



Advance Data

# Insulated Gate Bi-Polar Transistor

## Type T1375DF65E

### Absolute Maximum Ratings

	VOLTAGE RATINGS	MAXIMUM LIMITS	UNITS
V <sub>CES</sub>	Collector – emitter voltage	6500	V
V <sub>DC link</sub>	Permanent DC voltage for 100 FIT failure rate.	3600	V
V <sub>GES</sub>	Peak gate – emitter voltage	±20	V

	RATINGS	MAXIMUM LIMITS	UNITS
I <sub>C</sub>	Continuous DC collector current, IGBT	1375	A
I <sub>CRM</sub>	Repetitive peak collector current, t <sub>p</sub> =1ms, IGBT	2750	A
I <sub>ECO</sub>	Maximum reverse emitter current, t <sub>p</sub> =100µs, (note 2 & 3)	1375	A
P <sub>MAX</sub>	Maximum power dissipation, IGBT (note 2)	16.1	kW
T <sub>j op</sub>	Operating temperature range	-40 to +125	°C
T <sub>stg</sub>	Storage temperature range	-40 to +125	°C

Notes: -

- 1) Unless otherwise indicated T<sub>j</sub> = 125°C.
- 2) T<sub>sink</sub> = 25°C, double side cooled.
- 3) Maximum commutation loop inductance 200nH.

## Characteristics

### IGBT Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
V <sub>CE(sat)</sub>	Collector – emitter saturation voltage	-	3.75	4.05	I <sub>C</sub> = 1375A, V <sub>GE</sub> = 15V, T <sub>j</sub> = 25°C	V
		-	5.10	5.40	I <sub>C</sub> = 1375A, V <sub>GE</sub> = 15V	V
V <sub>T0</sub>	Threshold voltage	-	-	2.403	Current range: 458A – 1375A	V
r <sub>T</sub>	Slope resistance	-	-	2.18		mΩ
V <sub>GE(TH)</sub>	Gate threshold voltage	-	5.4	-	V <sub>CE</sub> = V <sub>GE</sub> , I <sub>C</sub> = 1375mA	V
I <sub>CES</sub>	Collector – emitter cut-off current	-	9	30	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V	mA
I <sub>GES</sub>	Gate leakage current	-	-	±60	V <sub>GE</sub> = ±20V	μA
C <sub>ies</sub>	Input capacitance	-	245	-	V <sub>CE</sub> = 25V, V <sub>GE</sub> = 0V, f = 100kHz	nF
t <sub>d(on)</sub>	Turn-on delay time	-	1.3	-	I <sub>C</sub> = 1375A, V <sub>CE</sub> = 3600V, di/dt = 3500A/μs V <sub>GE</sub> = ±15V, L <sub>s</sub> = 200nH	μs
t <sub>r(V)</sub>	Rise time	-	3.2	-		μs
Q <sub>g(on)</sub>	Turn-on gate charge	-	16	-	R <sub>G(ON)</sub> = 2Ω, R <sub>G(OFF)</sub> = 7.3Ω, C <sub>GE</sub> = 100nF Freewheel diode type E1780TG65E at T <sub>j</sub> = 125°C	μC
E <sub>on</sub>	Turn-on energy	-	11.6	-		J
t <sub>d(off)</sub>	Turn-off delay time	-	4.3	-	(Notes 3, 4 & 5)	μs
t <sub>f(l)</sub>	Fall time	-	2.1	-		μs
Q <sub>g(off)</sub>	Turn-off gate charge	-	15.5	-		μC
E <sub>off</sub>	Turn-off energy	-	8.1	-		J
I <sub>sc</sub>	Short circuit current	-	6200	-	V <sub>GE</sub> = +15V, V <sub>CC</sub> = 3600V, V <sub>CEmax</sub> ≤ V <sub>CES</sub> , t <sub>p</sub> ≤ 10μs, L <sub>s</sub> ≤ 200nH	A

