GDU 9X-XXXXX Series

GTO Gate Drive Units

Application Note

Replaces March 1998 version, AN4571 - 5.1

AN4571-6.0 January 2000

This application note should be used in conjunction with individual Gate Drive Unit datasheets which contain electrical, timing and outline information.

GTO GATE DRIVE UNITS

A range of Gate Drive Units (GDU) is available to control Dynex Semiconductor Gate Turn-Off Thyristors (GTO). These units provide the recommended waveforms for reliable switching of GTOs and have the following features:-

■ Input signal to the GDU (to turn the GDU ON and OFF) or output signal (that indicates the presence of GTO gate to cathode negative voltage) can be specified for either opto-couplers or fibre optics.

■ An output signal that monitors the GTO gate to cathode negative voltage. This voltage is monitored at the GDU GTO gate output connections or the GTO gate sense leads if they are wired to the GDU.

■ At initial switch-on a safe start up is achieved by incorporating an inhibit of GTO gate pulses until the power supplies stabilise.

■ Each power supply voltage is continuously monitored, if it falls below a preset level an OFF signal is sent to the GTO and further ON pulses are inhibited until the power supply recovers.

■ Adjustable inhibit of short ON pulses. This prevents the GTO switching ON from signals that may be false.

■ Adjustable minimum ON pulse width. This ensures that when the GTO is turned ON it is ON for a time that fully discharges the snubber capacitor.

■ Adjustable minimum OFF pulse width. This ensures that the GTO is turned OFF for longer than its' turn-off time.

GTO/GATE DRIVE RECOMMENDATIONS

				Recommended Gate Drive Conditions							
GTO	**I_{TCM} (A)**	**I_{GQM} (A)**	**Q_{GQM} (μC)**	**I_{FG} (A)**	**dI_{FG}/dt (A/μs)**	**$I_{G(ON)}$ (A)**	**$t_{w1(min)}$ (μs)**	**dI_{GQ}/dt (A/μs)**	**$V_{RG(min)}$ (V)**	**$V_{RG(max)}$ (V)**	**Recommended Gate Drive**
DGT304SE	700	120	700	20	20	2	4.5	15	2	16	GDU 91-202XX
DG306AE	600	190	1300	20	20	2	10	15	2	16	GDU 91-202XX
DG406BP	1000	420	3000	30	30	4	10	30	2	16	GDU 91-202XX
DG408BP	1000	420	3000	30	30	4	20	30	2	16	GDU 91-202XX
DGT409BCA	800	350	3600	30	30	4	20	30	2	15	GDU 91-202XX
DG646BH	2000	650	6600	30	30	7	20	40	2	16	GDU 90-204XX
DG648BH	2000	690	6000	30	30	7	20	40	2	16	GDU 90-204XX
DG758BX	3000	830	10000	40	40	8	10	40	2	16	GDU 90-203XX
DG856BW	3000	850	10500	40	40	10	20	40	2	16	GDU 90-207XX
DG858BW	3000	850	12000	40	40	10	20	40	2	16	GDU 90-207XX
DG858DW	3000	950	12500	40	40	10	20	40	2	18	GDU 90-207XX

