



Date:- 20 Feb, 2019

Data Sheet Issue:- A1

Advance data

# Insulated Gate Bi-Polar Transistor Type T0425VC33G

## 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
$I_{C(DC)}$	DC collector current, IGBT	425	A
$I_{CRM}$	Repetitive peak collector current, $t_p=1ms$ , IGBT	850	A
$I_{F(DC)}$	Continuous DC forward current, Diode	425	A
$I_{FRM}$	Repetitive peak forward current, $t_p=1ms$ , Diode	850	A
$I_{FSM}$	Peak non-repetitive surge $t_p=10ms$ , $V_{RM}=60\%V_{RRM}$ , Diode (Note 4)	2545	A
$I_{FSM2}$	Peak non-repetitive surge $t_p=10ms$ , $V_{RM}\leq 10V$ , Diode (Note 4)	2800	A
$P_{MAX}$	Maximum power dissipation, IGBT (Note 2)	2.75	kW
$P_D$	Maximum power dissipation, Diode (Note 2)	1.74	kW
$(di/dt)_{cr}$	Critical diode di/dt (note 3)	1000	A/ $\mu s$
$T_j$	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) Maximum commutation loop inductance 1000nH.
- 4) Half-sinewave,  $125^{\circ}C$   $T_j$  initial.

## Characteristics

### IGBT Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
$V_{CE(sat)}$	Collector – emitter saturation voltage	-	2.65	2.95	$I_C = 425A, V_{GE} = 15V, T_j = 25^\circ C$	V
		-	3.4	3.7	$I_C = 425A, V_{GE} = 15V$	V
$V_{T0}$	Threshold voltage	-	-	1.69	Current range: 142 – 425A	V
$r_T$	Slope resistance	-	-	4.74		m $\Omega$
$V_{GE(TH)}$	Gate threshold voltage	-	5.2	-	$V_{CE} = V_{GE}, I_C = 36mA$	V
$I_{CES}$	Collector – emitter cut-off current	-	4	11	$V_{CE} = V_{CES}, V_{GE} = 0V$	mA
$I_{GES}$	Gate leakage current	-	-	$\pm 7$	$V_{GE} = \pm 20V$	$\mu A$
$C_{ies}$	Input capacitance	-	58	-	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$	nF
$t_{d(on)}$	Turn-on delay time	-	1.6	-	$I_C = 425A, V_{CE} = 1800V, di/dt = 850A/\mu s$ $V_{GE} = \pm 15V, L_s = 500nH$ $R_{G(ON)} = 5.1\Omega, R_{G(OFF)} = 33\Omega, C_{GE} = 183nF$ Integral diode used as freewheel diode (Note 3, 4 & 5)	$\mu s$
$t_r(V)$	Rise time	-	2	-		$\mu s$
$Q_{g(on)}$	Turn-on gate charge	-	8.1	-		$\mu C$
$E_{on}$	Turn-on energy	-	1.1	-		J
$t_{d(off)}$	Turn-off delay time	-	4.9	-		$\mu s$
$t_f(I)$	Fall time	-	1.2	-		$\mu s$
$Q_{g(off)}$	Turn-off gate charge	-	6	-		$\mu C$
$E_{off}$	Turn-off energy	-	1.12	-		J
$I_{SC}$	Short circuit current	-	1600	-		$V_{GE} = +15V, V_{CC} = 1800V, V_{CEmax} \leq V_{CES}, t_p \leq 10\mu s$

### Diode Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
$V_F$	Forward voltage	-	2.65	2.95	$I_F = 425A, T_j = 25^\circ C$	V
		-	3.0	3.3	$I_F = 425A$	V
$V_{T0}$	Threshold voltage	-	-	1.72	Current range 142 - 425A	V
$r_T$	Slope resistance	-	-	3.72		m $\Omega$
$I_{rm}$	Peak reverse recovery current	-	305	-	$I_F = 425A, V_{GE} = \pm 15V, di/dt = 850A/\mu s$	A
$Q_{rr}$	Recovered charge	-	440	-		$\mu C$
$t_{rr}$	Reverse recovery time, 50% chord	-	1.7	-		$\mu s$
$E_r$	Reverse recovery energy	-	0.48	-		J

### Thermal Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
$R_{thJK}$	Thermal resistance junction to sink, IGBT	-	-	36.4	Double side cooled	K/kW
		-	-	59.4	Collector side cooled	K/kW
		-	-	94.3	Emitter side cooled	K/kW
$R_{thJK}$	Thermal resistance junction to sink, Diode	-	-	57.6	Double side cooled	K/kW
		-	-	88.2	Cathode side cooled	K/kW
		-	-	166	Anode 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
- 4)  $E_{on}$  integration time  $15\mu s$  from 10% rising  $I_G$ .
- 5)  $E_{off}$  integration time  $15\mu s$  from 90% falling  $V_{GE}$ .

