

Insulated Gate Bi-Polar Transistor

Type T0510VB45E

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	510	A
I_{CRM}	Repetitive peak collector current, $t_p=1ms$, IGBT	1020	A
I_{ECO}	Maximum reverse emitter current, $t_p=100\mu s$, (note 2 & 3)	510	A
P_{MAX}	Maximum power dissipation, IGBT (Note 2)	4.1	kW
T_j	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) The use of an-anti-parallel diode is recommended.

Characteristics

IGBT Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS	
V _{CE(sat)}	Collector – emitter saturation voltage	-	2.75	3.2	I _C = 510A, V _{GE} = 15V, T _j = 25°C	V	
		-	3.60	4.0	I _C = 510A, V _{GE} = 15V	V	
V _{T0}	Threshold voltage	-	-	1.81	Current range: 170 – 510A	V	
r _T	Slope resistance	-	-	4.28		mΩ	
V _{GE(TH)}	Gate threshold voltage	-	5.2	-	V _{CE} = V _{GE} , I _C = 55mA	V	
I _{CES}	Collector – emitter cut-off current	-	15	35	V _{CE} = V _{CES} , V _{GE} = 0V	mA	
I _{GES}	Gate leakage current	-	-	±10	V _{GE} = ±20V	µA	
C _{ies}	Input capacitance	-	90	-	V _{CE} = 25V, V _{GE} = 0V, f = 1MHz	nF	
t _{d(on)}	Turn-on delay time	-	3.8	-	I _C = 510A, V _{CE} = 2800V, di/dt = 750A/µs V _{GE} = ±15V, L _s = 200nH R _{g(ON)} = 12Ω, R _{g(OFF)} = 15Ω, C _{GE} = 68nF Freewheel diode type E0660NC45C at 125°C (Notes 3, 4 & 5)	µs	
t _{r(V)}	Rise time	-	3.3	-		µs	
Q _{g(on)}	Turn-on gate charge	-	10	-		µC	
E _{on}	Turn-on energy	-	4.2	-		J	
t _{d(off)}	Turn-off delay time	-	2.3	-		µs	
t _{f(l)}	Fall time	-	2.7	-		µs	
Q _{g(off)}	Turn-off gate charge	-	14	-		µC	
E _{off}	Turn-off energy	-	2.1	-		J	
I _{SC}	Short circuit current	-	1650	-		V _{GE} = +15V, V _{CC} = 2800V, V _{CEmax} ≤ V _{CES} , t _p ≤ 10µs	A

Thermal Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
R _{thJK}	Thermal resistance junction to sink, IGBT	-	-	24.3	Double side cooled	K/kW
		-	-	40.1	Collector side cooled	K/kW
		-	-	62.3	Emitter side cooled	K/kW
F	Mounting force	12	-	16	Note 2	kN
W _t	Weight	-	0.65	-		kg

Notes:-

- 1) Unless otherwise indicated T_j = 125°C.
- 2) Consult application note 2008AN01 for detailed mounting requirements
- 3) C_{GE} is additional gate – emitter capacitance added to output of gate drive circuit
- 4) E_{on} integration time 15µs from 10% rising I_G.
- 5) E_{off} integration time 15µs from 90% falling V_{GE}.