POWER CIRCUIT AND BLOCK DIAGRAM

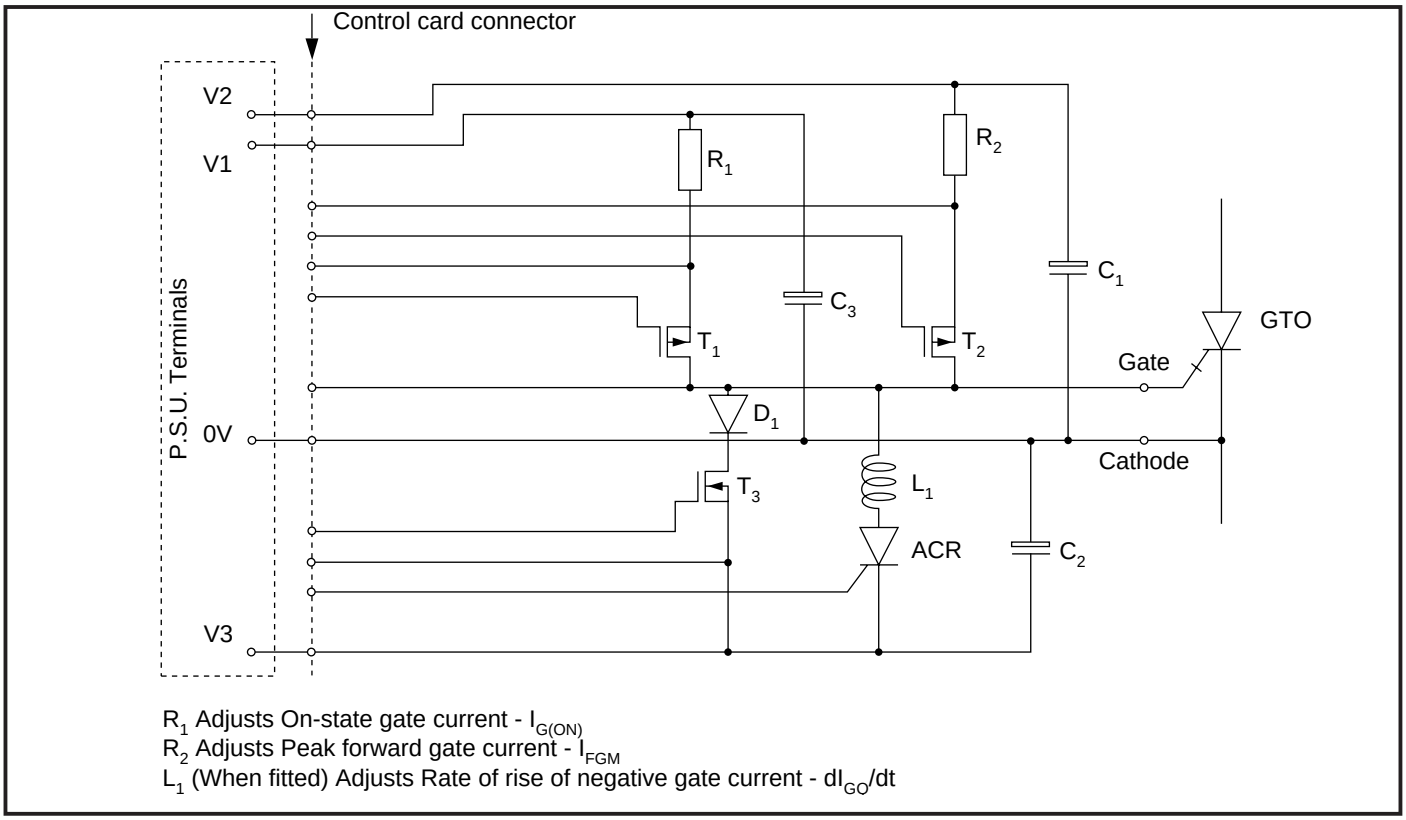


Fig.1 GTO gate drive - GDU9X-2XXXX - simplified power circuit

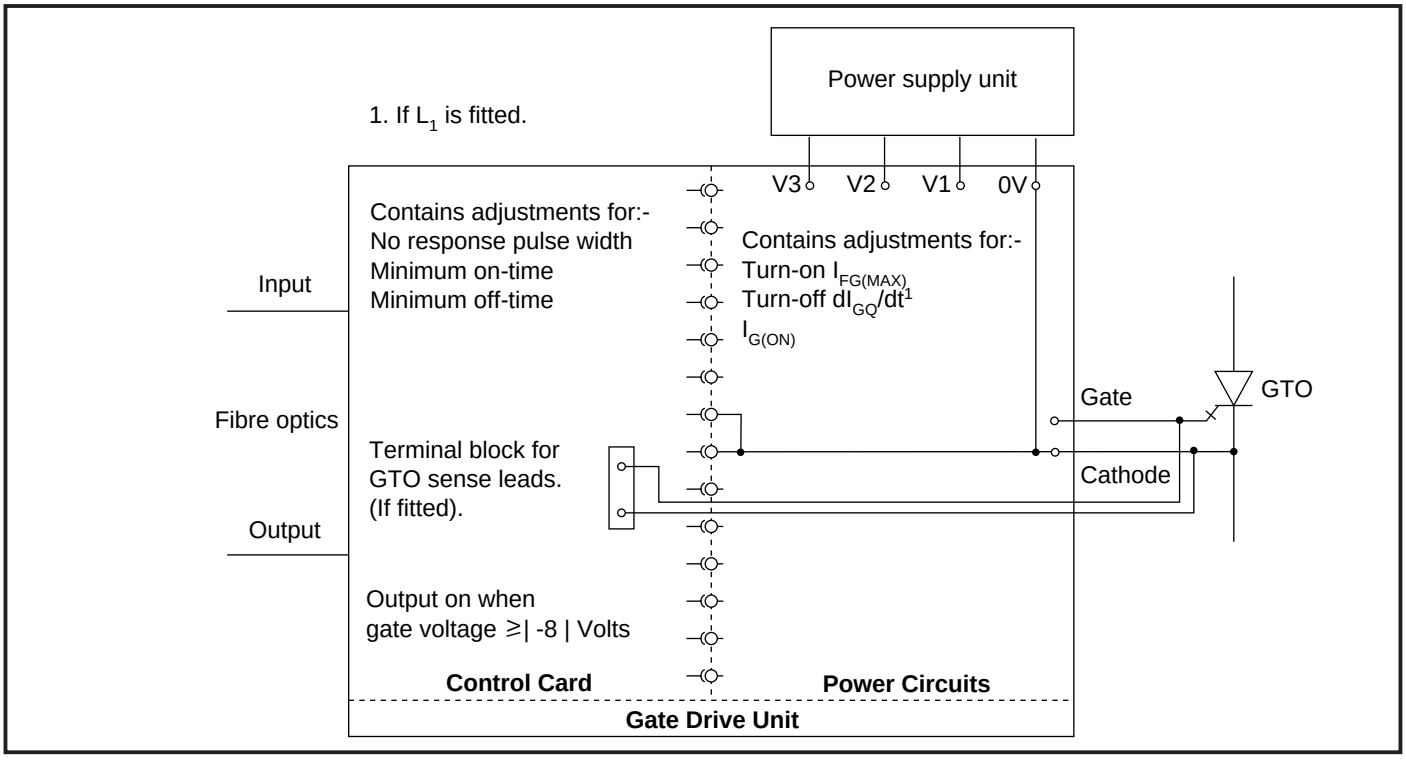