**Curves**

Figure 1 – Typical collector-emitter saturation voltage characteristics

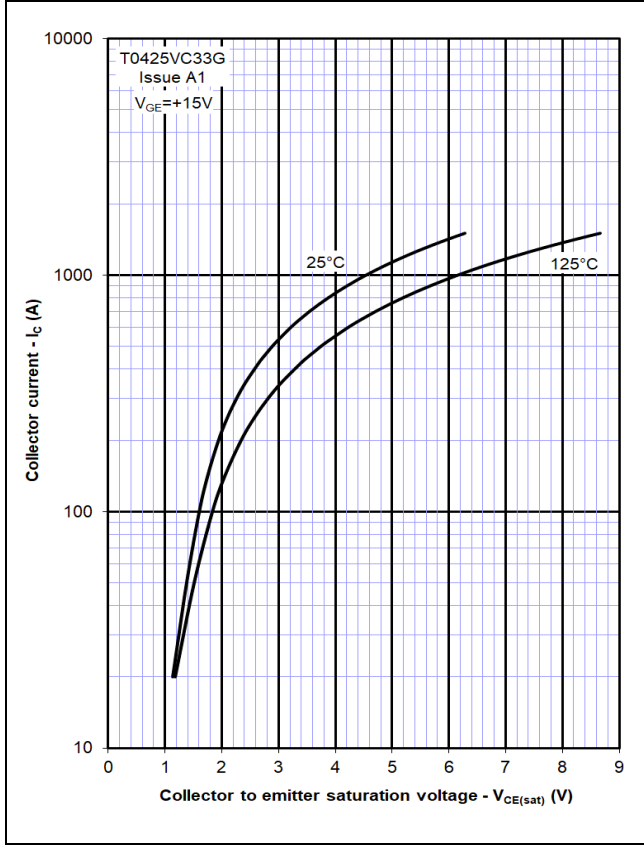


Figure 2 – Typical output characteristic

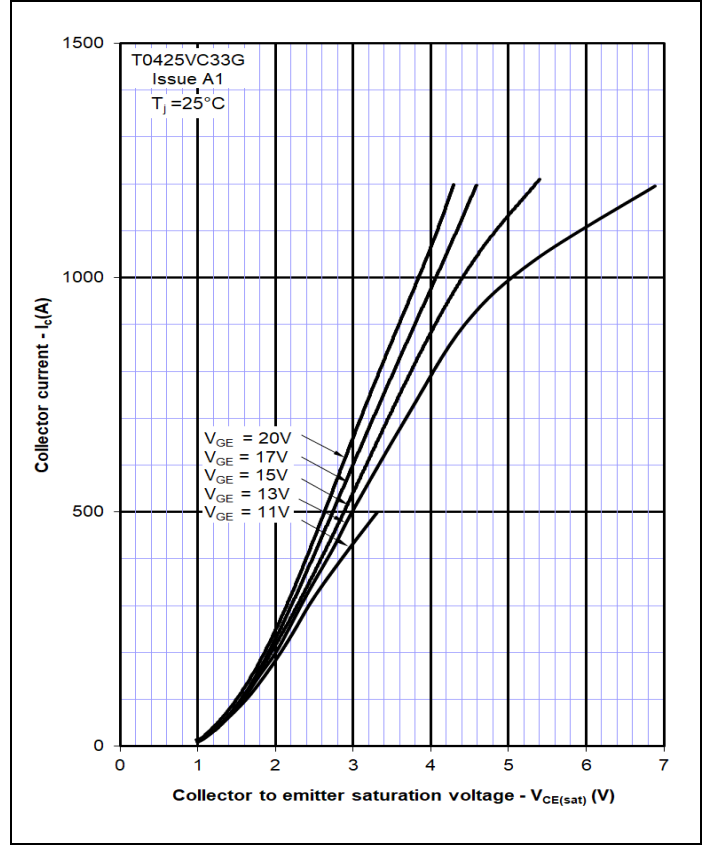


Figure 3 – Typical output characteristic

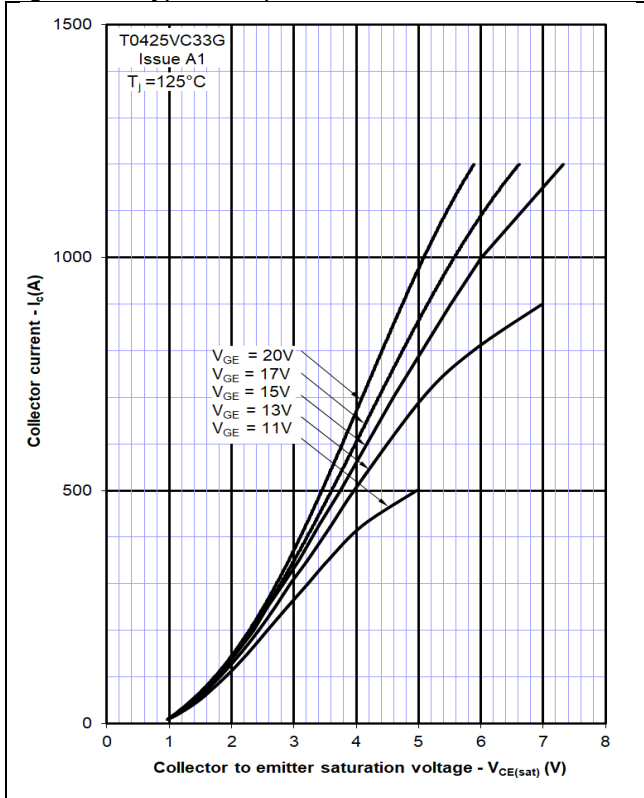


