

Insulated Gate Bi-Polar Transistor

Type T0510VB45E

Absolute Maximum Ratings

	VOLTAGE RATINGS	MAXIMUM LIMITS	UNITS
V_{CES}	Collector – emitter voltage	4500	V
$V_{DC \text{ link}}$	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, $t_p=1\text{ms}$, IGBT	1020	A
I_{ECO}	Maximum reverse emitter current, $t_p=100\mu\text{s}$, (note 2 & 3)	510	A
P_{MAX}	Maximum power dissipation, IGBT (Note 2)	4.1	kW
T_j	Operating temperature range.	-40 to +125	$^{\circ}\text{C}$
T_{stg}	Storage temperature range.	-40 to +125	$^{\circ}\text{C}$

Notes: -

- 1) Unless otherwise indicated $T_j = 125^{\circ}\text{C}$.
- 2) $T_{\text{sink}} = 25^{\circ}\text{C}$, 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	$I_C = 510A, V_{GE} = 15V, T_j = 25^\circ C$	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		m Ω
$V_{GE(TH)}$	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	$V_{GE} = \pm 20V$	μA
C_{ies}	Input capacitance	-	90	-	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$	nF
$t_{d(on)}$	Turn-on delay time	-	3.8	-	$I_C = 510A, V_{CE} = 2800V, di/dt = 750A/\mu s$ $V_{GE} = \pm 15V, L_s = 200nH$ $R_{g(ON)} = 12\Omega, R_{g(OFF)} = 15\Omega, C_{GE} = 68nF$ Freewheel diode type E0660NC45C at $125^\circ C$ (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
$t_f(I)$	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	-	$V_{GE} = +15V, V_{CC} = 2800V, V_{CEmax} \leq V_{CES}, t_p \leq 10\mu s$	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 $T_j = 125^\circ C$.
- 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 15 μs from 10% rising I_G .
- 5) E_{off} integration time 15 μs from 90% falling V_{GE} .