Fig.2 Gate drive block diagram

GATE DRIVE INTERFACES

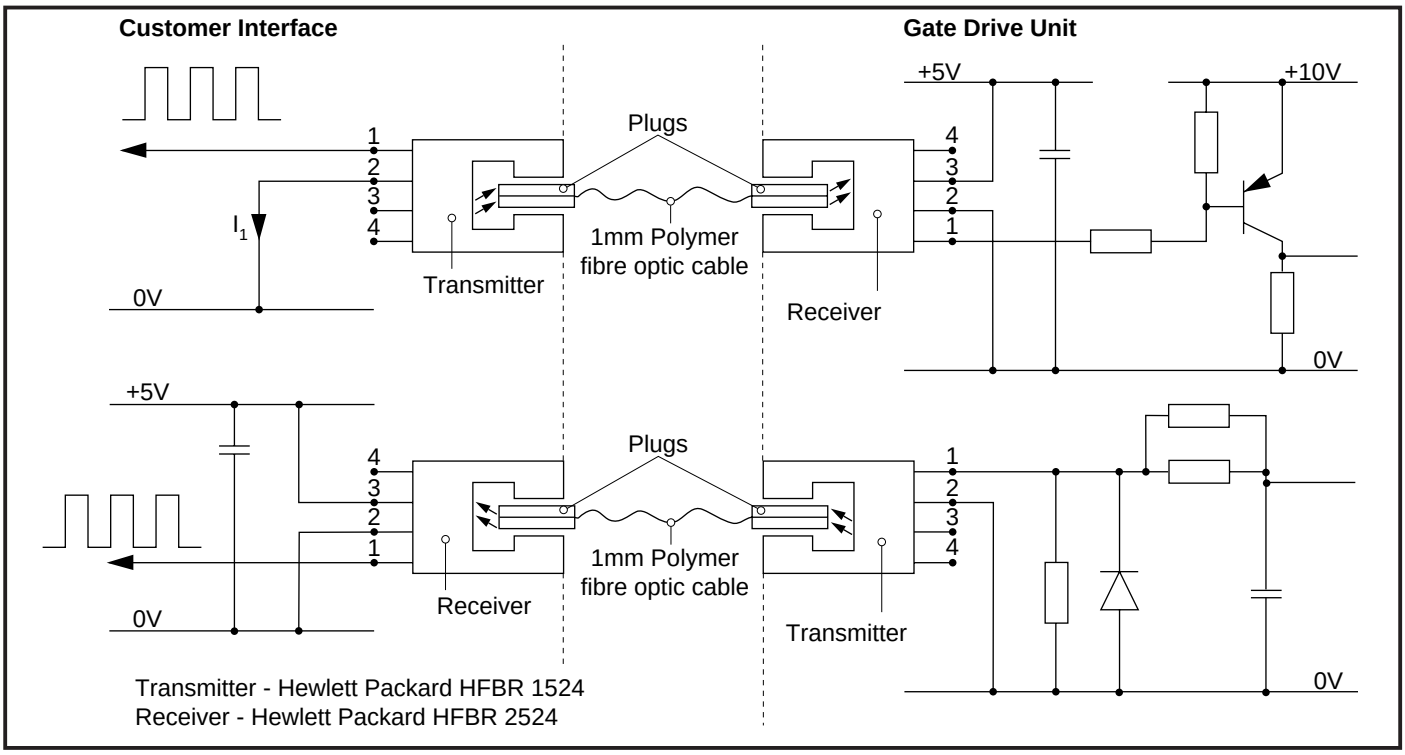


Fig.3 Hewlett Packard versatile link interface