### Thermal Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
R <sub>thJK</sub>	Thermal resistance junction to sink, IGBT	-	-	6.21	Double side cooled	K/kW
		-	-	9.68	Collector side cooled	K/kW
		-	-	18	Emitter side cooled	K/kW
F	Mounting force	45	-	55	Note 2	kN
W <sub>t</sub>	Weight	-	2.2	-		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>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

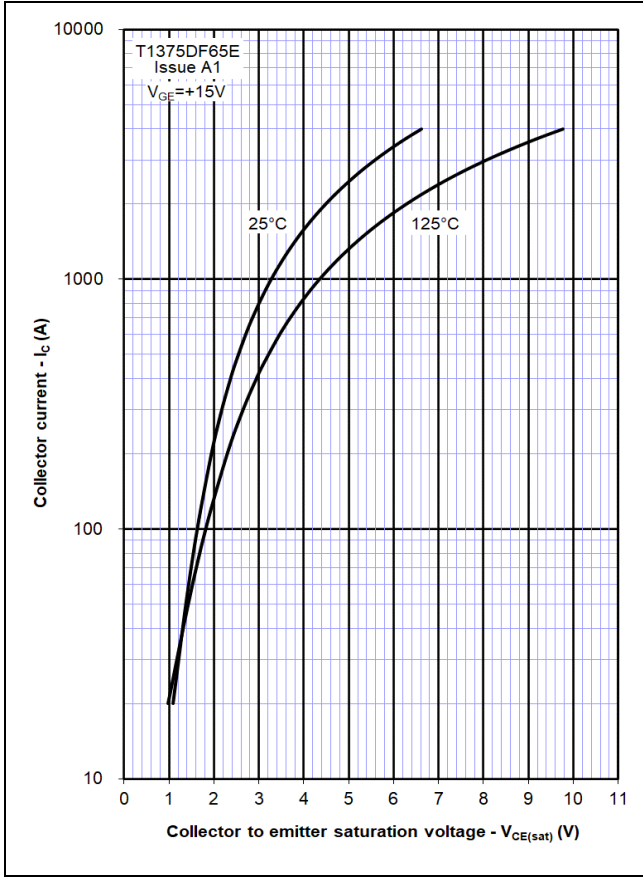


Figure 2 – Typical output characteristic

