WESTCODE

An IXYS Company

Date:- 30 Oct, 2008

Data Sheet Issue:- 1

Provisional Data

Insulated Gate Bi-Polar Transistor

Type T0900EB45A

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
$I_{C(DC)}$	Continuous DC collector current, IGBT	900	A
I_{CRM}	Repetitive peak collector current, t_p=1ms, IGBT	1800	A
$I_{F(DC)}$	Continuous DC forward current, Diode	900	A
I_{FRM}	Repetitive peak forward current, t_p=1ms, Diode	1800	A
I_{FSM}	Peak non-repetitive surge t_p=10ms, V_{RM}=60%V_{RRM}, Diode (Note 4)	14.2	kA
I_{FSM2}	Peak non-repetitive surge t_p=10ms, V_{RM}≤10V, Diode (Note 4)	15.6	kA
P_{MAX}	Maximum power dissipation, IGBT (Note 2)	7.1	kW
$(di/dt)_{cr}$	Critical diode di/dt (note 3)	2500	A/µs
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 = 125ºC.
2) T_{sink} = 25°C, double side cooled.
3) Maximum commutation loop inductance 250nH.
4) Half-sinewave, 125°C T_j initial.

Characteristics

IGBT Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
$V_{CE(sat)}$	Collector – emitter saturation voltage	-	3.05	3.40	I_C = 900A, V_{GE} = 15V, T_j = 25°C	V
		-	3.80	4.20	I_C = 900A, V_{GE} = 15V	V
V_{T0}	Threshold voltage	-	-	1.73	Current range: 400 – 1200A	V
r_T	Slope resistance	-	-	2.68		mΩ
$V_{GE(TH)}$	Gate threshold voltage	-	5.3	-	V_{CE} = V_{GE}, I_C = 90mA	V
I_{CES}	Collector – emitter cut-off current		10	30	V_{CE} = V_{CES}, V_{GE} = 0V	mA
I_{GES}	Gate leakage current	-	-	±10	V_{GE} = ±20V	μA
C_{ies}	Input capacitance	-	150	-	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz	nF
$t_{d(on)}$	Turn-on delay time	-	2.2	-	I_C =900A, V_{CE} =2800V, V_{GE} = ±15V, L_s=250nH $R_{g(ON)}$= 6.6Ω, $R_{g(OFF)}$=5.0Ω, C_{GE}=100nF Integral diode used as freewheel diode (Note 3)	μs
$t_r(I)$	Rise time	-	3.4	-		μs
$Q_{g(on)}$	Turn-on gate charge	-	5	-		μC
E_{on}	Turn-on energy	-	4.3	-		J
$t_{d(off)}$	Turn-off delay time	-	1.9	-		μs
t_f	Fall time	-	2.4	-		μs
$Q_{g(off)}$	Turn-off gate charge	-	10	-		μC
E_{off}	Turn-off energy	-	3.6	-		J
$t_{d(on)}$	Turn-on delay time	-	2.4	-	I_C =900A, V_{CE} = 2800V, V_{GE} = ±15V, L_s=250nH $R_{g(ON)}$= 6.6Ω, $R_{g(OFF)}$=5.0Ω, C_{GE}=100nF Free wheel diode type E900NC450 (Note 3)	μs
$t_r(I)$	Rise time	-	3.2	-		μs
$Q_{g(on)}$	Turn-on gate charge	-	5	-		μC
E_{on}	Turn-on energy	-	3.8	-		J
$t_{d(off)}$	Turn-off delay time	-	1.9	-		μs
t_f	Fall time	-	2.4	-		μs
$Q_{g(off)}$	Turn-off gate charge	-	10	-		μC
E_{off}	Turn-off energy	-	3.6	-		J
I_{SC}	Short circuit current	-	3400	-	V_{GE}=+15V, V_{CC}=2800V, $V_{CEmax} \leq V_{CES}$, $t_p \leq 10\mu s$	A

Diode Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
V_F	Forward voltage	-	3.4	3.7	I_F = 900A, T_j =25°C	V
		-	3.9	4.2	I_F = 900A	V
V_{To}	Threshold voltage	-	-	2.43	Current range 400-1200A	V
r_T	Slope resistance	-	-	1.86		mΩ
I_{rm}	Peak reverse recovery current	-	610	-	I_F = 900A, V_{GE} = ±15V, di/dt=2000A/μs	A
Q_{rr}	Recovered charge	-	920	-		μC
t_{rr}	Reverse recovery time, 50% chord	-	2.3	-		μs
E_r	Reverse recovery energy	-	0.9	-		J