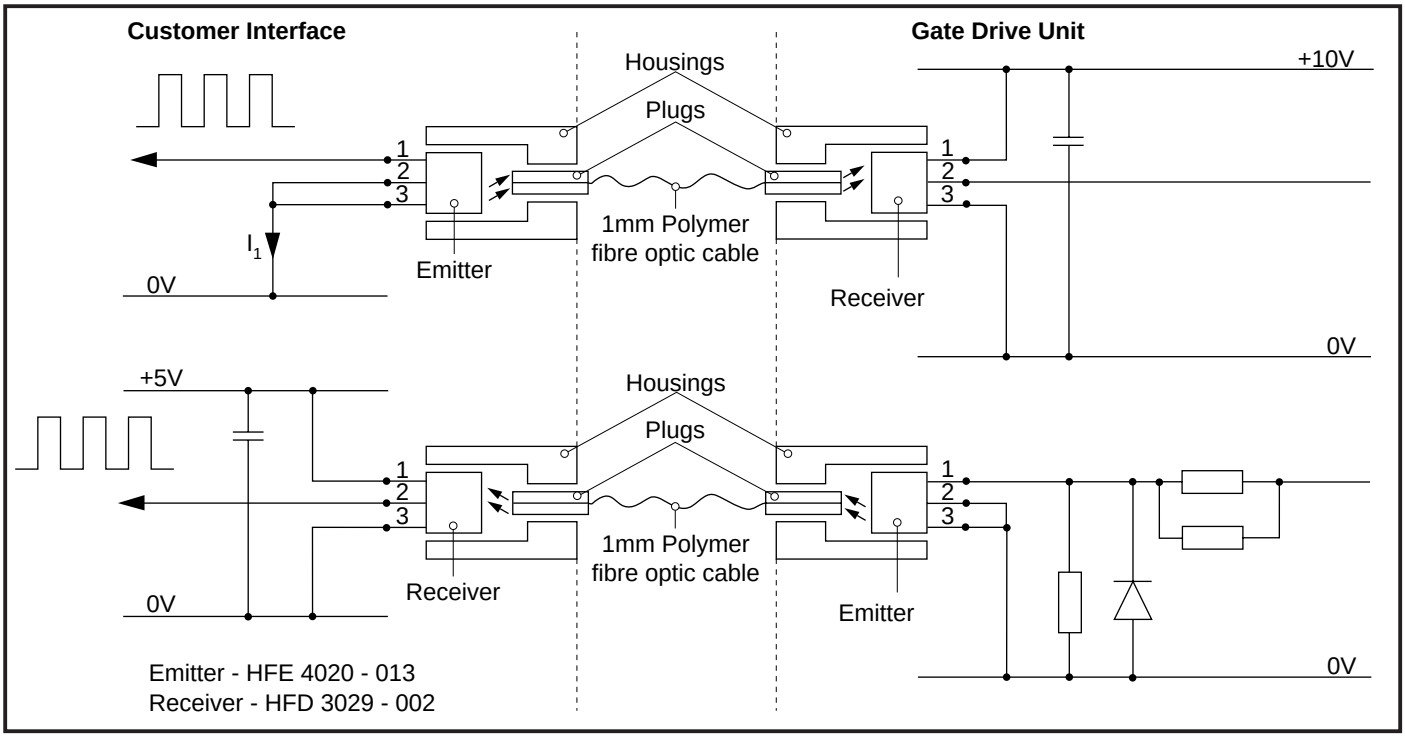


Fig.4 Honeywell sweetspot interface

GTO GATE DRIVE V1 P.S.U. CURRENTS

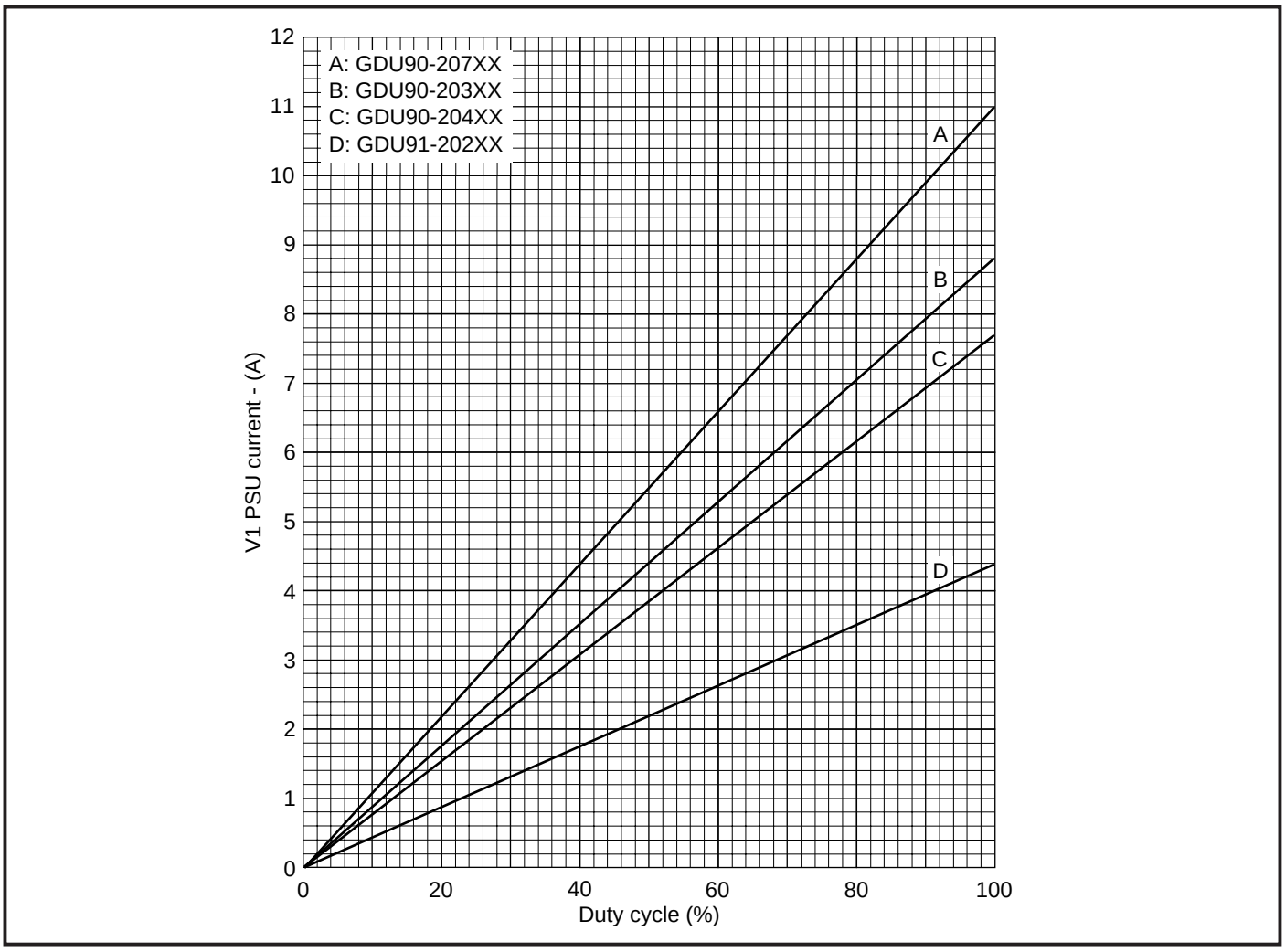


