



Tentative Data

# Insulated Gate Bi-Polar Transistor

## Type T1500EC33E

### Absolute Maximum Ratings

	VOLTAGE RATINGS	MAXIMUM LIMITS	UNITS
$V_{CES}$	Collector – emitter voltage	3300	V
$V_{DC\ link}$	Permanent DC voltage for 100 FIT failure rate.	1800	V
$V_{GES}$	Peak gate – emitter voltage	$\pm 20$	V

	RATINGS	MAXIMUM LIMITS	UNITS
$I_C$	Continuous DC collector current, IGBT	1500	A
$I_{CRM}$	Repetitive peak collector current, $t_p=1ms$ , IGBT	3000	A
$I_{ECO}$	Maximum reverse emitter current, $t_p=100\mu s$ , (note 2 & 3)	3000	A
$P_{MAX}$	Maximum power dissipation, IGBT (note 2)	9.6	kW
$T_{j\ op}$	Operating temperature range	-40 to +125	$^{\circ}C$
$T_{stg}$	Storage temperature range	-40 to +125	$^{\circ}C$

Notes: -

- 1) Unless otherwise indicated  $T_j = 125^{\circ}C$ .
- 2)  $T_{sink} = 25^{\circ}C$ , double side cooled.
- 3) Maximum commutation loop inductance 300nH.

## Characteristics

### IGBT Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
V <sub>CE(sat)</sub>	Collector – emitter saturation voltage	-	2.57	2.97	I <sub>C</sub> = 1500A, V <sub>GE</sub> = 15V, T <sub>j</sub> = 25°C	V
		-	3.40	3.80	I <sub>C</sub> = 1500A, V <sub>GE</sub> = 15V	V
V <sub>0</sub>	Threshold voltage	-	-	1.79	Current range: 500A – 1500A	V
r <sub>s</sub>	Slope resistance	-	-	1.34		mΩ
V <sub>GE(TH)</sub>	Gate threshold voltage	-	5.3	-	V <sub>CE</sub> = V <sub>GE</sub> , I <sub>C</sub> = 125mA	V
I <sub>CES</sub>	Collector – emitter cut-off current	-	13	40	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V	mA
I <sub>GES</sub>	Gate leakage current	-	-	±15	V <sub>GE</sub> = ±20V	μA
C <sub>ies</sub>	Input capacitance	-	200	-	V <sub>CE</sub> = 25V, V <sub>GE</sub> = 0V, f = 1MHz	nF
t <sub>d(on)</sub>	Turn-on delay time	-	1.7	-	I <sub>C</sub> = 1500A, V <sub>CE</sub> = 1800V, di/dt = 2700A/μs	μs
t <sub>r(V)</sub>	Rise time	-	1.6	-		μs
Q <sub>g(on)</sub>	Turn-on gate charge	-	25	-	V <sub>GE</sub> = ±15V, L <sub>s</sub> = 320μH	μC
E <sub>on</sub>	Turn-on energy	-	3.9	-	R <sub>G(ON)</sub> = 1.5Ω, R <sub>G(OFF)</sub> = 10Ω, C <sub>GE</sub> = TBC	J
t <sub>d(off)</sub>	Turn-off delay time	-	5.3	-	Freewheel diode type E1500MC33E at T <sub>j</sub> = 125°C	μs
t <sub>f(I)</sub>	Fall time	-	1.5	-		μs
Q <sub>g(off)</sub>	Turn-off gate charge	-	20	-	(Notes 3, 4 & 5)	μC
E <sub>off</sub>	Turn-off energy	-	4.1	-		J
I <sub>sc</sub>	Short circuit current	-	4500	-	V <sub>GE</sub> = +15V, V <sub>CC</sub> = 1800V, V <sub>CEmax</sub> ≤ V <sub>CES</sub> , t <sub>p</sub> ≤ 10μs	A