Thermal Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
R_{thJK}	Thermal resistance junction to sink, IGBT	-	-	14	Double side cooled	K/kW
		-	-	23	Collector side cooled	K/kW
		-	-	35	Emitter side cooled	K/kW
R_{thJK}	Thermal resistance junction to sink, Diode	-	-	26	Double side cooled	K/kW
		-	-	41	Cathode side cooled	K/kW
		-	-	78	Anode side cooled	K/kW
F	Mounting force	25	-	35	Note 2	kN
W_t	Weight	-	1.2	-		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

Curves

Figure 1 – Typical collector-emitter saturation voltage characteristics

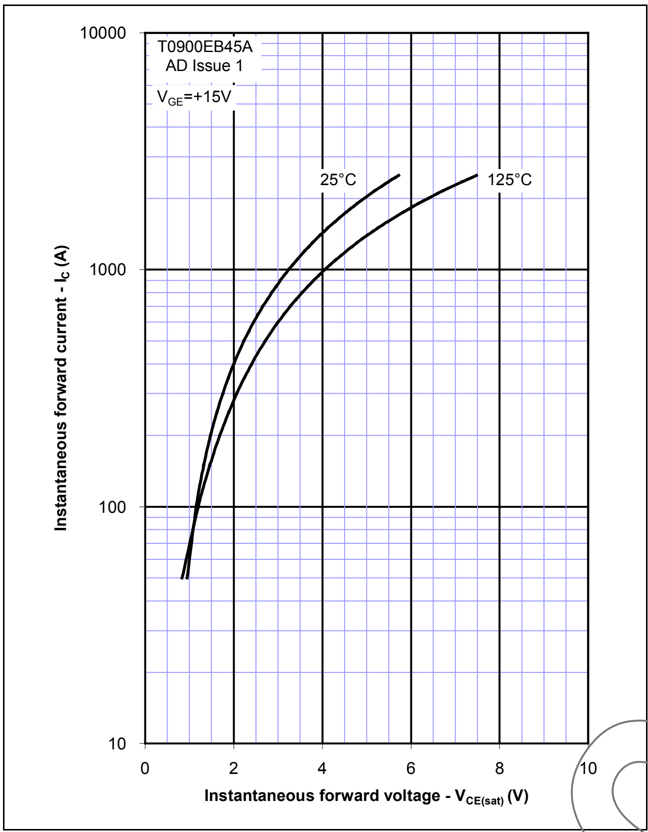