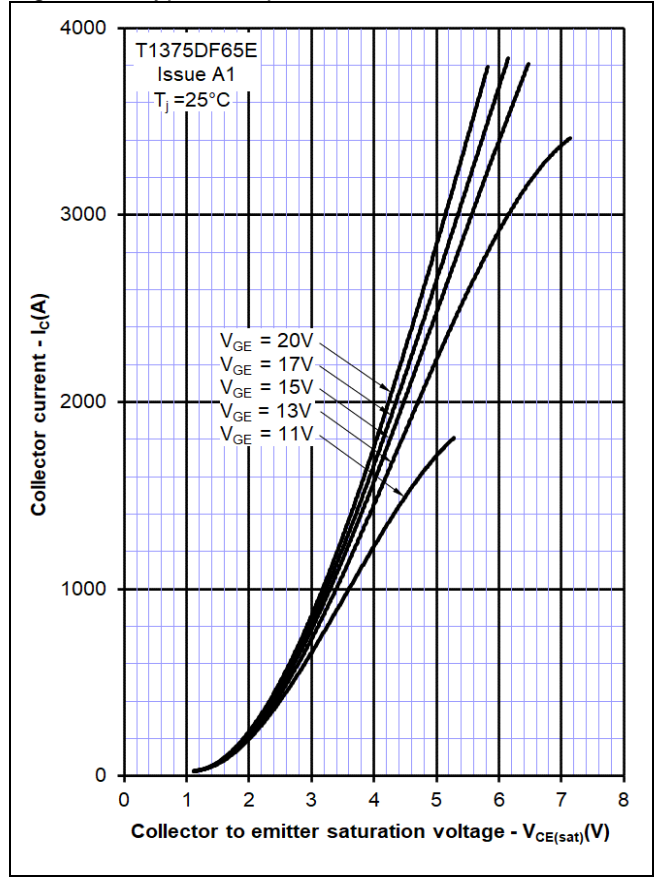


Figure 3 – Typical output characteristic

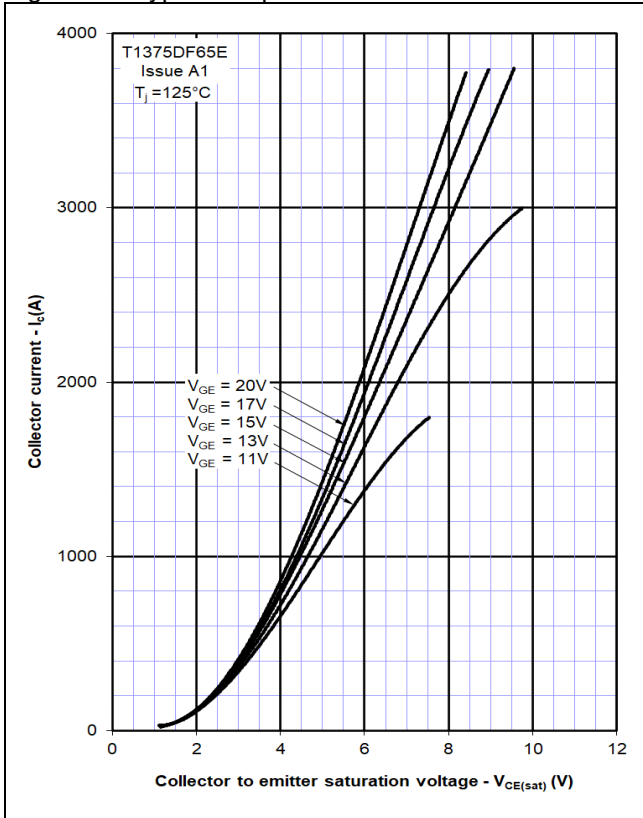


Figure 4 – Typical turn-on delay time vs gate resistance

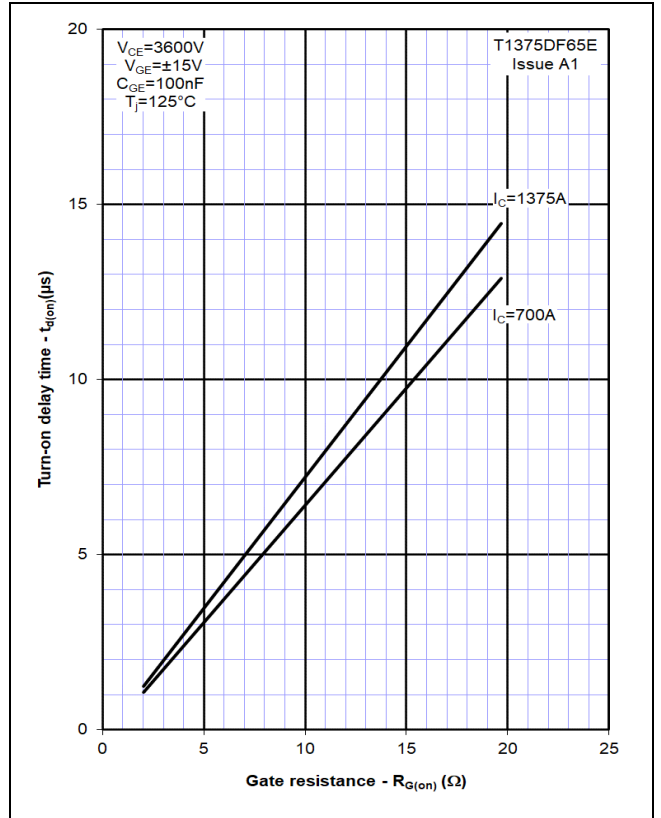