### Thermal Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
R <sub>thJK</sub>	Thermal resistance junction to sink, IGBT	-	-	10.4	Double side cooled	K/kW
		-	-	17	Collector side cooled	K/kW
		-	-	26.9	Emitter side cooled	K/kW
F	Mounting force	25	-	35	Note 2	kN
W <sub>t</sub>	Weight	-	1.2	-		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 circuit.
- 4) E<sub>on</sub> integration time 15μs from 10% rising I<sub>G</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

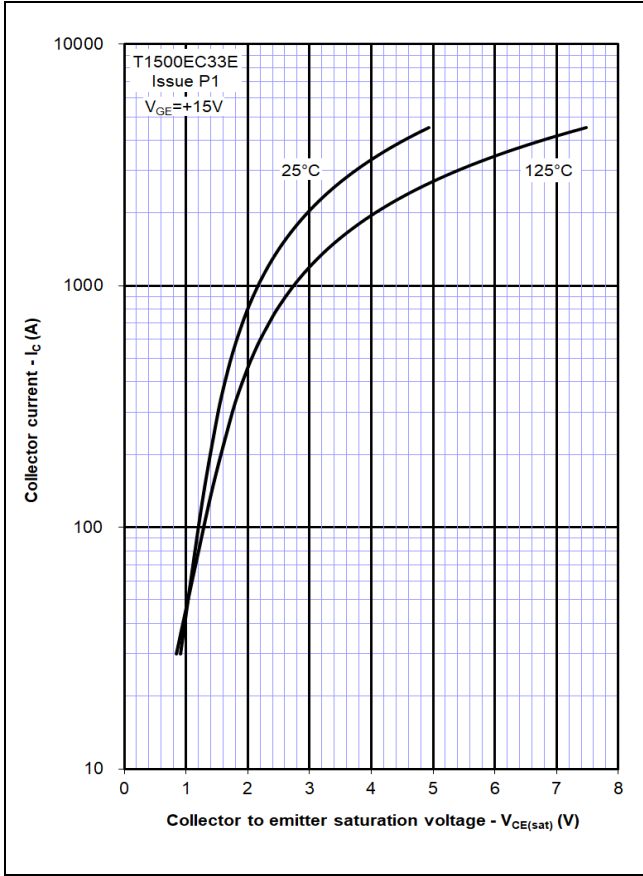


