

FEATURES

- Wide safe operating area
- 10µs short circuit withstand
- Outstanding thermal cycling capability
- Co-pack configuration
- High tolerance of non-uniform clamping pressure

APPLICATIONS

- High voltage DC transmission
- Flexible AC transmission systems
- High reliability inverters
- Motor controllers

ORDERING INFORMATION

Order As:

DPI1600P45C3616

Note: When ordering, please use the complete part number

KEY PARAMETERS

V_{CES}		4500V
$V_{CE(sat)}$	(typ)	2.5V
I_C	(max)	1600A
$I_{C(PK)}$	(max)	3200A

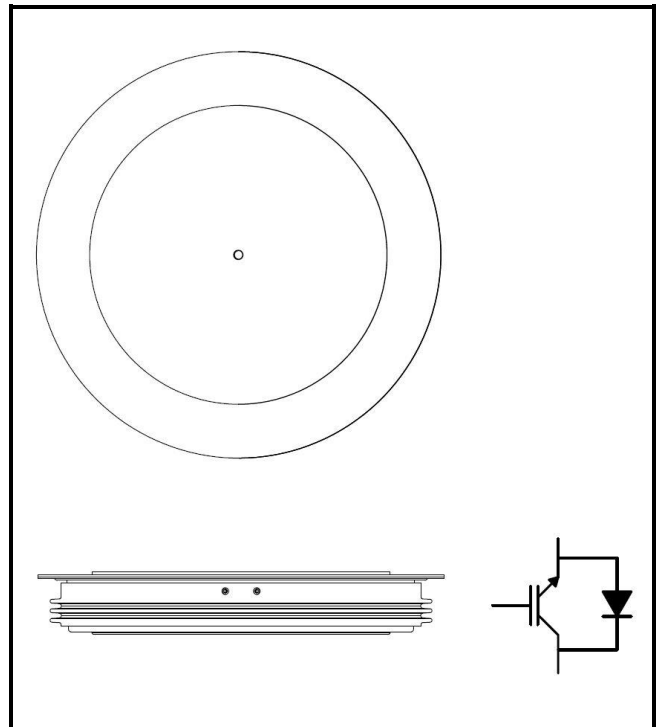
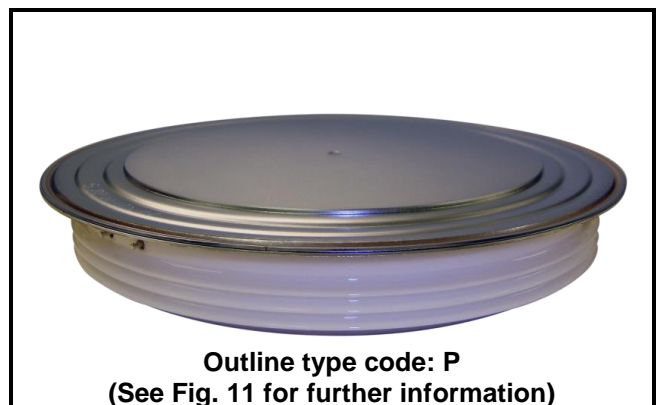


Fig.1 Circuit configuration



Outline type code: P
(See Fig. 11 for further information)

Fig. 2 Package

ABSOLUTE MAXIMUM RATINGS

Stresses above those listed under 'Absolute Maximum Ratings' may cause permanent damage to the device. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture of the package. Appropriate safety precautions should always be followed. Exposure to Absolute Maximum Ratings may affect device reliability.

$T_{case} = 25^{\circ}\text{C}$ unless stated otherwise

Symbol	Parameter	Test Conditions	Max.	Units
V_{CES}	Collector-emitter voltage	$V_{GE} = 0\text{V}$	4500	V
V_{GES}	Gate-emitter voltage	-	± 20	V
I_C	Continuous collector current	$T_{case} = 90^{\circ}\text{C}$	1600	A
$I_{C(PK)}$	Peak collector current	1ms, $T_j = 125^{\circ}\text{C}$	3200	A
P_{max}	Max. transistor power dissipation	$T_{case} = 25^{\circ}\text{C}$, $T_j = 125^{\circ}\text{C}$	15.6	kW
I_{FSM}	Surge (non-repetitive) on-state current	10ms half-sine, $T_{case}=125^{\circ}\text{C}$, $V_R=0\text{V}$	12.6	kA