Figure 4 – Typical turn-on delay time vs gate resistance

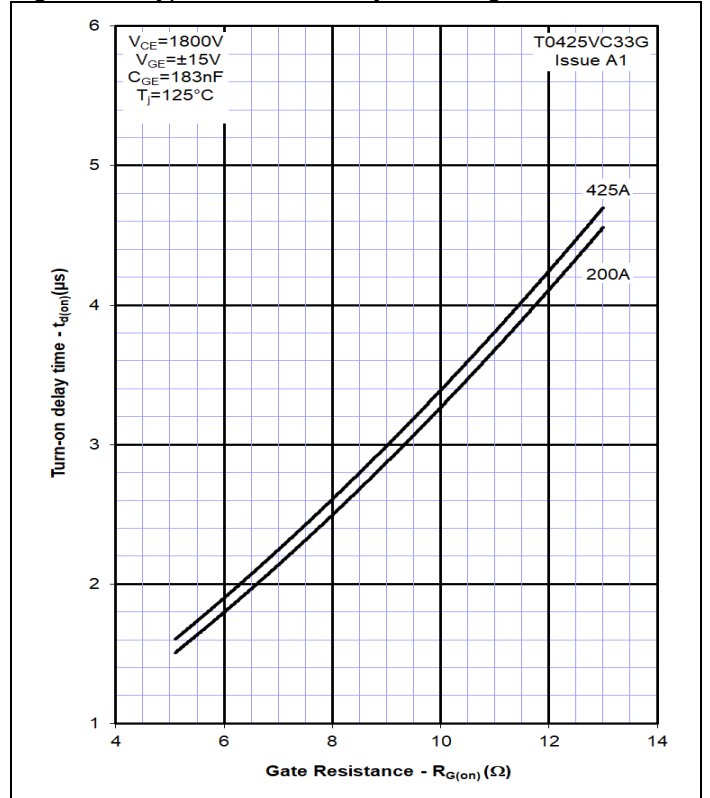


Figure 5 – Typical turn-off delay time vs. gate resistance

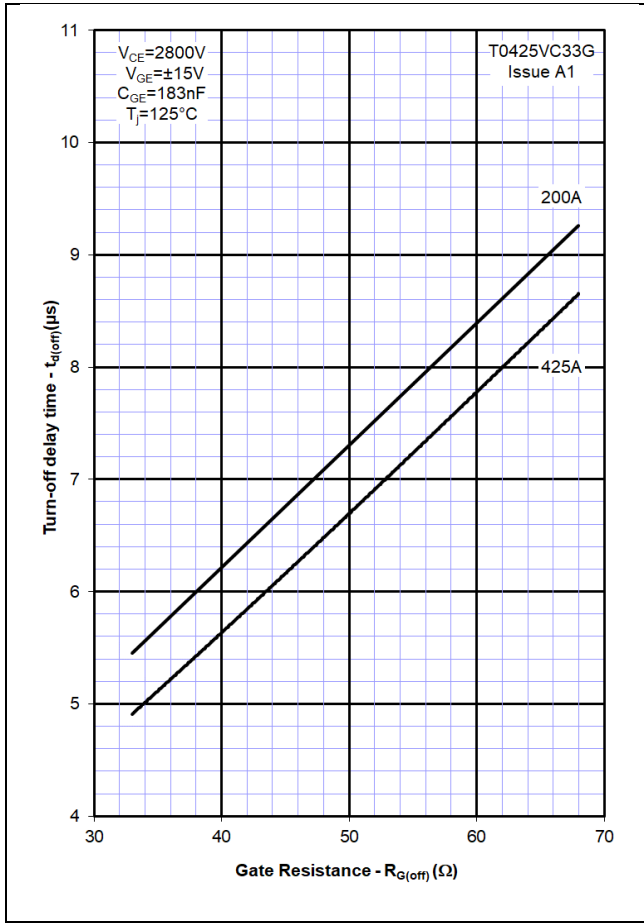


Figure 6 – Typical turn-on energy vs. collector current

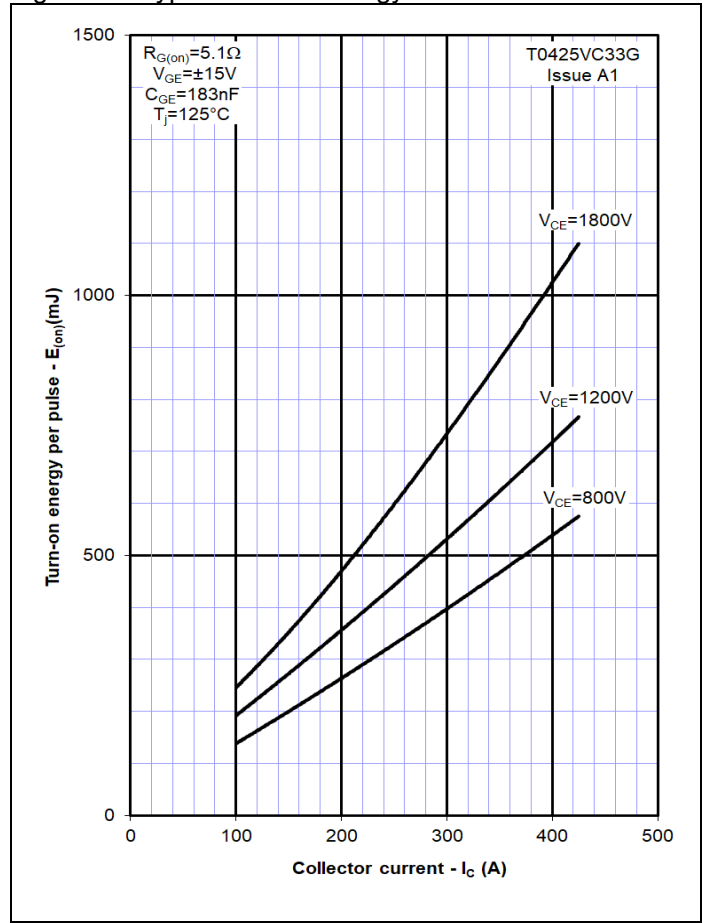


