

### FEATURES

- Double Side Cooling
- High Reliability In Service
- High Voltage Capability
- Fault Protection Without Fuses
- High Surge Current Capability
- Turn-off Capability Allows Reduction In Equipment Size And Weight. Low Noise Emission Reduces Acoustic Cladding Necessary For Environmental Requirements

### APPLICATIONS

- Variable speed A.C. motor drive inverters (VSD-AC).
- Uninterruptable Power Supplies
- High Voltage Converters.
- Choppers.
- Welding.
- Induction Heating.
- DC/DC Converters.

### KEY PARAMETERS

|             |                |
|-------------|----------------|
| $I_{TCM}$   | <b>3000A</b>   |
| $V_{DRM}$   | <b>4500V</b>   |
| $I_{T(AV)}$ | <b>1100A</b>   |
| $dV_D/dt$   | <b>750V/μs</b> |
| $dI_T/dt$   | <b>300A/μs</b> |

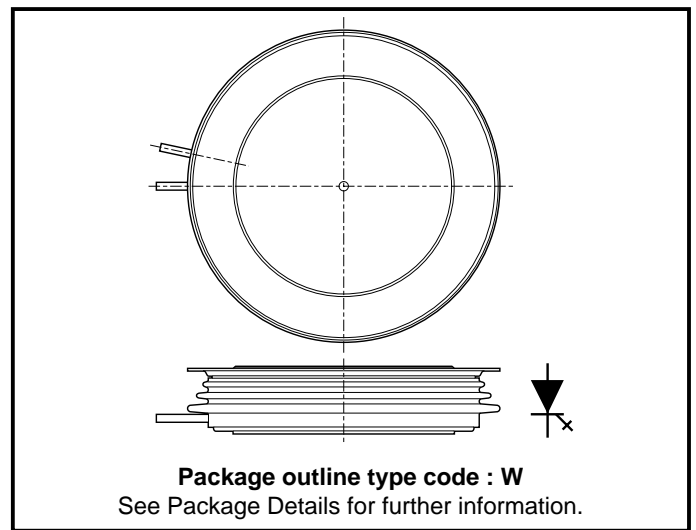


Fig.1 Package outline

### VOLTAGE RATINGS

| Type Number | Repetitive Peak Off-state Voltage<br>$V_{DRM}$<br>V | Repetitive Peak Reverse Voltage<br>$V_{RRM}$<br>V | Conditions   |
|-------------|---|---|--|
| DG858DW45   | 4500  | 16  | $T_{vj} = 125^{\circ}C, I_{DRM} = 100mA, I_{RRM} = 50mA$ |

### CURRENT RATINGS

| Symbol       | Parameter                                     | Conditions  | Max. | Units |
|--------------|---|---|------|-------|
| $I_{TCM}$    | Repetitive peak controllable on-state current | $V_D = V_{DRM}, T_i = 125^{\circ}C, di_{GQ}/dt = 40A/\mu s, C_s = 4.0\mu F, L_s \leq 200nH$ | 3000 | A     |
| $I_{T(AV)}$  | Mean on-state current                         | $T_{HS} = 80^{\circ}C$ . Double side cooled, half sine 50Hz.                                | 1100 | A     |
| $I_{T(RMS)}$ | RMS on-state current                          | $T_{HS} = 80^{\circ}C$ . Double side cooled, half sine 50Hz.                                | 1720 | A     |

