

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

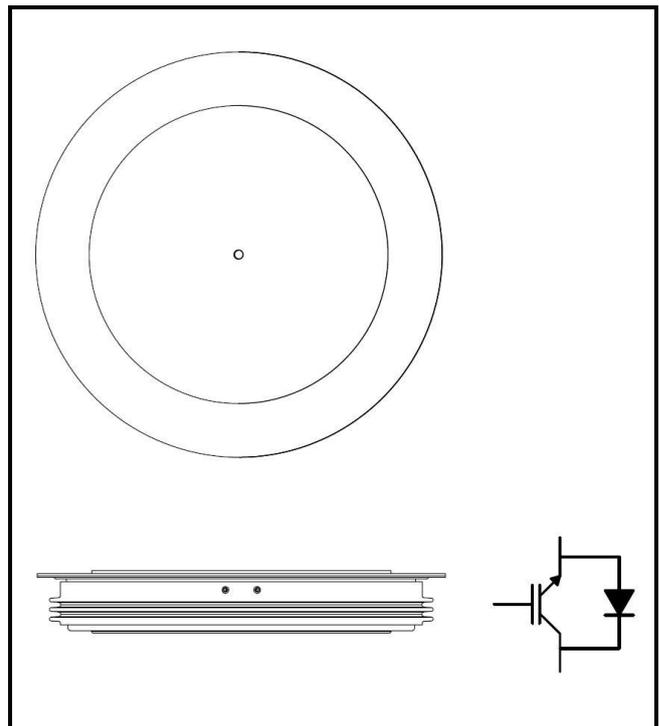
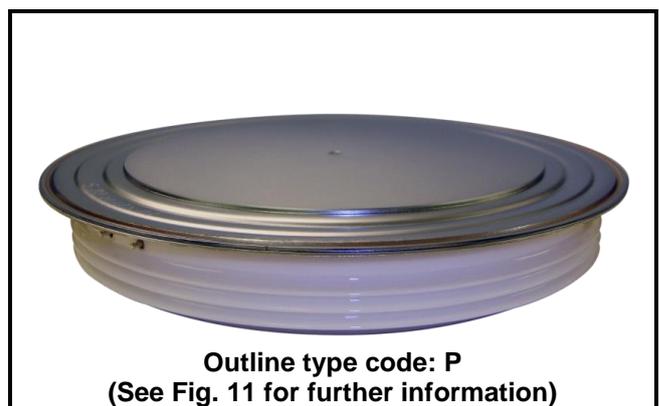


Fig.1 Circuit configuration



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	$V_{GE} = 0V$	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, $T_{case}=125^{\circ}\text{C}$, $V_R=0V$	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

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

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$t_{\text{d(off)}}$	Turn-off delay time	$I_{\text{C}} = 1600\text{A}$ $V_{\text{GE}} = \pm 15\text{V}$ $V_{\text{CE}} = 2800\text{V}$ $R_{\text{G(ON)}} = 2.7\Omega$ $R_{\text{G(OFF)}} = 6.8\Omega$ $C_{\text{GE}} = 220\text{nF}$ $L_{\text{S}} \sim 220\text{nH}$		4700		ns
t_{f}	Fall time			1900		ns
E_{OFF}	Turn-off energy loss			7650		mJ
$t_{\text{d(on)}}$	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		$I_{\text{F}} = 1600\text{A}$ $V_{\text{CE}} = 2800\text{V}$ $dI_{\text{F}}/dt = 3500\text{A}/\mu\text{s}$		1550	
I_{rr}	Diode reverse recovery current			1250		A
E_{rec}	Diode reverse recovery energy			2700		mJ