Figure 2 – Typical output characteristic

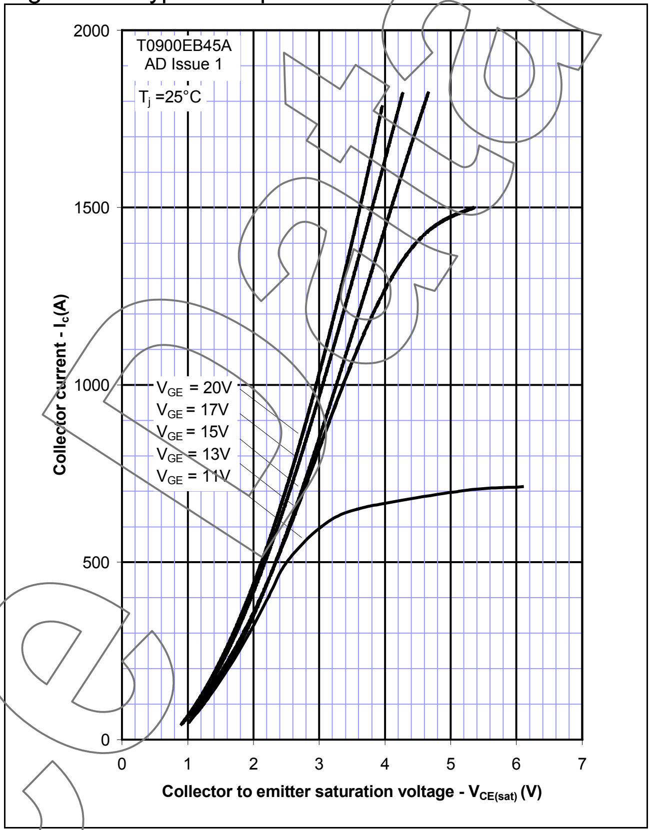


Figure 3 – Typical output characteristic

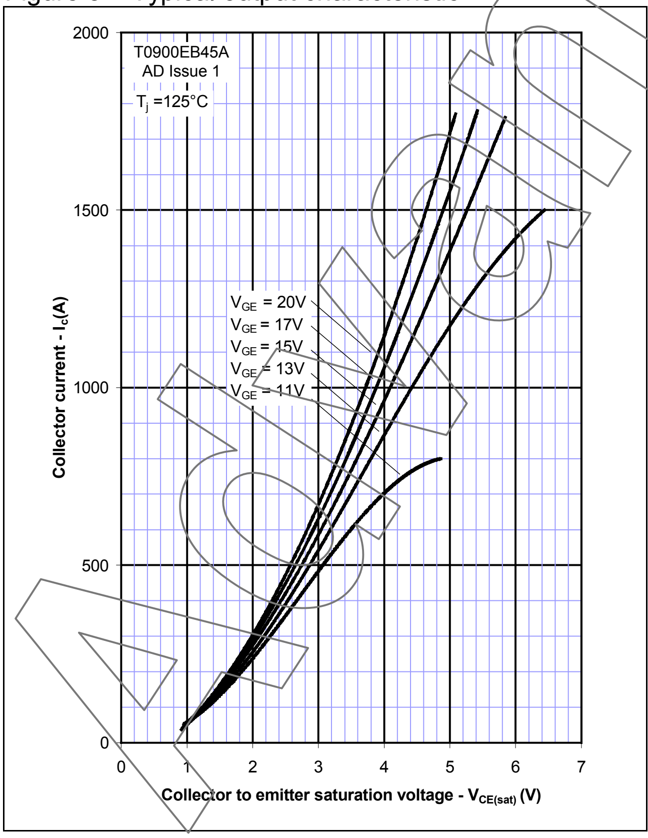


Figure 4 – Typical turn-on delay time vs gate resistance

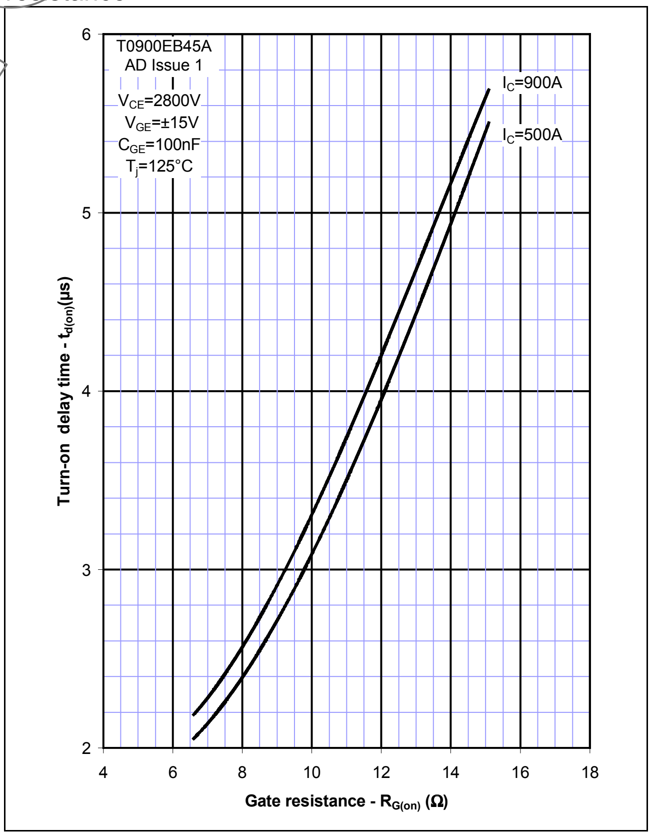


Figure 5 – Typical turn-off delay time vs. gate resistance