Figure 7 – Typical turn-on energy vs. di/dt

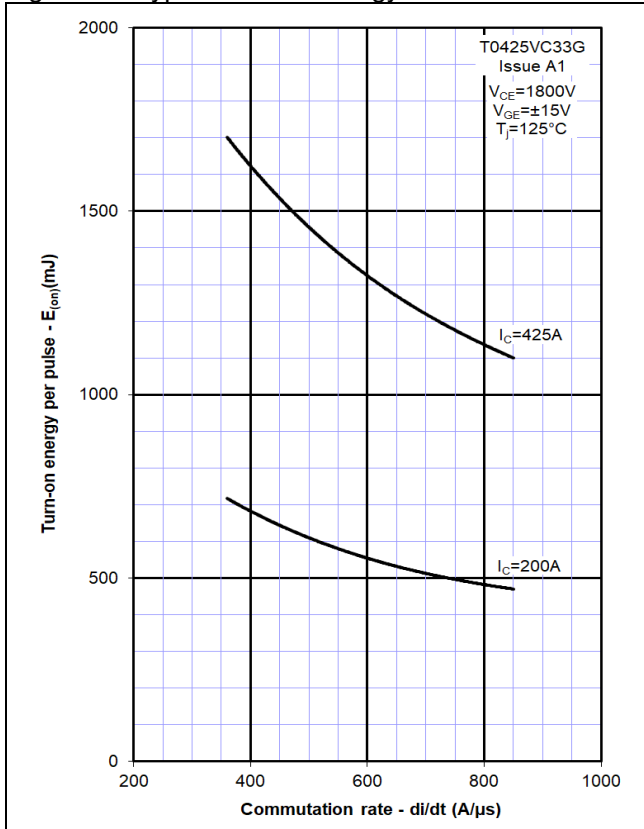


Figure 8 – Typical turn-off energy vs. collector current

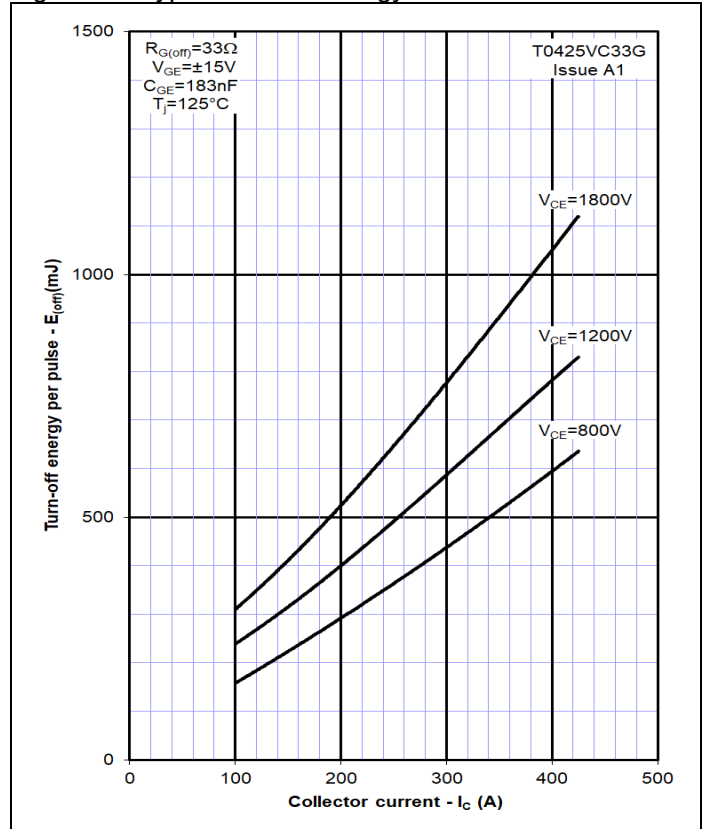


Figure 9 – Turn-off energy vs voltage

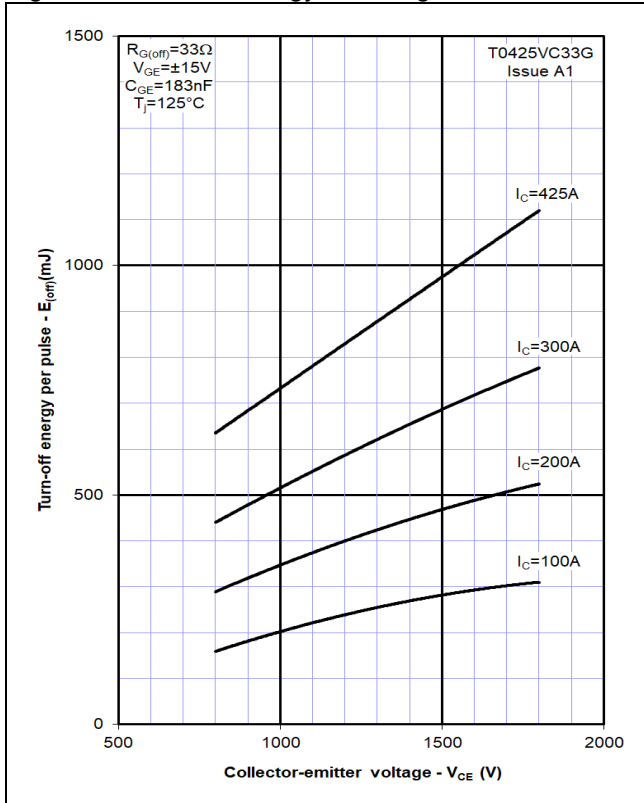


Figure 10 – Safe operating area (IGBT)

