

# DF685

## FAST RECOVERY DIODE

### APPLICATIONS

- Snubber Diode For GTO Applications.

### KEY PARAMETERS

|             |             |
|-------------|-------------|
| $V_{RRM}$   | 4500V       |
| $I_{F(AV)}$ | 445A        |
| $I_{FSM}$   | 4500A       |
| $Q_r$       | 650 $\mu$ C |
| $t_{rr}$    | 5 $\mu$ s   |

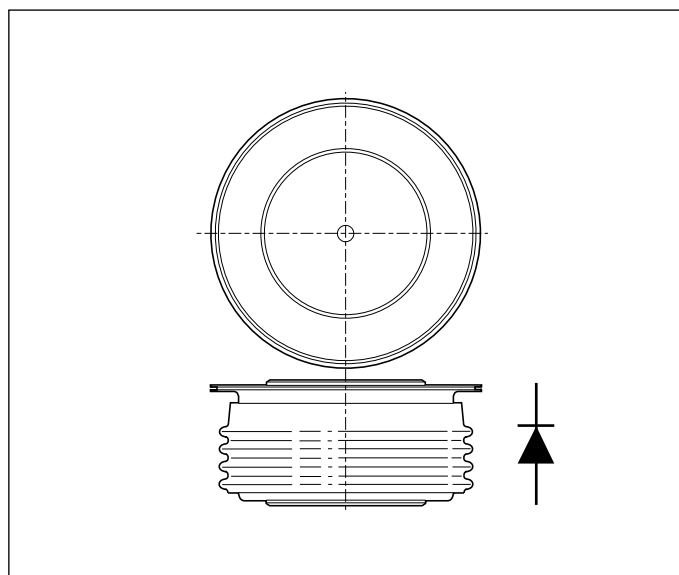
### FEATURES

- Double Side Cooling.
- High Surge Capability.
- Low Recovery Charge.

### VOLTAGE RATINGS

| Type Number | Repetitive Peak Reverse Voltage<br>$V_{RRM}$<br>V | Conditions                 |
|-------------|---|----------------------------|
| DF685 45    | 4500  | $V_{RSM} = V_{RRM} + 100V$ |
| DF685 44    | 4400  |                            |
| DF685 43    | 4300  |                            |
| DF685 42    | 4200  |                            |
| DF685 41    | 4100  |                            |
| DF685 40    | 4000  |                            |

Lower voltage grades available.



Outline type code: M779b. Turn to page 8 for further information.

### CURRENT RATINGS

| Symbol                                 | Parameter                           | Conditions   | Max. | Units |
|--|-------------------------------------|--|------|-------|
| <b>Double Side Cooled</b>              |                                     |  |      |       |
| $I_{F(AV)}$                            | Mean forward current                | Half wave resistive load, $T_{case} = 65^{\circ}C$ | 445  | A     |
| $I_{F(RMS)}$                           | RMS value                           | $T_{case} = 65^{\circ}C$                           | 700  | A     |
| $I_F$                                  | Continuous (direct) forward current | $T_{case} = 65^{\circ}C$                           | 610  | A     |
| <b>Single Side Cooled (Anode side)</b> |                                     |  |      |       |
| $I_{F(AV)}$                            | Mean forward current                | Half wave resistive load, $T_{case} = 65^{\circ}C$ | 280  | A     |
| $I_{F(RMS)}$                           | RMS value                           | $T_{case} = 65^{\circ}C$                           | 440  | A     |
| $I_F$                                  | Continuous (direct) forward current | $T_{case} = 65^{\circ}C$                           | 365  | A     |

## SURGE RATINGS

| Symbol    | Parameter                              | Conditions  | Max.                 | Units                |
|-----------|--|---|----------------------|----------------------|
| $I_{FSM}$ | Surge (non-repetitive) forward current | 10ms half sine; with 0% $V_{RRM}$ , $T_j = 150^\circ\text{C}$   | 4.5                  | kA                   |
| $I^2t$    | $I^2t$ for fusing                      |   | $101.25 \times 10^3$ | $\text{A}^2\text{s}$ |
| $I_{FSM}$ | Surge (non-repetitive) forward current | 10ms half sine; with 50% $V_{RRM}$ , $T_j = 150^\circ\text{C}$  | 3.6                  | kA                   |
| $I^2t$    | $I^2t$ for fusing                      |   | $64.8 \times 10^3$   | $\text{A}^2\text{s}$ |
| $I_{FSM}$ | Surge (non-repetitive) forward current | 10ms half sine; with 100% $V_{RRM}$ , $T_j = 150^\circ\text{C}$ | -                    | kA                   |
| $I^2t$    | $I^2t$ for fusing                      |   | -                    | $\text{A}^2\text{s}$ |