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

Symbol	Parameter	Test Conditions	Min	Typ.	Max	Units
$t_{\text{d(off)}}$	Turn-off delay time	$I_{\text{C}} = 1600\text{A}$ $V_{\text{GE}} = \pm 15\text{V}$ $V_{\text{CE}} = 2800\text{V}$ $R_{\text{G(ON)}} = 2.7\Omega$ $R_{\text{G(OFF)}} = 6.8\Omega$ $C_{\text{GE}} = 220\text{nF}$ $L_{\text{S}} \sim 220\text{nH}$		4800		ns
t_{f}	Fall time			2900		ns
E_{OFF}	Turn-off energy loss			8600		mJ
$t_{\text{d(on)}}$	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		$I_{\text{F}} = 1600\text{A}$ $V_{\text{CE}} = 2800\text{V}$ $dI_{\text{F}}/dt = 3500\text{A}/\mu\text{s}$		3000	
I_{rr}	Diode reverse recovery current			1550		A
E_{rec}	Diode reverse recovery energy			5200		mJ

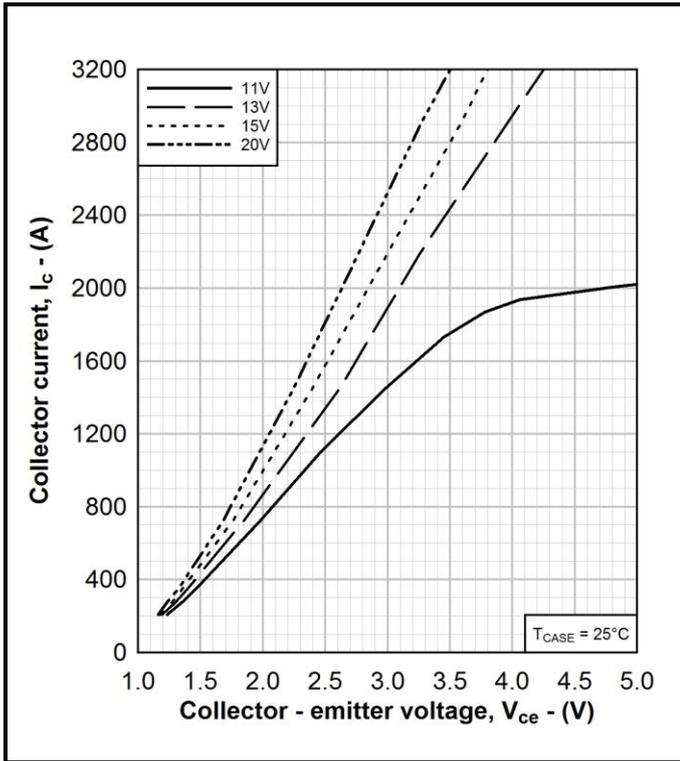


Fig. 3 Typical output characteristics

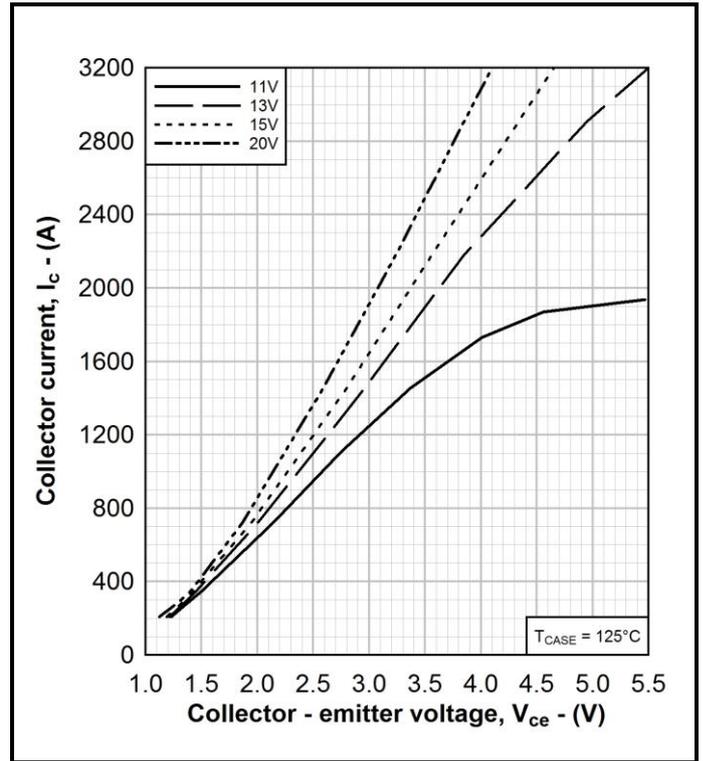


Fig. 4 Typical output characteristics

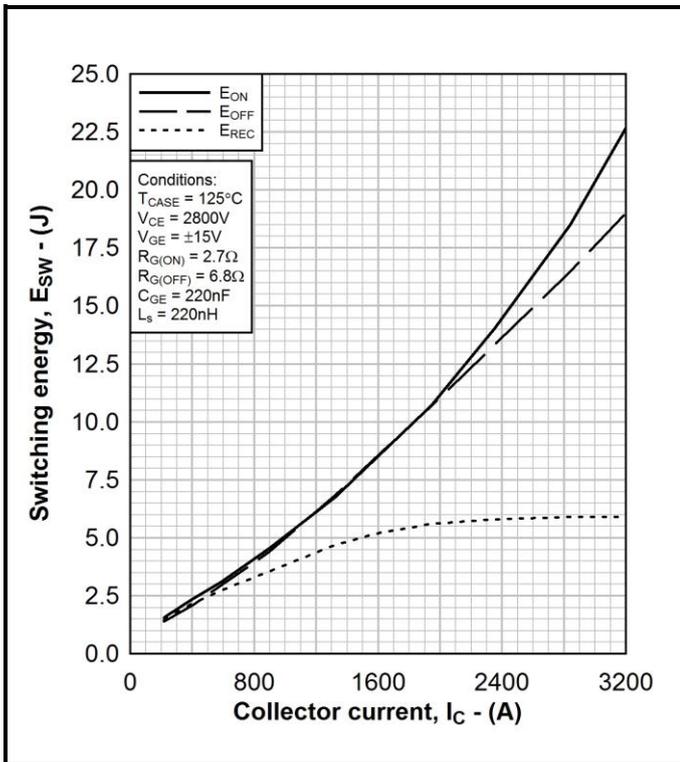


Fig. 5 Typical switching energy vs. collector current

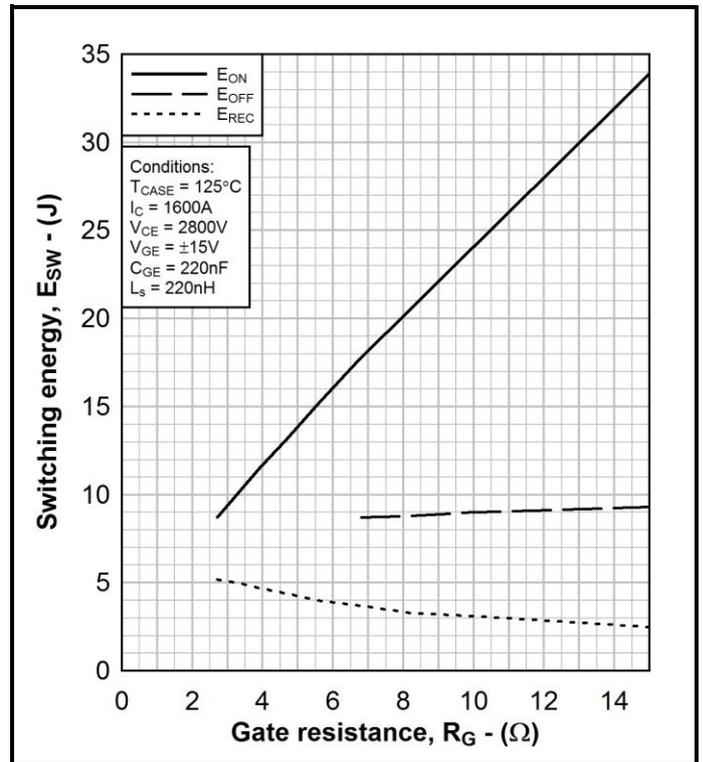