Figure 5 – Typical turn-off delay time vs. gate resistance

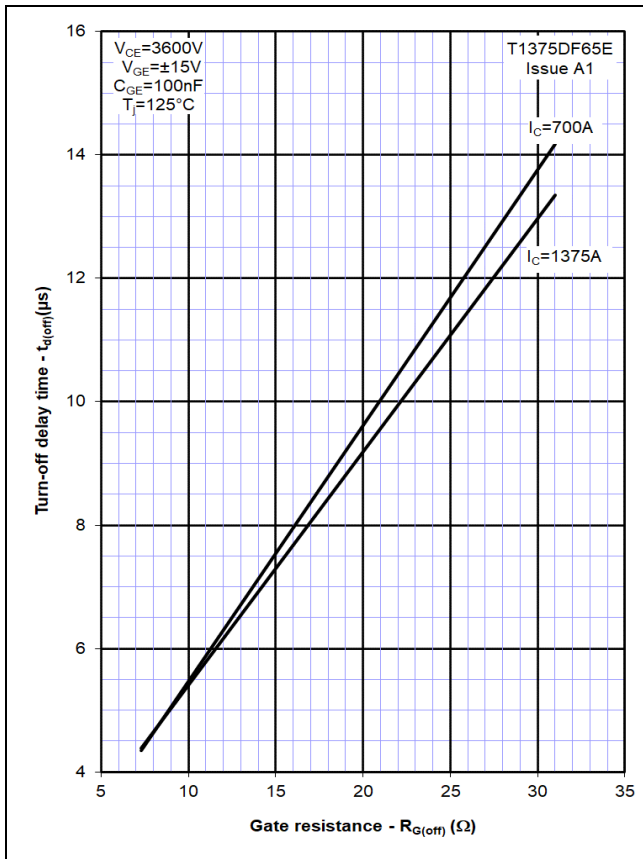


Figure 6 – Typical turn-on energy vs. collector current

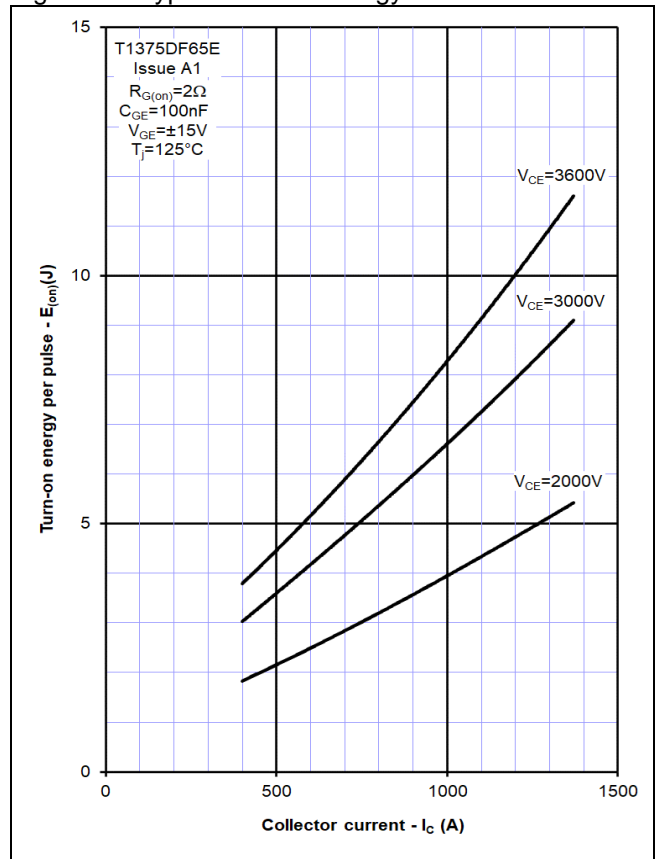


Figure 7 – Typical turn-on energy vs. di/dt

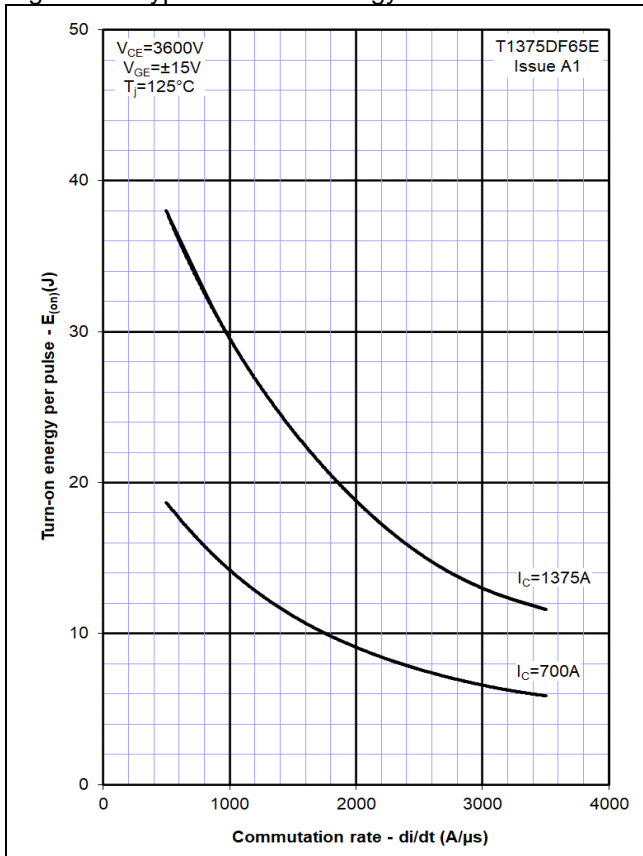