THERMAL AND MECHANICAL RATINGS

Symbol	Parameter	Test Conditions	Min.	Max.	Units
$R_{th(j-c)}$ *	Thermal resistance – junction to case IGBT (collector side)	DC	-	0.0064	$^{\circ}\text{C/W}$
$R_{th(j-c)}$ *	Thermal resistance – junction to case Diode (cathode side)	DC	-	0.0143	$^{\circ}\text{C/W}$
$R_{th(c-h)}$ *	Thermal resistance – case to heatsink IGBT (collector side)	Clamping force 70kN (with mounting compound)	-	0.0026	$^{\circ}\text{C/W}$
$R_{th(c-h)}$ *	Thermal resistance – case to heatsink Diode (cathode side)	Clamping force 70kN (with mounting compound)	-	0.0059	$^{\circ}\text{C/W}$
T_{vj}	Virtual junction temperature	Transistor	-	125	$^{\circ}\text{C}$
		Diode	-	125	$^{\circ}\text{C}$
T_{stg}	Storage temperature range	-	-40	125	$^{\circ}\text{C}$
F_m	Clamping force	-	65	75	kN

Note:

* Device should be cooled from collector/cathode side only.

ELECTRICAL CHARACTERISTICS
T_{case} = 25°C unless stated otherwise.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I _{CES}	Collector cut-off current	V _{GE} = 0V, V _{CE} = V _{CES}			5	mA
		V _{GE} = 0V, V _{CE} = V _{CES} , T _{case} = 125°C		25	75	mA
I _{GES}	Gate leakage current	V _{GE} = ± 20V, V _{CE} = 0V			10	μA
V _{GE(TH)}	Gate threshold voltage	I _C = 180mA, V _{GE} = V _{CE}		6.1		V
V _{CE(sat)}	Collector-emitter saturation voltage	V _{GE} = 15V, I _C = 1600A, T _j = 25°C		2.5		V
		V _{GE} = 15V, I _C = 1600A, T _j = 125°C		3.0		V
I _F	Diode forward current	DC		1600		A
I _{FM}	Diode maximum forward current	t _p = 1ms		3200		A
V _F	Diode forward voltage	I _F = 1600A, T _j = 25°C		3.2		V
		I _F = 1600A, T _j = 125°C		3.2		V
Q _g	Gate charge	±15V		26		μC
SC _{Data}	Short circuit current, I _{SC}	T _j = 125°C, V _{CC} = 3400V t _p ≤ 10μs, V _{GE} ≤ 15V V _{CE(max)} = V _{CES} - L* x di/dt IEC 60747-9		7000		A

Note:

* L is the circuit inductance

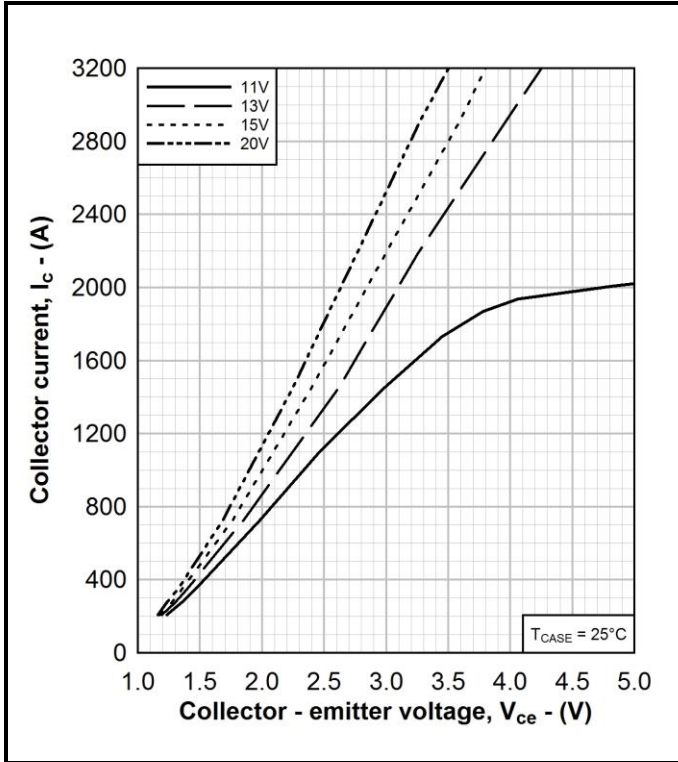
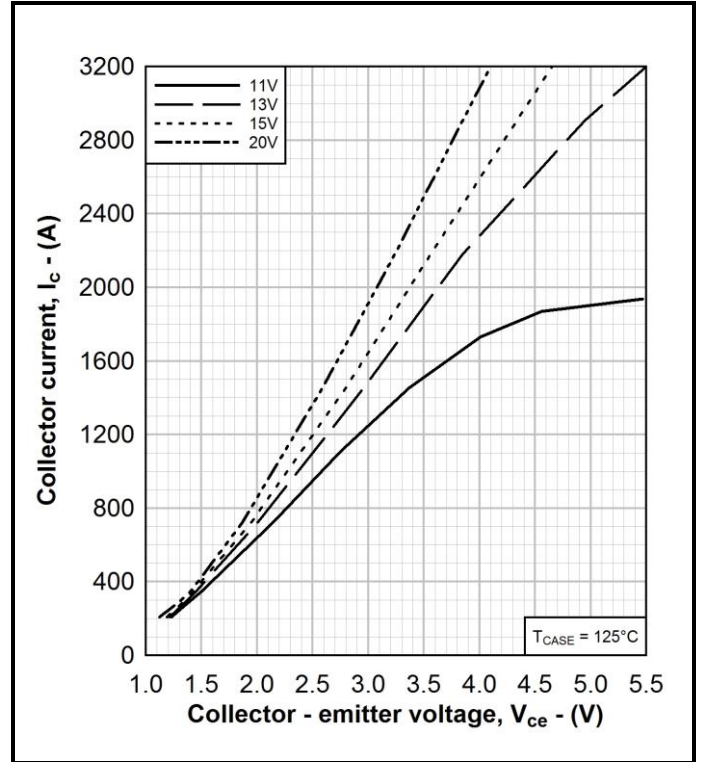
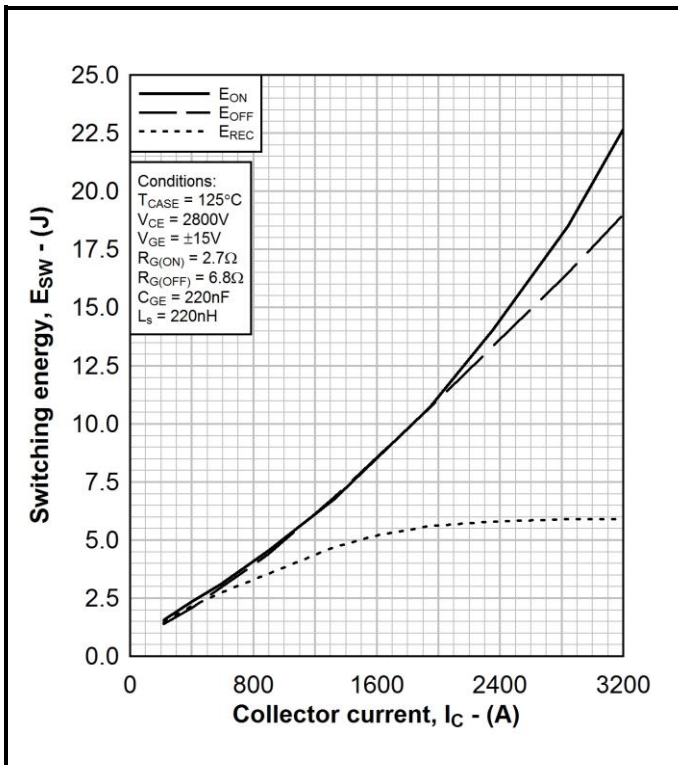
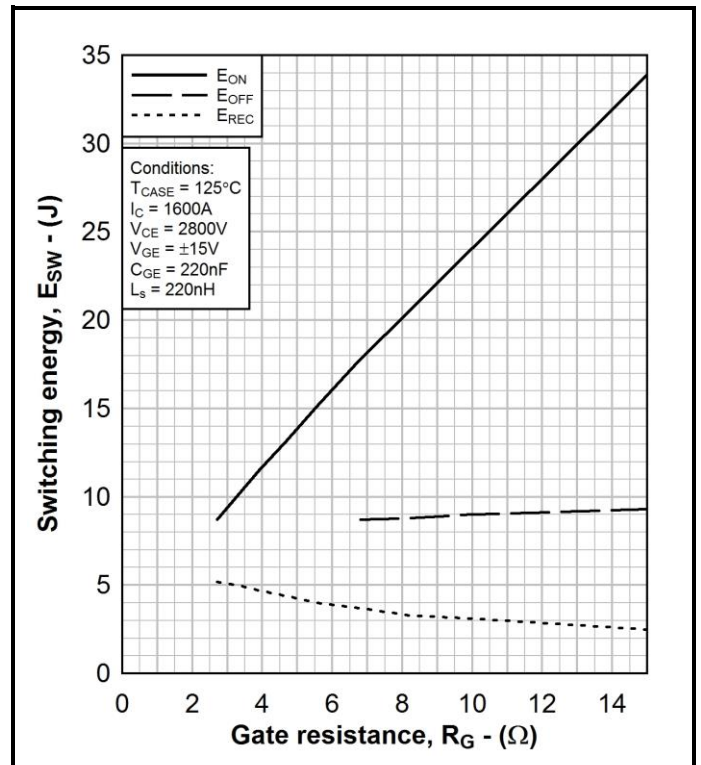
ELECTRICAL CHARACTERISTICS

