate Threshold Voltage, $I_C=2\text{mA}$	$V_{GE(TH)}$	4.0		7.0	V
Zero Gate Voltage Collector Current $V_{CE} = 600 \text{ V}, V_{GE}=0\text{V} T_i=25^{\circ}\text{C}$ $V_{CE} = 480 \text{ V}, V_{GE}=0\text{V} T_i=125^{\circ}\text{C}$	I_{CES}	-	-	1.0 3.0	mA mA
Collector to Emitter Saturation Voltage, $I_C = 50\text{A}, V_{GE} = 15\text{V},$ $T_C = 25^{\circ}\text{C}$ $T_C = 125^{\circ}\text{C}$	$V_{CE(SAT)}$	-	2.1 2.4	2.5 2.8	V
Input Capacitance Output Capacitance Reverse Transfer Cap. $V_{CE} = 25 \text{ V}, V_{GE} = 0 \text{ V}, f = 1 \text{ MHz}$	C_{ies} C_{oes} C_{res}		2800 300 200		pF
Turn On Delay Time Rise Time Turn Off Delay Time Fall Time Turn off Energy Loss $(T_j = 125^{\circ}\text{C}, I_C = 40\text{A}, V_{GE} = 15\text{V}, \text{inductive load}, V_{CC} = 300 \text{ V}, R_G = 22 \Omega)$	$t_{d(on)}$ t_r $t_{d(off)}$ t_f E_{off} E_{on}	- - - - -	100 50 300 40 1.5 2.0	- - - - -	nsec mJ mJ
Maximum Thermal Resistance	$R_{\theta JC}$	-	-	0.7	$^{\circ}\text{C/W}$

ULTRAFAST DIODES RATING AND CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Diode Peak Inverse Voltage	PIV	600	-		V
Continuous Forward Current, $T_C = 90^\circ\text{C}$	I_F			50	A
Forward Surge Current, $t_p = 10$ msec	I_{FSM}			400	A
Diode Forward Voltage, $I_F = 50\text{A}$	V_F	-	1.2	1.7	V
Diode Reverse Recovery Time	t_{rr}	-	150	200	nsec
Diode Reverse Recovery Charge ($I_F=25\text{A}$, $V_{RR}=300\text{V}$, $di/dt=500\text{ A}/\mu\text{s}$)	Q_{rr}		1.5	2.5	? C
Maximum Thermal Resistance	$R_{\theta JC}$	-	-	1.0	$^\circ\text{C}/\text{W}$
Maximum and Storage Junction Temperature	T_{jmax}	-55	-	150	$^\circ\text{C}$

Gate Driver

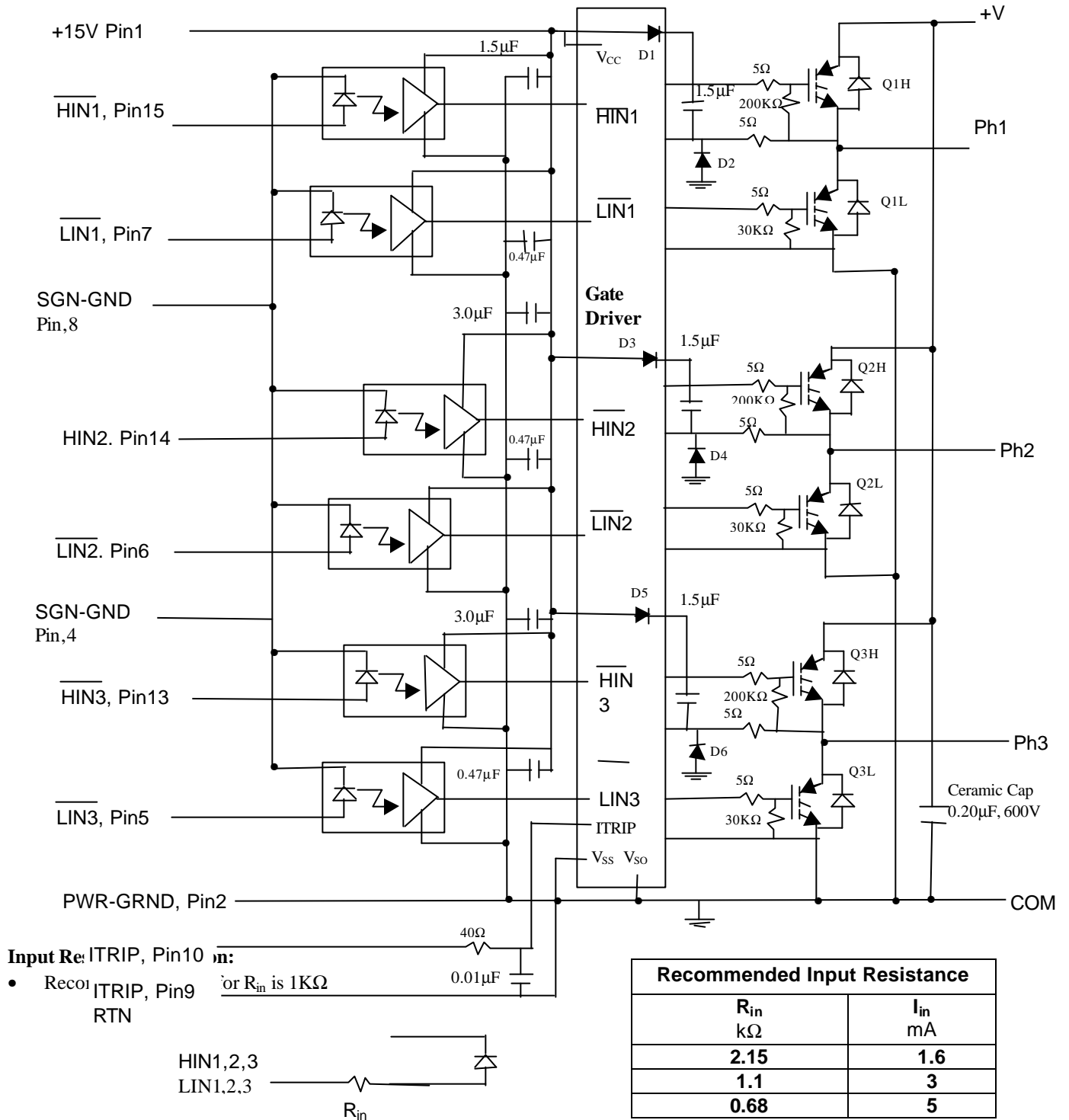
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Supply Voltage	VCC	10	15	20	V
Input On Current	HIN, LIN	1.6	-	5.0	mA
Input Reverse Breakdown Voltage	BV_{in}	5.0	-	-	V
Input Forward Voltage @ $I_{in} = 5\text{mA}$	V_F	-	1.5	1.7	V
Under Voltage Lockout	VCCUV	7.0	-	9.7	V
ITRIP Threshold Voltage ⁽¹⁾	ITRIP _{th}	0.4	0.49	0.58	V
Turn On Delay	t_{ond}	-	-	TBD	nsec
Turn On Rise Time	t_r	-	-	TBD	nsec
Turn Off Delay	t_{offd}	-	-	TBD	nsec
Turn Off Fall Time	t_f	-	-	TBD	nsec
Input-Output Isolation Voltage		1000	-	-	V