Curves

Figure 1 – Typical collector-emitter saturation voltage characteristics

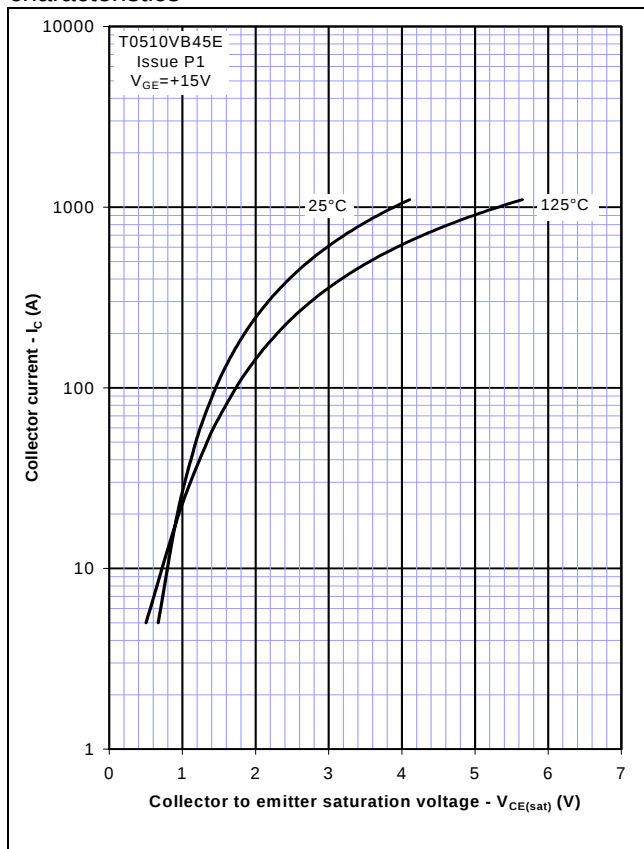


Figure 2 – Typical output characteristic

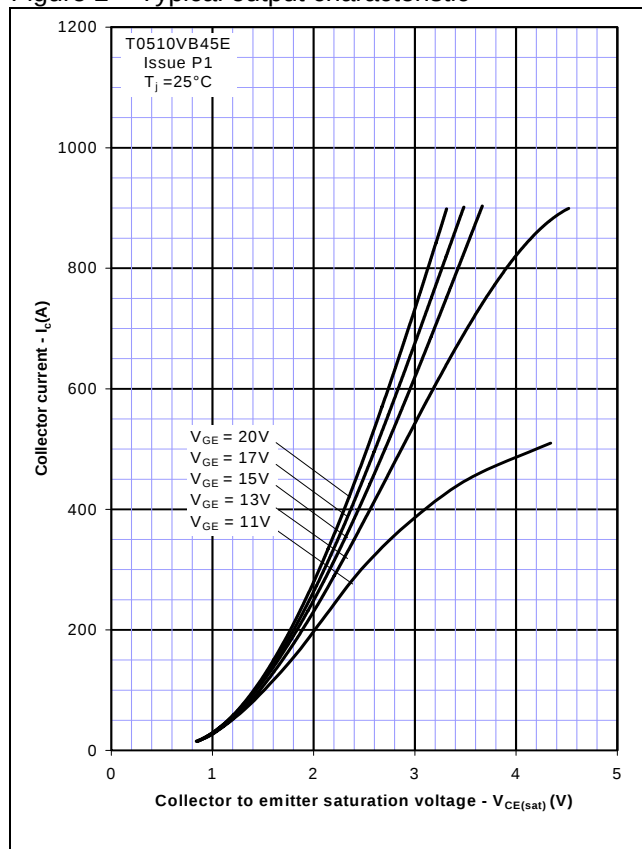