Curves

Figure 1 – Typical collector-emitter saturation voltage characteristics

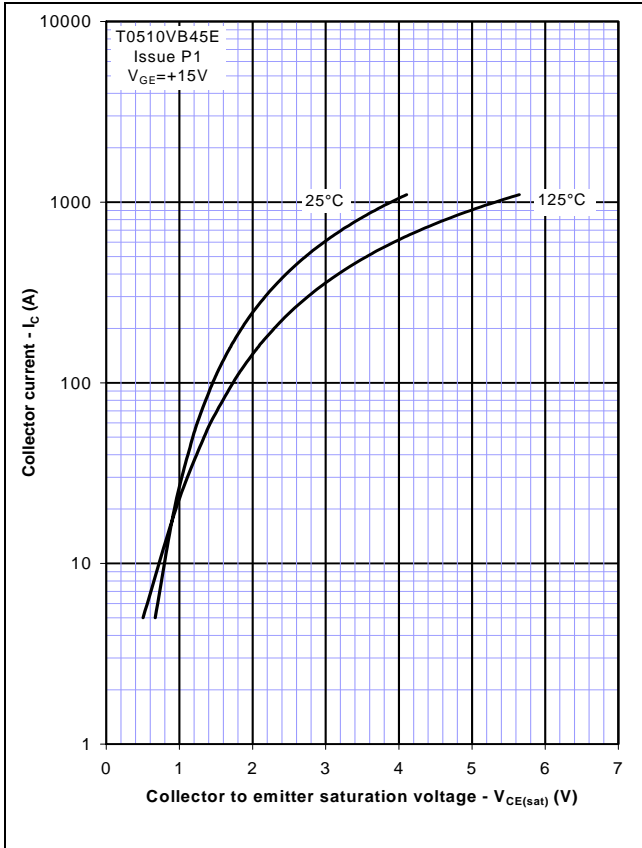


Figure 2 – Typical output characteristic

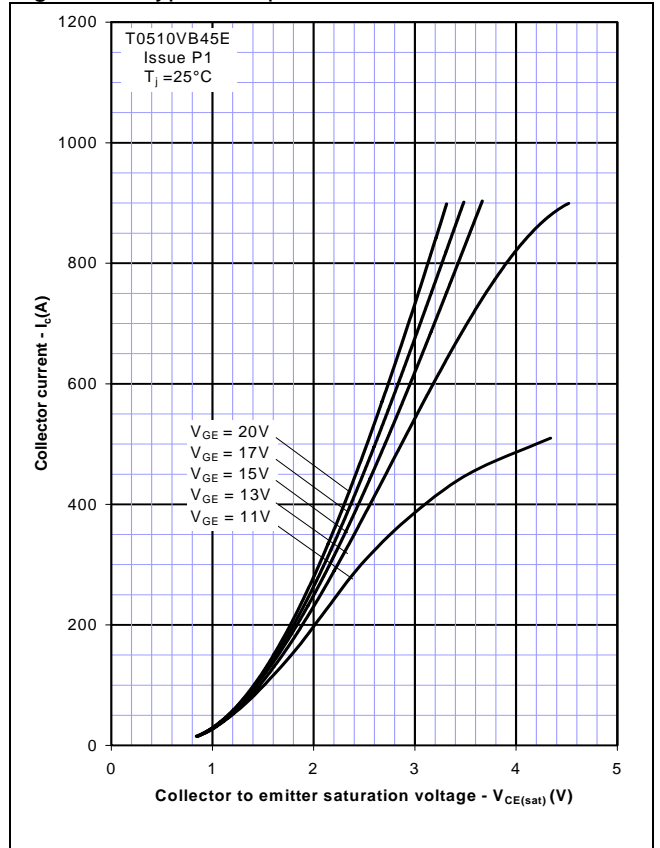


Figure 3 – Typical output characteristic