## DG858DW45

### SURGE RATINGS

| Symbol    | Parameter                                 | Conditions   | Max.              | Units                  |
|-----------|---|--|-------------------|------------------------|
| $I_{TSM}$ | Surge (non-repetitive) on-state current   | 10ms half sine. $T_j = 125^\circ\text{C}$  | 20.0              | kA                     |
| $I^2t$    | $I^2t$ for fusing                         | 10ms half sine. $T_j = 125^\circ\text{C}$  | $2.0 \times 10^6$ | $\text{A}^2\text{s}$   |
| $di_T/dt$ | Critical rate of rise of on-state current | $V_D = 3000\text{V}$ , $I_T = 3000\text{A}$ , $T_j = 125^\circ\text{C}$<br>$I_{FG} > 40\text{A}$ , Rise time $< 1.0\mu\text{s}$        | 300               | $\text{A}/\mu\text{s}$ |
| $dV_D/dt$ | Rate of rise of off-state voltage         | To 66% $V_{DRM}$ ; $R_{GK} \leq 22\Omega$ , $T_j = 125^\circ\text{C}$  | 20                | $\text{V}/\mu\text{s}$ |
|           |   | To 66% $V_{DRM}$ ; $V_{RG} = -2\text{V}$ , $T_j = 125^\circ\text{C}$   | 750               | $\text{V}/\mu\text{s}$ |
| $L_S$     | Peak stray inductance in snubber circuit  | $I_T = 3000\text{A}$ , $V_D = V_{DRM}$ , $T_j = 125^\circ\text{C}$ ,<br>$di_{GQ}/dt = 40\text{A}/\mu\text{s}$ , $C_s = 4.0\mu\text{F}$ | 200               | nH                     |

### GATE RATINGS

| Symbol         | Parameter                            | Conditions                                | Min. | Max. | Units                  |
|----------------|--------------------------------------|---|------|------|------------------------|
| $V_{RGM}$      | Peak reverse gate voltage            | This value maybe exceeded during turn-off | -    | 16   | V                      |
| $I_{FGM}$      | Peak forward gate current            |   | 20   | 100  | A                      |
| $P_{FG(AV)}$   | Average forward gate power           |   | -    | 20   | W                      |
| $P_{RGM}$      | Peak reverse gate power              |   | -    | 24   | kW                     |
| $di_{GQ}/dt$   | Rate of rise of reverse gate current |   | 20   | 60   | $\text{A}/\mu\text{s}$ |
| $t_{ON(min)}$  | Minimum permissible on time          |   | 50   | -    | $\mu\text{s}$          |
| $t_{OFF(min)}$ | Minimum permissible off time         |   | 100  | -    | $\mu\text{s}$          |

### THERMAL AND MECHANICAL DATA

| Symbol           | Parameter  | Conditions                                    | Min. | Max.   | Units                     |
|------------------|--|---|------|--------|---------------------------|
| $R_{th(j-hs)}$   | DC thermal resistance - junction to heatsink surface | Double side cooled                            | -    | 0.011  | $^\circ\text{C}/\text{W}$ |
|                  |  | Anode side cooled                             | -    | 0.017  | $^\circ\text{C}/\text{W}$ |
|                  |  | Cathode side cooled                           | -    | 0.03   | $^\circ\text{C}/\text{W}$ |
| $R_{th(c-hs)}$   | Contact thermal resistance                           | Clamping force 40kN<br>With mounting compound | -    | 0.0021 | $^\circ\text{C}/\text{W}$ |
| $T_{vj}$         | Virtual junction temperature                         |   | -40  | 125    | $^\circ\text{C}$          |
| $T_{OP}/T_{stg}$ | Operating junction/storage temperature range         |   | -40  | 125    | $^\circ\text{C}$          |
| -                | Clamping force                                       |   | 36.0 | 44.0   | kN                        |

