

Advance Data

## Insulated Gate Bi-Polar Transistor Type T1800GB45A

### Absolute Maximum Ratings

	VOLTAGE RATINGS	MAXIMUM LIMITS	UNITS
$V_{CES}$	Collector – emitter voltage	4500	V
$V_{DC\ link}$	Permanent DC voltage for 100 FIT failure rate.	2800	V
$V_{GES}$	Peak gate – emitter voltage	±20	V

	RATINGS	MAXIMUM LIMITS	UNITS
$I_{C(DC)}$	DC collector current, IGBT	1800	A
$I_{CRM}$	Repetitive peak collector current, $t_p=1ms$ , IGBT	3600	A
$I_{F(DC)}$	Continuous DC forward current, Diode	1800	A
$I_{FRM}$	Repetitive peak forward current, $t_p=1ms$ , Diode	3600	A
$I_{FSM}$	Peak non-repetitive surge $t_p=10ms$ , $V_{RM}=60\%V_{RRM}$ , Diode (Note 4)	25.7	kA
$I_{FSM2}$	Peak non-repetitive surge $t_p=10ms$ , $V_{RM}\leq 10V$ , Diode (Note 4)	28.3	kA
$P_{MAX}$	Maximum power dissipation, IGBT (Note 2)	13.7	kW
$(di/dt)_{cr}$	Critical diode di/dt (note 3)	3000	A/ $\mu s$
$T_j$	Operating temperature range.	-40 to +125	°C
$T_{stg}$	Storage temperature range.	-40 to +125	°C

Notes: -

- 1) Unless otherwise indicated  $T_j = 125^\circ C$ .
- 2)  $T_{sink} = 25^\circ C$ , double side cooled.
- 3) Maximum commutation loop inductance 200nH.
- 4) Half-sinewave,  $125^\circ C$   $T_j$  initial.

## Characteristics

### IGBT Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
V <sub>CE(sat)</sub>	Collector – emitter saturation voltage	-	2.8	3.2	I <sub>C</sub> = 1800A, V <sub>GE</sub> = 15V, T <sub>j</sub> = 25°C	V
		-	3.6	4.0	I <sub>C</sub> = 1800A, V <sub>GE</sub> = 15V	V
V <sub>T0</sub>	Threshold voltage	-	-	1.82	Current range: 600 – 1800A	V
r <sub>T</sub>	Slope resistance	-	-	1.21		mΩ
V <sub>GE(TH)</sub>	Gate threshold voltage	-	5.3	-	V <sub>CE</sub> = V <sub>GE</sub> , I <sub>C</sub> = 180mA	V
I <sub>CES</sub>	Collector – emitter cut-off current	-	20	70	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V	mA
I <sub>GES</sub>	Gate leakage current	-	-	±20	V <sub>GE</sub> = ±20V	µA
C <sub>ies</sub>	Input capacitance	-	280	-	V <sub>CE</sub> = 25V, V <sub>GE</sub> = 0V, f = 1MHz	nF
t <sub>d(on)</sub>	Turn-on delay time	-	1.6	-	I <sub>C</sub> = 1800A, V <sub>CE</sub> = 2800V, di/dt = 3000A/µs	µs
t <sub>r(V)</sub>	Rise time	-	3.3	-		µs
Q <sub>g(on)</sub>	Turn-on gate charge	-	10	-	V <sub>GE</sub> = ±15V, L <sub>S</sub> = 200nH	µC
E <sub>on</sub>	Turn-on energy	-	12.6	-	R <sub>g(ON)</sub> = 2.8Ω, R <sub>g(OFF)</sub> = 3Ω, C <sub>GE</sub> = 183nF	J
t <sub>d(off)</sub>	Turn-off delay time	-	4	-	Integral diode used as freewheel diode (Note 3, 4 & 5)	µs
t <sub>f(I)</sub>	Fall time	-	2	-		µs
Q <sub>g(off)</sub>	Turn-off gate charge	-	20	-		µC
E <sub>off</sub>	Turn-off energy	-	9.5	-		J
I <sub>SC</sub>	Short circuit current	-	5500	-	V <sub>GE</sub> = +15V, V <sub>CC</sub> = 2800V, V <sub>CEmax</sub> ≤ V <sub>CES</sub> , t <sub>p</sub> ≤ 10µs	A

### Diode Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
V <sub>F</sub>	Forward voltage	-	3.7	4.0	I <sub>F</sub> = 1800A, T <sub>j</sub> = 25°C	V
		-	3.9	4.2	I <sub>F</sub> = 1800A	V
V <sub>To</sub>	Threshold voltage	-	-	2.27	Current range 600-1800A	V
r <sub>T</sub>	Slope resistance	-	-	1.07		mΩ
I <sub>rm</sub>	Peak reverse recovery current	-	1600	-	I <sub>F</sub> = 1800A, V <sub>r</sub> = 2800V, V <sub>GE</sub> = -15V, di/dt = 3000A/µs	A
Q <sub>rr</sub>	Recovered charge	-	1850	-		µC
t <sub>rr</sub>	Reverse recovery time, 50% chord	-	1.6	-		µs
E <sub>r</sub>	Reverse recovery energy	-	2.3	-		J