Fig. 6 Typical switching energy vs. gate resistance

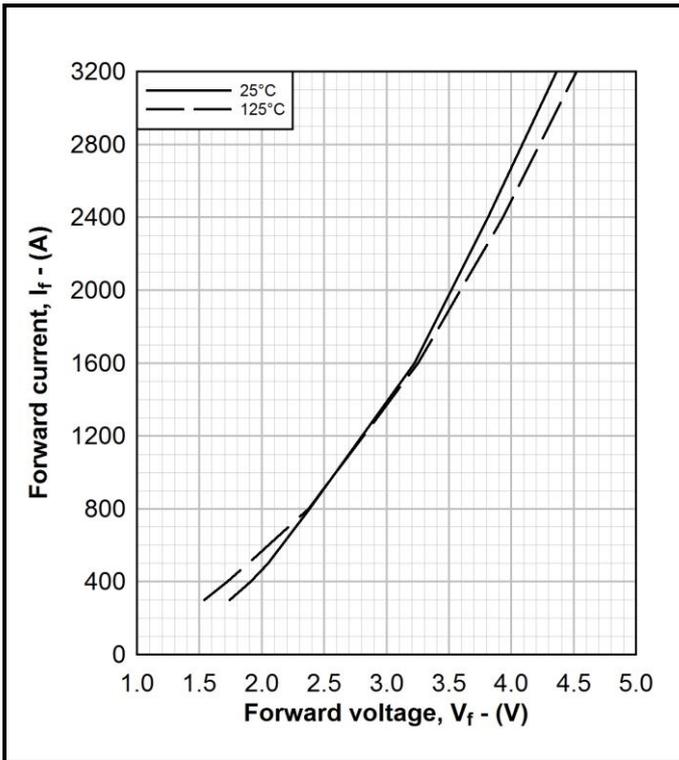


Fig. 7 Diode typical forward characteristics

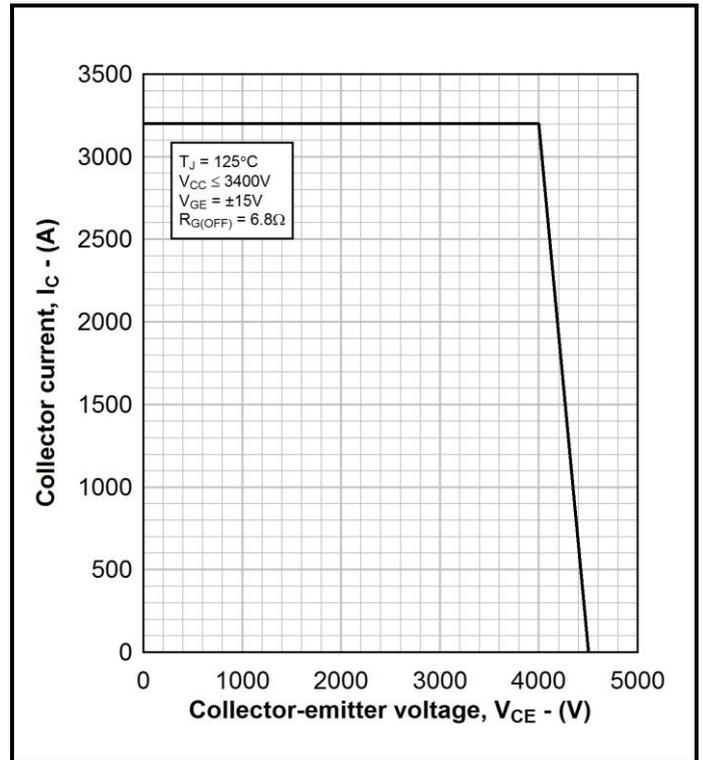


Fig. 8 Reverse bias safe operating area

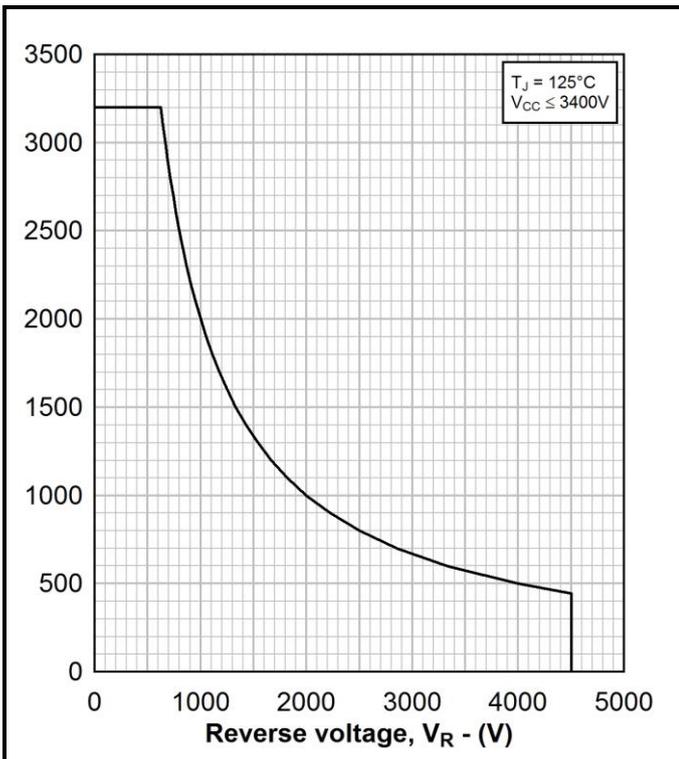


Fig. 9 Diode reverse bias safe operating area

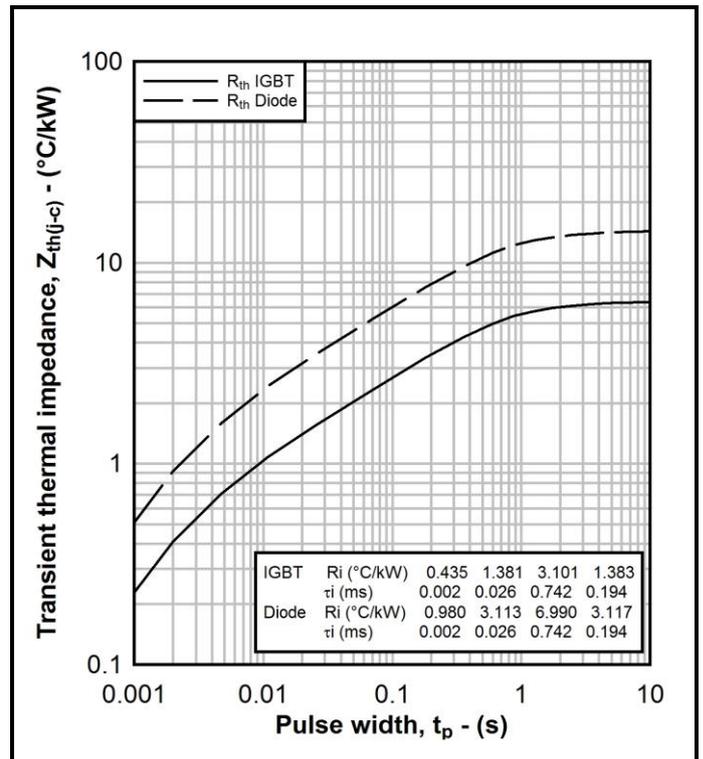