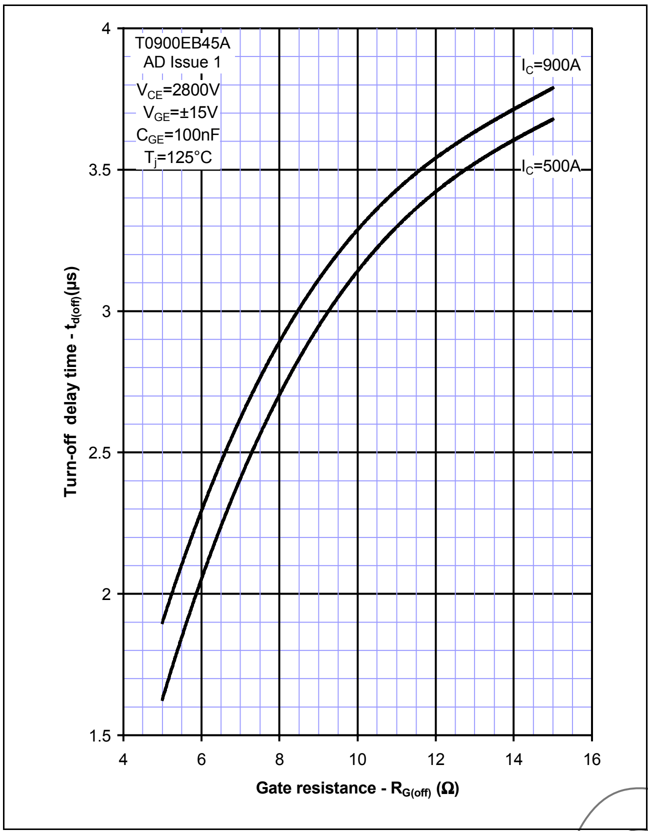


Figure 6 – Typical turn-on energy vs. collector current

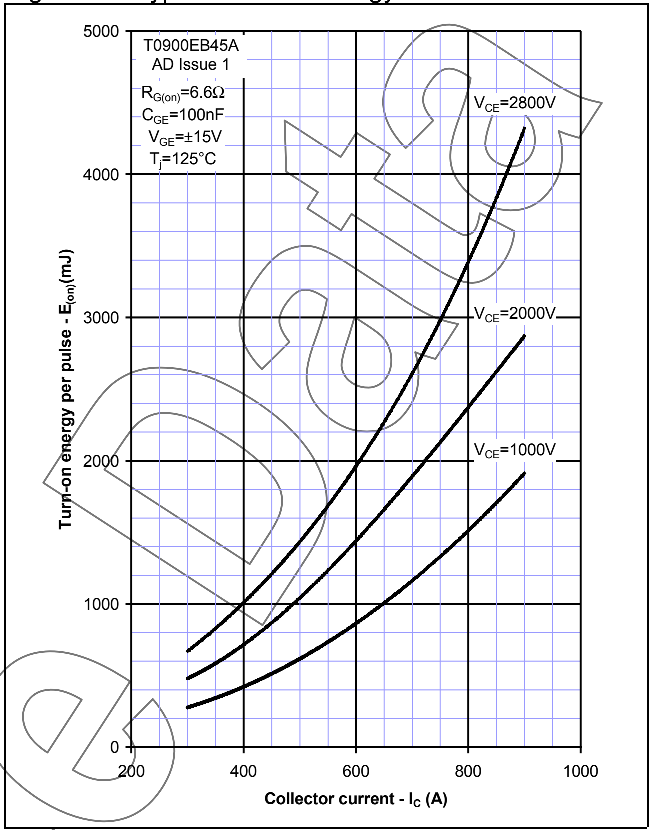


Figure 7 – Typical turn-on energy vs. di/dt

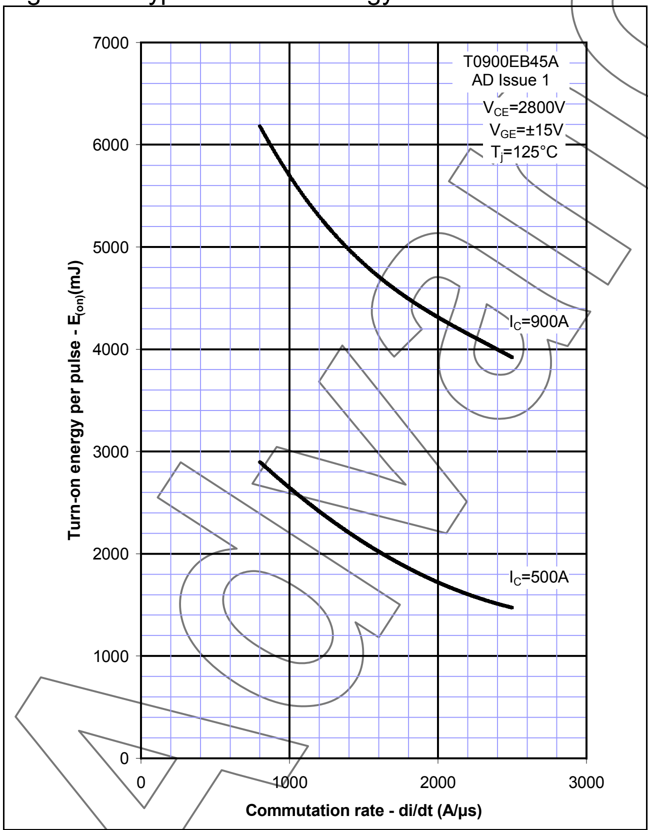


Figure 8 – Typical turn-off energy vs. collector current