### Thermal Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
R <sub>thJK</sub>	Thermal resistance junction to sink, IGBT	-	-	7.3	Double side cooled	K/kW
		-	-	11.9	Collector side cooled	K/kW
		-	-	19	Emitter side cooled	K/kW
R <sub>thJK</sub>	Thermal resistance junction to sink, Diode	-	-	14.4	Double side cooled	K/kW
		-	-	22.3	Cathode side cooled	K/kW
		-	-	41.1	Anode side cooled	K/kW
F	Mounting force	50	-	70	Note 2	kN
W <sub>t</sub>	Weight	-	2	-		kg

Notes:-

- 1) Unless otherwise indicated T<sub>j</sub> = 125°C.
- 2) Consult application note 2008AN01 for detailed mounting requirements
- 3) C<sub>GE</sub> is additional gate – emitter capacitance added to output of gate drive
- 4) E<sub>on</sub> integration time 15µs from 10% rising I<sub>C</sub>.
- 5) E<sub>off</sub> integration time 15µs from 90% falling V<sub>GE</sub>.

**Curves**

Figure 1 – Typical collector-emitter saturation voltage characteristics

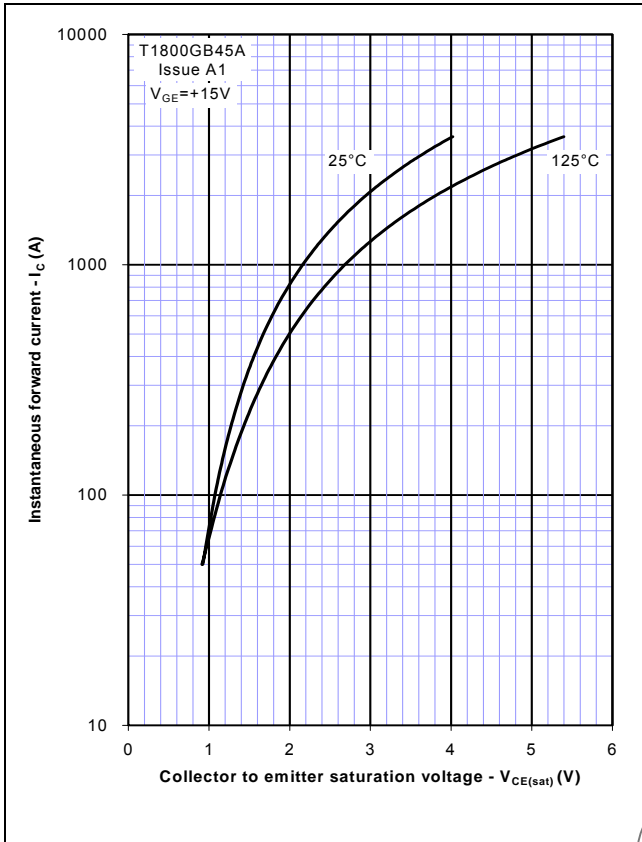


Figure 2 – Typical output characteristic

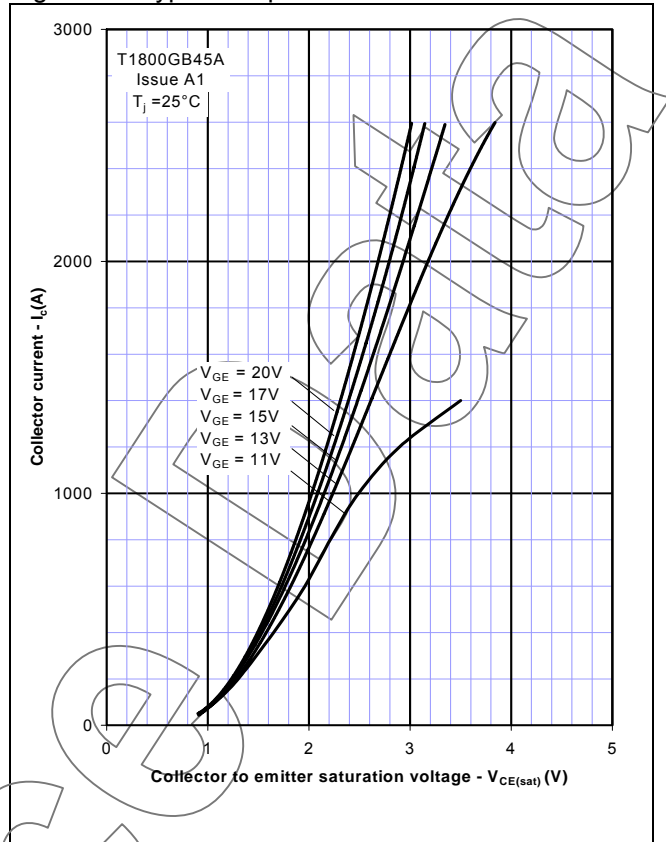


Figure 3 – Typical output characteristic

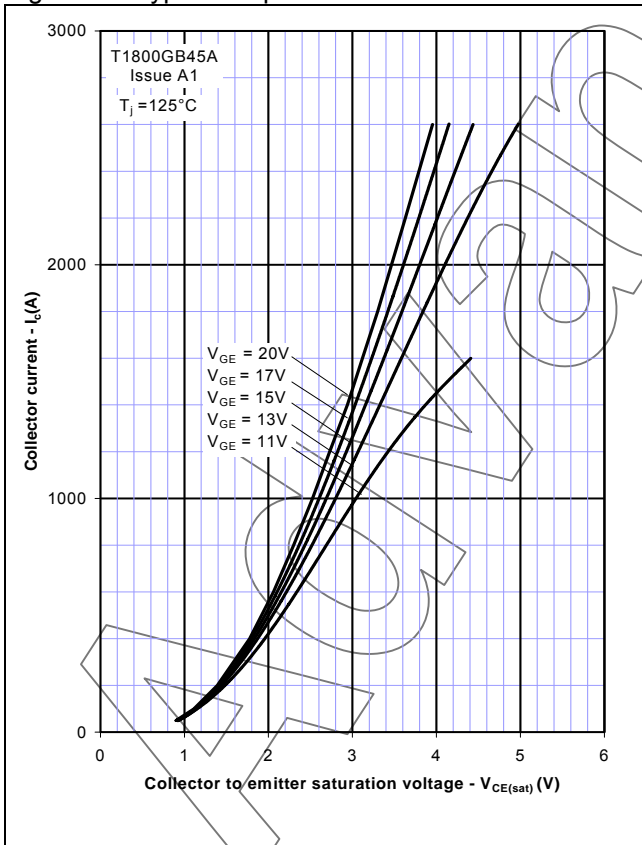