Figure 8 – Typical turn-off energy vs. collector current

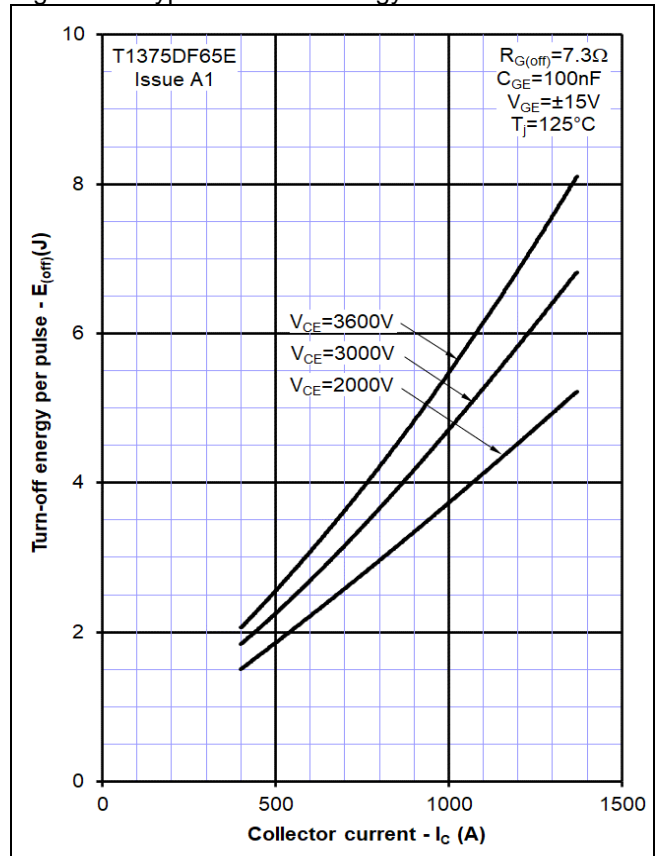


Figure 9 – Turn-off energy vs voltage

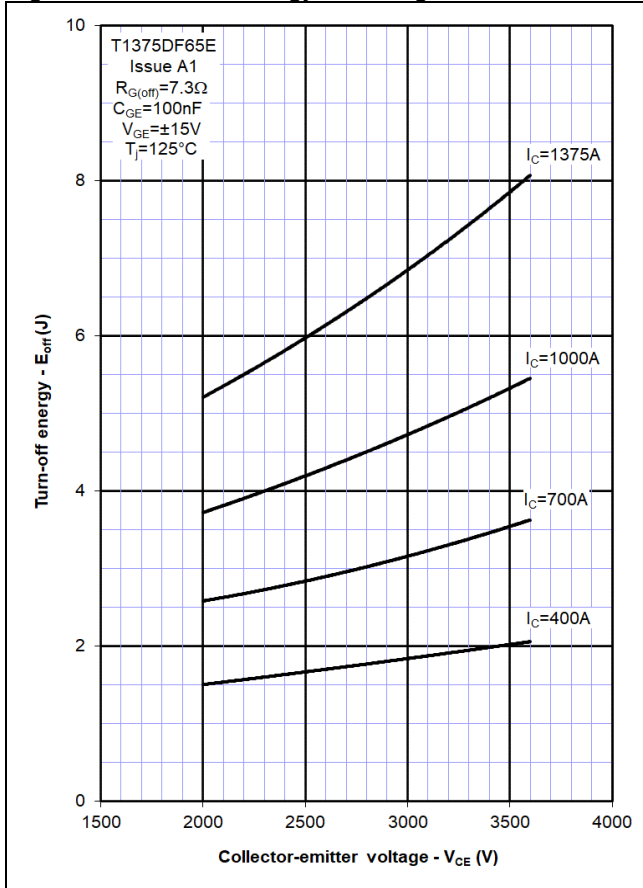


Figure 10 – Safe operating area