⁽¹⁾ Once ITRIP reaches threshold, the driver latches off. This condition can be reset by holding all three low-side inputs high for more than 10 μ sec or by recycling the V_{cc} supply.

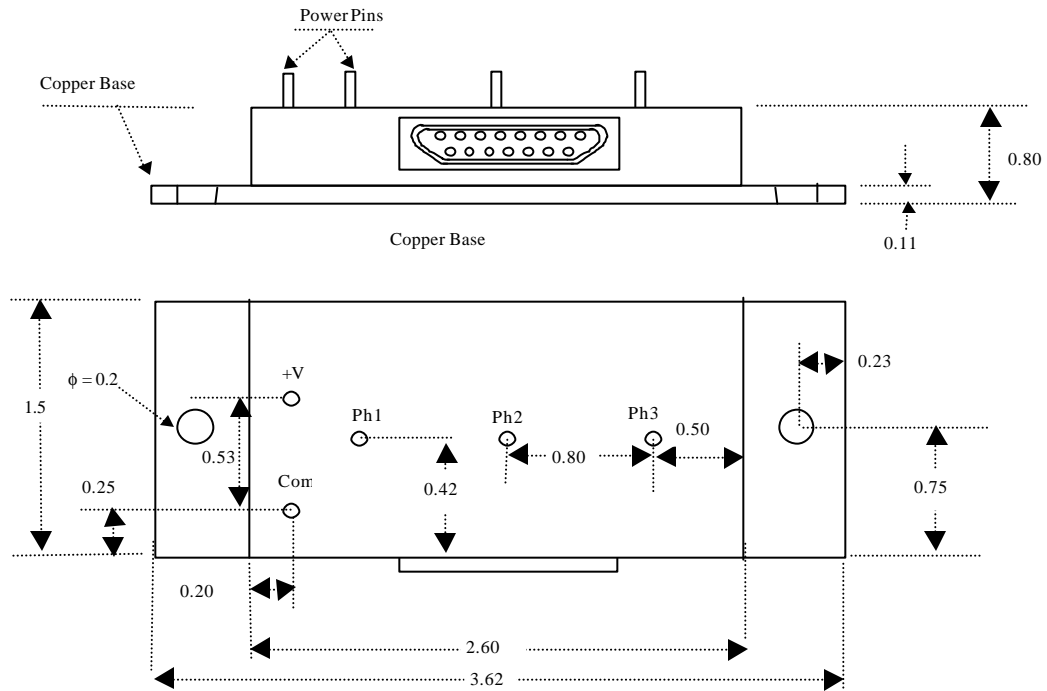
Gate Driver Truth Table

HIN1,2,3	LIN1,2,3	HO1,2,3	LO1,2,3
0	0	0	0
0	1	1	0
1	0	0	1
1	1	0	0

Schematic Diagram:

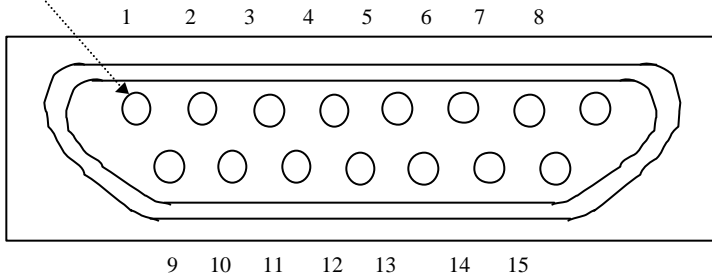


Package Drawing:



Signal Terminals Microminiature D Connector:

Pins: $\phi = 0.02$, 0.05 center-to-center



Signal Pins	
Pin #	Function
1	+15V
2	PWR-GRND
3	NC
4	SGN-GRND
5	LIN3
6	LIN2
7	LIN1
8	SGN-GRND
9	ITRIP-RTN
10	ITRIP
11	NC
12	NC
13	HIN3
14	HIN2
15	HIN1