Figure 4 – Typical turn-on delay time vs gate resistance

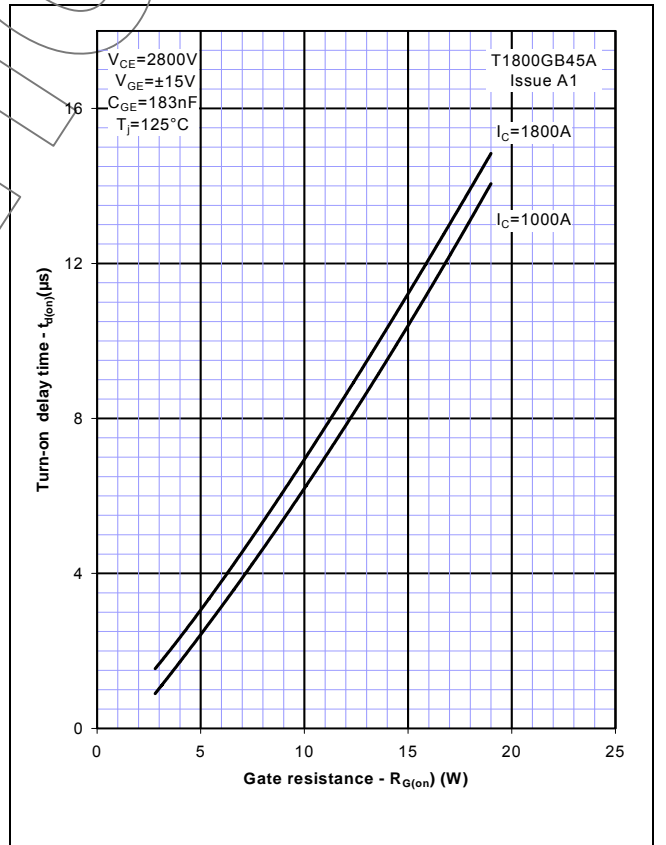


Figure 5 – Typical turn-off delay time vs. gate resistance

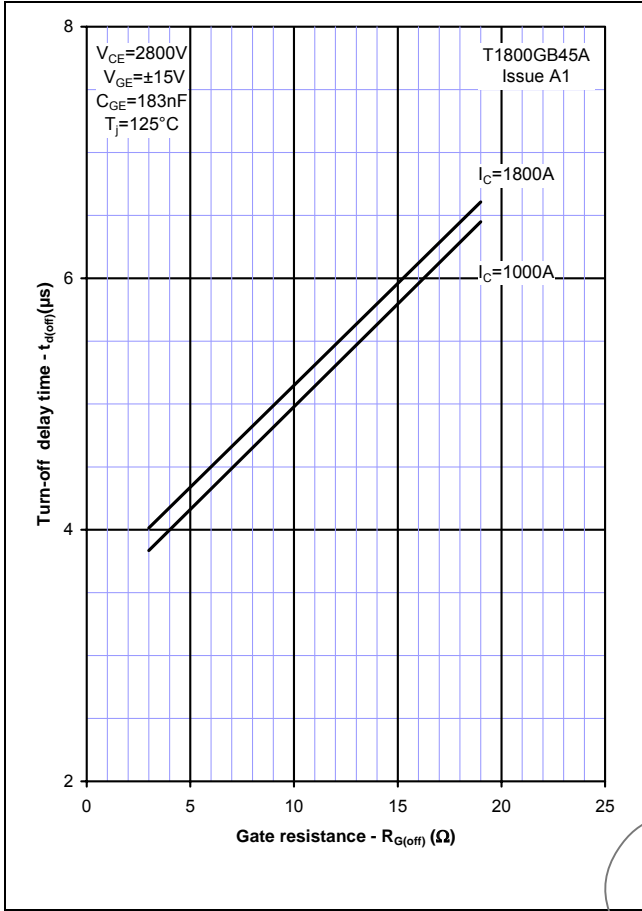


Figure 6 – Typical turn-on energy vs. collector current

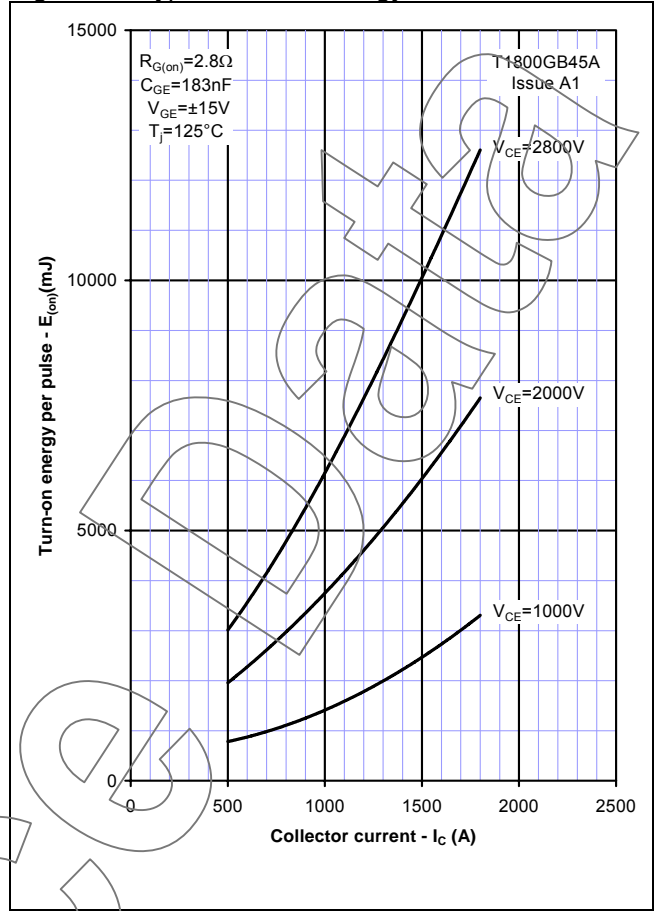


Figure 7 – Typical turn-on energy vs. di/dt

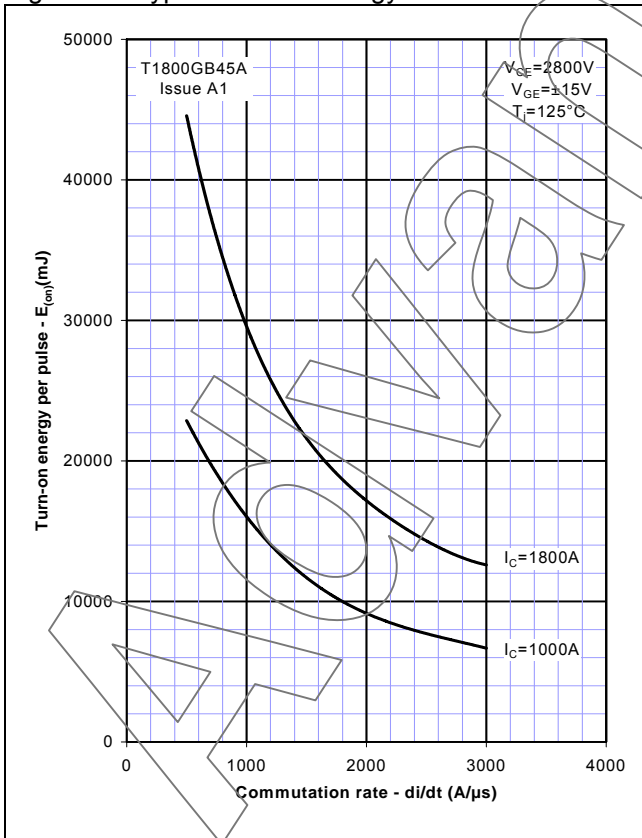