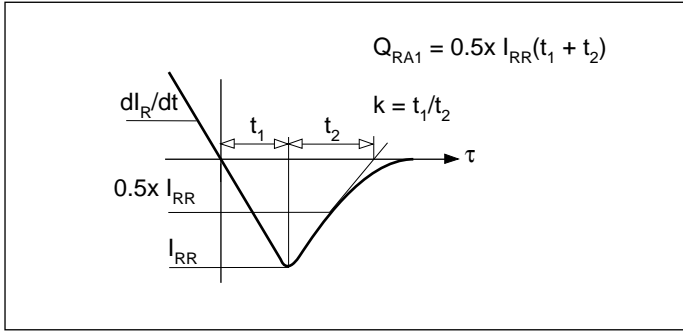
## THERMAL AND MECHANICAL DATA

| Symbol        | Parameter                             | Conditions                                    |             | Min. | Max.  | Units              |
|---------------|---------------------------------------|---|-------------|------|-------|--------------------|
| $R_{th(j-c)}$ | Thermal resistance - junction to case | Double side cooled                            | dc          | -    | 0.045 | $^\circ\text{C/W}$ |
|               |                                       | Single side cooled                            | Anode dc    | -    | 0.086 | $^\circ\text{C/W}$ |
|               |                                       |   | Cathode dc  | -    | 0.095 | $^\circ\text{C/W}$ |
| $R_{th(c-h)}$ | Thermal resistance - case to heatsink | Clamping force 10kN<br>with mounting compound | Double side | -    | 0.01  | $^\circ\text{C/W}$ |
|               |                                       |   | Single side | -    | 0.02  | $^\circ\text{C/W}$ |
| $T_{vj}$      | Virtual junction temperature          | On-state (conducting)                         |             | -    | 150   | $^\circ\text{C}$   |
| $T_{stg}$     | Storage temperature range             |   |             | -55  | 150   | $^\circ\text{C}$   |
| -             | Clamping force                        |   |             | 9.0  | 11.0  | kN                 |