Figure 3 – Typical output characteristic

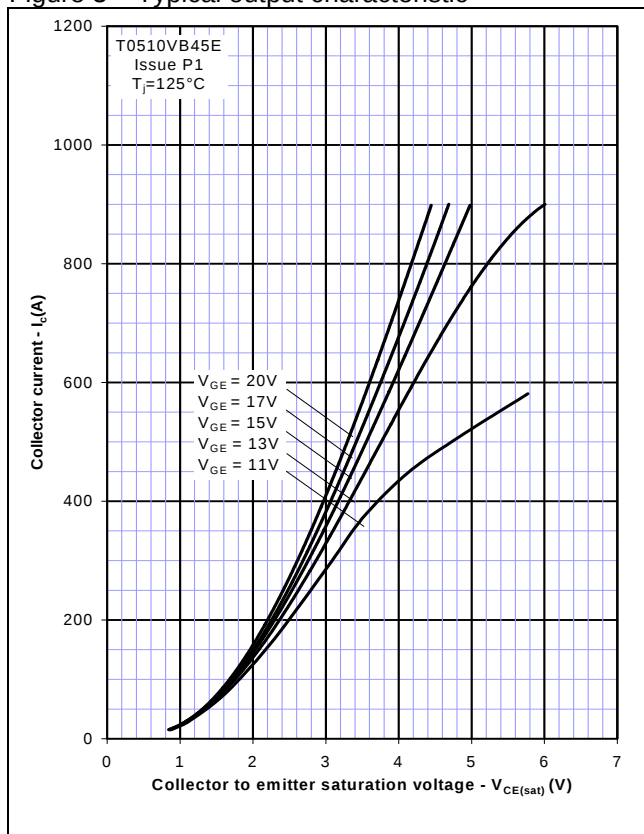


Figure 4 – Typical turn-on delay time vs gate resistance

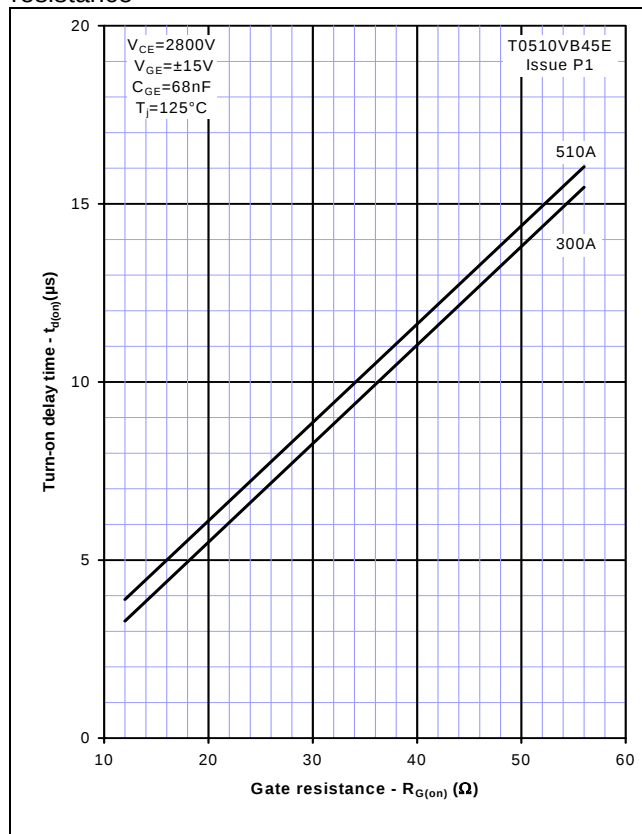


