

Ver: 0906B

Key Parameters

V_{DRM}	1200~1800	V
$I_{T(AV)}$	3030	A
I_{TSM}	60	kA
V_{TO}	0.9	V
r_T	0.11	mΩ

Applications

- Traction drive
- Motor drive
- Industry converter

Features

- Double-side cooling
- High power capability
- Low loss

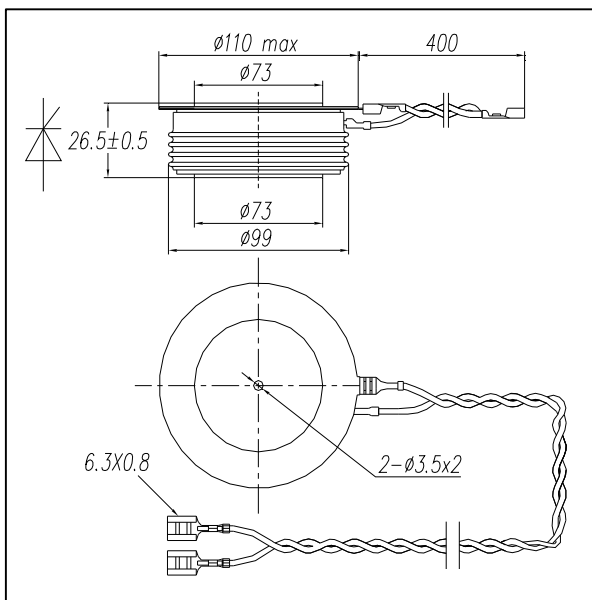
Thermal & Mechanical Data

Symb.	Parameter	Min	Type	Max	Unit
R_{thjc}	Thermal Resistance Junction to Case	-	-	0.01	K / W
R_{thcs}	Thermal Resistance Case to Heatsink	-	-	0.003	K / W
T_{vj}	Junction Temperature	-40	-	125	°C
T_{stg}	Storage Temperature	-40	-	150	°C
F	Mounting Force	-	56	-	kN
m	Weight	-	1.44	-	kg

Voltage Ratings

Device Type	$V_{DRM}/V_{RRM}(V)$	Test Conditions
KP _x 3000-12	1200	$T_{vj} = 125\text{ °C}$
KP _x 3000-14	1400	$I_{DRM} = 300\text{ mA}$
KP _x 3000-16	1600	$I_{RRM} = 300\text{ mA}$
KP _x 3000-18	1800	$V_{DM} = V_{DRM}, V_{RM} = V_{RRM}$ $t_p = 10\text{ ms}$ $V_{DSM} = V_{DRM}$ $V_{RSM} = V_{RRM} + 100$

Outline



Current Ratings

Symb.	Parameter	Test Conditions	Min	Type	Max	Unit
$I_{T(AV)}$	Mean On-State Current	Half Sine Wave $T_C = 70\text{ °C}$ $T_C = 85\text{ °C}$	-	-	3030 2430	A A
$I_{T(RMS)}$	RMS On-State Current	$T_C = 70\text{ °C}$	-	-	4757	A
I_{TSM}	Surge (non-repetitive) On-State Current	10ms, $T_{vj} = 125\text{ °C}$ $V_R = 0$	-	-	60	kA
I^2t	Limiting load integral	Sine Wave, 10ms	-	-	1800	$10^4 A^2s$

Characteristics

Symb.	Parameter	Test Conditions	Min	Type	Max	Unit
V_{TM}	Peak on-state voltage	$T_{vj} = 125\text{ }^{\circ}\text{C}$, $I_{TM} = 3000\text{ A}$	--		1.24	V
I_{DRM}	Forward leakage current	$T_{vj} = 125\text{ }^{\circ}\text{C}$, V_{DRM}	--		300	mA
I_{RRM}	Reverse leakage current	$T_{vj} = 125\text{ }^{\circ}\text{C}$, V_{RRM}	--		300	mA
V_{TO}	Threshold voltage	$T_{vj} = 125\text{ }^{\circ}\text{C}$	--		0.90	V
r_T	Slope resistance	$T_{vj} = 125\text{ }^{\circ}\text{C}$	--		0.11	m Ω
I_H	Holding current	$T_{vj} = 25\text{ }^{\circ}\text{C}$	--		200	mA
I_L	Latching current	$T_{vj} = 25\text{ }^{\circ}\text{C}$	--		1000	mA