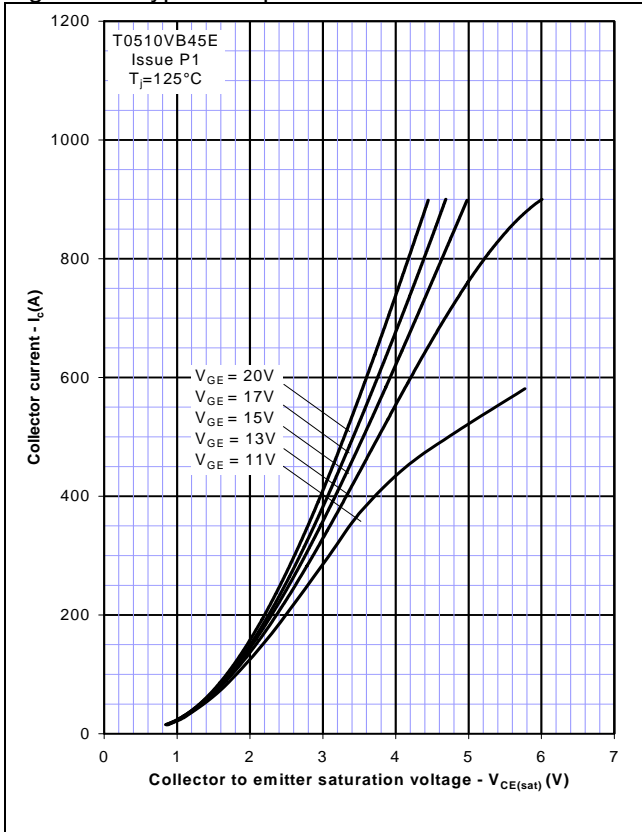


Figure 4 – Typical turn-on delay time vs gate resistance

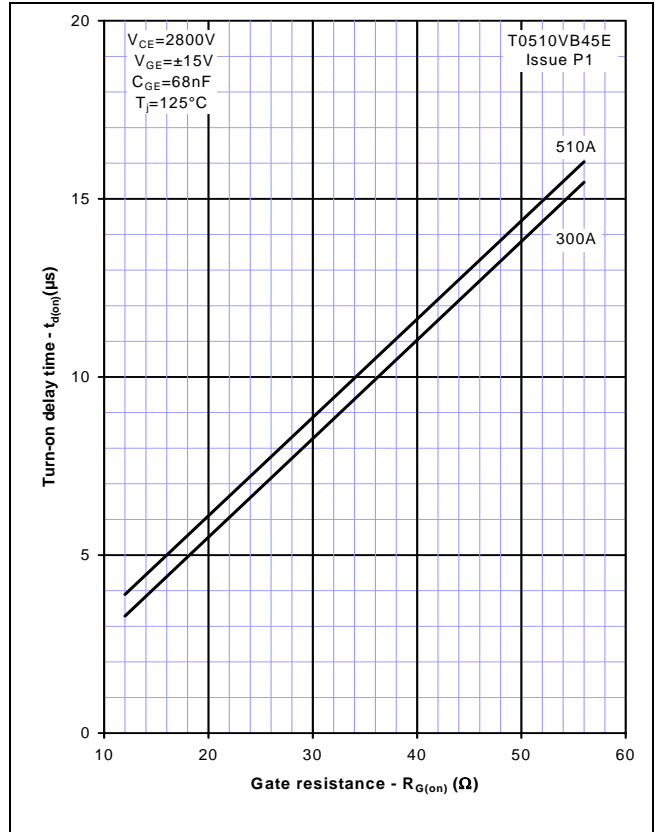


Figure 5 – Typical turn-off delay time vs. gate resistance