## CHARACTERISTICS

| $T_j = 125^\circ\text{C}$ unless stated otherwise |                               |   |      |       |               |
|---|-------------------------------|---|------|-------|---------------|
| Symbol  | Parameter                     | Conditions  | Min. | Max.  | Units         |
| $V_{TM}$  | On-state voltage              | At 3000A peak, $I_{G(ON)} = 10\text{A d.c.}$  | -    | 3.85  | V             |
| $I_{DM}$  | Peak off-state current        | $V_{DRM} = 4500\text{V}$ , $V_{RG} = 2\text{V}$   | -    | 100   | mA            |
| $I_{RRM}$   | Peak reverse current          | At $V_{RRM}$  | -    | 50    | mA            |
| $V_{GT}$  | Gate trigger voltage          | $V_D = 24\text{V}$ , $I_T = 100\text{A}$ , $T_j = 25^\circ\text{C}$   | -    | 1.2   | V             |
| $I_{GT}$  | Gate trigger current          | $V_D = 24\text{V}$ , $I_T = 100\text{A}$ , $T_j = 25^\circ\text{C}$   | -    | 4.0   | A             |
| $I_{RGM}$   | Reverse gate cathode current  | $V_{RGM} = 16\text{V}$ , No gate/cathode resistor   | -    | 50    | mA            |
| $E_{ON}$  | Turn-on energy                | $V_D = 2000\text{V}$  | -    | 4400  | mJ            |
| $t_d$   | Delay time                    | $I_T = 3000\text{A}$ , $di_T/dt = 300\text{A}/\mu\text{s}$  | -    | 2.0   | $\mu\text{s}$ |
| $t_r$   | Rise time                     | $I_{FG} = 40\text{A}$ , rise time $< 1.0\mu\text{s}$  | -    | 6.0   | $\mu\text{s}$ |
| $E_{OFF}$   | Turn-off energy               | $I_T = 3000\text{A}$ , $V_{DM} = 4200\text{V}$<br>Snubber Cap $C_s = 4.0\mu\text{F}$ ,<br>$di_{GQ}/dt = 40/\mu\text{s}$ | -    | 12500 | mJ            |
| $t_{gs}$  | Storage time                  |   | -    | 26    | $\mu\text{s}$ |
| $t_{gf}$  | Fall time                     |   | -    | 2.5   | $\mu\text{s}$ |
| $t_{gq}$  | Gate controlled turn-off time |   | -    | 28.5  | $\mu\text{s}$ |
| $Q_{GQ}$  | Turn-off gate charge          |   | -    | 12500 | $\mu\text{C}$ |
| $Q_{GQT}$   | Total turn-off gate charge    |   | -    | 25000 | $\mu\text{C}$ |
| $I_{GQM}$   | Peak reverse gate current     |   | -    | 950   | A             |

## RELIABILITY

|                         | Conditions   | Limit | Units |
|-------------------------|--|-------|-------|
| DC blocking reliability | $V_{dc} = 3500\text{V}$ , $T_j = -40$ to $+125^\circ\text{C}$ ,<br>ambient cosmic radiation at sea level, in<br>open air, 100% duty cycle. | 100   | FIT   |