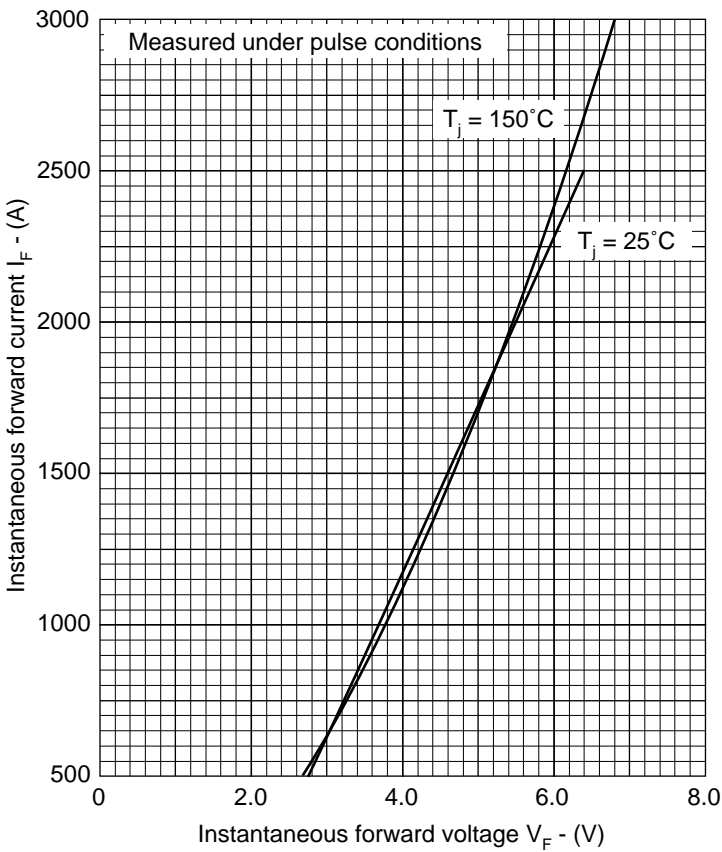
# CHARACTERISTICS

| Symbol    | Parameter                    | Conditions  | Typ. | Max. | Units     |
|-----------|------------------------------|---|------|------|-----------|
| $V_{FM}$  | Forward voltage              | At 1500A peak, $T_{case} = 25^{\circ}C$   | -    | 4.8  | V         |
| $I_{RRM}$ | Peak reverse current         | At $V_{RRM}$ , $T_{case} = 150^{\circ}C$  | -    | 80   | mA        |
| $t_{rr}$  | Reverse recovery time        | $I_F = 1000A$ , $di_{RR}/dt = 100A/\mu s$<br>$T_{case} = 150^{\circ}C$ , $V_R = 100V$ | 5    | -    | $\mu s$   |
| $Q_{RA1}$ | Recovered charge (50% chord) |   | -    | 650  | $\mu C$   |
| $I_{RM}$  | Reverse recovery current     |   | 270  | -    | A         |
| K         | Soft factor                  |   | 1.8  | -    | -         |
| $V_{TO}$  | Threshold voltage            | At $T_{vj} = 150^{\circ}C$  | -    | 2.0  | V         |
| $r_T$     | Slope resistance             | At $T_{vj} = 150^{\circ}C$  | -    | 1.76 | $m\Omega$ |
| $V_{FRM}$ | Forward recovery voltage     | $di/dt = 1000A/\mu s$ , $T_j = 125^{\circ}C$  | -    | 220  | V         |