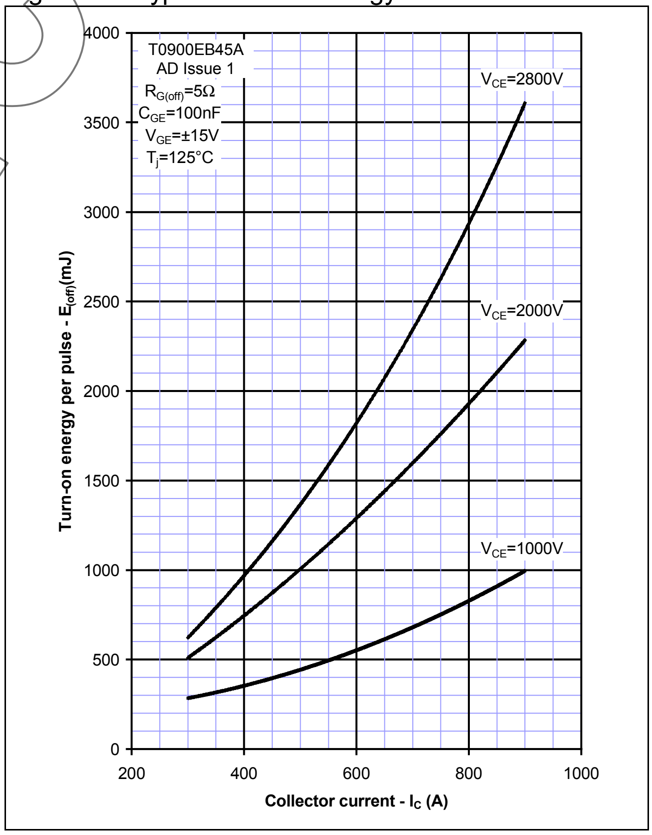


Figure 9 – Turn-off energy vs voltage

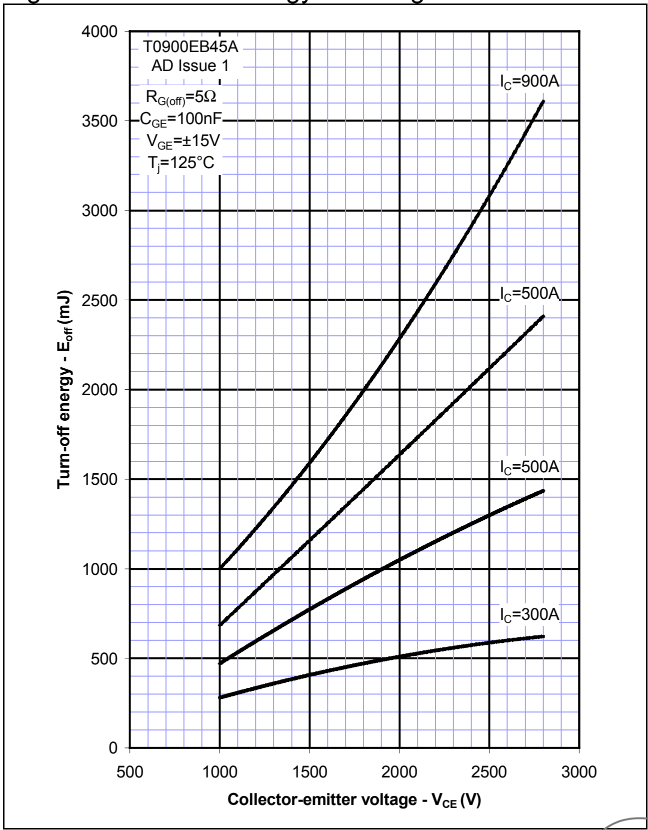


Figure 10 – Safe operating area

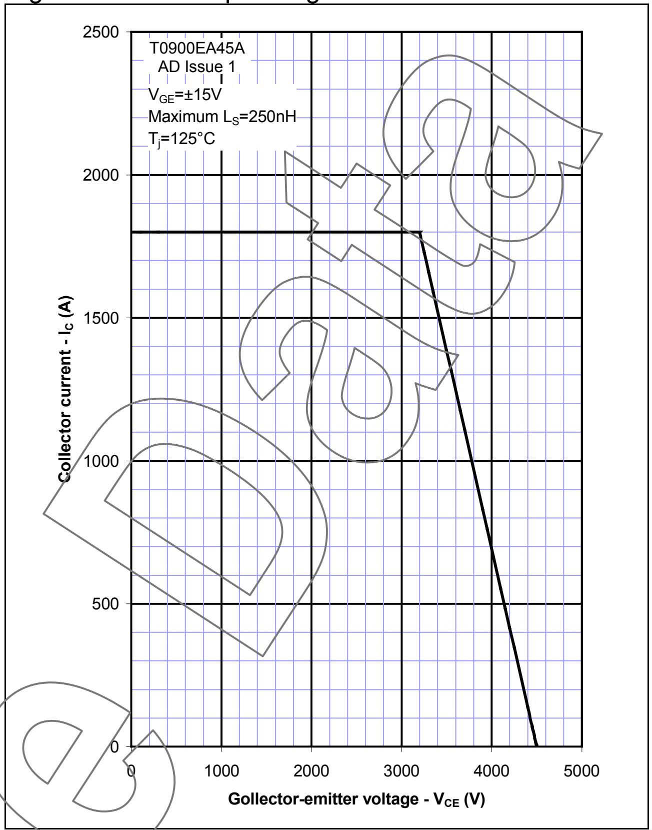


Figure 11 – Typical diode forward characteristic

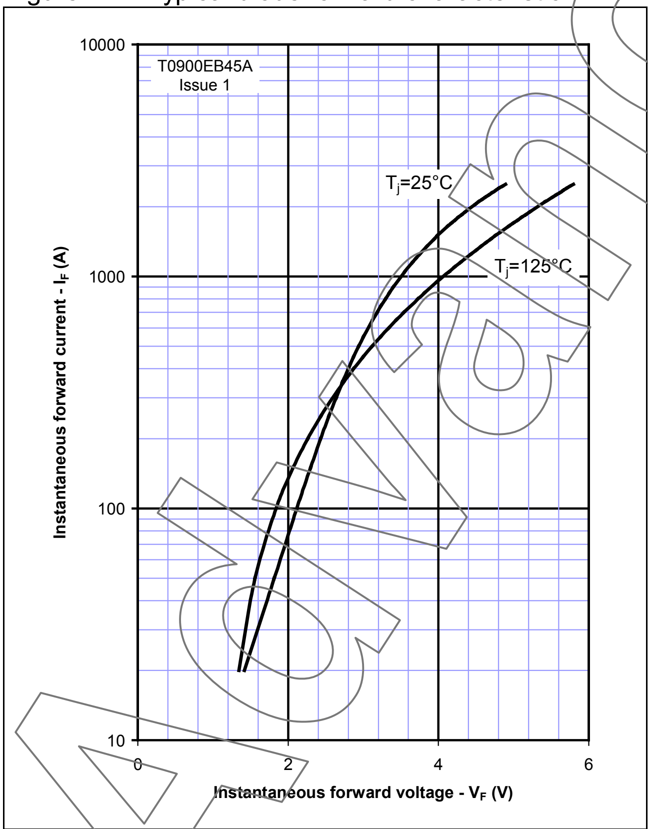