# DG858DW45

## CURVES

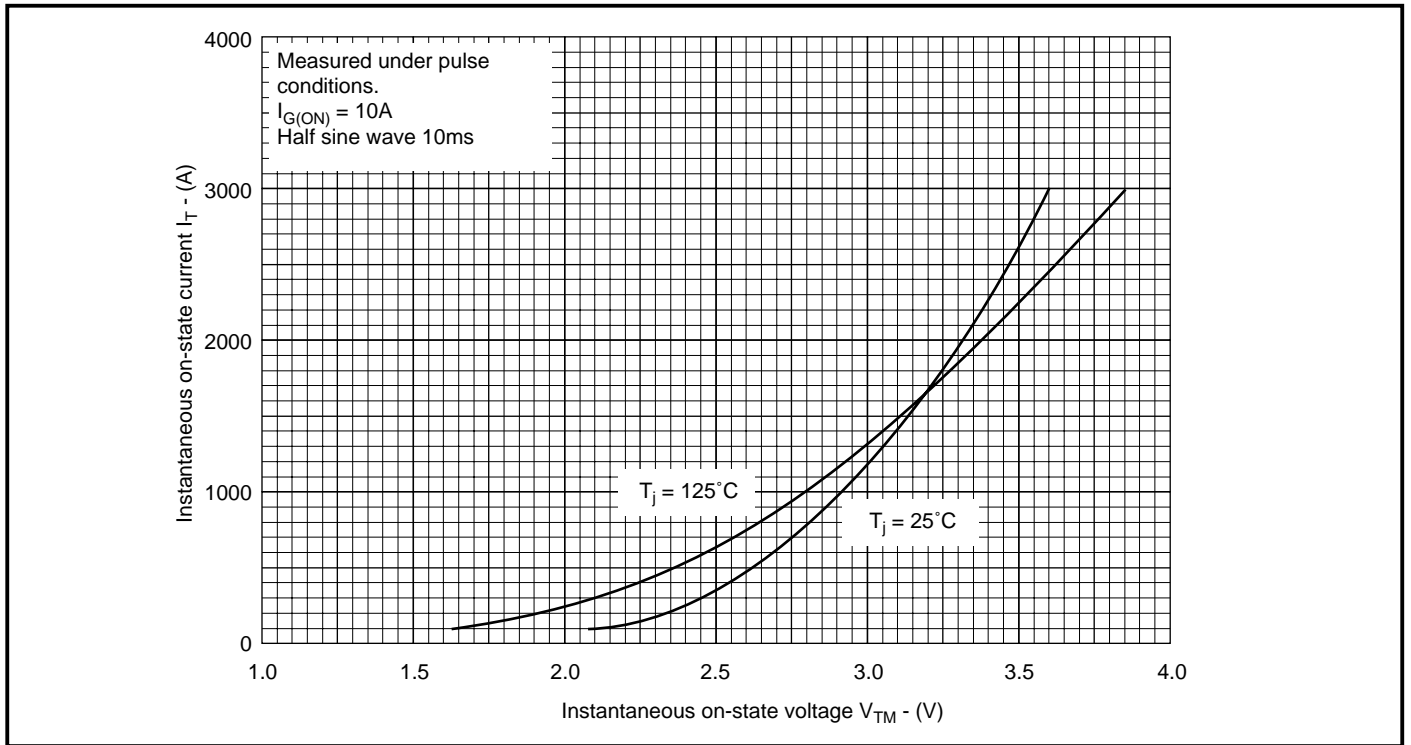