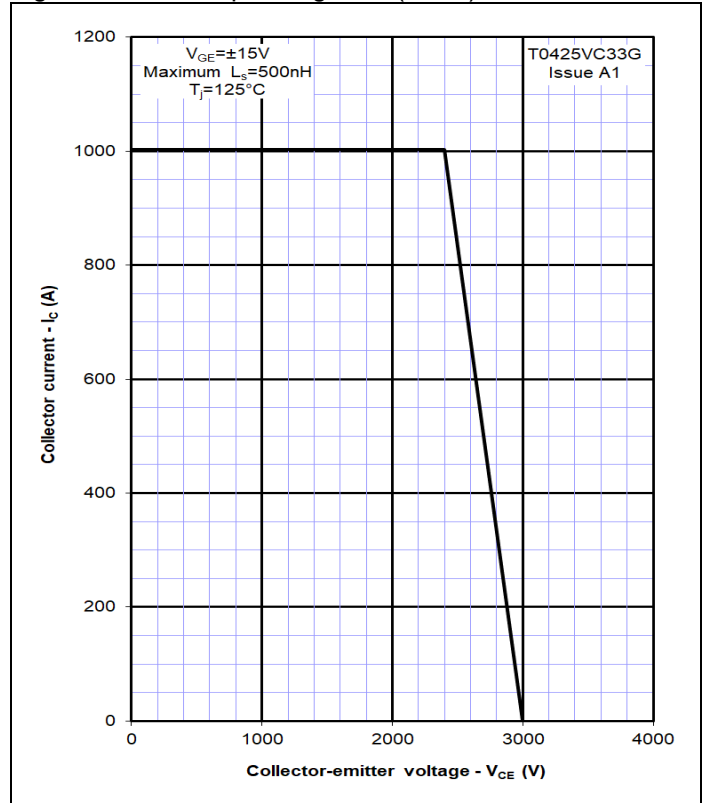


Figure 11 – Typical diode forward characteristics

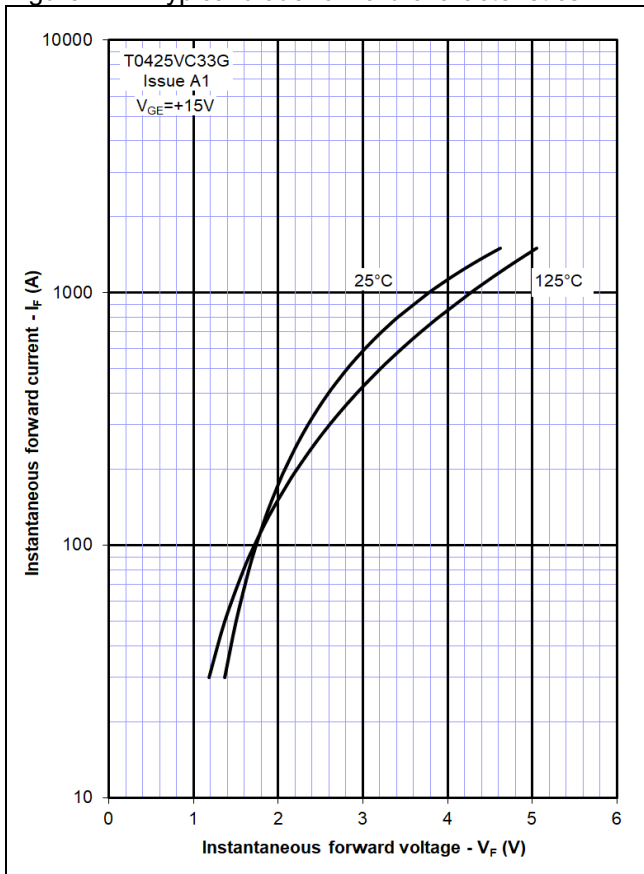


Figure 12 – Typical recovered charge

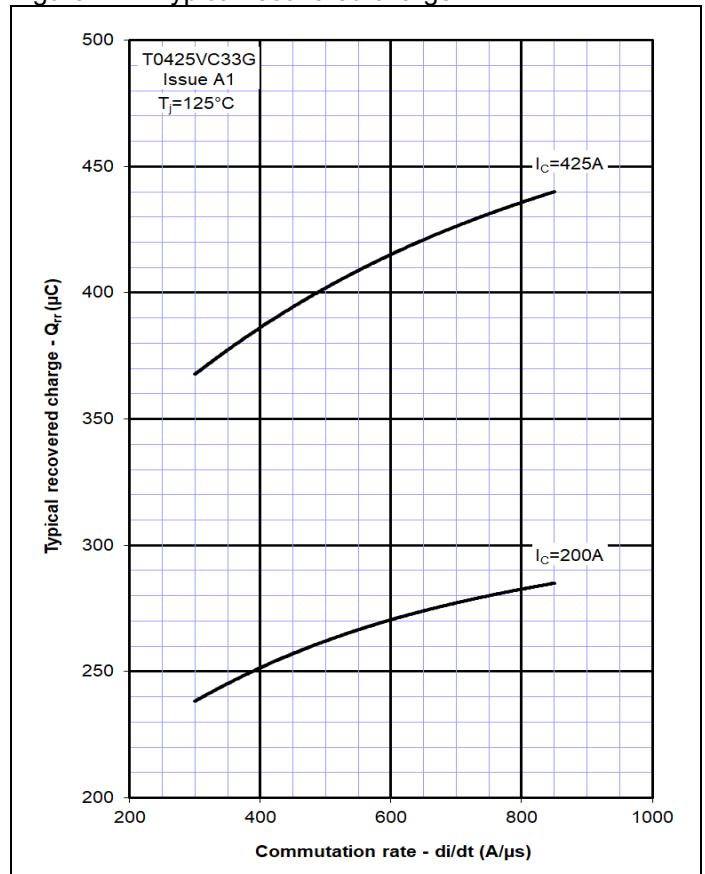