Figure 8 – Typical turn-off energy vs. collector current

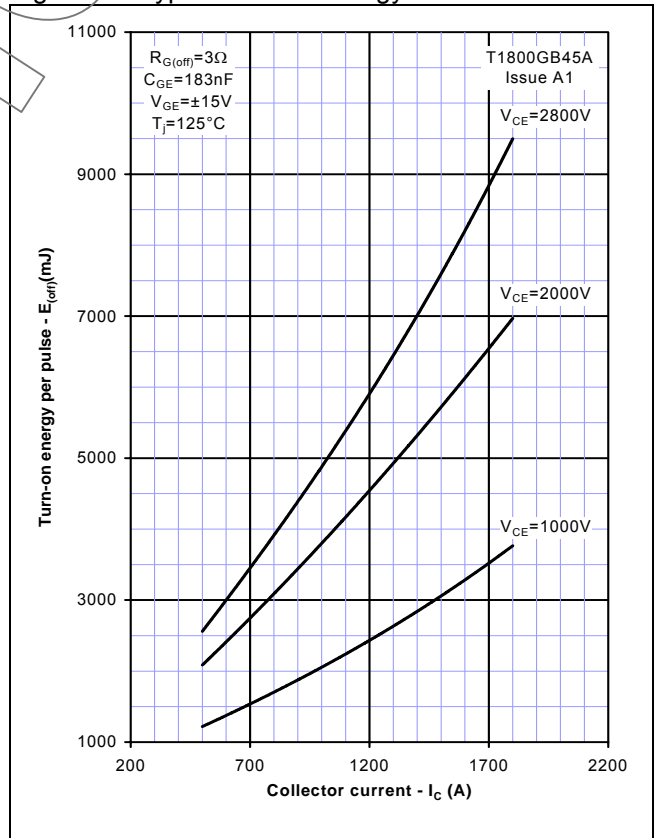


Figure 9 – Turn-off energy vs voltage

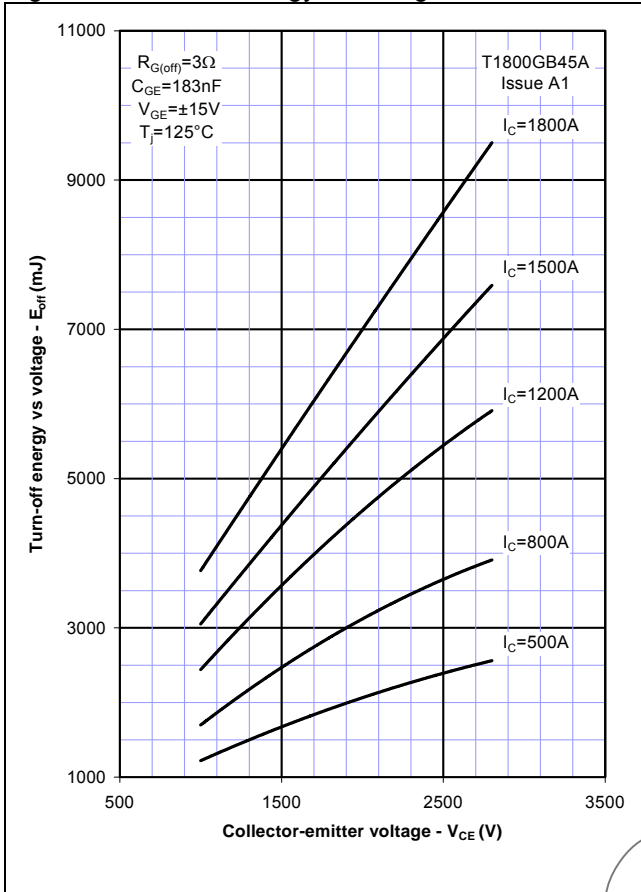


Figure 10 – Safe operating area

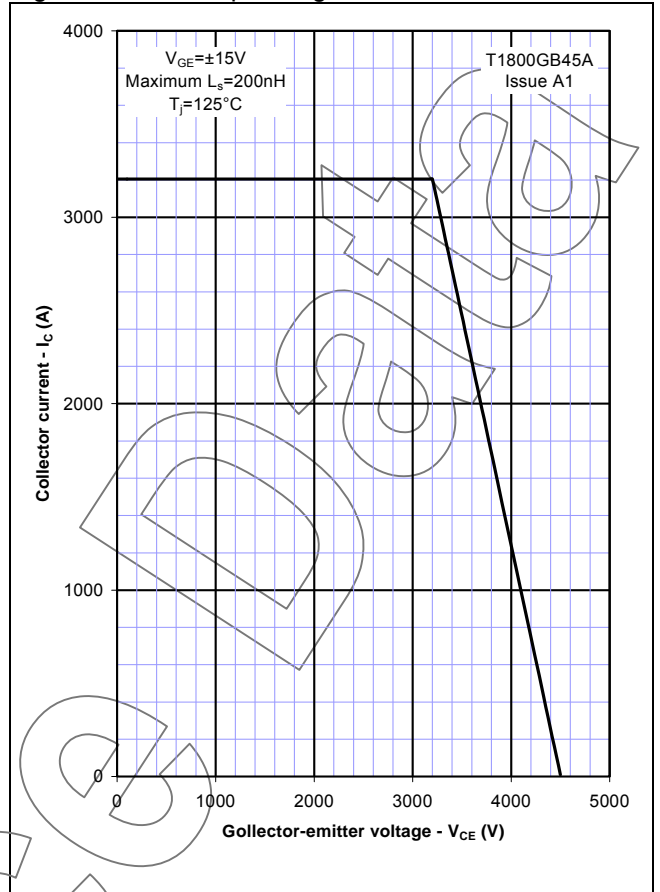


Figure 11 – Typical diode forward characteristics

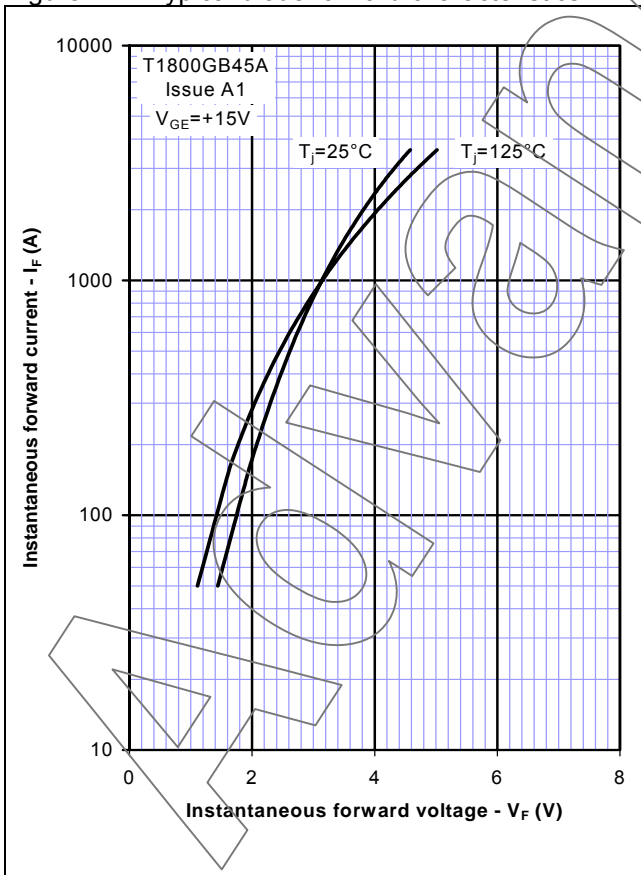


Figure 12 – Typical recovered charge