Figure 2 – Typical output characteristic

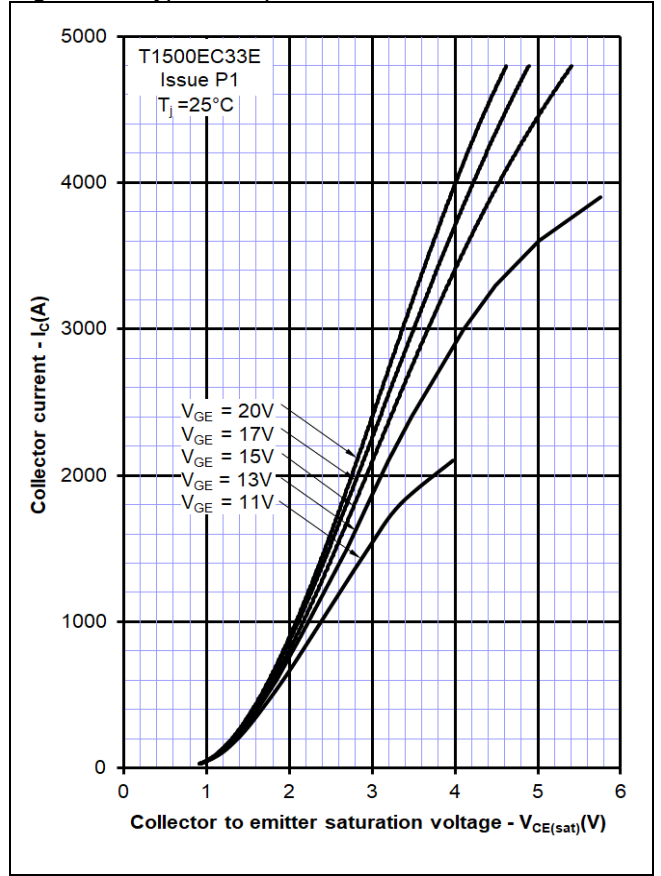


Figure 3 – Typical output characteristic

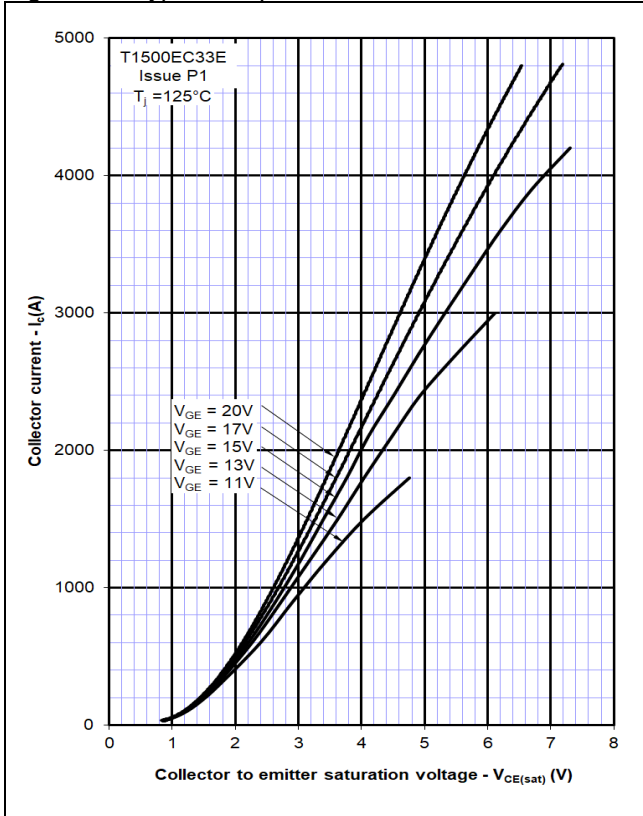


Figure 4 – Typical turn-on delay time vs gate resistance