Figure 12 – Typical recovered charge

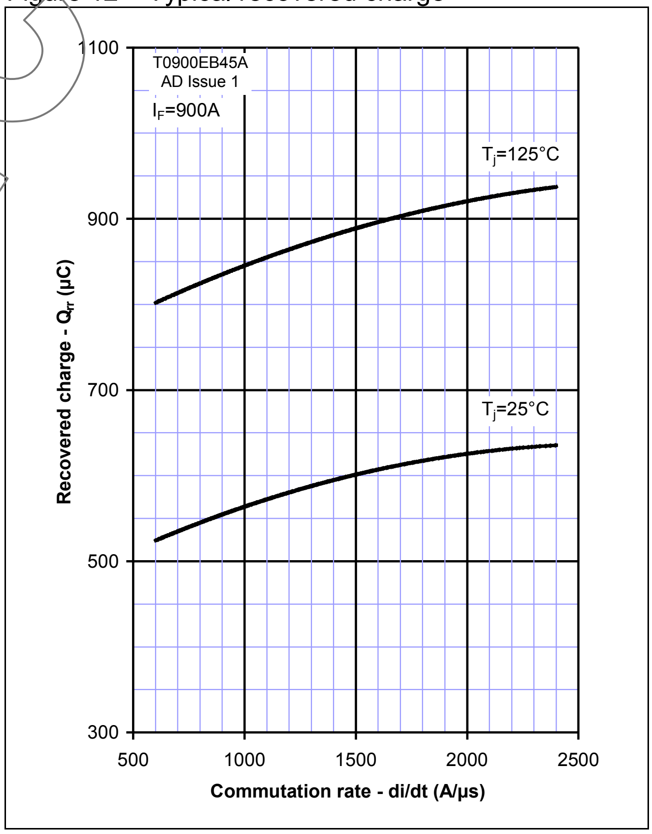


Figure 13 – Typical reverse recovery current

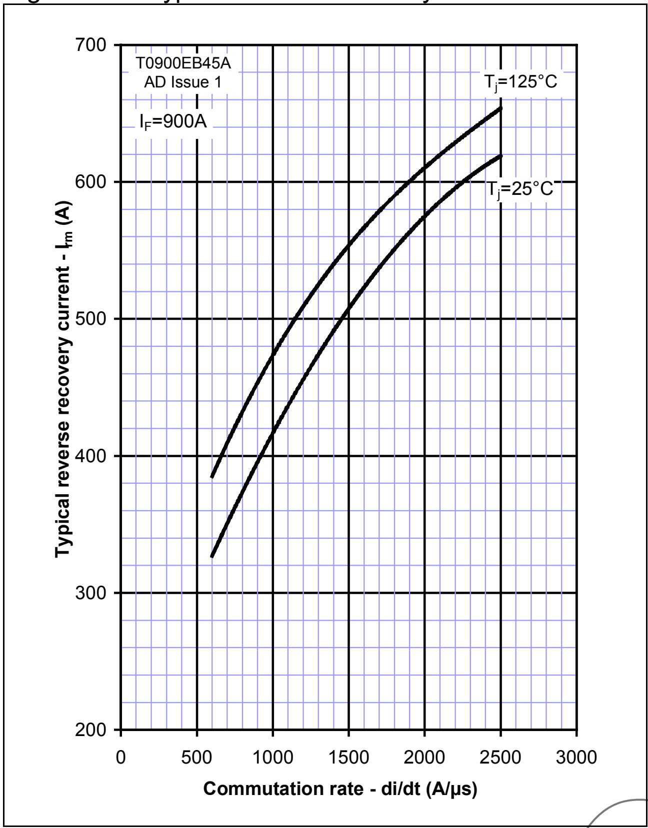


Figure 14 – Typical reverse recovery time

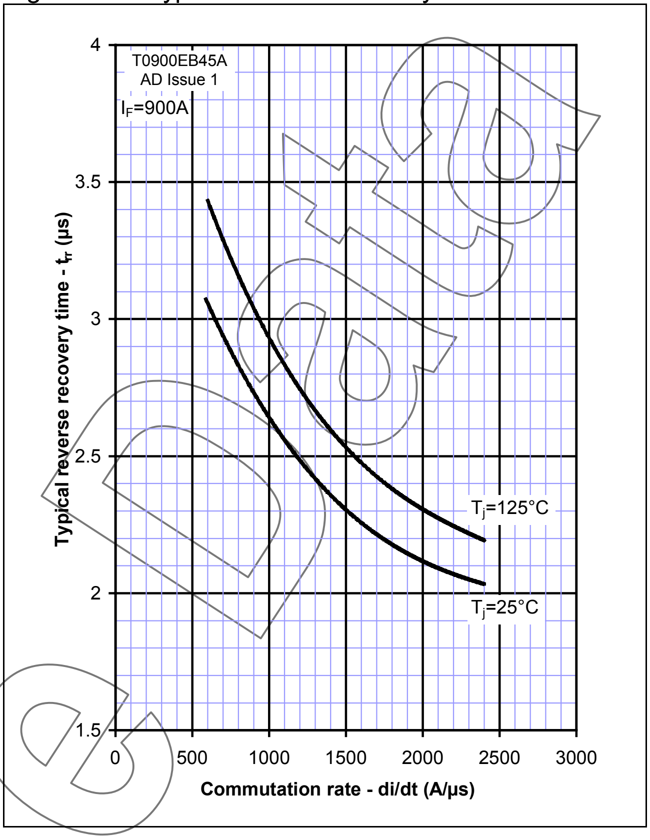


Figure 15 – Transient thermal impedance (IGBT)