$T_{case} = 25^{\circ}\text{C}$ unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$t_{d(off)}$	Turn-off delay time	$I_C = 1600\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 2800\text{V}$ $R_{G(ON)} = 2.7\Omega$ $R_{G(OFF)} = 6.8\Omega$ $C_{GE} = 220\text{nF}$ $L_S \sim 220\text{nH}$		4700		ns
t_f	Fall time			1900		ns
E_{OFF}	Turn-off energy loss			7650		mJ
$t_{d(on)}$	Turn-on delay time			940		ns
t_r	Rise time			490		ns
E_{ON}	Turn-on energy loss			5900		mJ
Q_{rr}	Diode reverse recovery charge		$I_F = 1600\text{A}$ $V_{CE} = 2800\text{V}$ $dI_F/dt = 3500\text{A}/\mu\text{s}$		1550	
I_{rr}	Diode reverse recovery current			1250		A
E_{rec}	Diode reverse recovery energy			2700		mJ

$T_{case} = 125^{\circ}\text{C}$ unless stated otherwise

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$t_{d(off)}$	Turn-off delay time	$I_C = 1600\text{A}$ $V_{GE} = \pm 15\text{V}$ $V_{CE} = 2800\text{V}$ $R_{G(ON)} = 2.7\Omega$ $R_{G(OFF)} = 6.8\Omega$ $C_{GE} = 220\text{nF}$ $L_S \sim 220\text{nH}$		4800		ns
t_f	Fall time			2900		ns
E_{OFF}	Turn-off energy loss			8600		mJ
$t_{d(on)}$	Turn-on delay time			820		ns
t_r	Rise time			530		ns
E_{ON}	Turn-on energy loss			8500		mJ
Q_{rr}	Diode reverse recovery charge		$I_F = 1600\text{A}$ $V_{CE} = 2800\text{V}$ $dI_F/dt = 3500\text{A}/\mu\text{s}$		3000	
I_{rr}	Diode reverse recovery current			1550		A
E_{rec}	Diode reverse recovery energy			5200		mJ