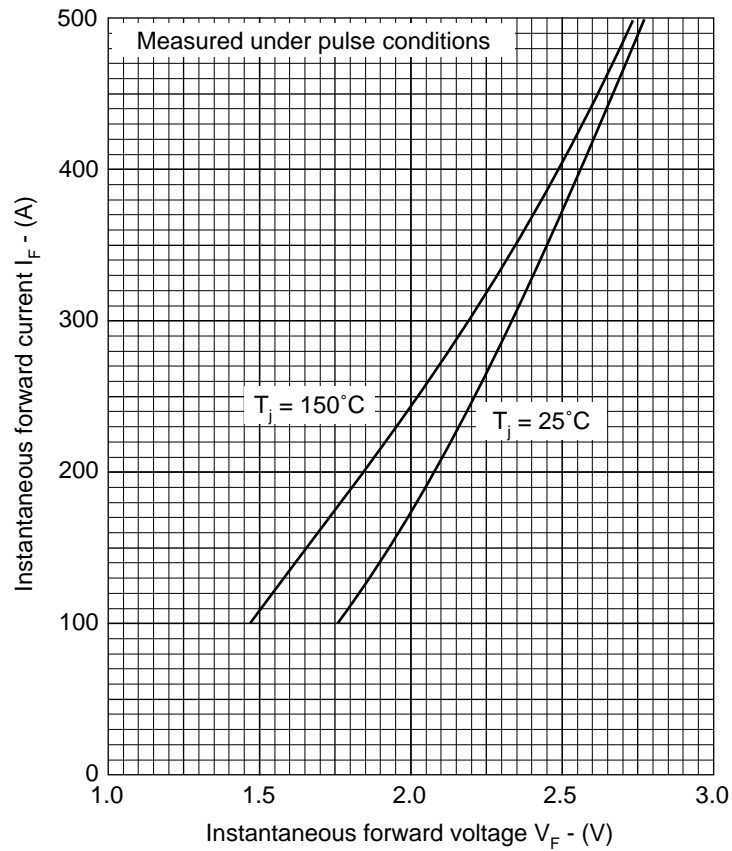
## DEFINITION OF K FACTOR AND $Q_{RA1}$



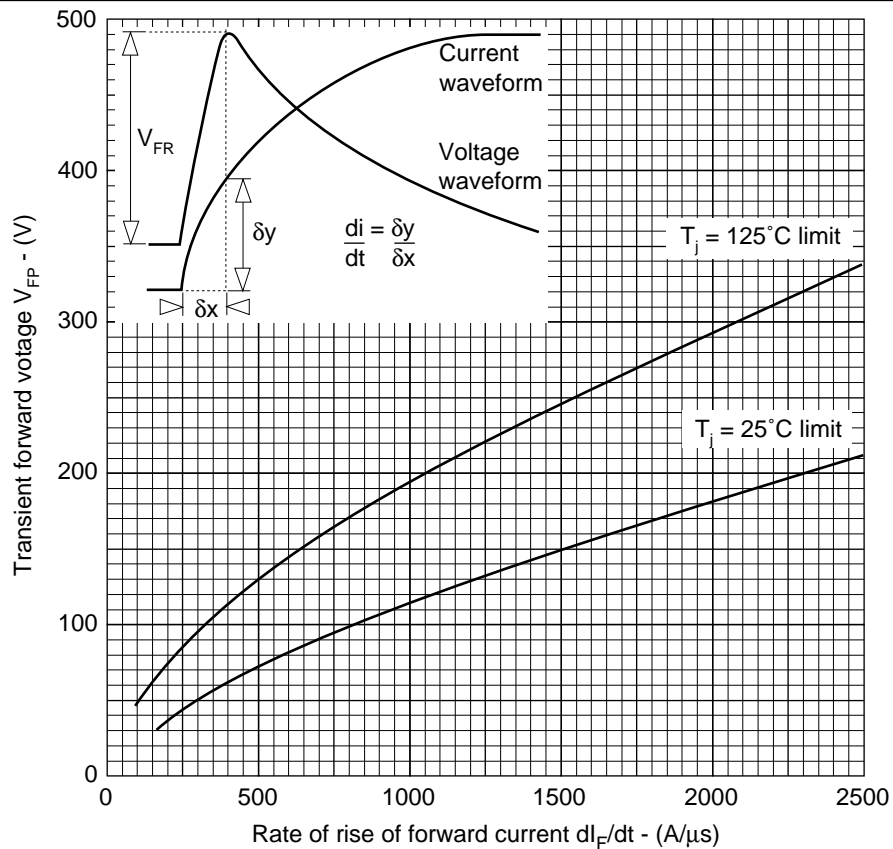
CURVES



**FIG. 1 MAXIMUM (LIMIT) FORWARD CHARACTERISTICS**



**FIG. 2 MAXIMUM (LIMIT) FORWARD CHARACTERISTICS**