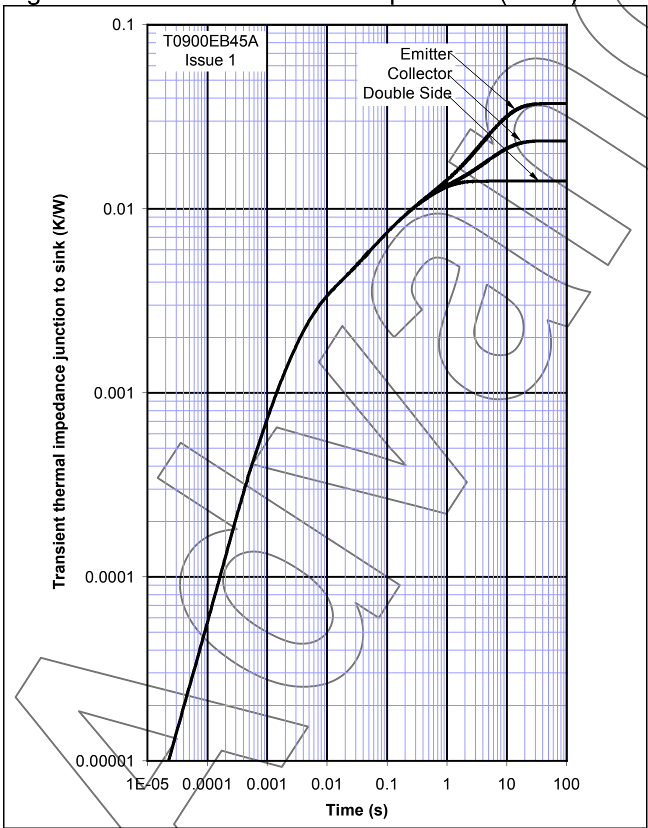
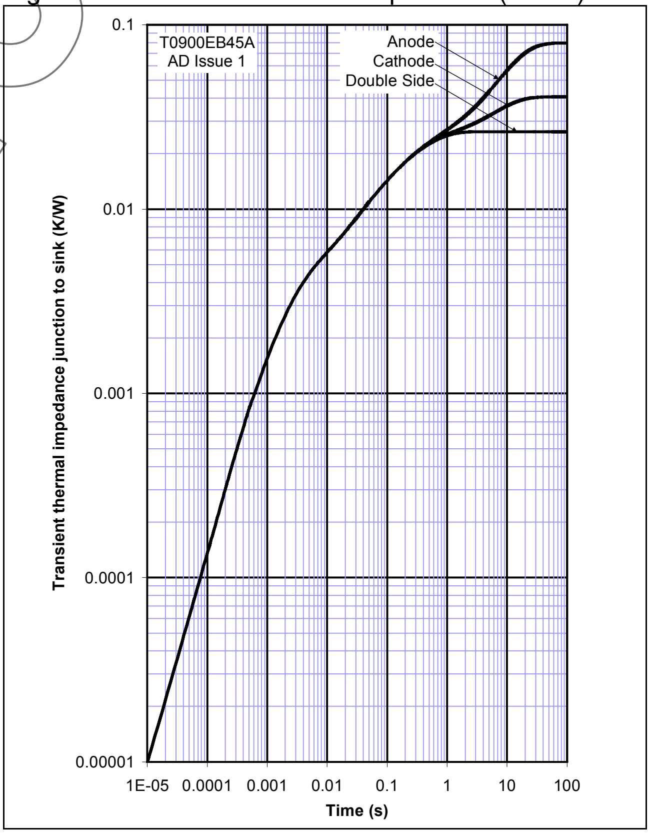
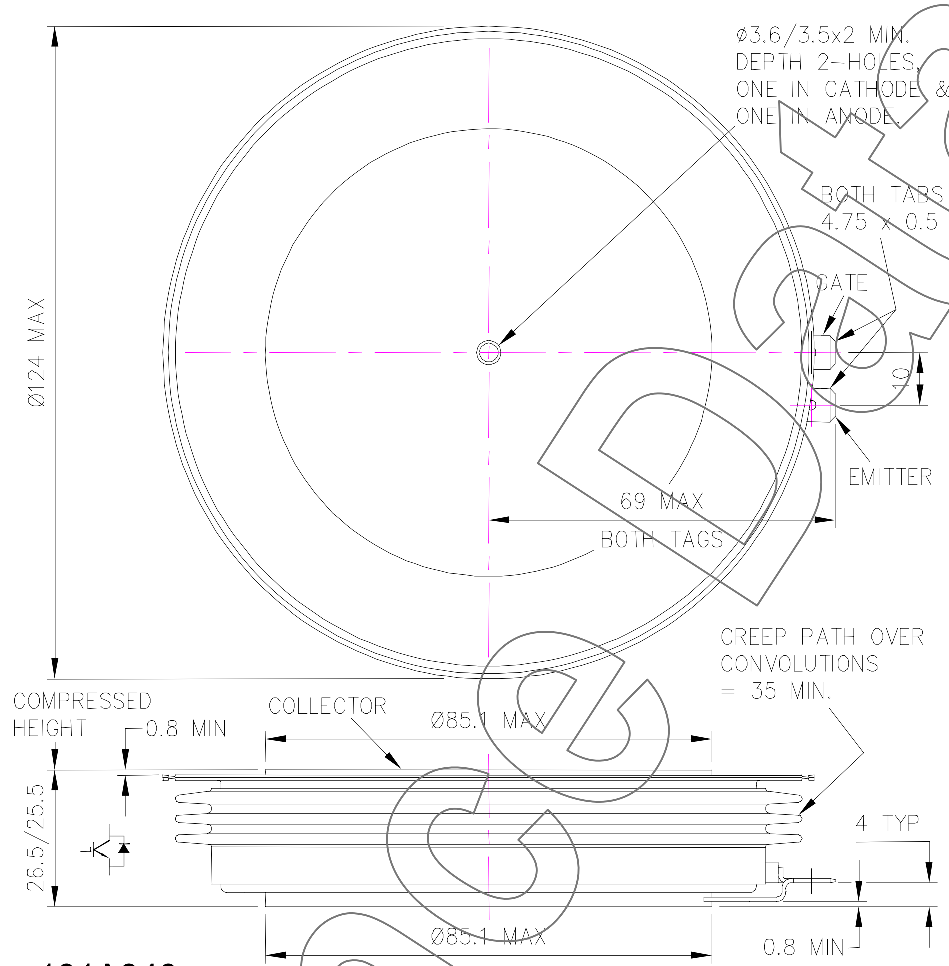


Figure 16 – Transient thermal impedance (Diode)



Outline Drawing & Ordering Information



ORDERING INFORMATION		(Please quote 10 digit code as below)	
T0900	**EB**	**45**	**A**
Fixed type Code	Fixed Outline Code	Voltage Grade 4500	Fixed format code

Typical order code: T0900EB45A (V_{CES} = 4500V)

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Devices with a suffix code (2-letter or letter/digit/letter combination) added to their generic code are not necessarily subject to the conditions and limits contained in this report.