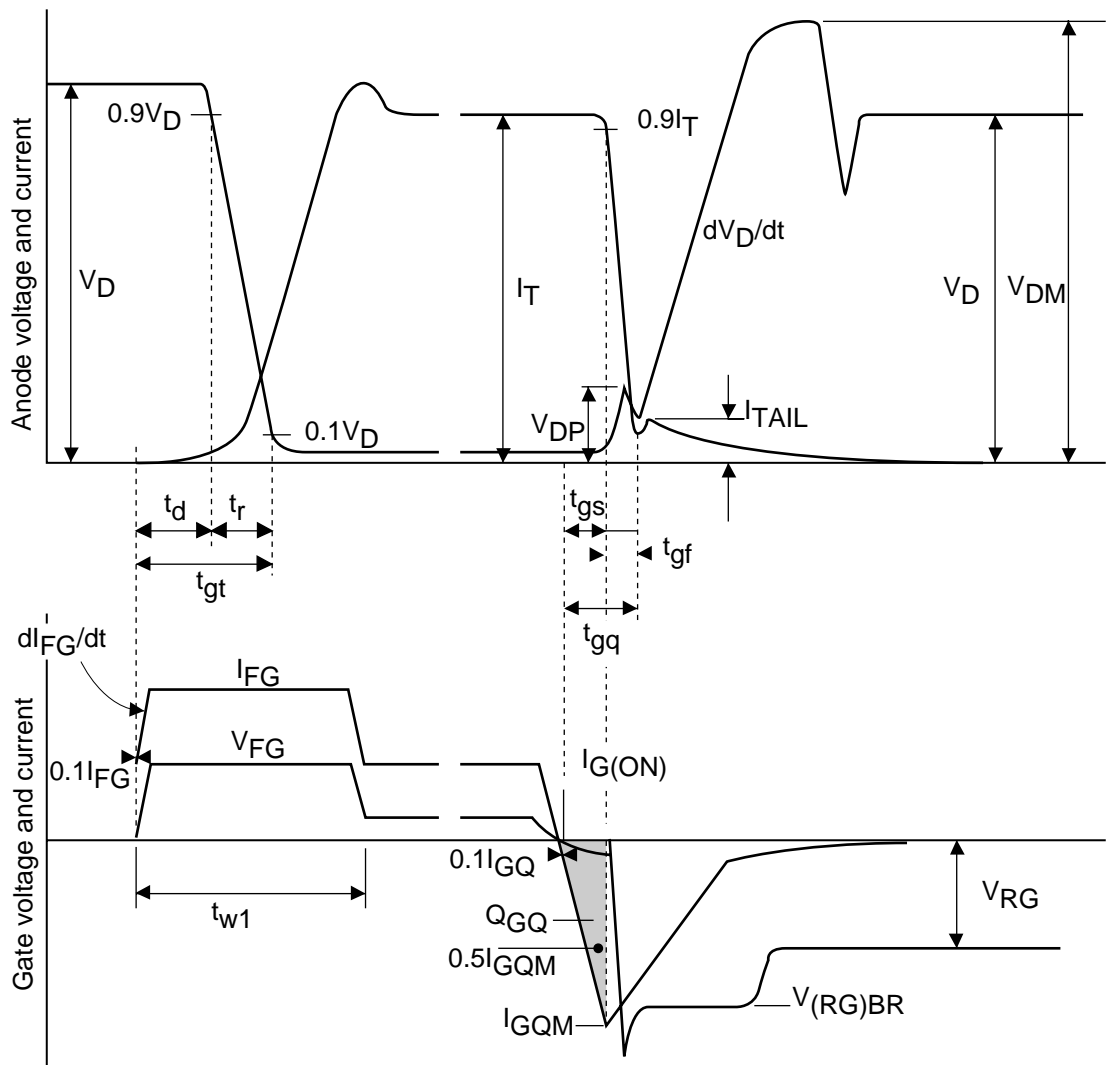


