

Tentative data

# Insulated Gate Bi-Polar Transistor

## Type T0960VC17G

### Absolute Maximum Ratings

	VOLTAGE RATINGS	MAXIMUM LIMITS	UNITS
$V_{CES}$	Collector – emitter voltage	1700	V
$V_{DC\ link}$	Permanent DC voltage for 100 FIT failure rate.	900	V
$V_{GES}$	Peak gate – emitter voltage	$\pm 20$	V

	RATINGS	MAXIMUM LIMITS	UNITS
$I_C$	DC collector current, IGBT	960	A
$I_{CRM}$	Repetitive peak collector current, $t_p=1ms$ , IGBT	1920	A
$I_{F(DC)}$	Continuous DC forward current, Diode	960	A
$I_{FRM}$	Repetitive peak forward current, $t_p=1ms$ , Diode	1920	A
$I_{FSM}$	Peak non-repetitive surge $t_p=10ms$ , $V_{RM}=60\%V_{RRM}$ , Diode (Note 4)	5635	A
$I_{FSM2}$	Peak non-repetitive surge $t_p=10ms$ , $V_{RM}\leq 10V$ , Diode (Note 4)	6200	A
$P_{MAX}$	Maximum power dissipation, IGBT (Note 2)	2.96	kW
$(di/dt)_{cr}$	Critical diode di/dt (note 3)	6000	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 150nH.
- 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	-	2.36	2.65	$I_C = 960A, V_{GE} = 15V, T_j = 25^\circ C$	V
		-	3.0	3.3	$I_C = 960A, V_{GE} = 15V$	V
$V_{T0}$	Threshold voltage	-	-	1.22	Current range: 320A – 960A	V
$r_T$	Slope resistance	-	-	2.17		mΩ
$V_{GE(TH)}$	Gate threshold voltage	-	5	-	$V_{CE} = V_{GE}, I_C = 32mA$	V
$I_{CES}$	Collector – emitter cut-off current	-	5.5	15	$V_{CE} = V_{CES}, V_{GE} = 0V$	mA
$I_{GES}$	Gate leakage current	-	-	±15	$V_{GE} = \pm 20V$	µA
$C_{ies}$	Input capacitance	-	75	-	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$	nF
$t_{d(on)}$	Turn-on delay time	-	0.32	-	$I_C = 960A, V_{CE} = 900V, di/dt = 5000A/\mu s$	µs
$t_r(V)$	Rise time	-	0.84	-		µs
$Q_{g(on)}$	Turn-on gate charge	-	4.2	-	$V_{GE} = \pm 15V, L_s = 120nH$	µC
$E_{on}$	Turn-on energy	-	0.47	-	$R_{g(ON)} = 2\Omega, R_{g(OFF)} = 15\Omega, C_{GE} = 120nF$	J
$t_{d(off)}$	Turn-off delay time	-	2.1	-	Integral diode used as freewheel diode (Note 3 & 4)	µs
$t_f(I)$	Fall time	-	0.55	-		µs
$Q_{g(off)}$	Turn-off gate charge	-	2.4	-		µC
$E_{off}$	Turn-off energy	-	0.8	-		J
$I_{SC}$	Short circuit current	-	2400	-	$V_{GE} = +15V, V_{CC} = 900V, V_{CEmax} \leq V_{CES}, t_p \leq 10\mu s$	A

### Diode Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
$V_F$	Forward voltage	-	1.95	2.25	$I_F = 960A, T_j = 25^\circ C$	V
		-	2.05	2.35	$I_F = 960A$	V
$V_{T0}$	Threshold voltage	-	-	1.37	Current range 320A - 960A	V
$r_T$	Slope resistance	-	-	1.02		mΩ
$I_{rm}$	Peak reverse recovery current	-	540	-	$I_F = 960A, V_r = 900V, V_{GE} = -15V, di/dt = 5000A/\mu s$	A
$Q_{rr}$	Recovered charge	-	310	-		µC
$t_{rr}$	Reverse recovery time, 50% chord	-	0.6	-		µs
$E_r$	Reverse recovery energy	-	0.18	-		J