Fig.5 V1 P.S.U. current vs duty cycle

GTO GATE DRIVE V2 P.S.U. CURRENTS

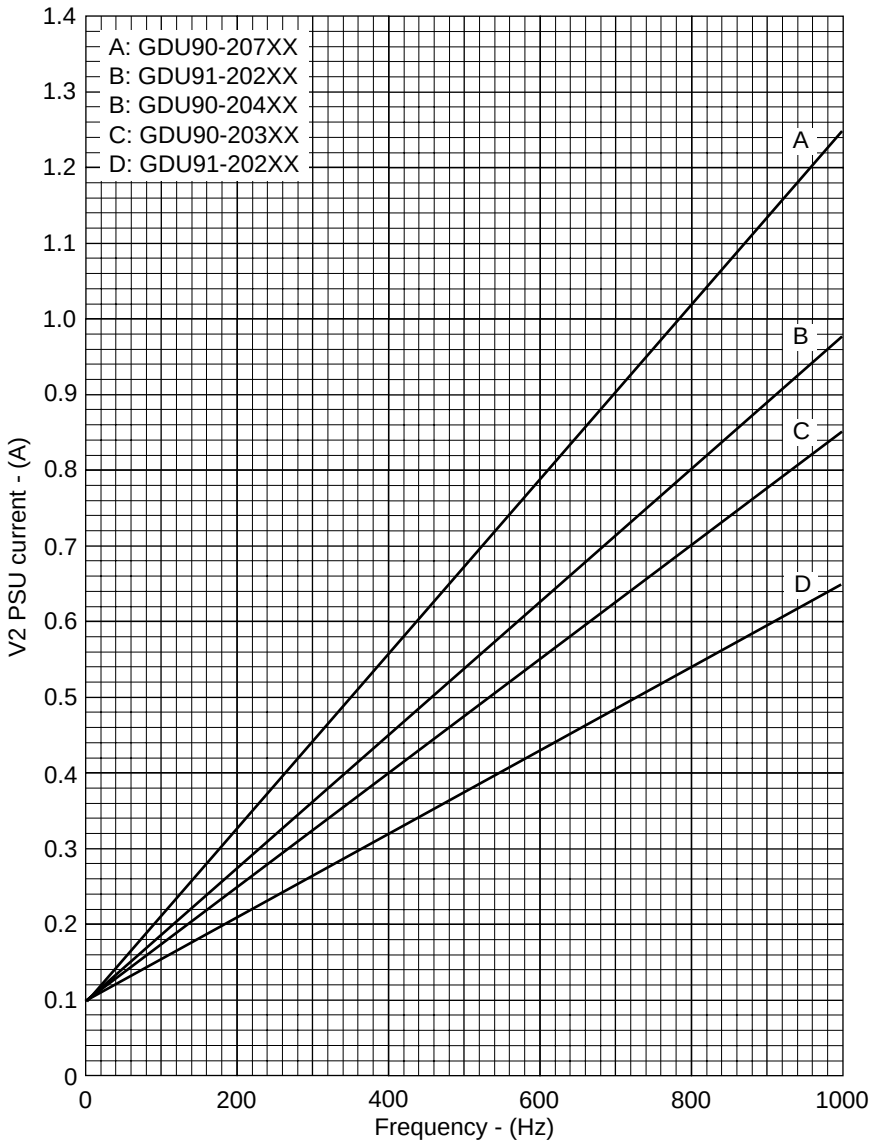
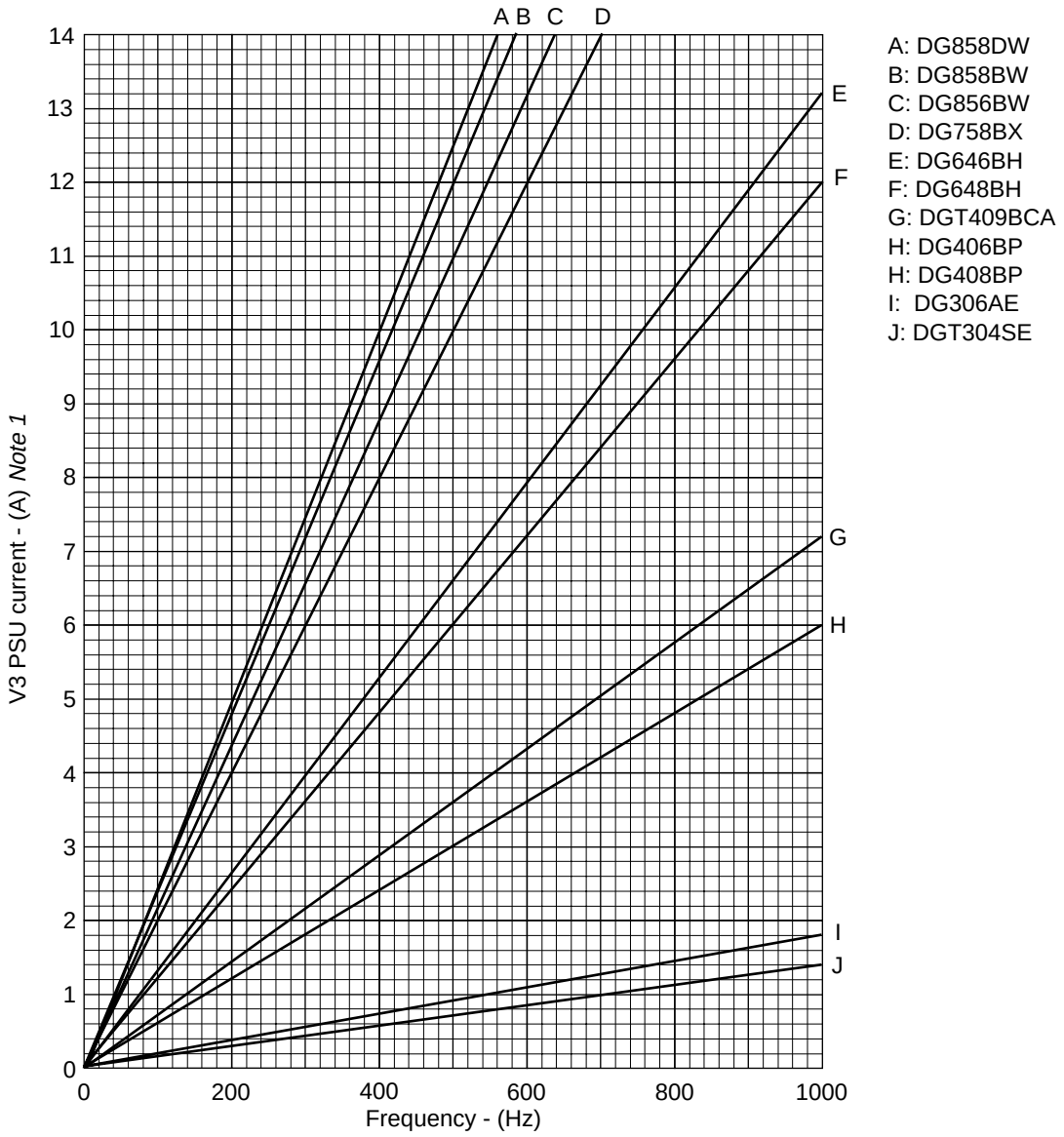


Fig.6 V2 P.S.U. current vs frequency

GTO GATE DRIVE V3 P.S.U. CURRENTS



Note 1: V3 current is that required for operation of the GTO at max. I_{TCM} and T_j.