Dynamic Parameters

Symb.	Parameter	Test Conditions	Min	Type	Max	Unit
dv/dt	Critical rate of rise of off-state voltage	$T_{vj} = 125\text{ }^{\circ}\text{C}$, $0.67V_{DRM}$	1000	--		V/ μ s
di/dt	Critical rate of rise of on-state current	$T_{vj}=125^{\circ}\text{C}$, $V_{DM}=0.5V_{DRM}$, $I_{TM}=5000\text{A}$ $I_{FG} = 2\text{ A}$, $tr = 0.5\text{ }\mu\text{ s}$	--		1000	A/ μ s
		$f = 1\text{ Hz}$ $f = 50\text{ Hz}$	--		200	
t_d	Delay time	$T_{vj} = 25\text{ }^{\circ}\text{C}$, $V_{DM} = 0.67V_{DRM}$, $I_{TM} = 2400\text{ A}$	--		1.5	μ s
t_{on}	Turn-on time	$I_{FG} = 2\text{ A}$, $tr = 0.5\text{ }\mu\text{ s}$, $di_T/dt = 60\text{ A}/\mu\text{ s}$	--		2.5	μ s
t_q	Turn-off time	$T_{vj}=125^{\circ}\text{C}$, $V_{DM}=0.67V_{DRM}$, $dv_D/dt=20\text{V}/\mu\text{ s}$, $V_R=50\text{V}$ $di_T/dt = -10\text{ A}/\mu\text{ s}$, $I_T = 4000\text{ A}$	-	300	-	μ s
Q_{rr}	Recovery Charge	$T_{vj} = 125\text{ }^{\circ}\text{C}$, $di_T/dt = -10\text{A}/\mu\text{ s}$, $V_R = 50\text{V}$, $I_T = 4000\text{A}$	-	2700	-	μ C
Q_{ra}	Recovery Charge, 50% chord		-	1900	-	μ C
I_{rr}	Reverse recovery current		-	160	-	A
t_{rr}	Reverse recovery time		-	23	-	μ s

Gate Parameters

Symb.	Parameter	Test Conditions	Min	Type	Max	Unit
I_{GT}	Gate trigger current	$T_{vj} = 25\text{ }^{\circ}\text{C}$	--		300	mA
V_{GT}	Gate trigger voltage	$T_{vj} = 25\text{ }^{\circ}\text{C}$	--		3	V
V_{GD}	Gate non-trigger voltage	$T_{vj} = 125\text{ }^{\circ}\text{C}$, $V_D = 0.4V_{DRM}$	0.3	--		V
V_{FGM}	Peak forward gate voltage		--		12	V
V_{RGM}	Peak reverse gate voltage		--		5	V
I_{FGM}	Peak forward gate current		--		4	A
P_{GM}	Gate power losses		--		20	W
$P_{G(AV)}$	Gate power losses (mean)		--		4	W

Max. on-state characteristic model

$$V_T = A + B \cdot \ln(I_T) + C \cdot I_T + D \cdot \sqrt{I_T}$$

	25 °C	125 °C
A	1.431481194	0.8125799
B	-0.11118968	-0.03085335
C	9.38611×10^{-6}	3.9418×10^{-5}
D	0.012830389	0.010181358

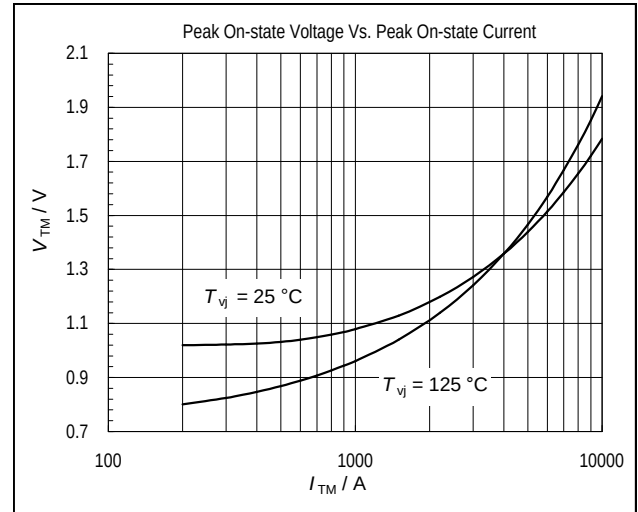


Fig1. Peak On-state Voltage Vs. Peak On-state Current

Transient thermal impedance function
(double side cooled)

$$R_{thjc}(t) = \sum_{i=1}^n R_{thi} \cdot \left(1 - e^{-\frac{t}{\tau_i}} \right)$$