### Thermal Characteristics

	PARAMETER	MIN	TYP	MAX	TEST CONDITIONS	UNITS
$R_{thJK}$	Thermal resistance junction to sink, IGBT	-	-	33.8	Double side cooled	K/kW
		-	-	51.8	Collector side cooled	K/kW
		-	-	96.9	Emitter side cooled	K/kW
$R_{thJK}$	Thermal resistance junction to sink, Diode	-	-	36.1	Double side cooled	K/kW
		-	-	55.6	Cathode side cooled	K/kW
		-	-	104	Anode side cooled	K/kW
F	Mounting force	11	-	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) Figures 6 to 9 are obtained using integral diode as freewheeling diode

**Curves**

Figure 1 – Typical collector-emitter saturation voltage characteristics

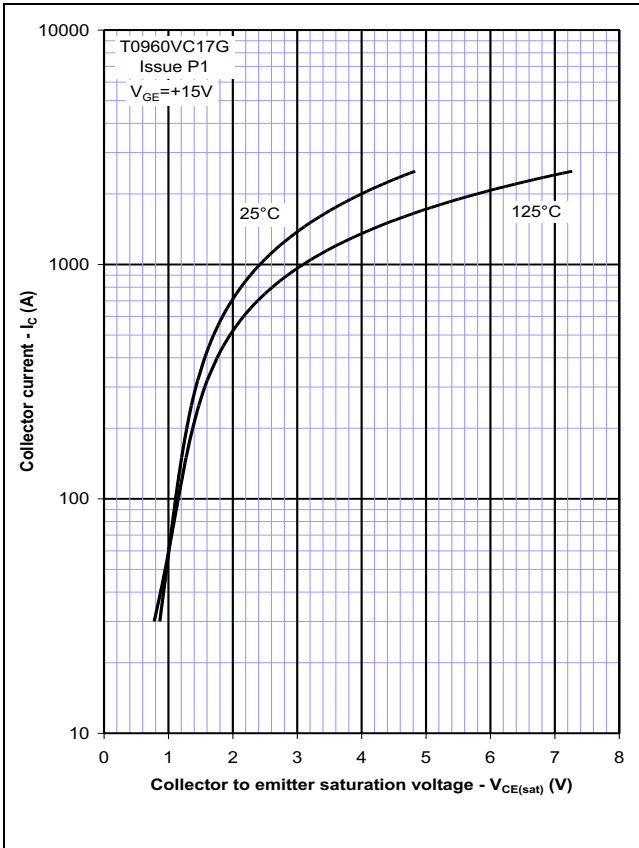


Figure 2 – Typical output characteristic

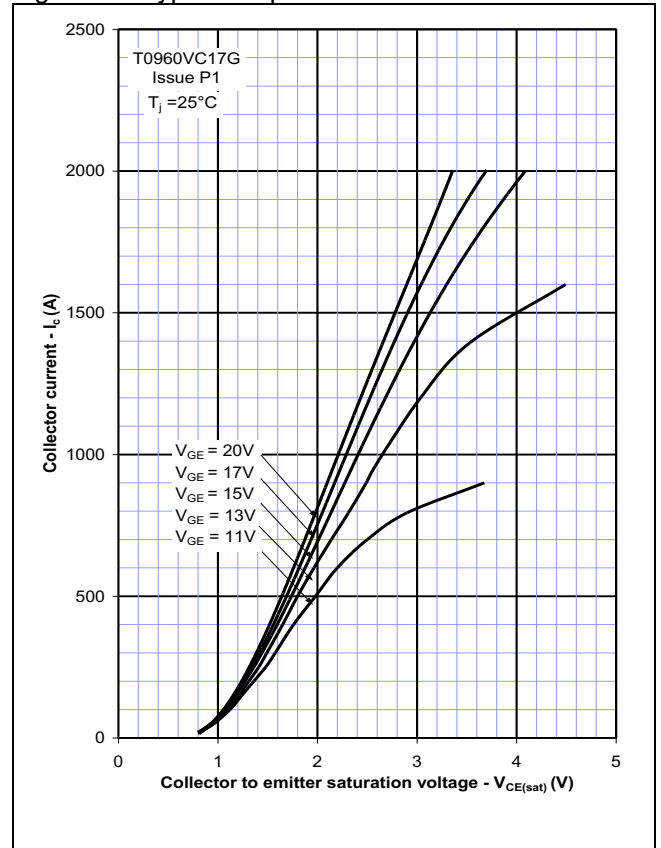


Figure 3 – Typical output characteristic

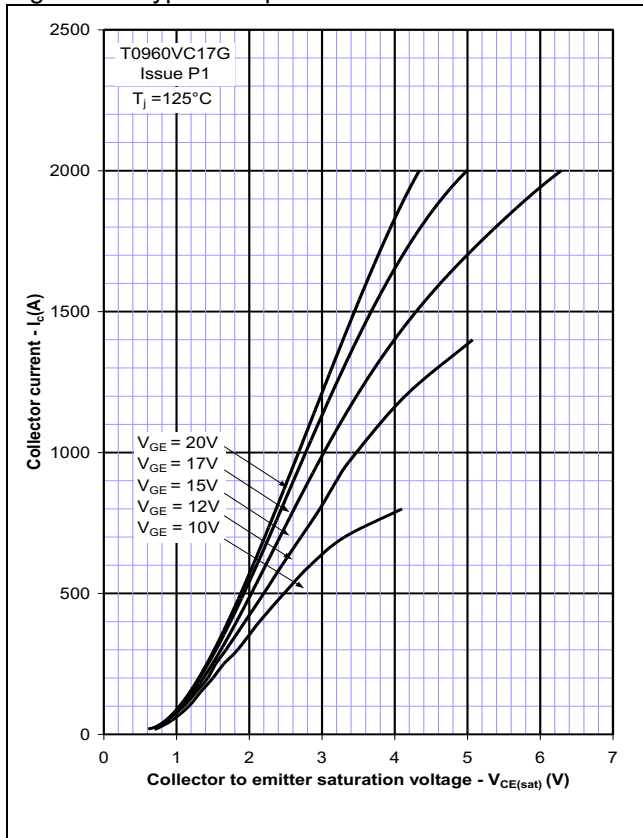


Figure 4 – Safe operating area (IGBT)