Figure 13 – Typical reverse recovery current

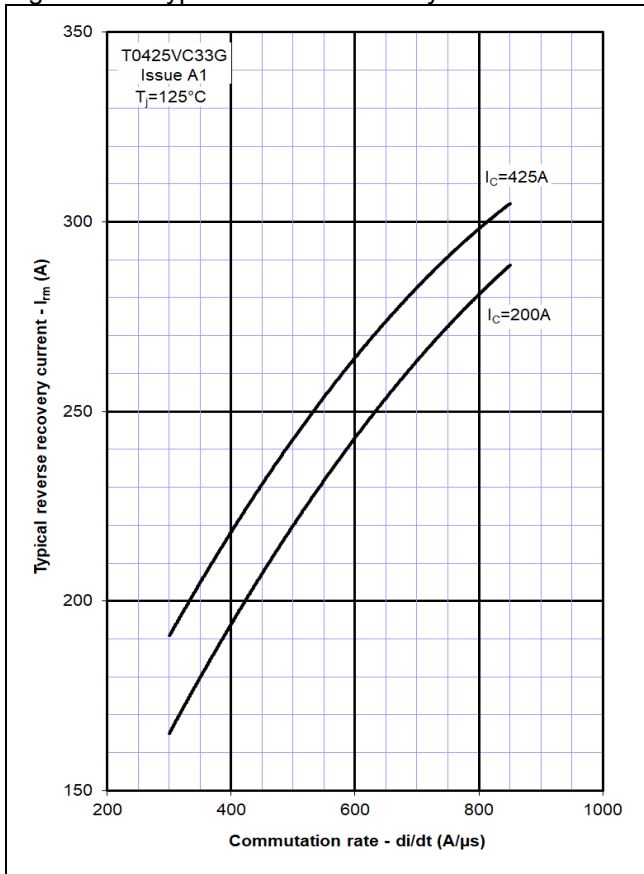


Figure 14 – Typical reverse recovery time

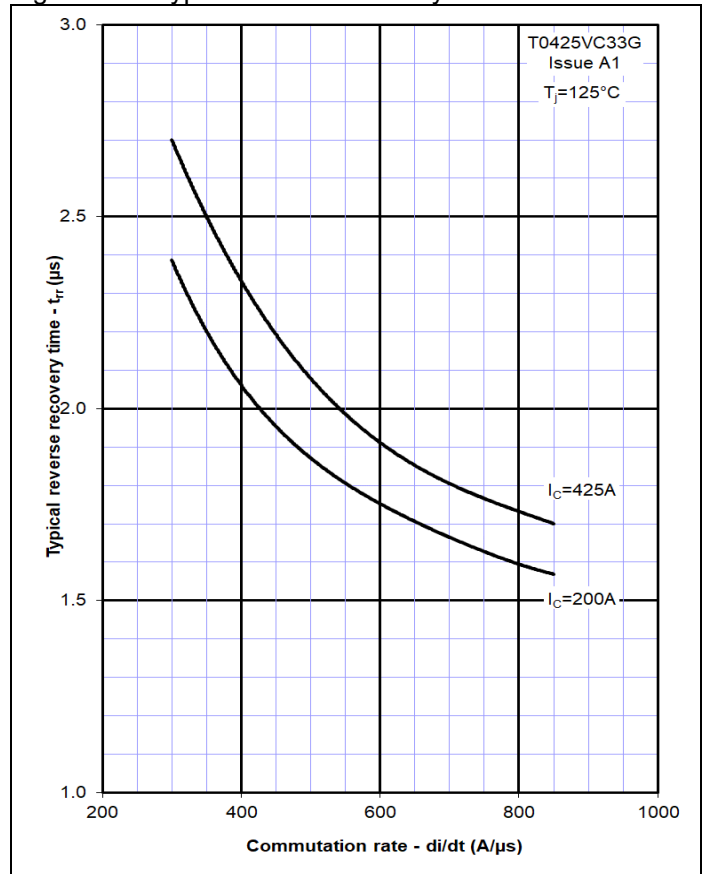