Figure 5 – Typical turn-off delay time vs. gate resistance

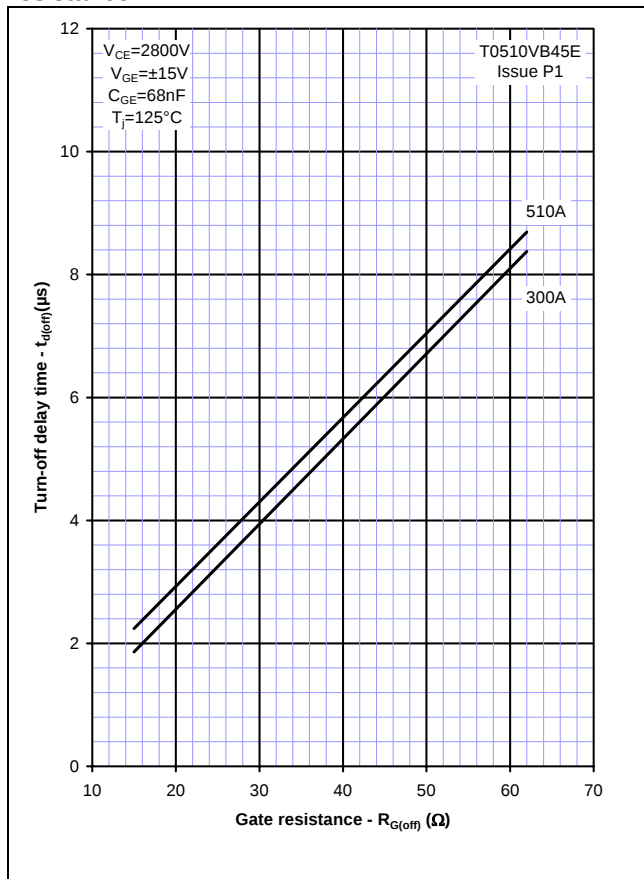


Figure 6 – Typical turn-on energy vs. collector current

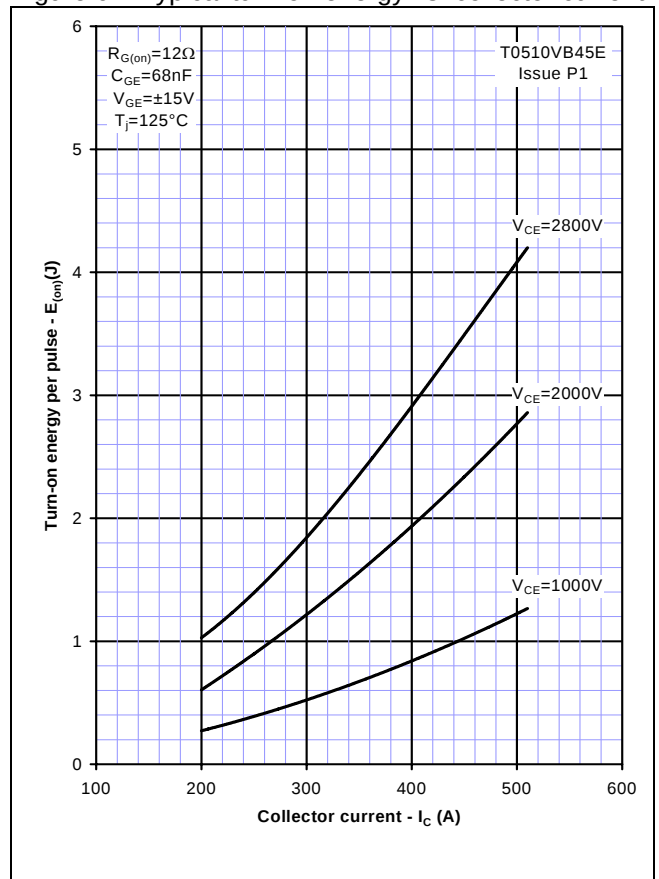