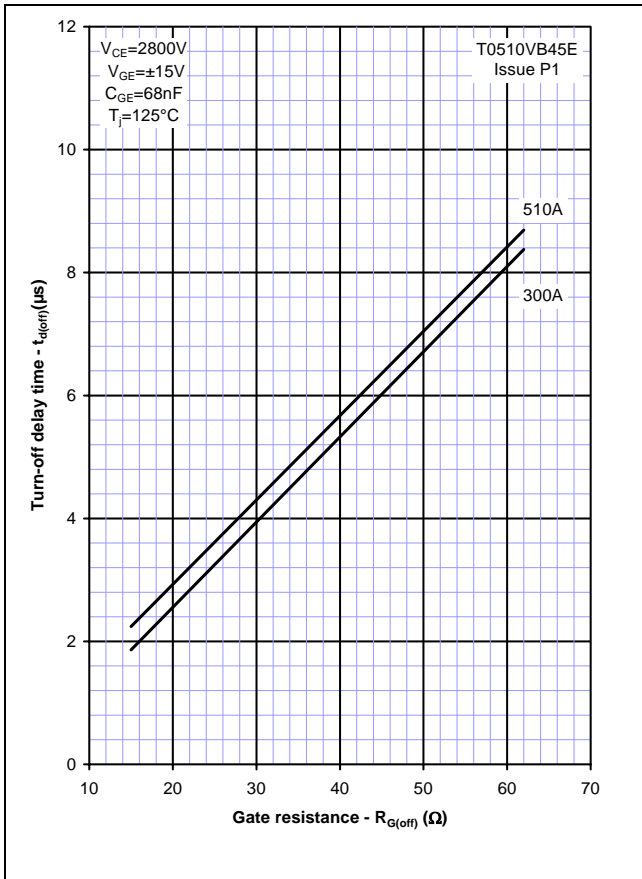


Figure 6 – Typical turn-on energy vs. collector current

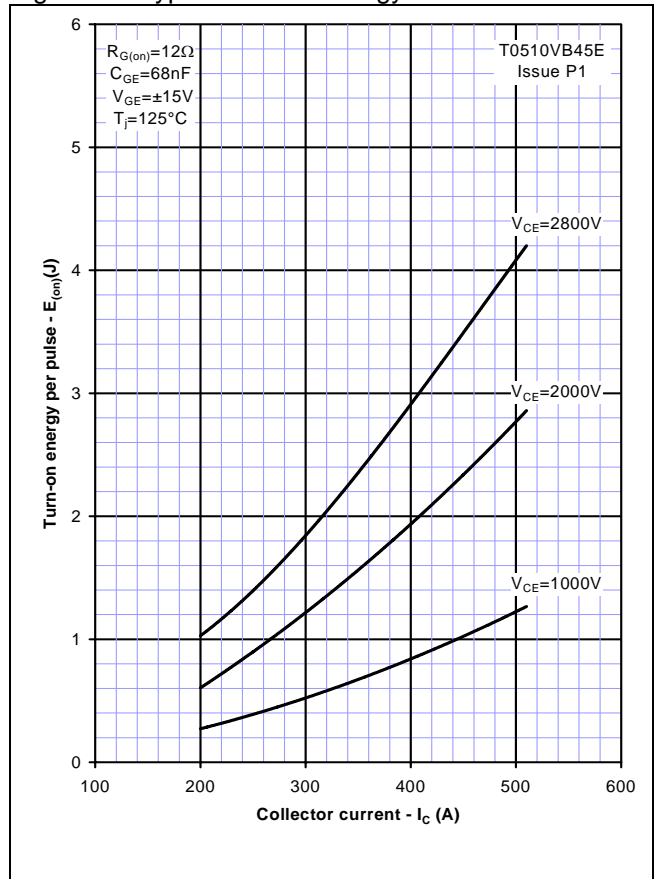


Figure 7 – Typical turn-on energy vs. di/dt

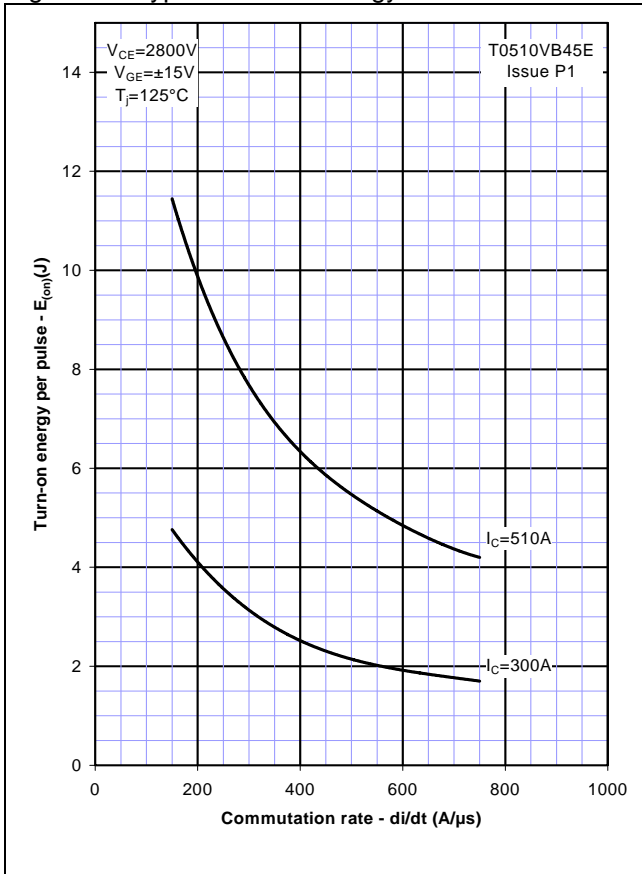