Fig.7 V3 P.S.U. current vs frequency

GATE DRIVE Q_{GQT} LIMITS VS FREQUENCY

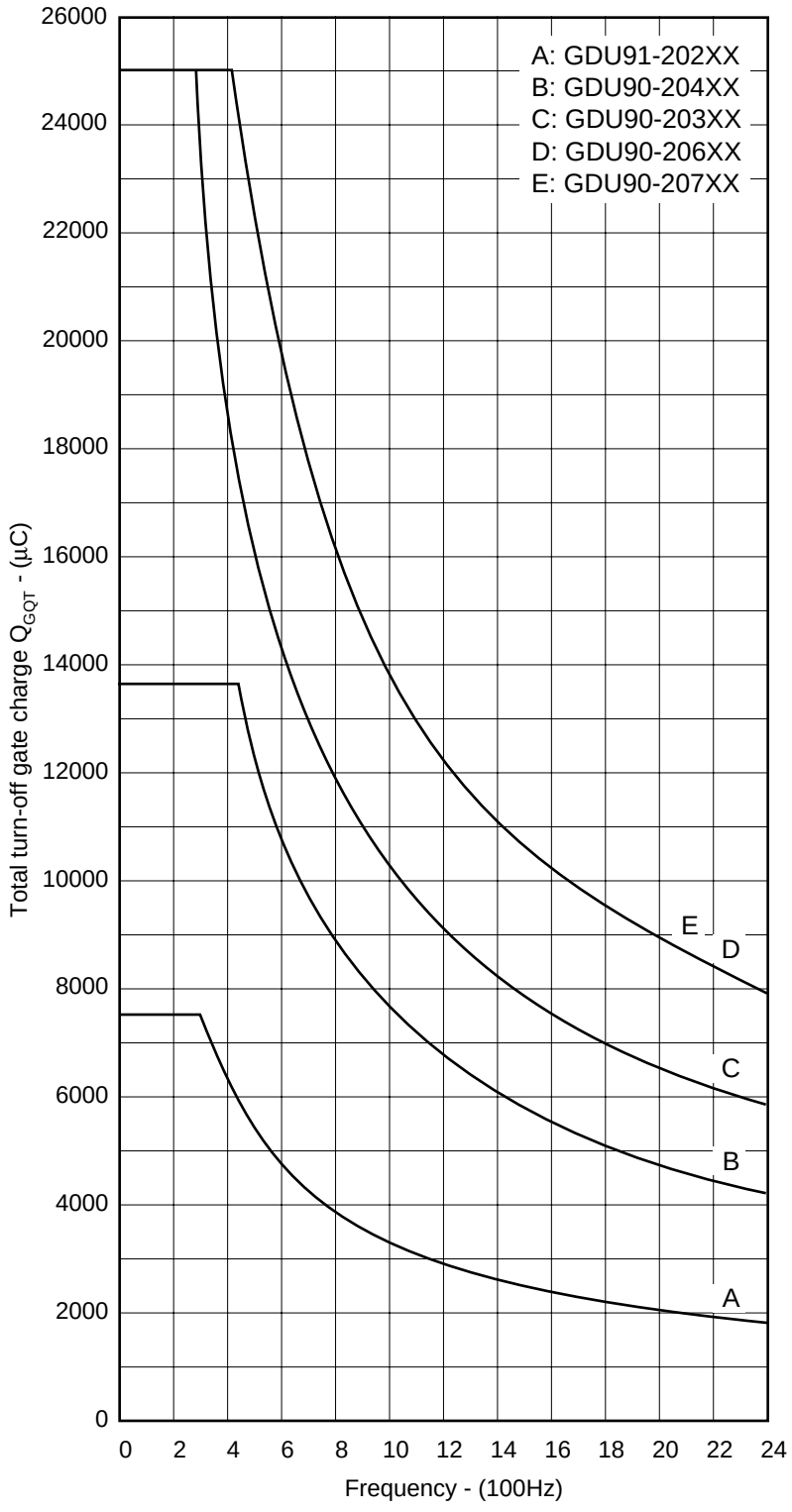


Fig.8

GUIDANCE FOR SELECTION OF GATE DRIVE UNIT

1. Choose GTO Thyristor.
2. Select the appropriate GDU from the GTO/GDU recommendations, (see page 1).
3. Decide on input signal method and t_{w1} period, and enter the last two digits in the Gate Drive code: -