Fig. 3 Typical output characteristics

Fig. 4 Typical output characteristics

Fig. 5 Typical switching energy vs. collector current

Fig. 6 Typical switching energy vs. gate resistance

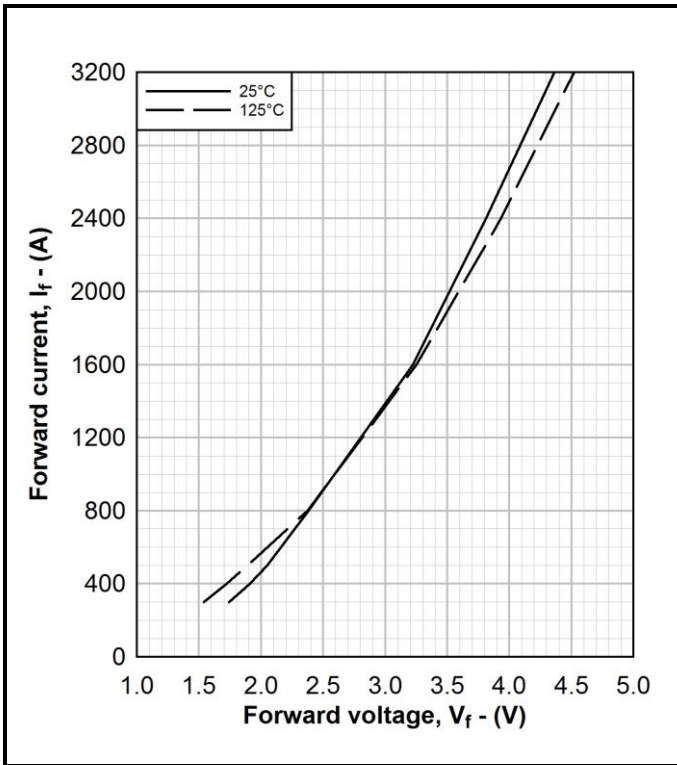


Fig. 7 Diode typical forward characteristics

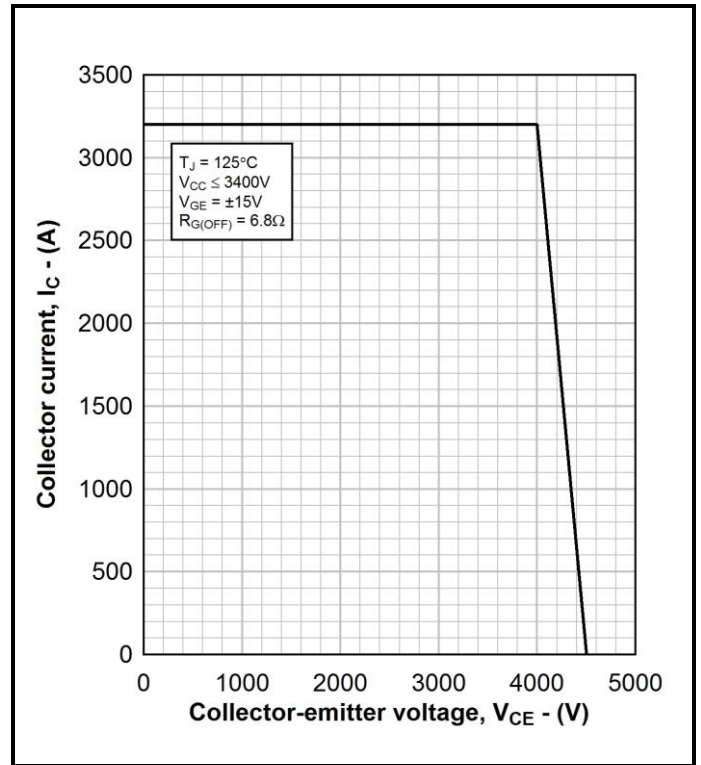


Fig. 8 Reverse bias safe operating area

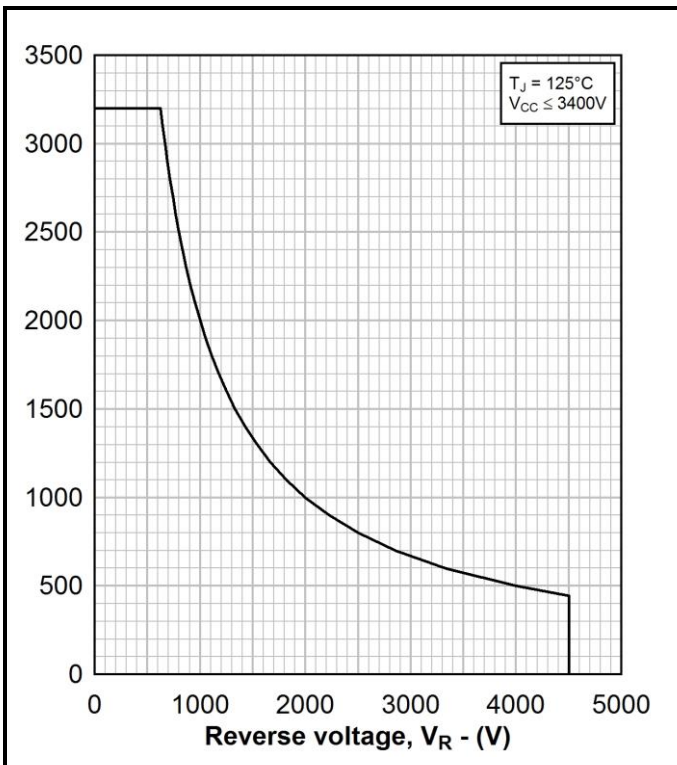


Fig. 9 Diode reverse bias safe operating area

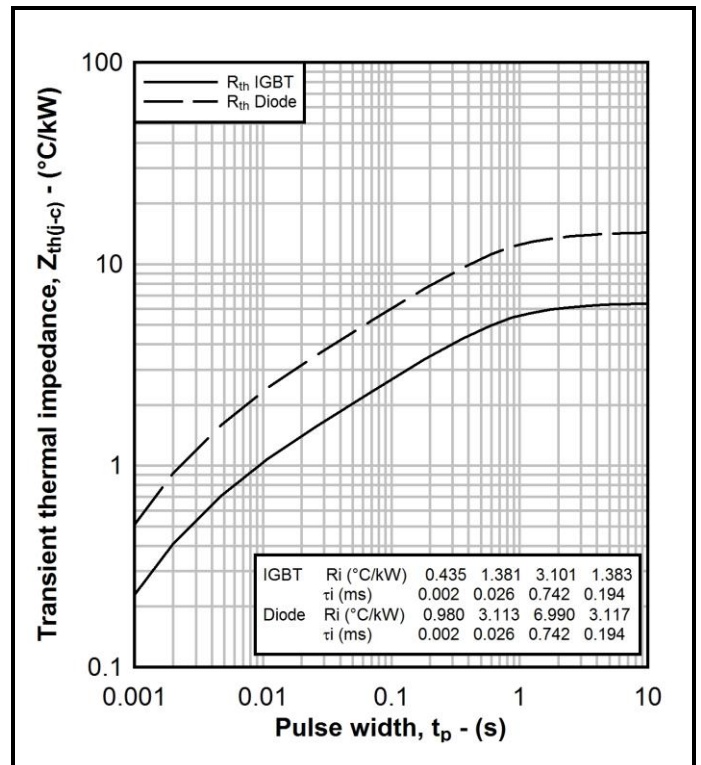


Fig. 10 Transient thermal impedance

PACKAGE DETAILS

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

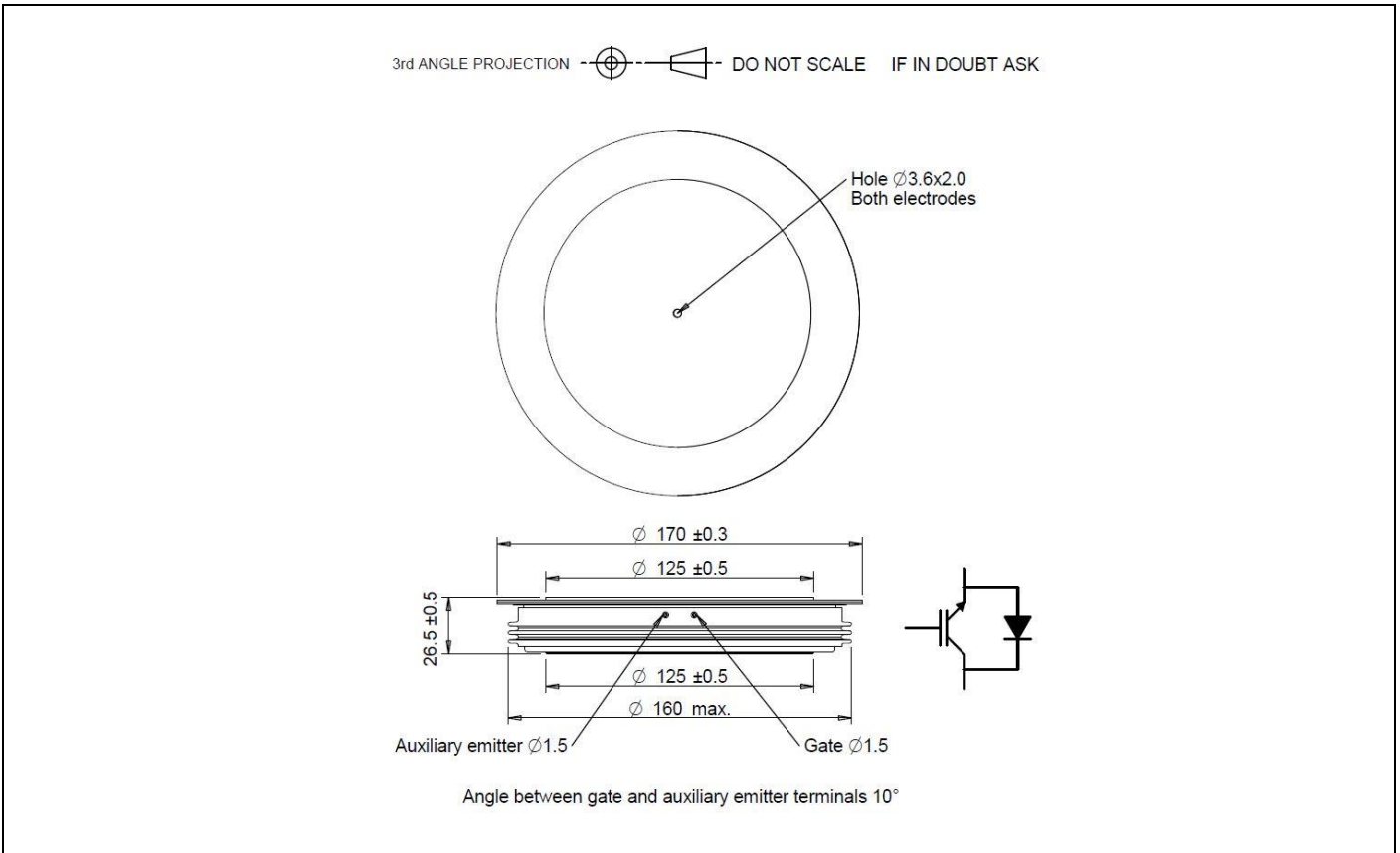


Fig. 11 Package outline

IMPORTANT INFORMATION:

This publication is provided for information only and not for resale.

The products and information in this publication are intended for use by appropriately trained technical personnel.

Due to the diversity of product applications, the information contained herein is provided as a general guide only and does not constitute any guarantee of suitability for use in a specific application. The user must evaluate the suitability of the product and the completeness of the product data for the application. The user is responsible for product selection and ensuring all safety and any warning requirements are met. Should additional product information be needed please contact Customer Service.