Figure 8 – Typical turn-off energy vs. collector current

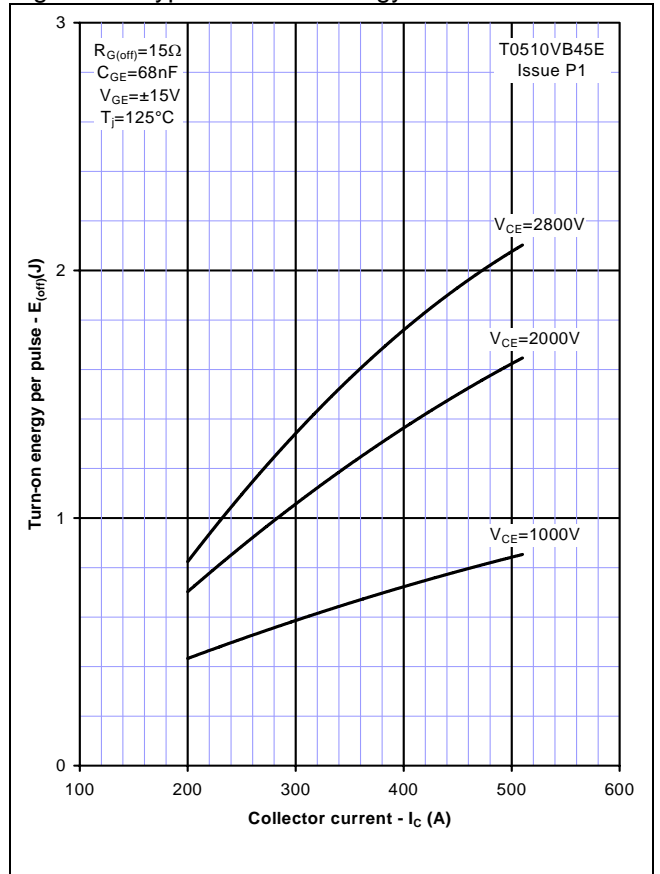


Figure 9 – Turn-off energy vs voltage

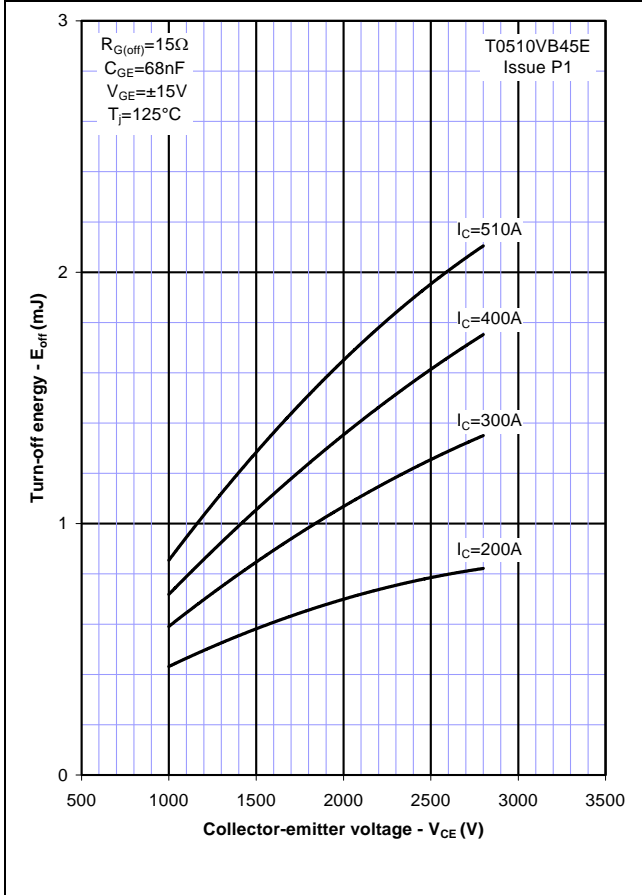


Figure 10 – Safe operating area