01 HP Versatile link fibre optics:	(t_{w1} = 10µs)	21 HP Versatile link fibre optics:	(t_{w1} = 20µs)
02 Honeywell sweetspot fibre optics:	(t_{w1} = 10µs)	22 Honeywell sweetspot fibre optics:	(t_{w1} = 20µs)
04 HP opto-coupler.	(t_{w1} = 10µs)	24 HP opto-coupler.	(t_{w1} = 20µs)

GUIDANCE FOR POWER SUPPLY SPECIFICATION

1. From GTO datasheet recommendations for $I_{G(ON)}$ add 10% to calculate the maximum current required from the V1 supply. The average value of current could be lower for reduced duty cycle operation. (See Fig.5, page 4).

2. Read the V2 supply current from Fig.6 (See page 5).

3. Read the maximum V3 supply current from Fig.7 (See page 6). If the GTO is to be operated at lower current than the I_{TCM} and/ or $T_{vj(max)}$ then the V3 power supply current can be calculated as follows:-

   a. From the GTO turn-off gate charge vs rate of rise of reverse gate current graph read Q_{GQ} for worst case requirements.

   b. GDU Q_{GQT} is 2x GTO Q_{GQ} per pulse.

   c. V3 power supply current is 2x GTO Q_{GQ} x Max. Frequency (Hz) of operation.

4. The Power Supply Unit must have satisfactory isolation between its' input and output in order to withstand the GTO cathode voltage.

GENERAL NOTES

1. The drive unit mounting holes 4xØ4.4mm have a generous clearance for mounting nuts or bolts and can be opened out by end users to suit individual requirements.

2. The GDU circuits are referenced to the GTO cathode and hence operate near to the GTO cathode voltage. Suitable spacing around the GDU, and in the mounting method, should be provided for the electrical isolation of the worst case GTO cathode voltage.

3. The preferred mounting is with the heatsink fins vertical - to improve cooling from the unit.

4. The GDU has two CMOS compatible inputs that are referenced to the unit 0V line (connected to the GTO cathode). Connecting these to 0V will turn the GTO OFF and inhibit further GTO ON pulses. These could be used, for example, to turn the GTO OFF if the GTO cathode heatsink temperature rise operated a thermostat that shorted one of the inputs to 0V.

5. Fibre optic interface cables/components are also available to suit Dynex Semiconductor Gate Drive Units.

POWER ASSEMBLY CAPABILITY

The Power Assembly group was set up to provide a support service for those customers requiring more than the basic semiconductor, and has developed a flexible range of heatsink and clamping systems in line with advances in device voltages and current capability of our semiconductors.

We offer an extensive range of air and liquid cooled assemblies covering the full range of circuit designs in general use today. The Assembly group offers high quality engineering support dedicated to designing new units to satisfy the growing needs of our customers.

Using the latest CAD methods our team of design and applications engineers aim to provide the Power Assembly Complete Solution (PACs).

HEATSINKS

The Power Assembly group has its own proprietary range of extruded aluminium heatsinks which have been designed to optimise the performance of Dynex semiconductors. Data with respect to air natural, forced air and liquid cooling (with flow rates) is available on request.

For further information on device clamps, heatsinks and assemblies, please contact your nearest sales representative or Customer Services.

DYNEX SEMICONDUCTOR

http://www.dynexsemi.com

e-mail: power_solutions@dynexsemi.com

HEADQUARTERS OPERATIONS
DYNEX SEMICONDUCTOR LTD
Doddington Road, Lincoln.
Lincolnshire. LN6 3LF. United Kingdom.
Tel: +44-(0)1522-500500
Fax: +44-(0)1522-500550

CUSTOMER SERVICE
Tel: +44 (0)1522 502753 / 502901. Fax: +44 (0)1522 500020

SALES OFFICES
Benelux, Italy & Switzerland: Tel: +33 (0)1 64 66 42 17. Fax: +33 (0)1 64 66 42 19.
France: Tel: +33 (0)2 47 55 75 52. Fax: +33 (0)2 47 55 75 59.
Germany, Northern Europe, Spain & Rest Of World: Tel: +44 (0)1522 502753 / 502901.
Fax: +44 (0)1522 500020
North America: Tel: (613) 723-7035. Fax: (613) 723-1518. Toll Free: 1.888.33.DYNEX (39639) /
Tel: (949) 733-3005. Fax: (949) 733-2986.

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Target Information: This is the most tentative form of information and represents a very preliminary specification. No actual design work on the product has been started.

Preliminary Information: The product is in design and development. The datasheet represents the product as it is understood but details may change.

Advance Information: The product design is complete and final characterisation for volume production is well in hand.

No Annotation: The product parameters are fixed and the product is available to datasheet specification.