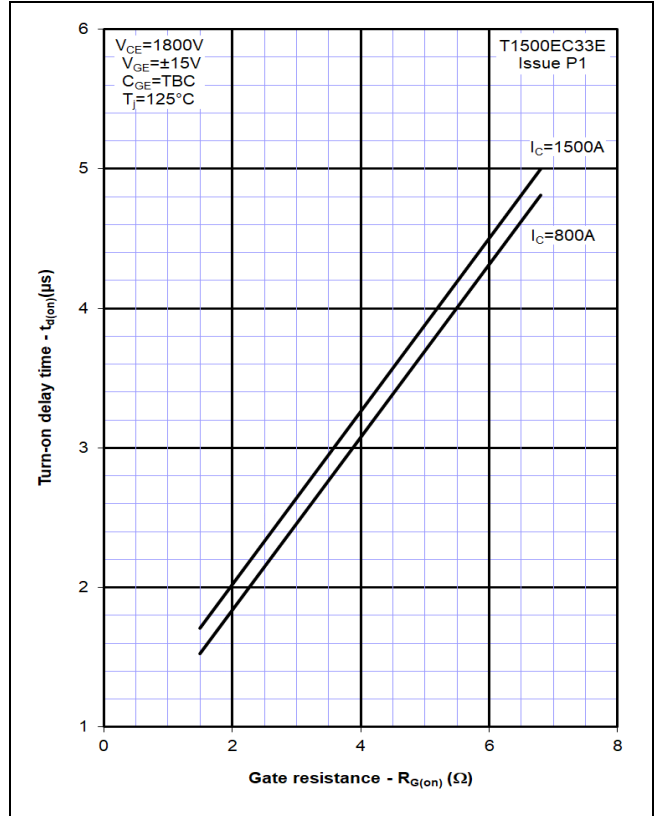


Figure 5 – Typical turn-off delay time vs. gate resistance

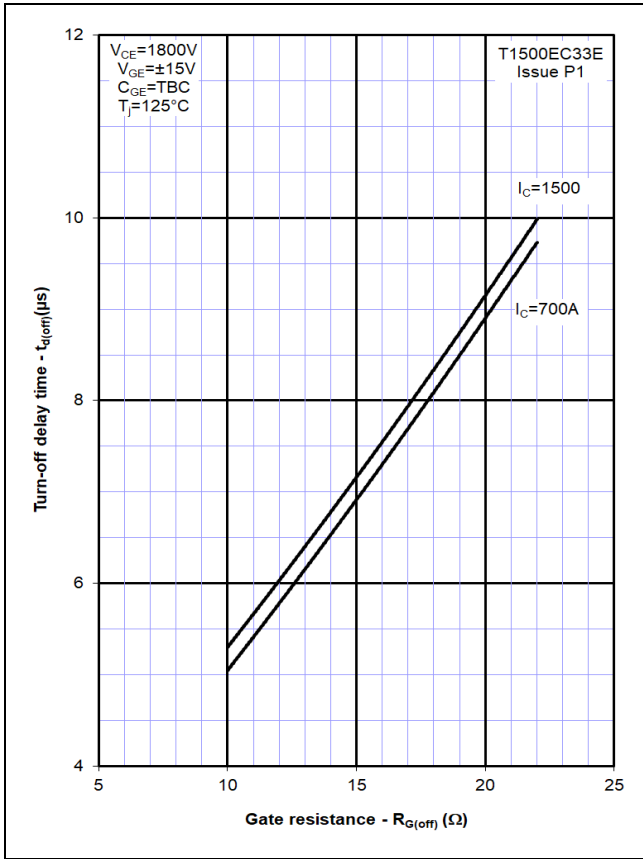


Figure 6 – Typical turn-on energy vs. collector current

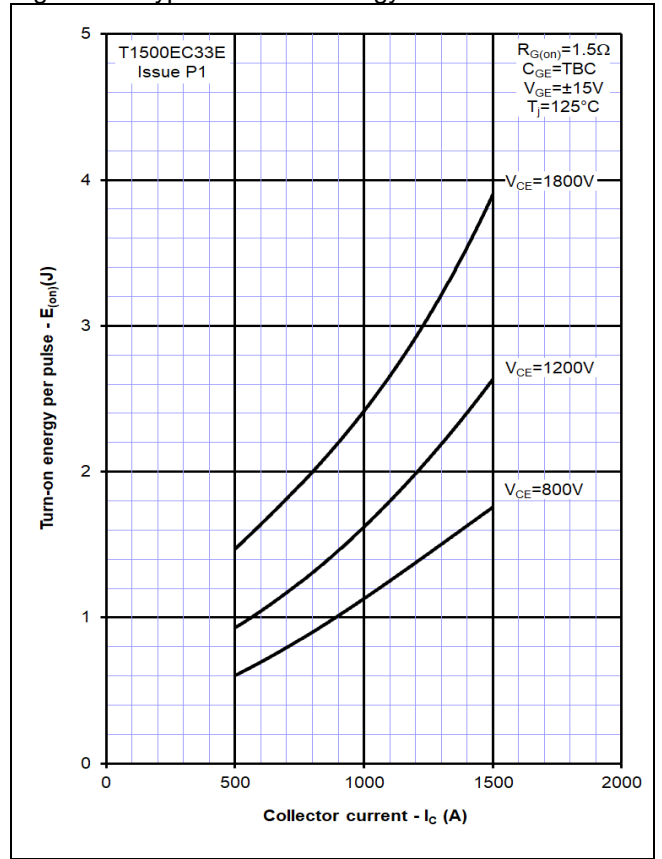


Figure 7 – Typical turn-on energy vs. di/dt