Fig. 10 Transient thermal impedance

PACKAGE DETAILS

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

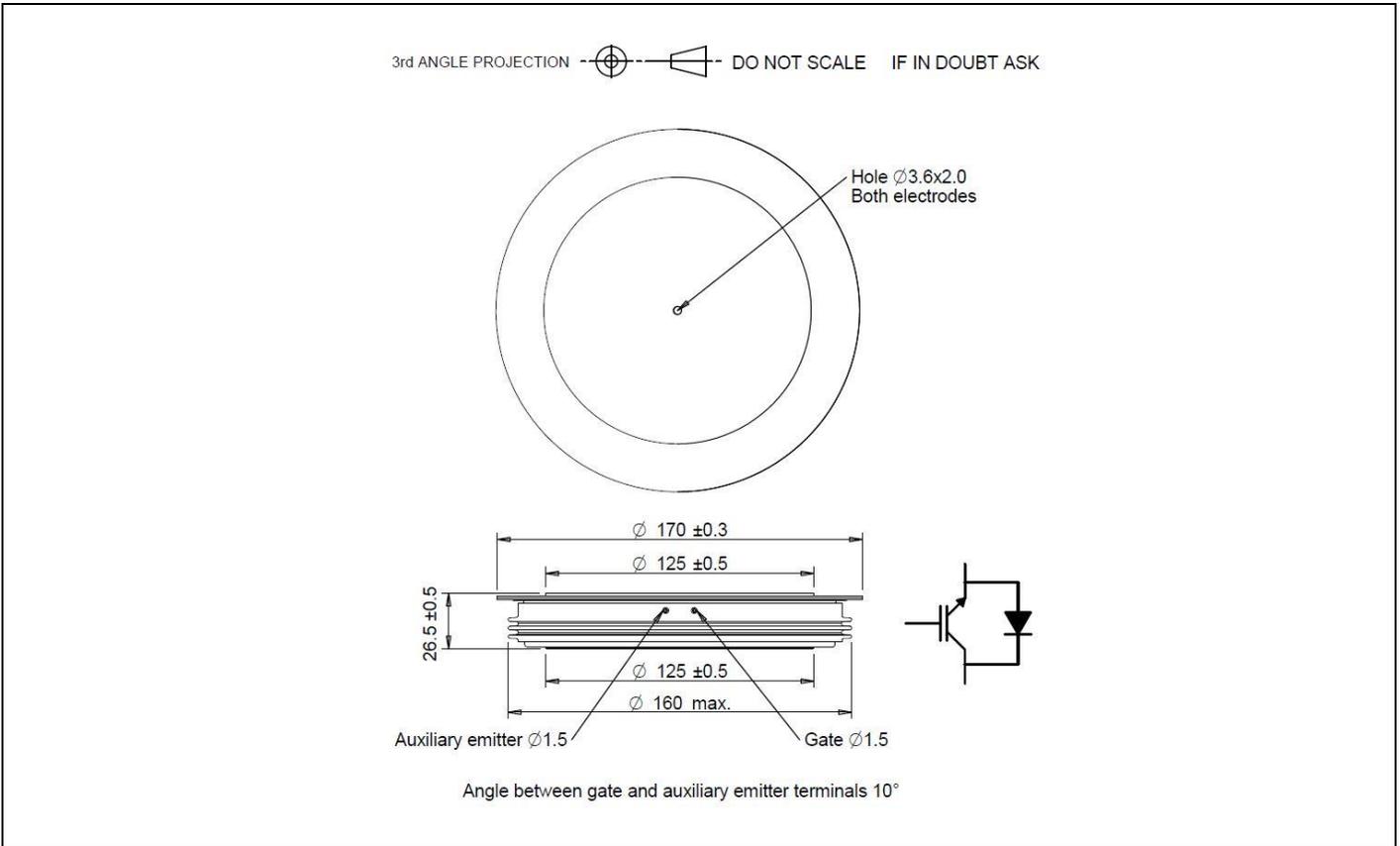


Fig. 11 Package outline

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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.
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