Figure 7 – Typical turn-on energy vs. di/dt

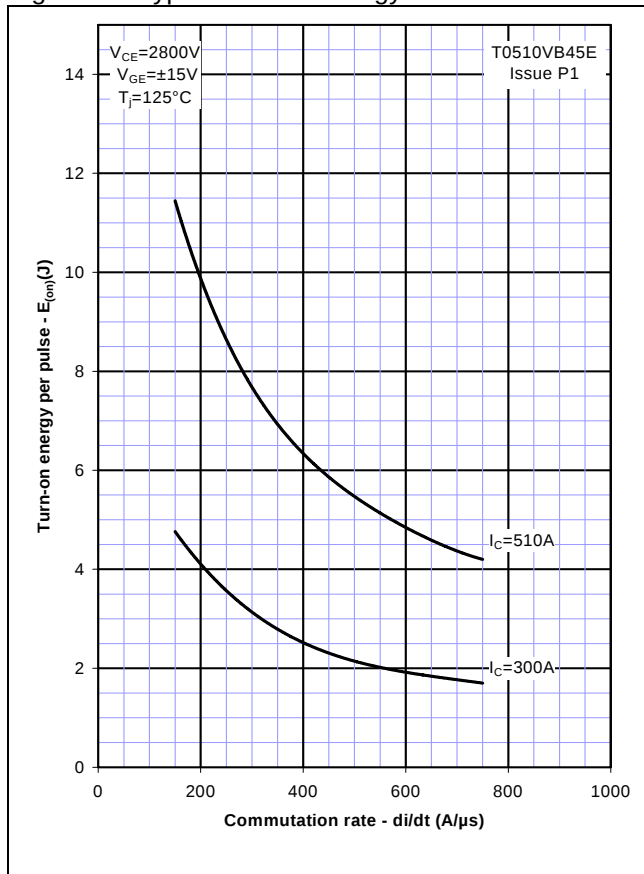


Figure 8 – Typical turn-off energy vs. collector current

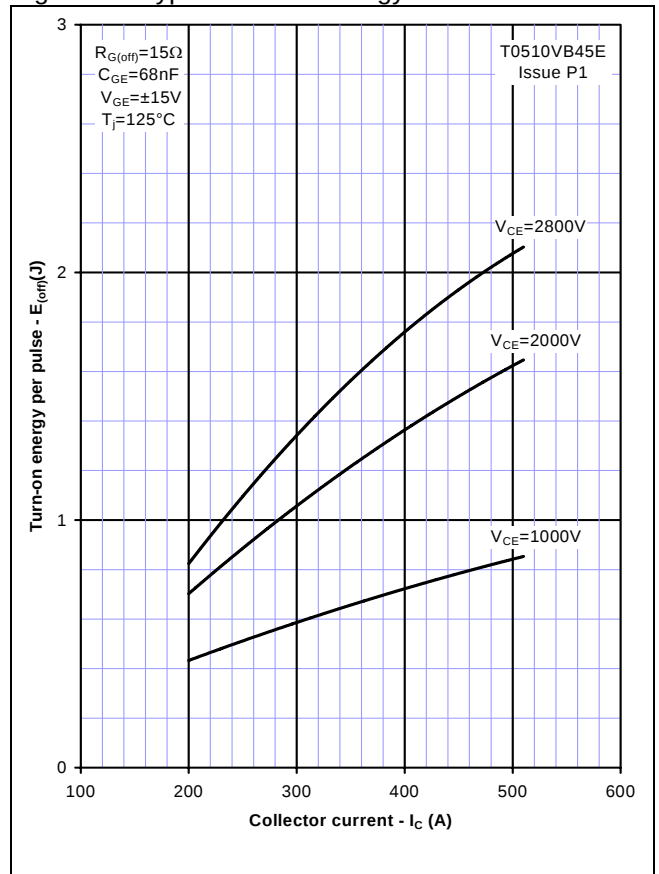