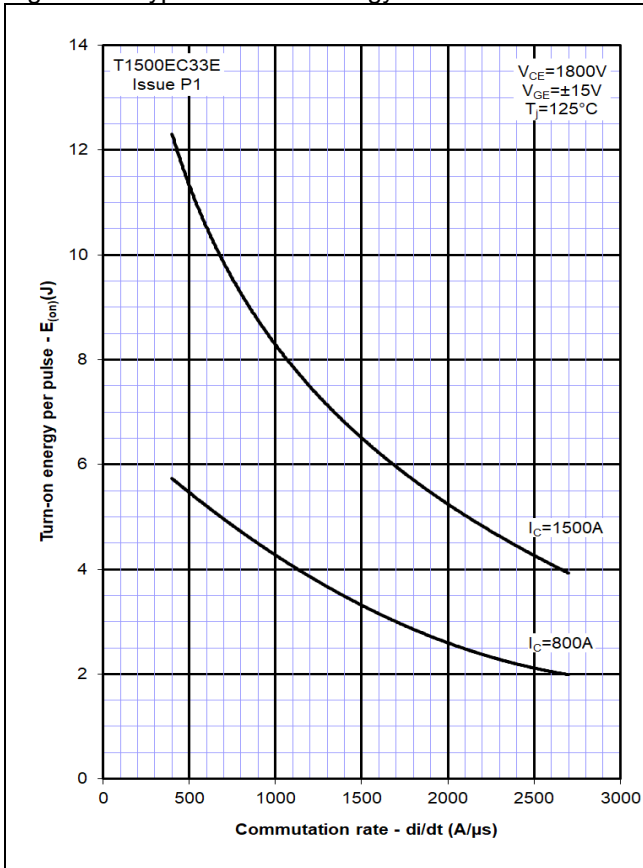


Figure 8 – Typical turn-off energy vs. collector current

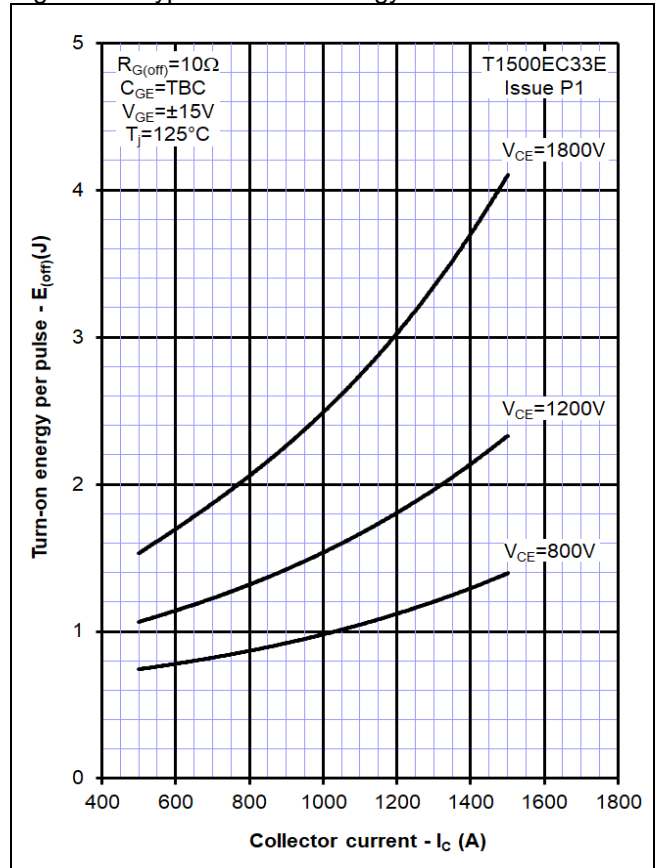


Figure 9 – Turn-off energy vs voltage

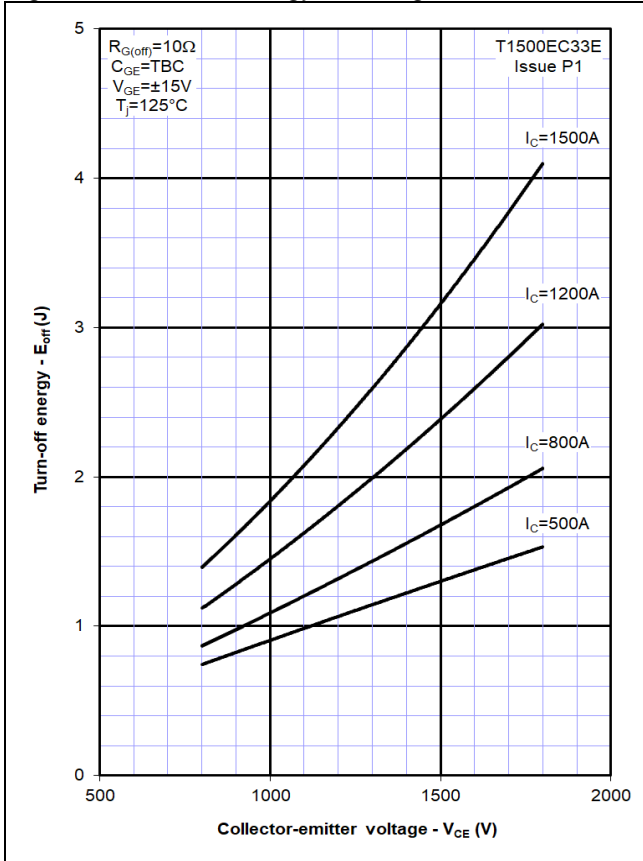