Although we have endeavoured to carefully compile the information in this publication it may contain inaccuracies or typographical errors. The information is provided without any warranty or guarantee of any kind.

This publication is an uncontrolled document and is subject to change without notice. When referring to it please ensure that it is the most up to date version and has not been superseded.

The products are not intended for use in applications where a failure or malfunction may cause loss of life, injury or damage to property. The user must ensure that appropriate safety precautions are taken to prevent or mitigate the consequences of a product failure or malfunction.

The products must not be touched when operating because there is a danger of electrocution or severe burning. Always use protective safety equipment such as appropriate shields for the product and wear safety glasses. Even when disconnected any electric charge remaining in the product must be discharged and allowed to cool before safe handling using protective gloves.

Extended exposure to conditions outside the product ratings may affect reliability leading to premature product failure. Use outside the product ratings is likely to cause permanent damage to the product. In extreme conditions, as with all semiconductors, this may include potentially hazardous rupture, a large current to flow or high voltage arcing, resulting in fire or explosion. Appropriate application design and safety precautions should always be followed to protect persons and property.

Product Status & Product Ordering:

We annotate datasheets in the top right hand corner of the front page, to indicate product status if it is not yet fully approved for production. 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 design is complete and final characterisation for volume production is in progress. The datasheet represents the product as it is now understood but details may change.
No Annotation:	The product has been approved for production and unless otherwise notified by Dynex any product ordered will be supplied to the current version of the data sheet prevailing at the time of our order acknowledgement.

All products and materials are sold and services provided subject to Dynex's conditions of sale, which are available on request.

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

HEADQUARTERS OPERATIONS

DYNEX SEMICONDUCTOR LTD

Doddington Road, Lincoln, Lincolnshire, LN6 3LF,
United Kingdom

Fax: +44(0)1522 500550

Tel: +44(0)1522 500500

Web: <http://www.dynexsemi.com>

CUSTOMER SERVICE

DYNEX SEMICONDUCTOR LTD

Doddington Road, Lincoln, Lincolnshire, LN6 3LF,
United Kingdom

Fax: +44(0)1522 500020

Tel: +44(0)1522 502753 / 502901

Email: Power_solutions@dynexsemi.com