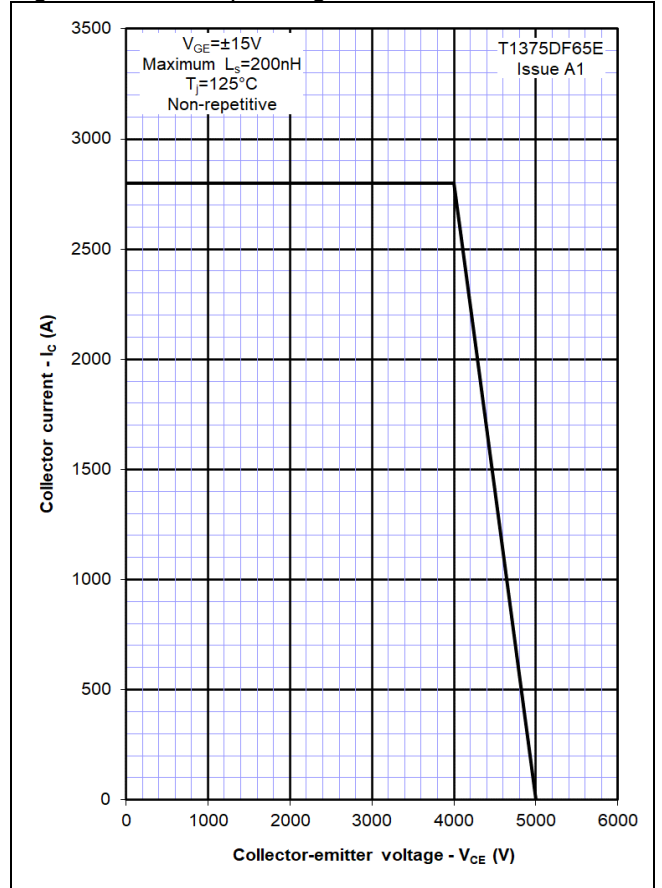
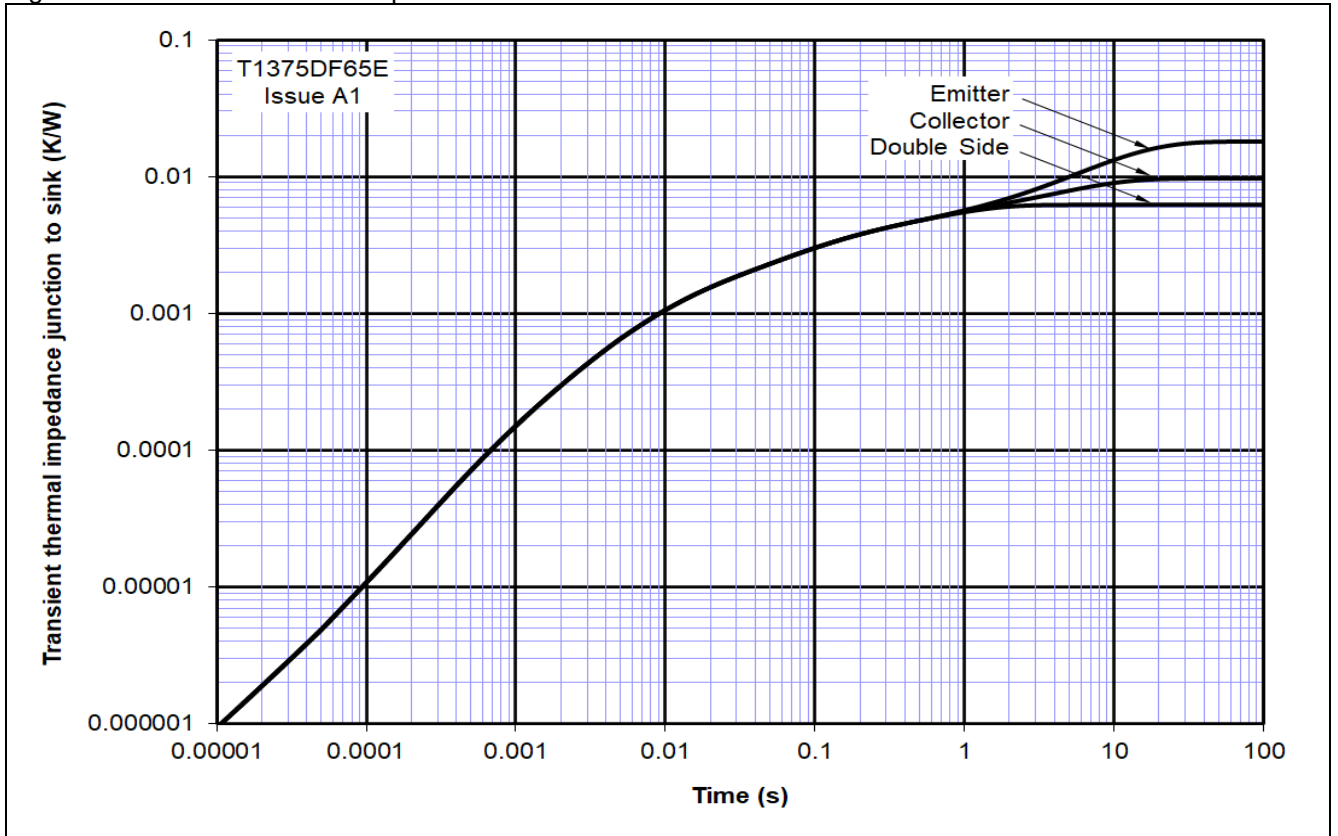
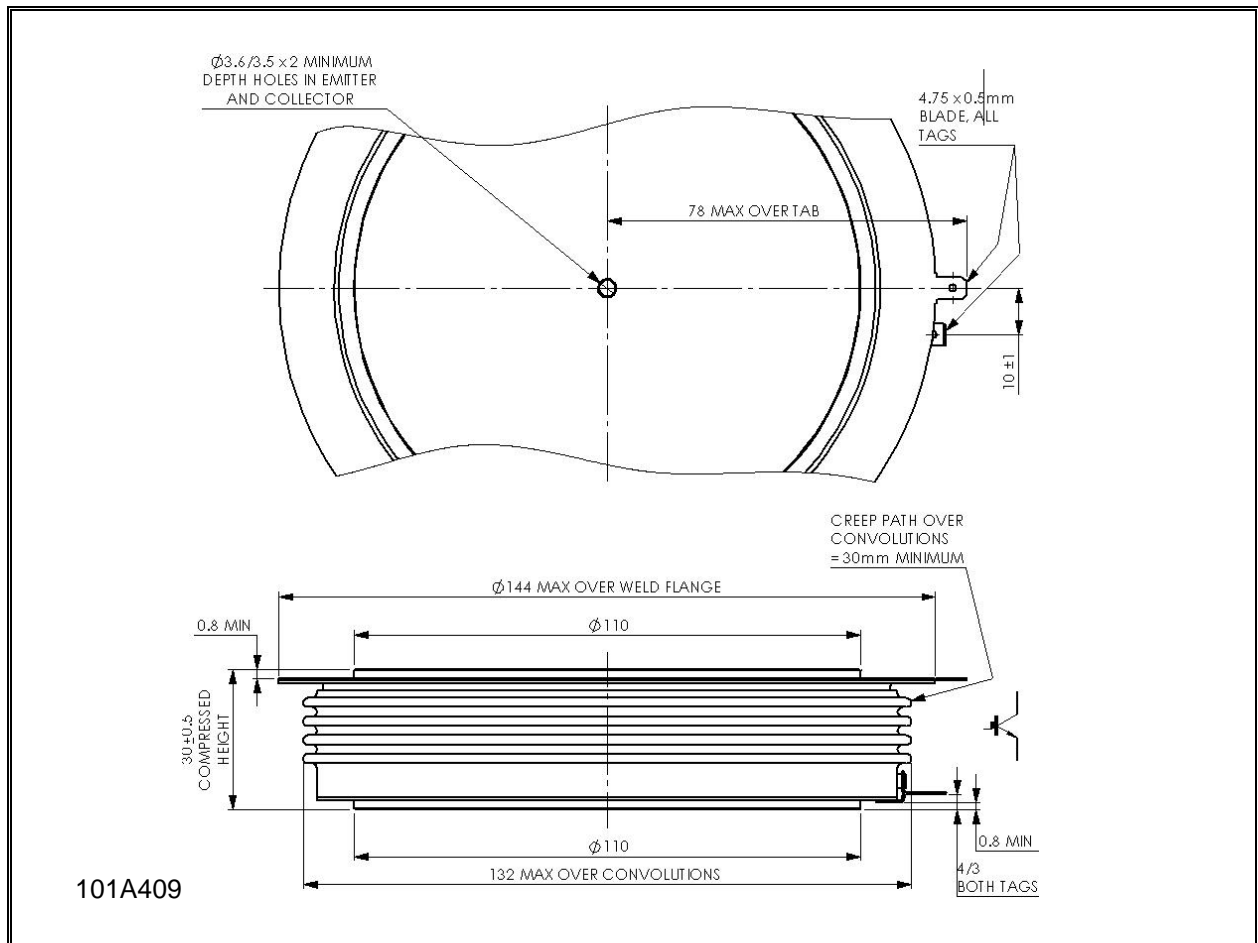


Figure 11 – Transient thermal impedance



## Outline Drawing & Ordering Information



### ORDERING INFORMATION

(Please quote 10 digit code as below)

<b>T1375</b>	<b>DF</b>	<b>65</b>	<b>E</b>
Fixed type Code	Fixed Outline Code	Voltage Grade $V_{CES}/100$ 65	Fixed format code

Typical order code: T1375DF65E ( $V_{CES} = 6500V$ )

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