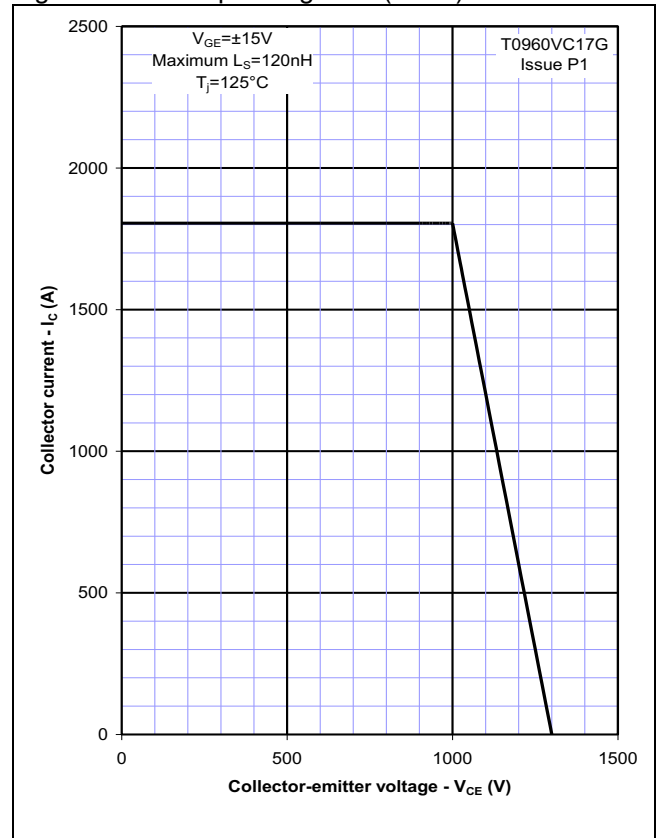


Figure 5 – Typical diode forward characteristics

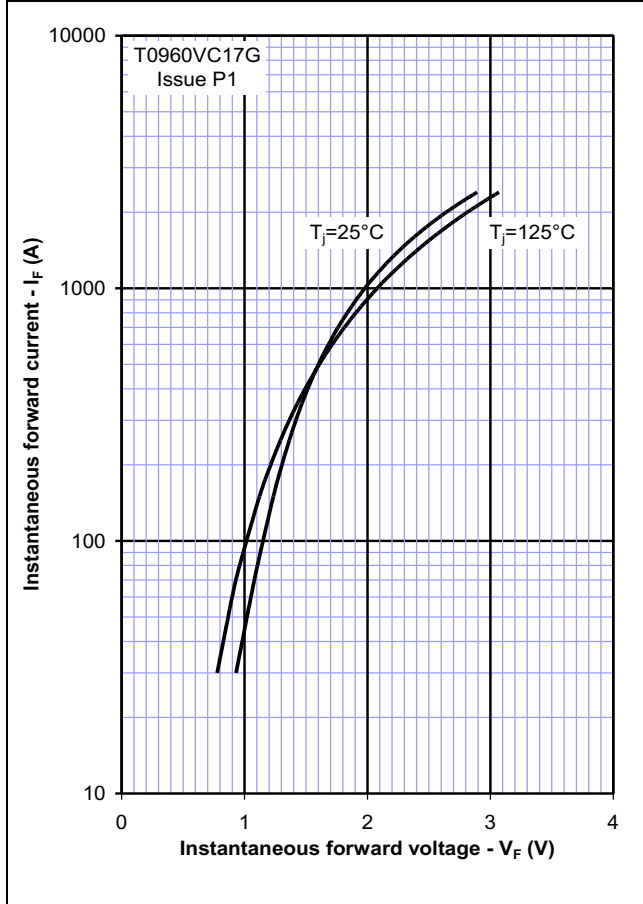


Figure 6 – Safe operating area (Diode)

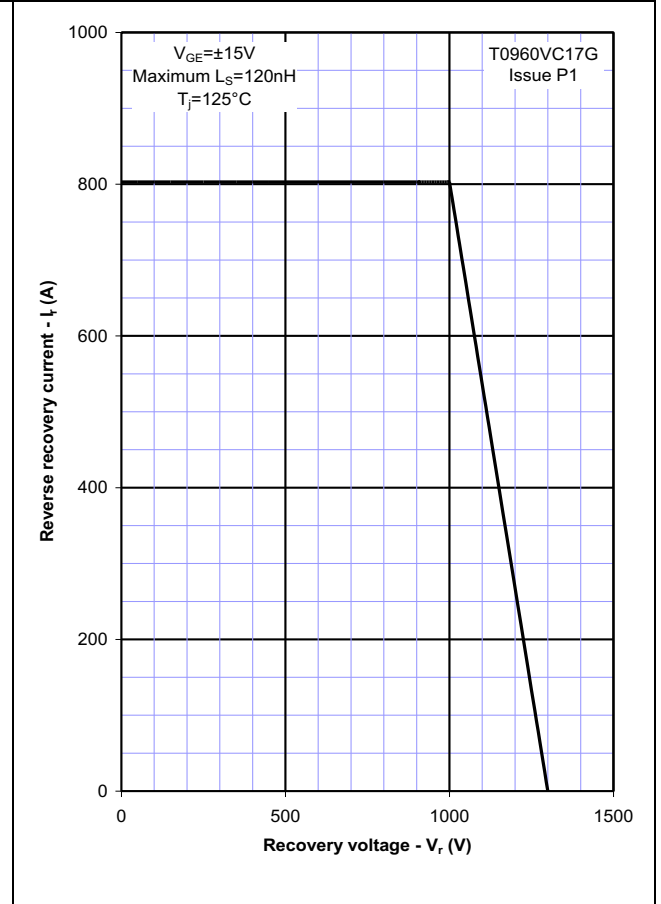


Figure 7 – Transient thermal impedance (IGBT)