Figure 15 – Typical reverse recovery energy

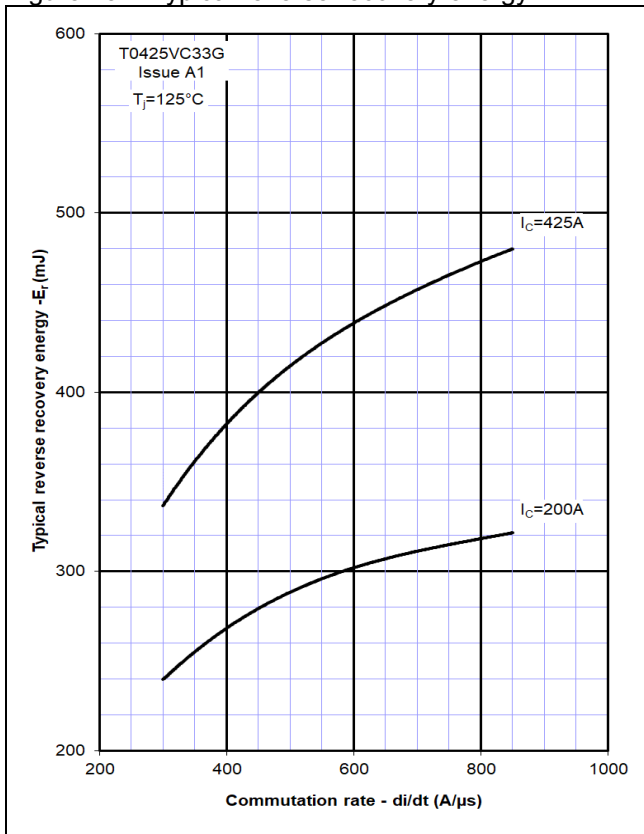


Figure 16 – Safe operating area (Diode)

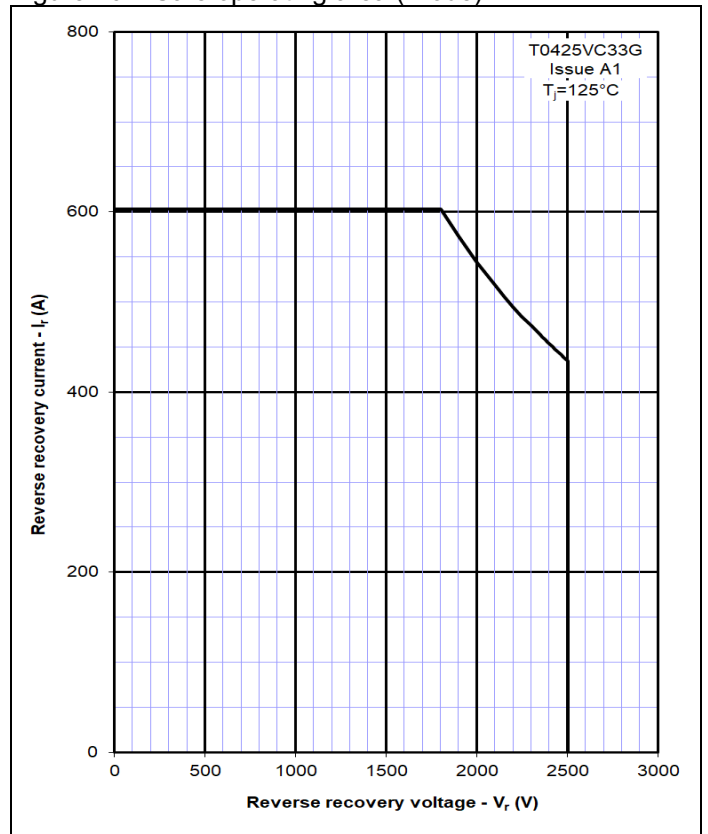


Figure 17 – Transient thermal impedance (IGBT)