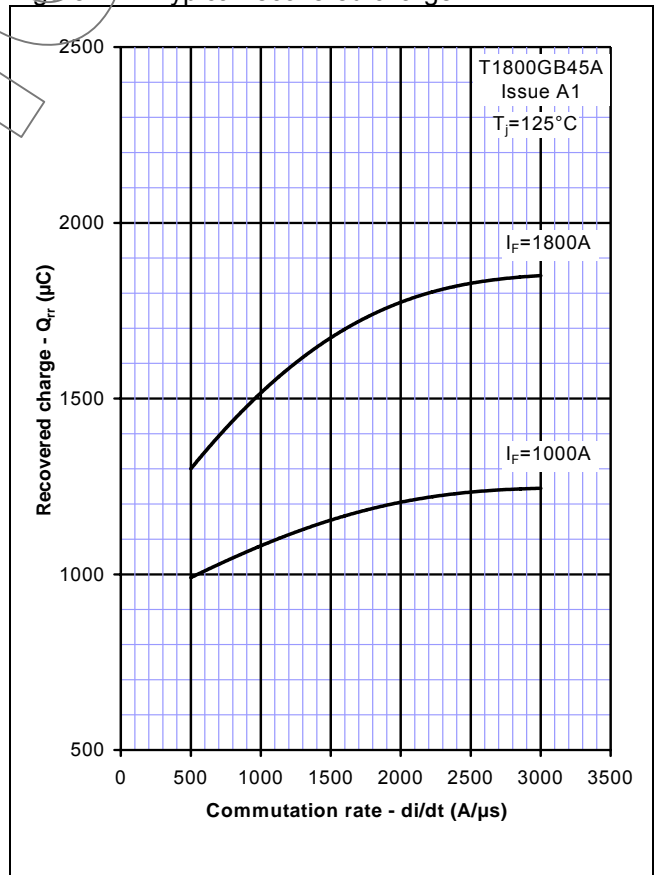


Figure 13 – Typical reverse recovery current

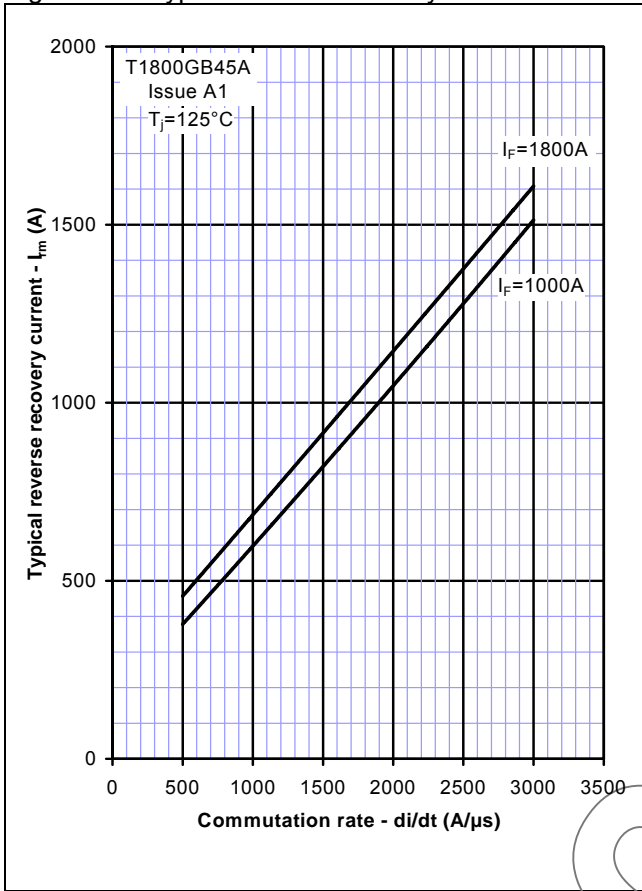


Figure 14 – Typical reverse recovery time

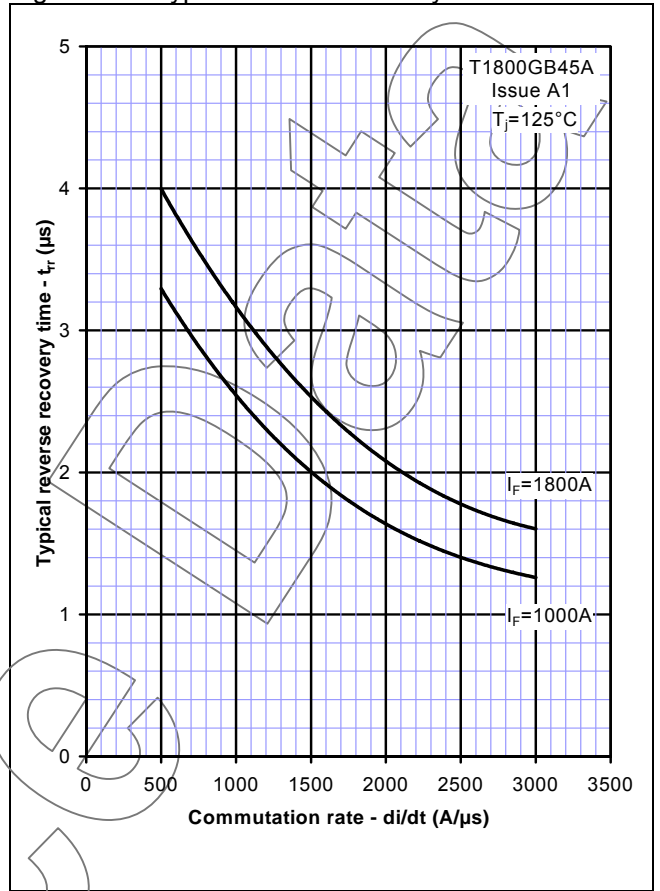


Figure 15 – Transient thermal impedance (IGBT)

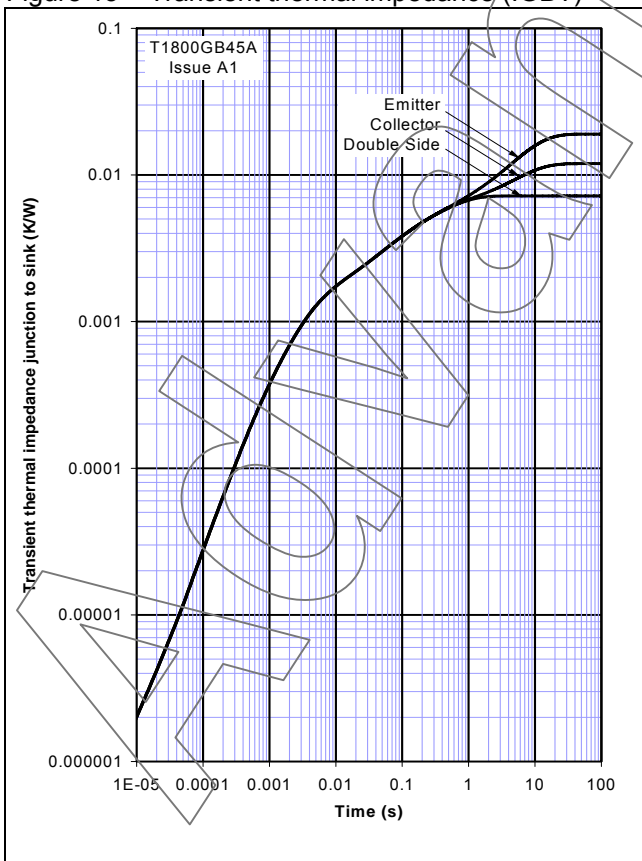
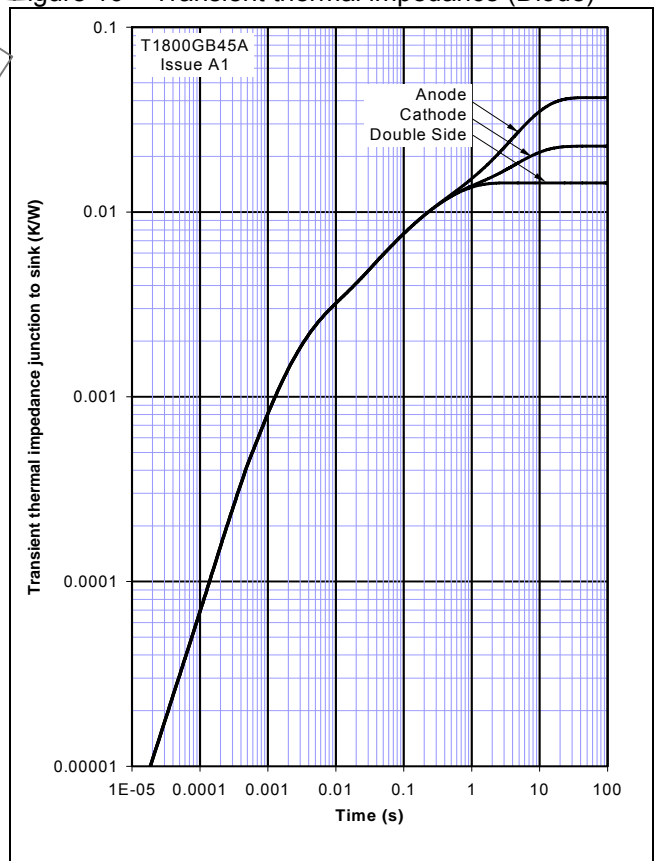
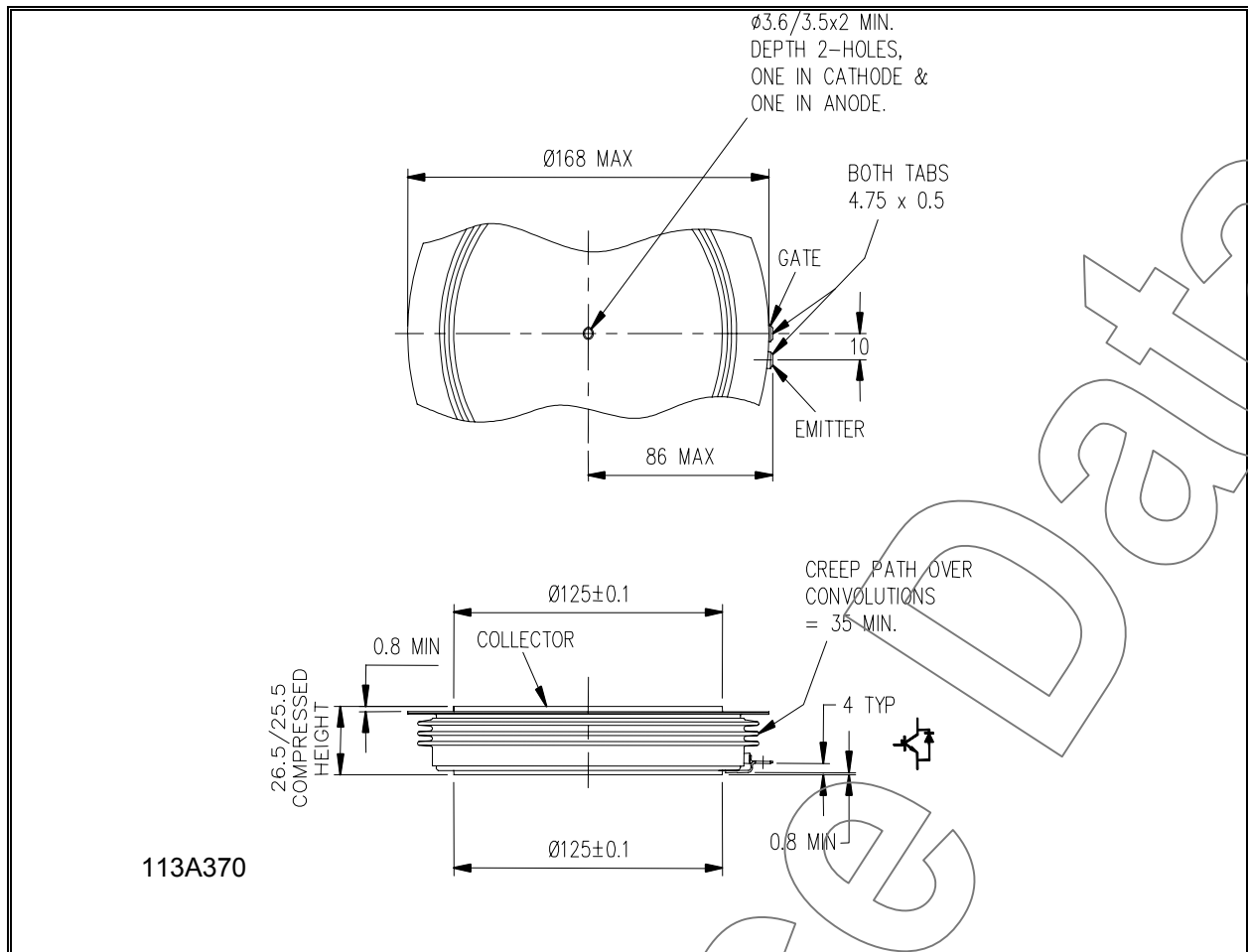