Figure 10 – Safe operating area

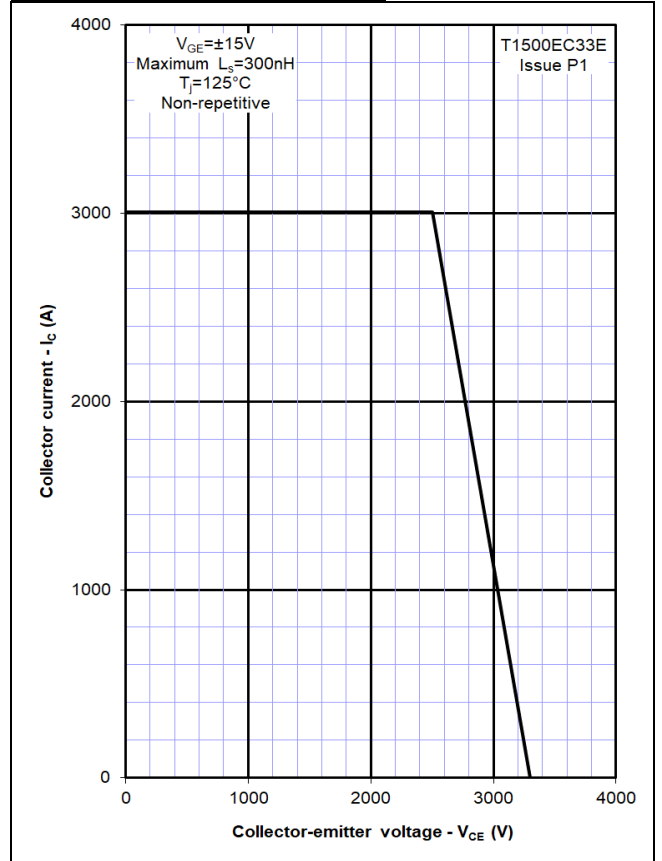
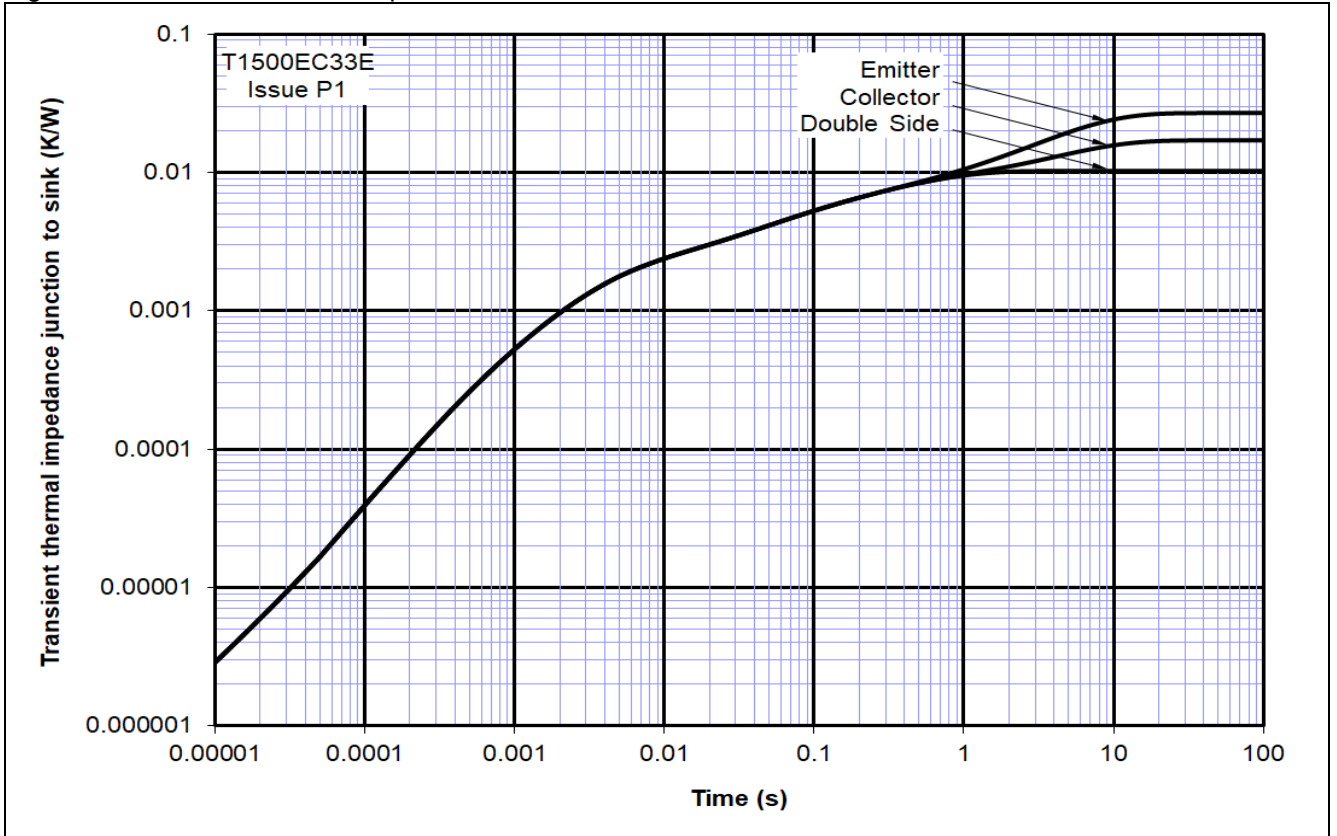
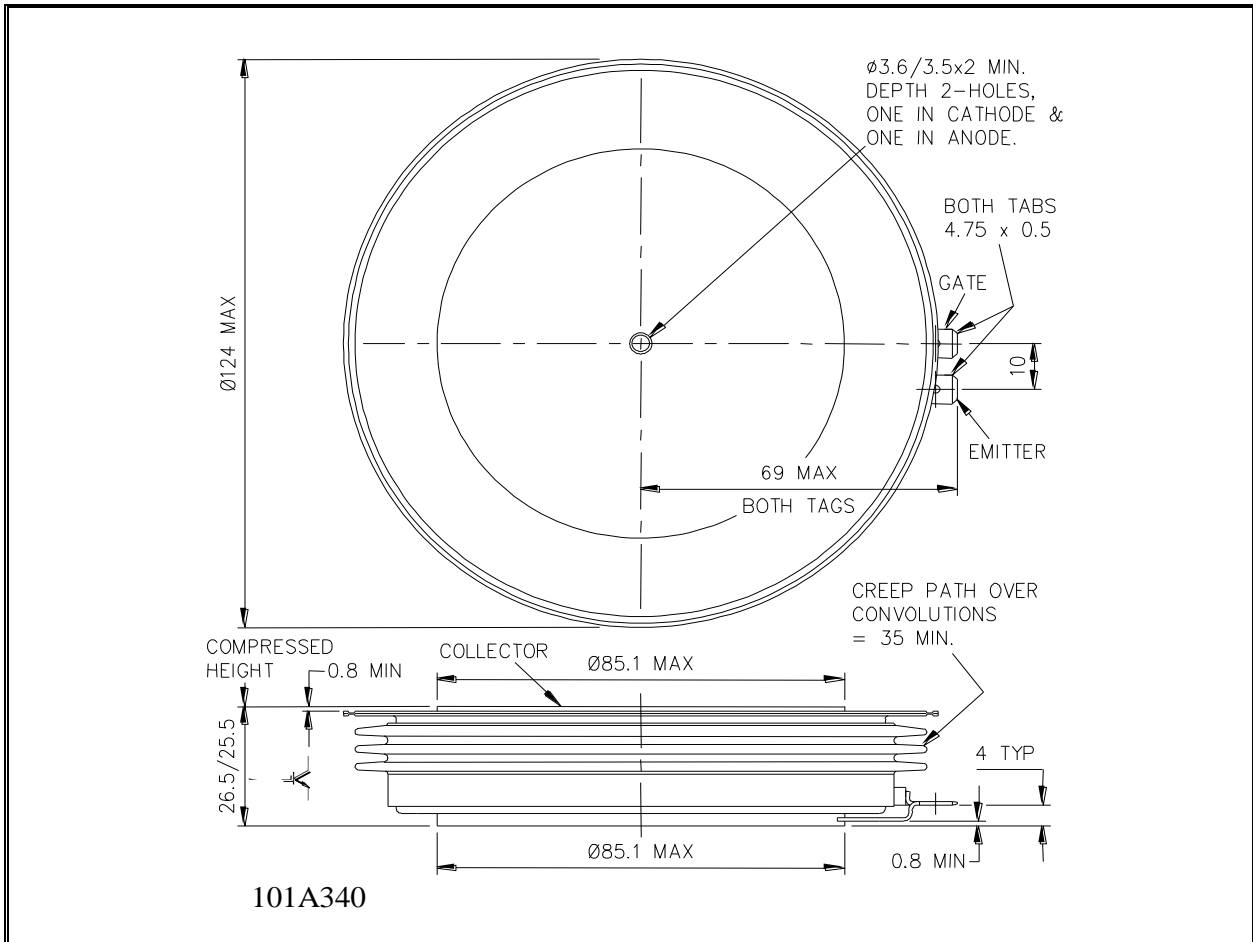


Figure 11 – Transient thermal impedance



## Outline Drawing & Ordering Information



### ORDERING INFORMATION

(Please quote 10 digit code as below)

T1500	EC	33	E
Fixed type Code	Fixed Outline Code	Voltage Grade $V_{CES}/100$ 33	Fixed format code

 Typical order code: T1500EC33E ( $V_{CES} = 3300V$ )

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