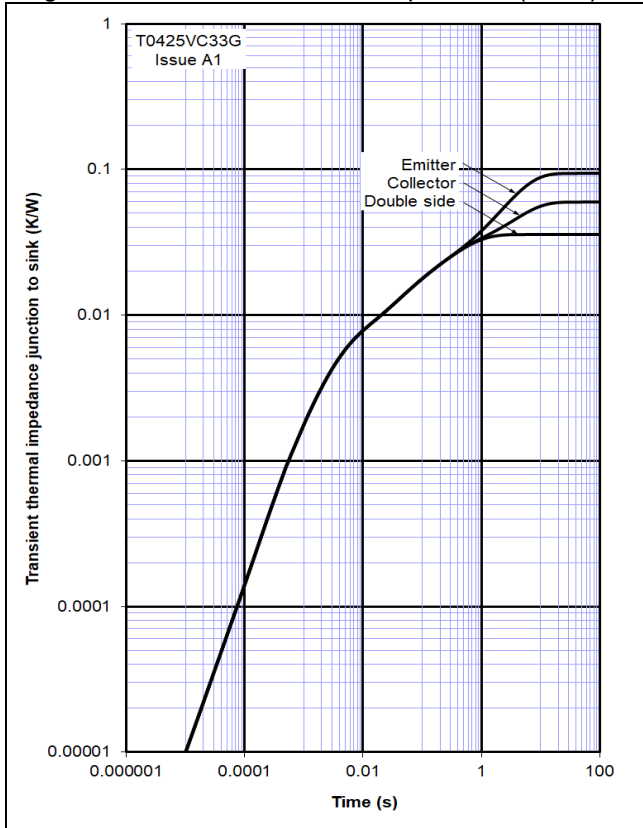
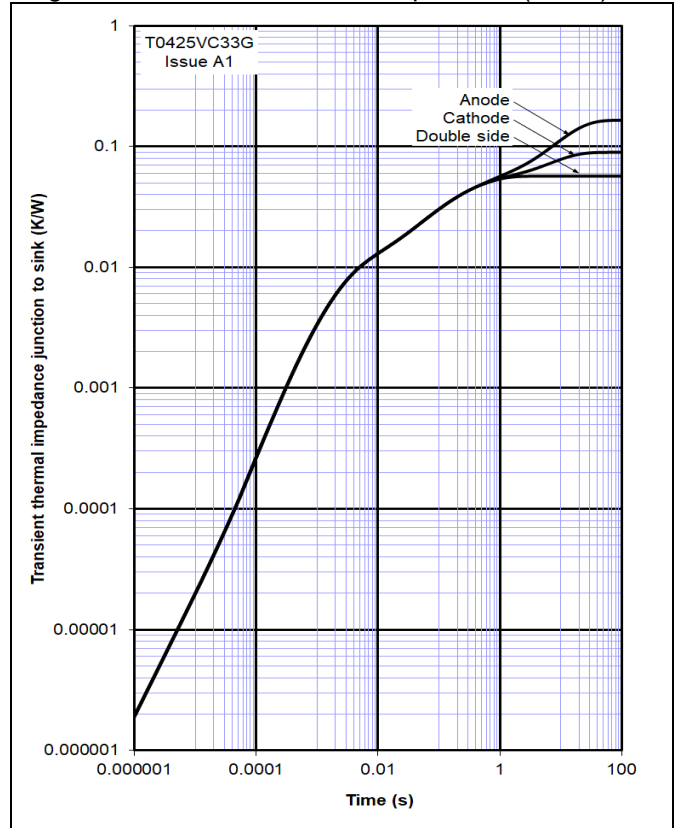
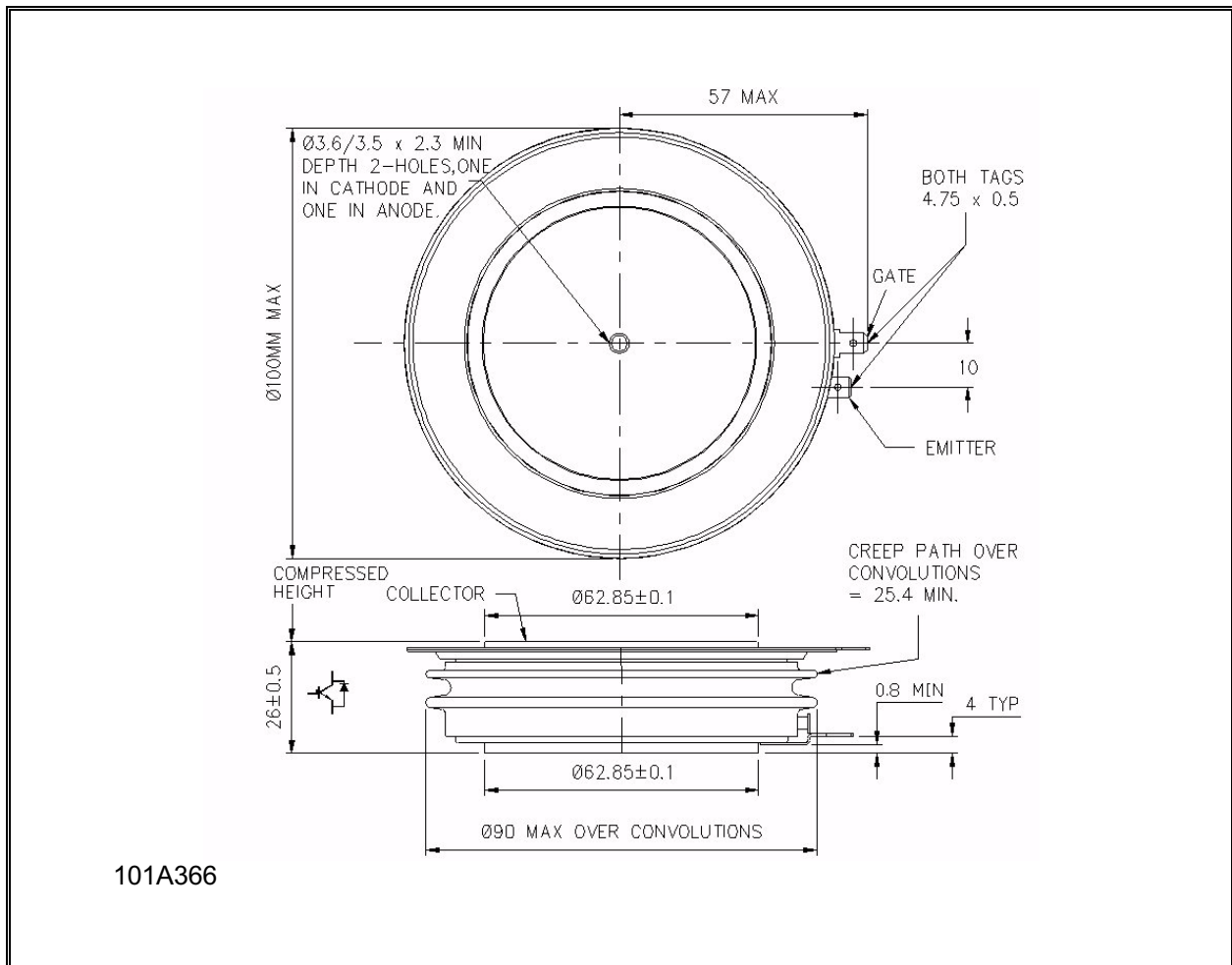


Figure 18 – Transient thermal impedance (Diode)



## Outline Drawing & Ordering Information



### ORDERING INFORMATION

(Please quote 10 digit code as below)

T0425	VC	33	G
Fixed type Code	Fixed Outline Code	Voltage Grade $V_{CES}/100$ 33	Fixed format code

 Typical order code: T0425VC33G ( $V_{CES} = 3300V$ )

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