Figure 16 – Transient thermal impedance (Diode)



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(Please quote 10 digit code as below)			
<b>T1800</b>	<b>GB</b>	<b>45</b>	<b>A</b>
Fixed type Code	Fixed Outline Code	Voltage Grade $V_{CES}/100$ 45	Fixed format code
Typical order code: T1800GB45A ( $V_{CES} = 4500V$ )			

**IXYS Semiconductor GmbH**  
 Edisonstraße 15  
 D-68623 Lampertheim  
 Tel: +49 6206 503-0  
 Fax: +49 6206 503-627  
 E-mail: [marcom@ixys.de](mailto:marcom@ixys.de)

**WESTCODE**  
 An IXYS Company

**Westcode Semiconductors Ltd**  
 Langley Park Way, Langley Park,  
 Chippenham, Wiltshire, SN15 1GE.  
 Tel: +44 (0)1249 444524  
 Fax: +44 (0)1249 659448  
 E-mail: [WSL.sales@westcode.com](mailto:WSL.sales@westcode.com)

**IXYS Corporation**  
 1590 Buckeye Drive  
 Milpitas CA 95035-7418  
 Tel: +1 (408) 457 9000  
 Fax: +1 (408) 496 0670  
 E-mail: [sales@ixys.net](mailto:sales@ixys.net)

[www.westcode.com](http://www.westcode.com)

[www.ixys.net](http://www.ixys.net)

**IXYS Long Beach**  
 IXYS Long Beach, Inc  
 2500 Mira Mar Ave, Long Beach  
 CA 90815  
 Tel: +1 (562) 296 6584  
 Fax: +1 (562) 296 6585  
 E-mail: [service@ixyslongbeach.com](mailto:service@ixyslongbeach.com)

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