Figure 9 – Turn-off energy vs voltage

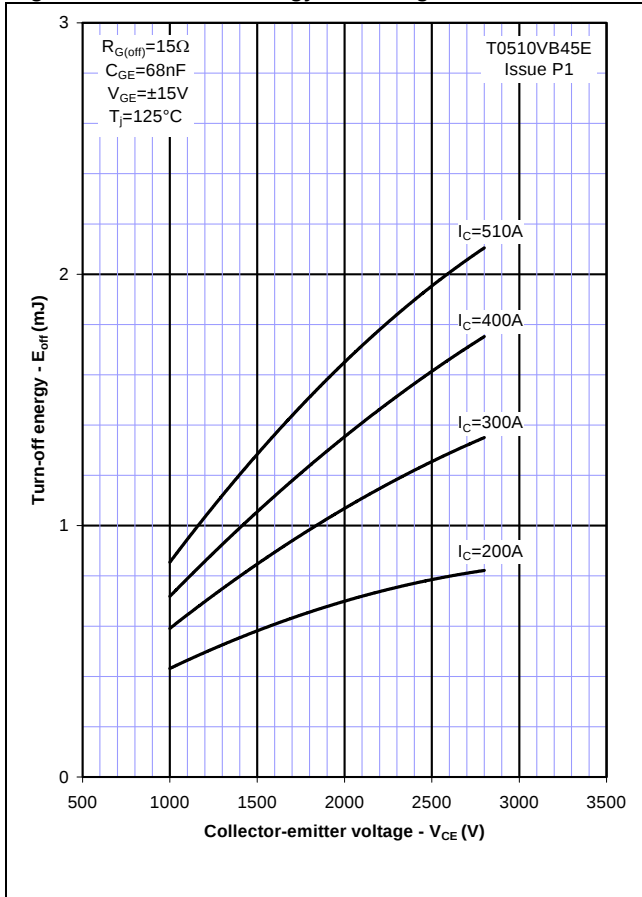


Figure 10 – Safe operating area

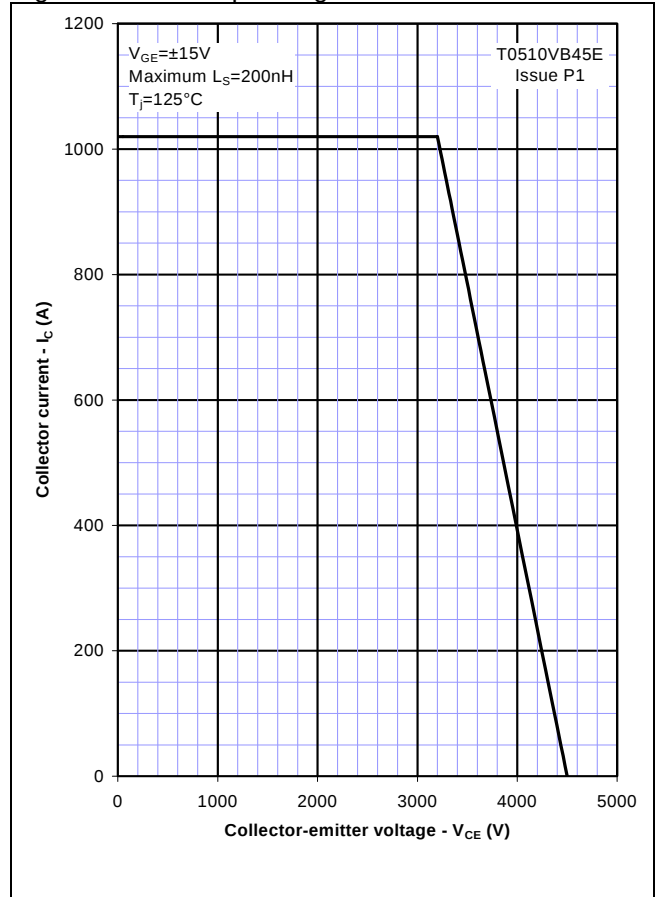
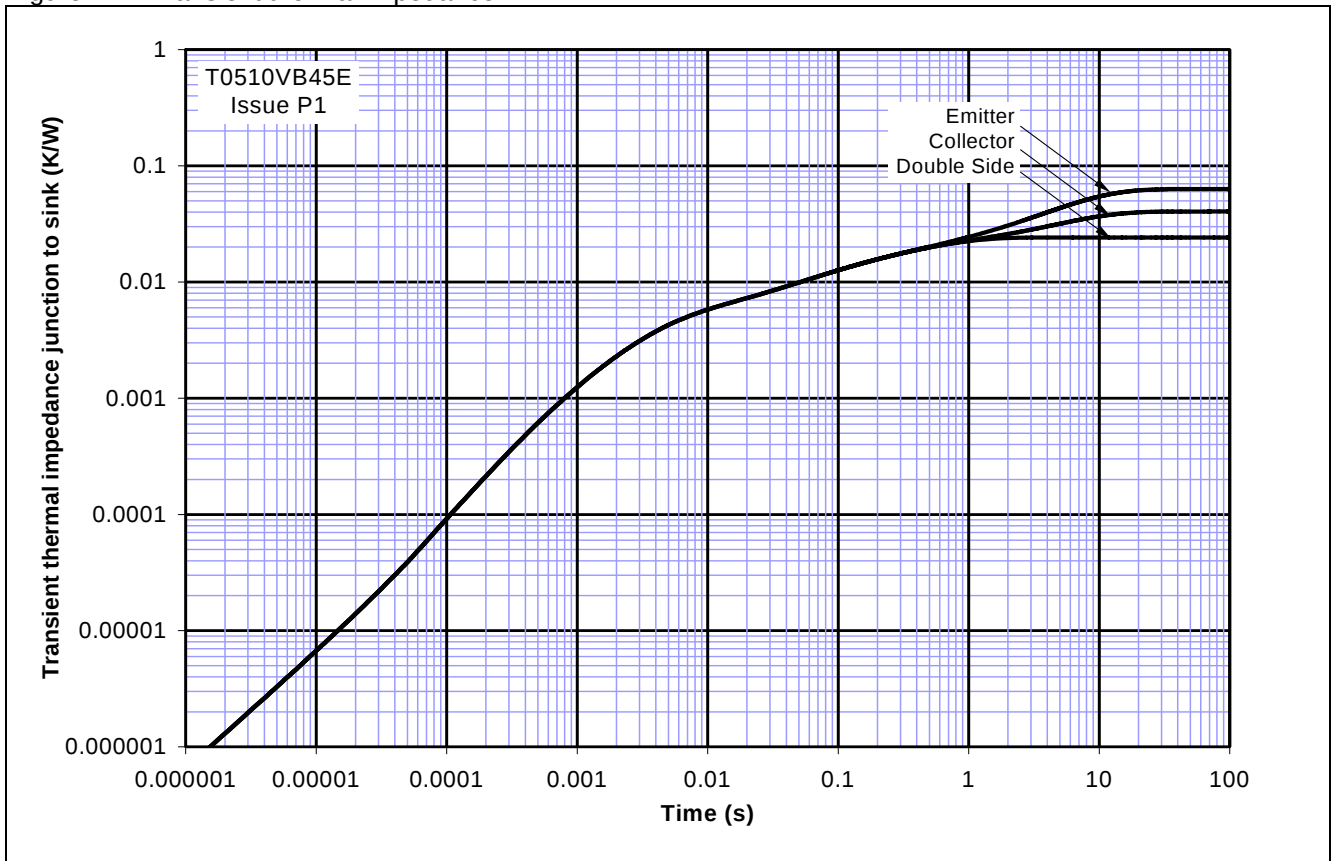