Figure 2. On-state characteristics



Recommended gate conditions:

- $I_{TCM} = 3000A$
- $I_{FG} = 40A$
- $I_{G(ON)} = 10A$  d.c.
- $t_{w1(min)} = 20\mu s$
- $I_{GQM} = 1200A$
- $di_{GQ}/dt = 40A/\mu s$
- $Q_{GQ} = 12500\mu C$
- $V_{RG(min)} = 2V$
- $V_{RG(max)} = 18V$

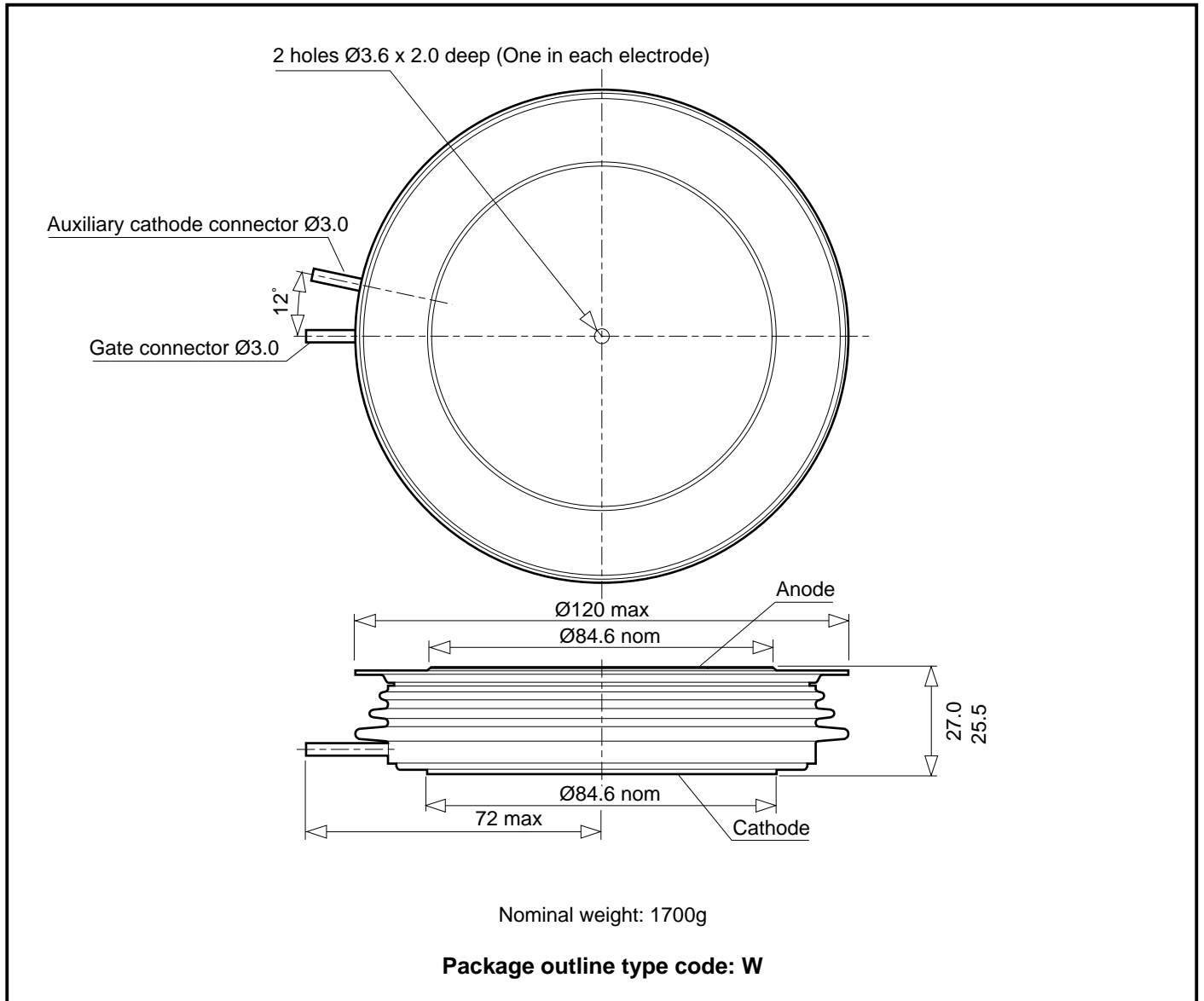
These are recommended Dynex Semiconductor conditions. Other conditions are permitted according to users gate drive specifications.

Figure 3. General switching waveforms

# DG858DW45

## PACKAGE DETAILS

For further package information, please contact Customer Services. All dimensions in mm, unless stated otherwise. DO NOT SCALE.



## 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.



<http://www.dynexsemi.com>

**e-mail: [power\\_solutions@dynexsemi.com](mailto: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: (440) 259-2060. Fax: (440) 259-2059. Tel: (949) 733-3005. Fax: (949) 733-2986.

These offices are supported by Representatives and Distributors in many countries world-wide.  
© Dynex Semiconductor 2003 TECHNICAL DOCUMENTATION – NOT FOR RESALE. PRODUCED IN UNITED KINGDOM

### Datasheet Annotations:

Dynex Semiconductor annotate datasheets in the top right hand corner of the front page, to indicate product status. The annotations are as follows:-

**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.

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.

All brand names and product names used in this publication are trademarks, registered trademarks or trade names of their respective owners.