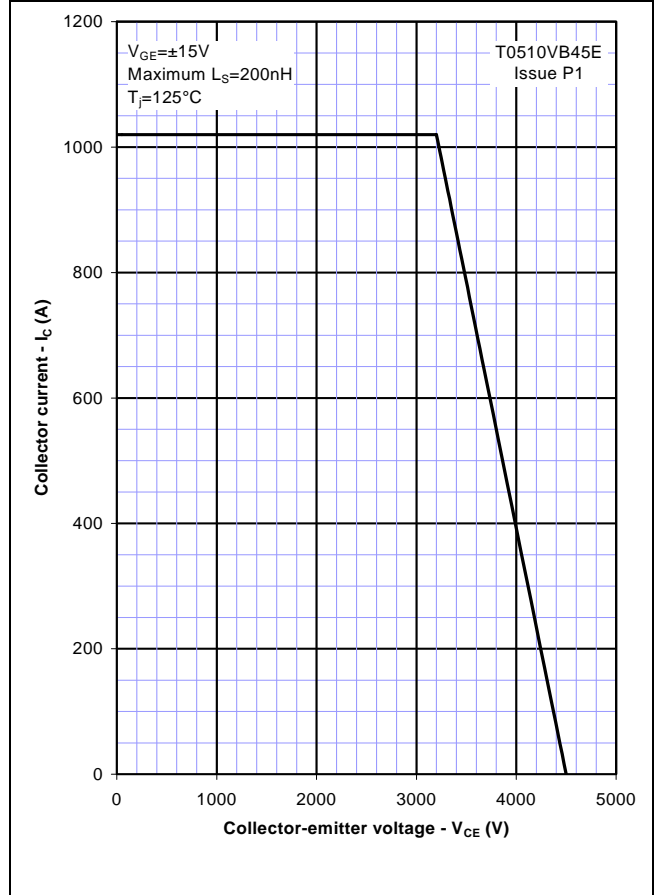
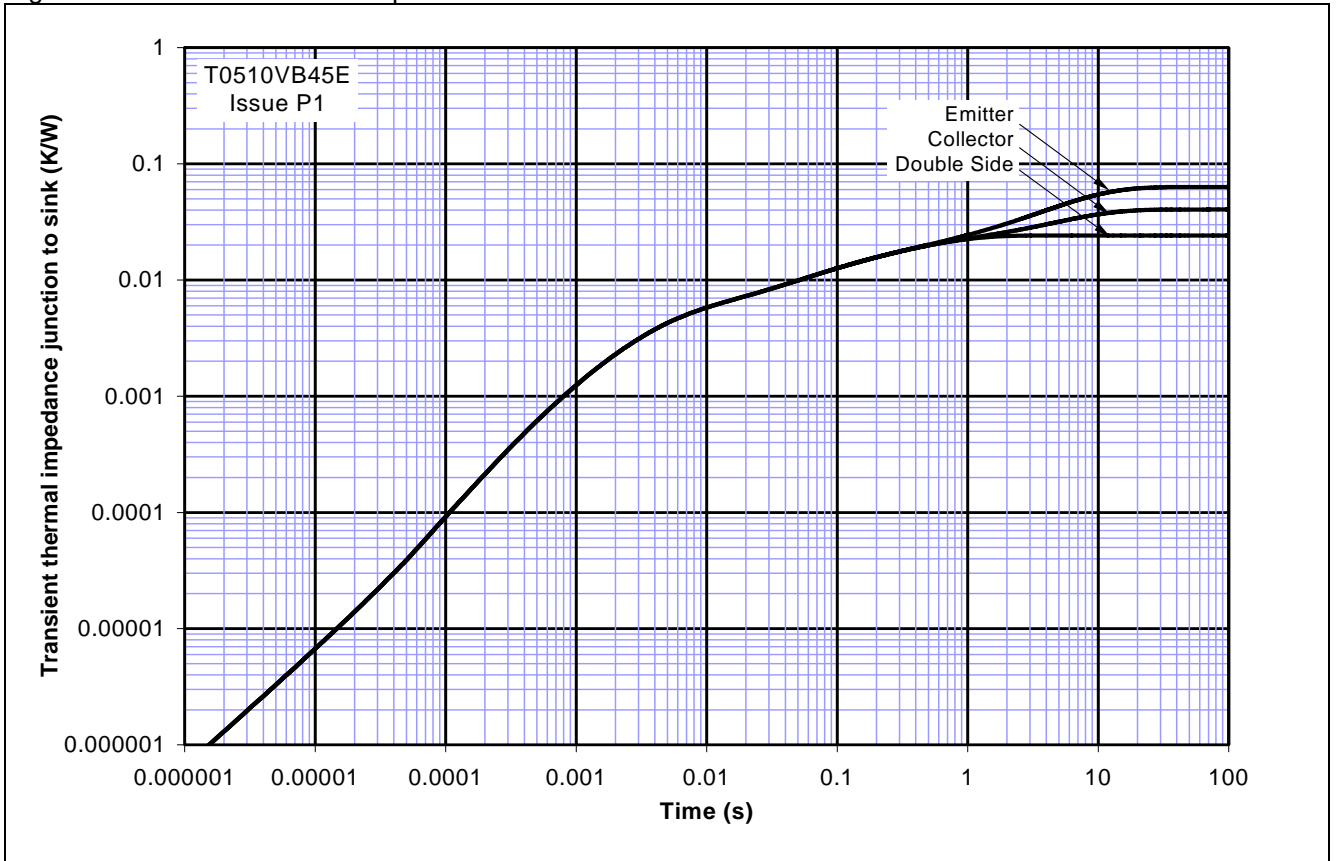
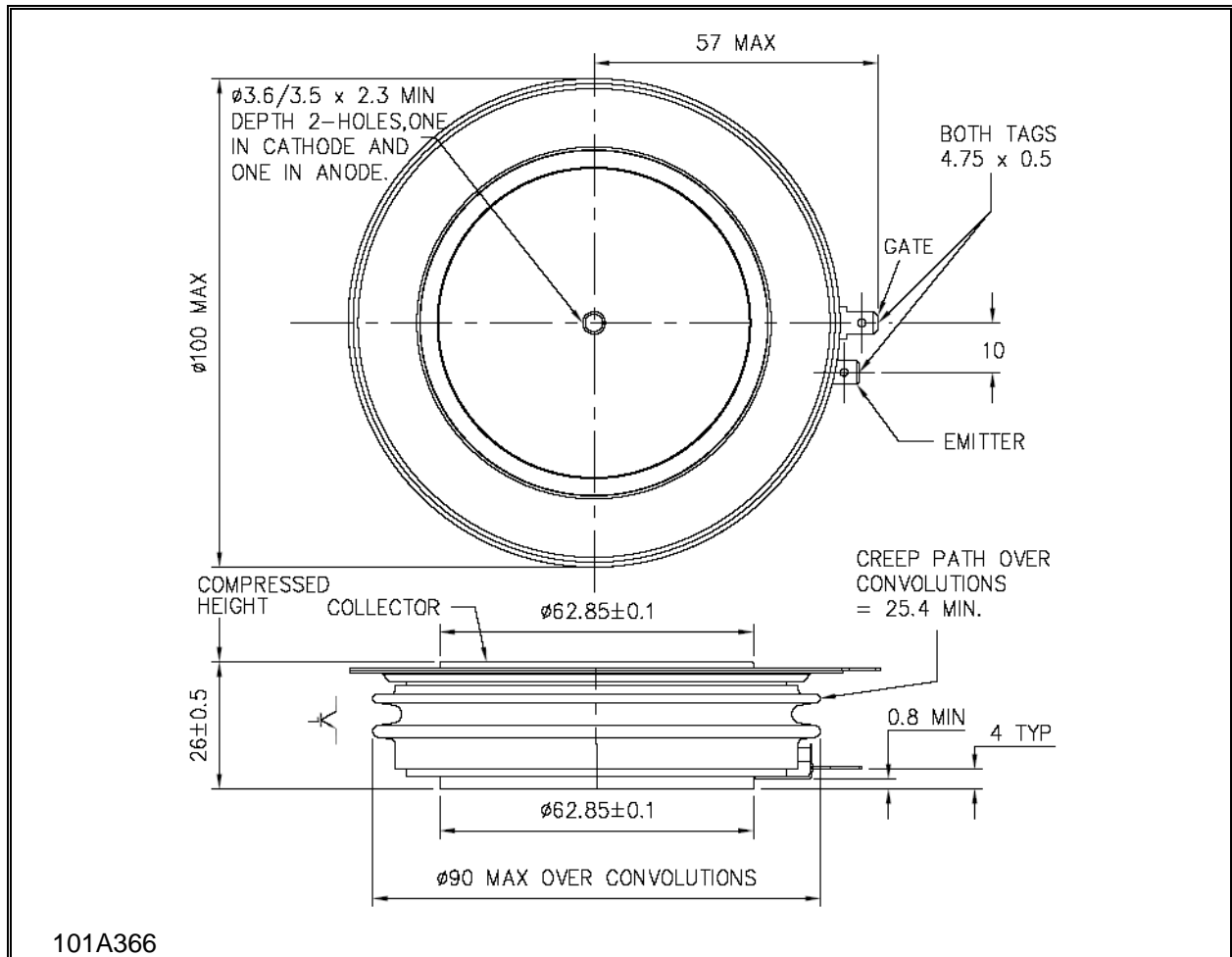


Figure 11 – Transient thermal impedance



Outline Drawing & Ordering Information



ORDERING INFORMATION			
(Please quote 10 digit code as below)			
T0510	VB	45	E
Fixed type Code	Fixed Outline Code	Voltage Grade $V_{CES}/100$ 45	Fixed format code
Typical order code: T0510VB45E ($V_{CES} = 4500V$)			

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