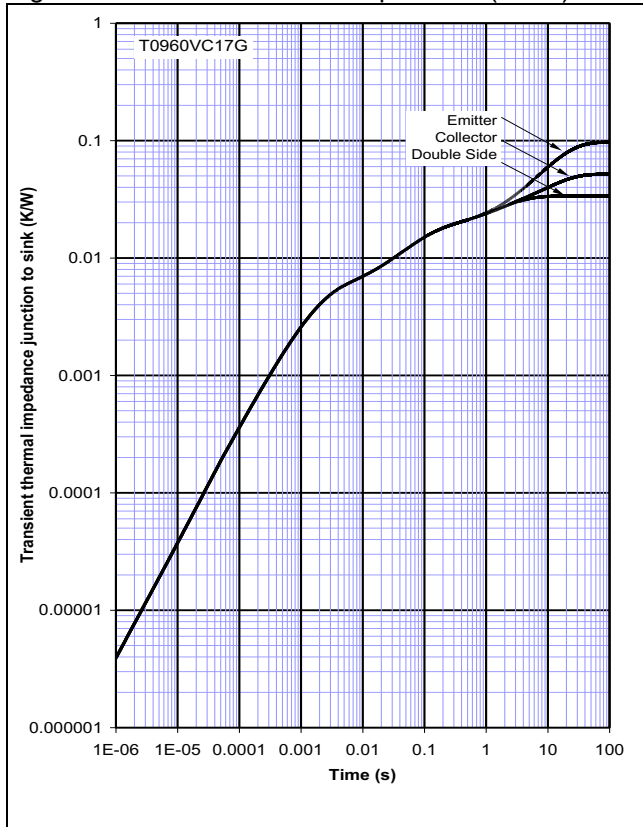
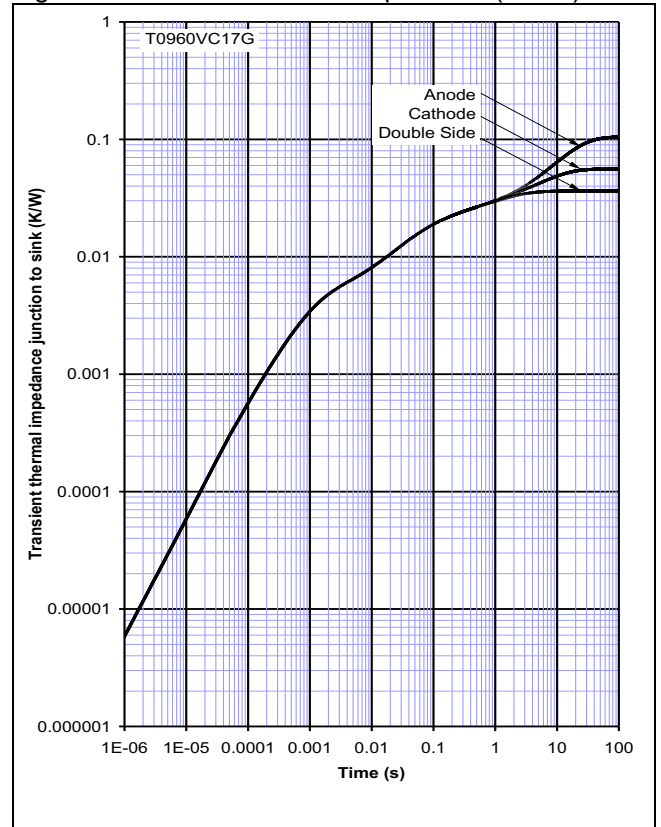
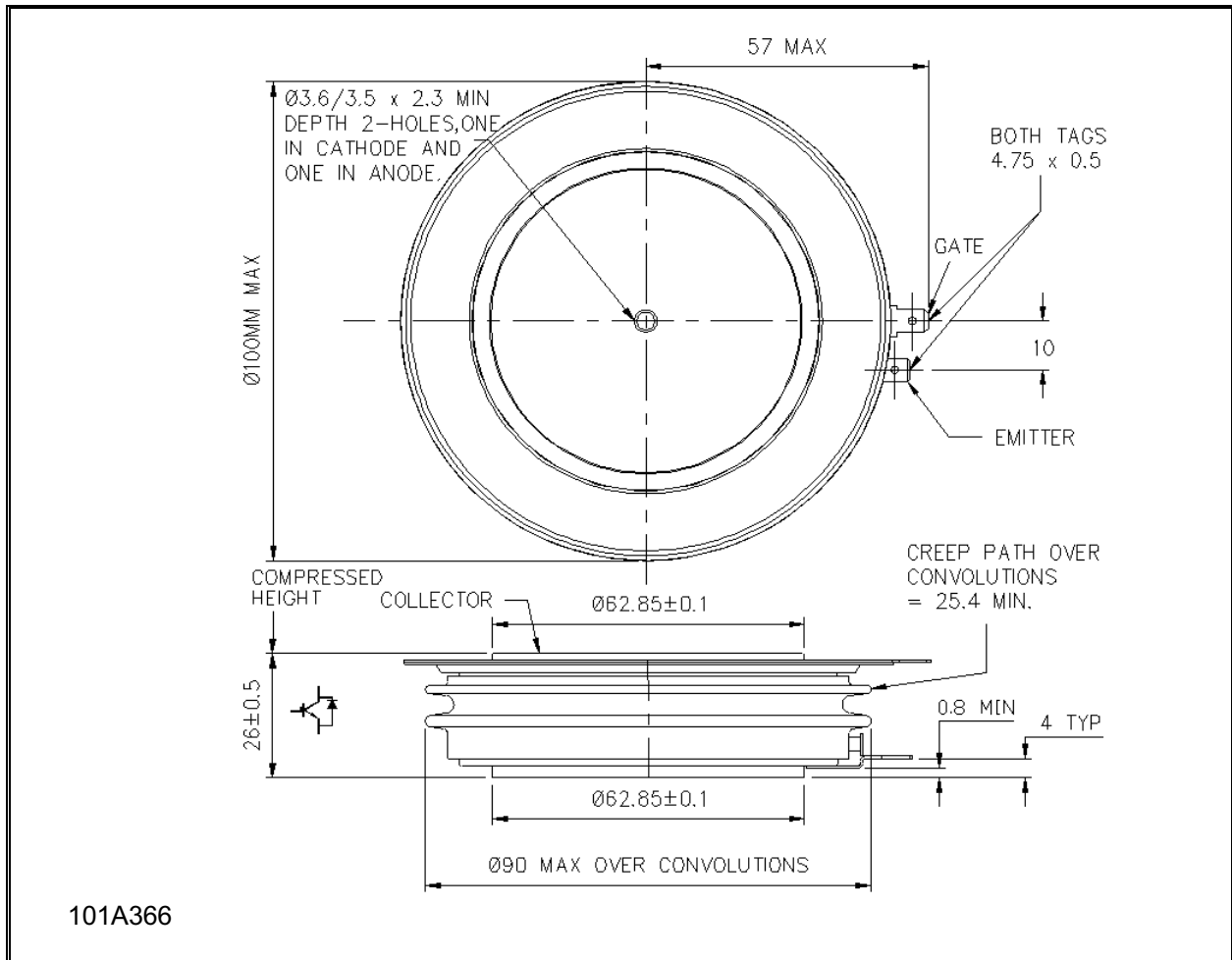


Figure 8 – Transient thermal impedance (Diode)



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<b>ORDERING INFORMATION</b>			
(Please quote 10 digit code as below)			
<b>T0960</b>	<b>VC</b>	<b>17</b>	<b>G</b>
Fixed type Code	Fixed Outline Code	Voltage Grade $V_{CES}/100$ 17	Fixed format code
Typical order code: T0960VC17G ( $V_{CES} = 1700V$ )			

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