**FIG. 3 TRANSIENT FORWARD VOLTAGE vs RATE OF RISE OF FORWARD CURRENT**

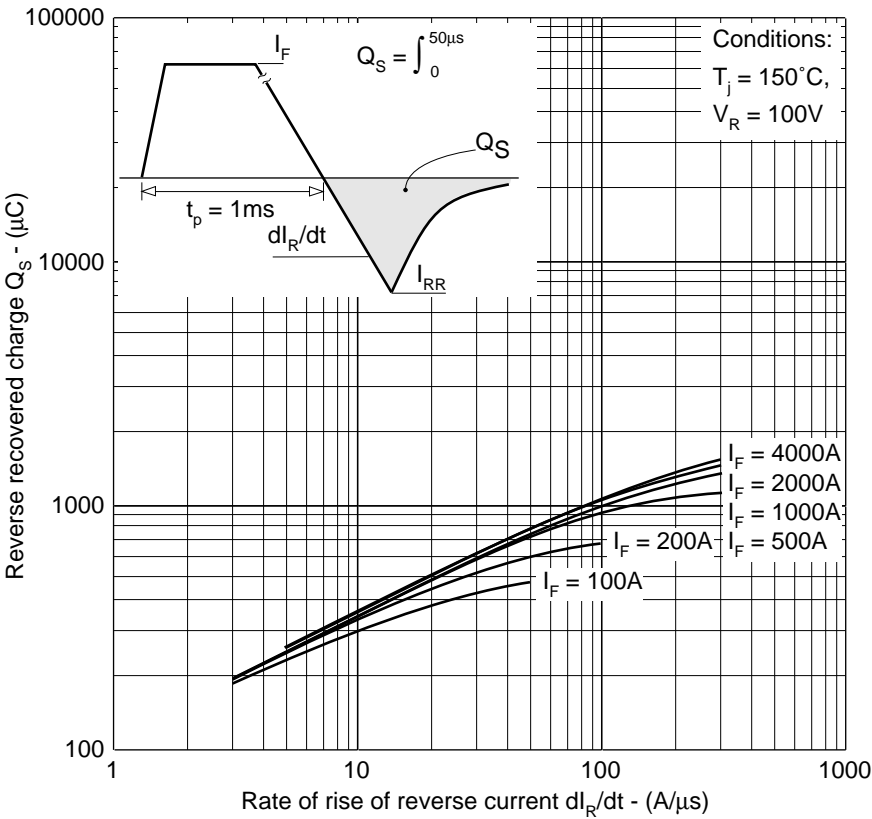


FIG. 4 RECOVERED CHARGE

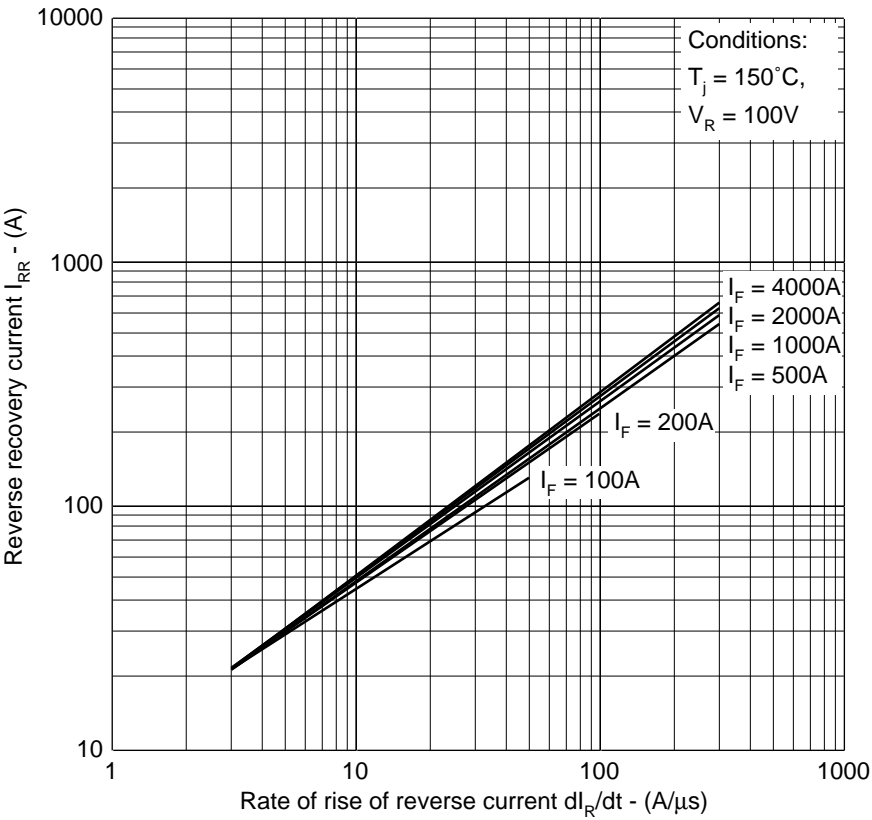
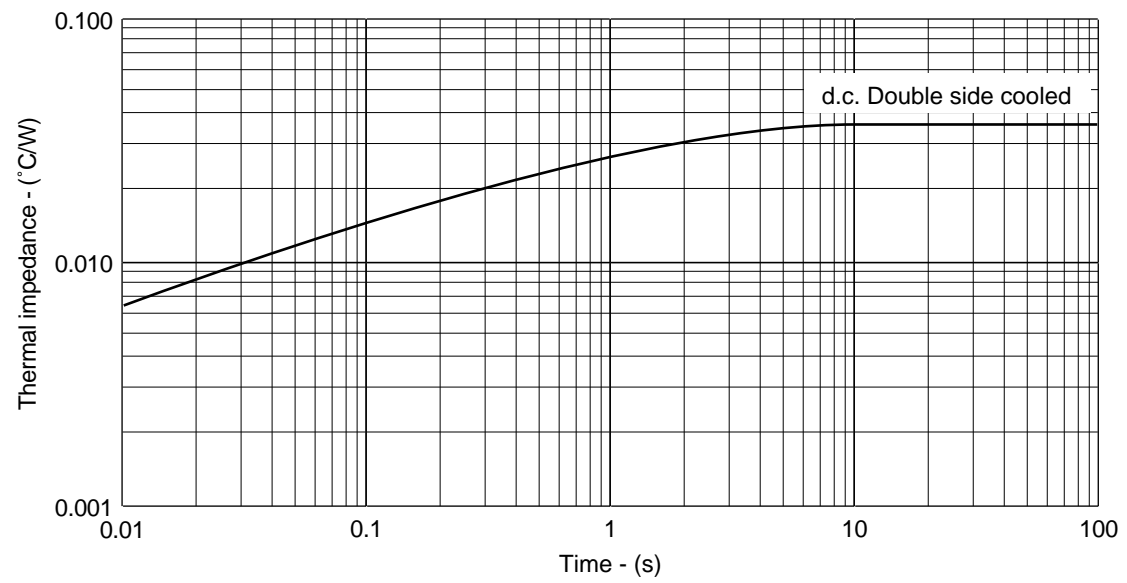