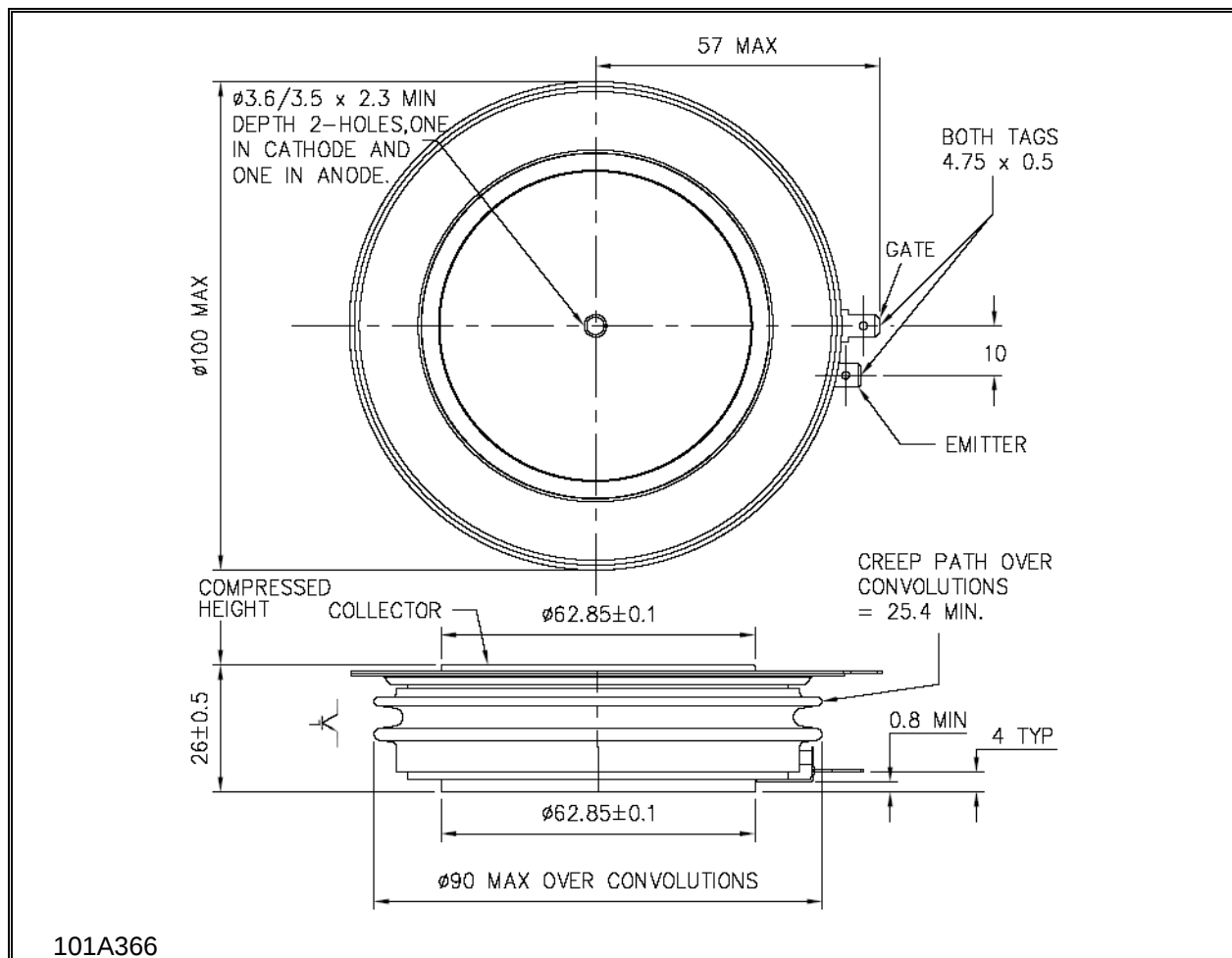


Figure 11 – Transient thermal impedance



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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