FIG. 5 TYPICAL REVERSE RECOVERY CURRENT vs RATE OF RISE OF REVERSE CURRENT

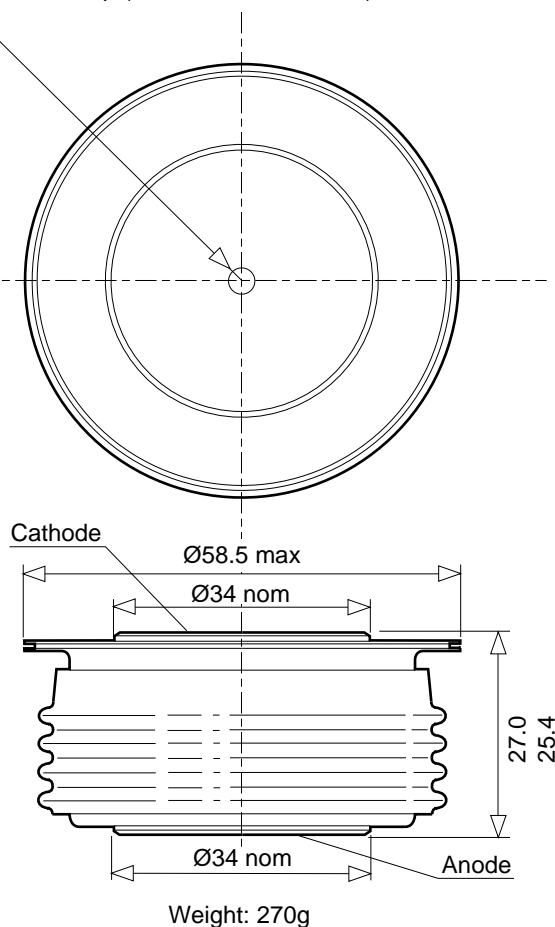


**FIG. 6 MAXIMUM (LIMIT) TRANSIENT THERMAL IMPEDANCE - JUNCTION TO CASE - ( $^{\circ}\text{C/W}$ )**

**PACKAGE DETAILS - M779b**

For further package information, please contact your local Customer Service Centre. All dimensions in mm, unless stated otherwise.  
DO NOT SCALE.

2 holes Ø3.6 x 2.0 deep (One in each electrode)

**HEADQUARTERS OPERATIONS****GEC PLESSEY SEMICONDUCTORS**

Cheney Manor, Swindon,  
Wiltshire, SN2 2QW, United Kingdom.

Tel: + 44 (0)1793 518000

Fax: + 44 (0)1793 518411

**GEC PLESSEY SEMICONDUCTORS**

P.O. Box 660017

1500 Green Hills Road,  
Scotts Valley, California 95067-0017,  
United States of America.

Tel: + 1 (408) 438 2900

Fax: + 1 (408) 438 5576

**POWER PRODUCT CUSTOMER SERVICE CENTRES**

- **FRANCE.** 2 rue Henri-Bergson, 92665 Asnieres Cedex.  
Tel: + 33 1 40 80 54 00. Fax: + 33 1 40 80 55 87.
- **GERMANY.** Ungererstrasse 129, 80505 München.  
Tel: + 49 (0)89 36 09 060. Fax: + 49 (0)89 36 09 06 55.
- **NORTH AMERICA.** Two Dedham Place, Suite 125, 3 Allied Drive, Dedham. MA 02026.  
Tel: + 1 617 251 0126. Fax: + 1 617 251 0106.
- **UNITED KINGDOM.** Doddington Road, Lincoln. LN6 3LF.  
Tel: + 44 (0)1522 500500. Fax: + 44 (0)1522 500550.

These are supported by Agents and Distributors in major countries world-wide.

© GEC Plessey Semiconductors 1995 Publication No. DS4303-1 Issue No. 1.2 September 1995

TECHNICAL DOCUMENTATION - NOT FOR RESALE. PRINTED IN UNITED KINGDOM.

This publication is issued to provide information only which (unless agreed by the Company in writing) may not be used, applied or reproduced for any purpose nor form part of any order or contract nor to be regarded as a representation relating to the products or services concerned. No warranty or guarantee express or implied is made regarding the capability, performance or suitability of any product or service. The Company reserves the right to alter without prior notice the specification, design or price of any product or service. Information concerning possible methods of use is provided as a guide only and does not constitute any guarantee that such methods of use will be satisfactory in a specific piece of equipment. It is the user's responsibility to fully determine the performance and suitability of any equipment using such information and to ensure that any publication or data used is up to date and has not been superseded. These products are not suitable for use in any medical products whose failure to perform may result in significant injury or death to the user. All products and materials are sold and services provided subject to the Company's conditions of sale, which are available on request.