i	1	2	3	4
R_{thi} (K/kW)	6.22	2.465	0.723	0.607
τ_i (s)	1.23	0.235	0.061	0.0092

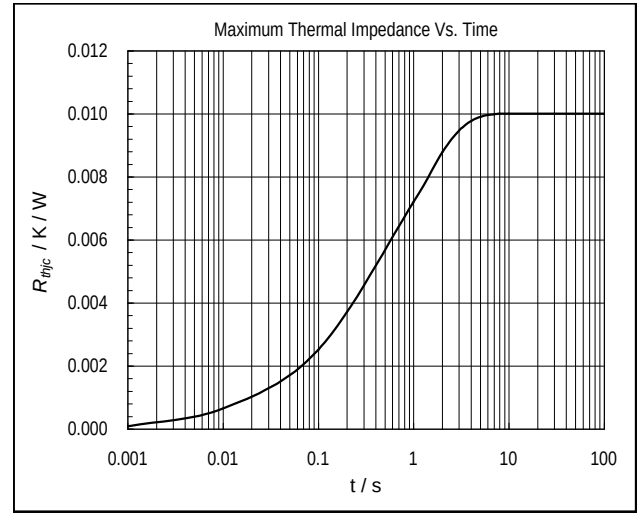


Fig2. Maximum Thermal Impedance Vs. Time

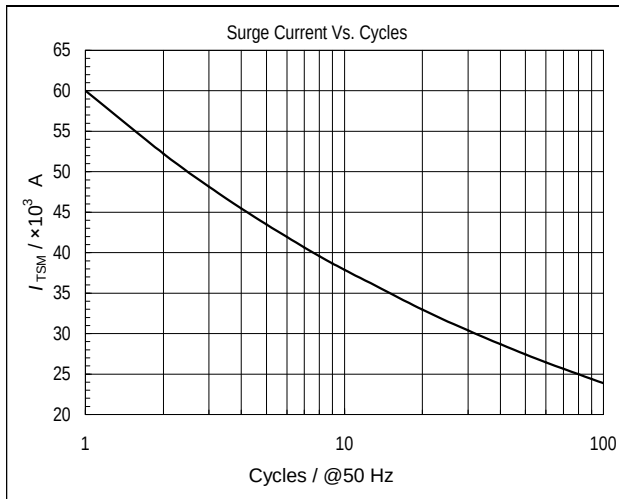
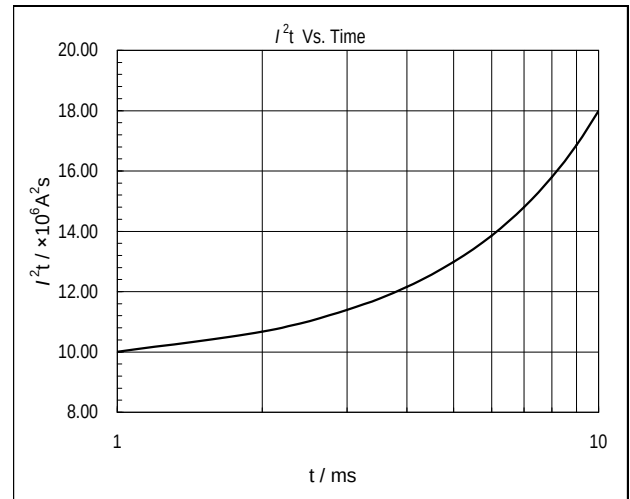


Fig3. Surge Current Vs. Cycles

Fig4. $I^2 t$ Vs. Time

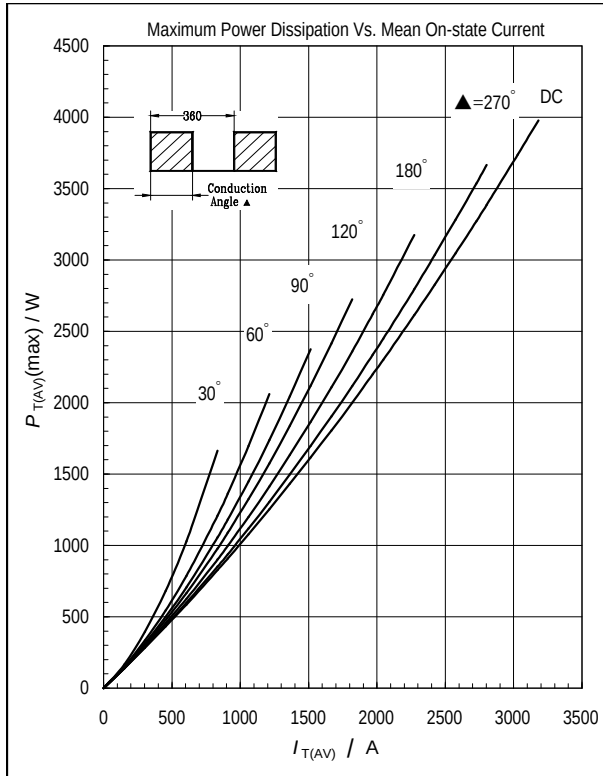


Fig5. Maximum Power Dissipation Vs. Mean On-state Current

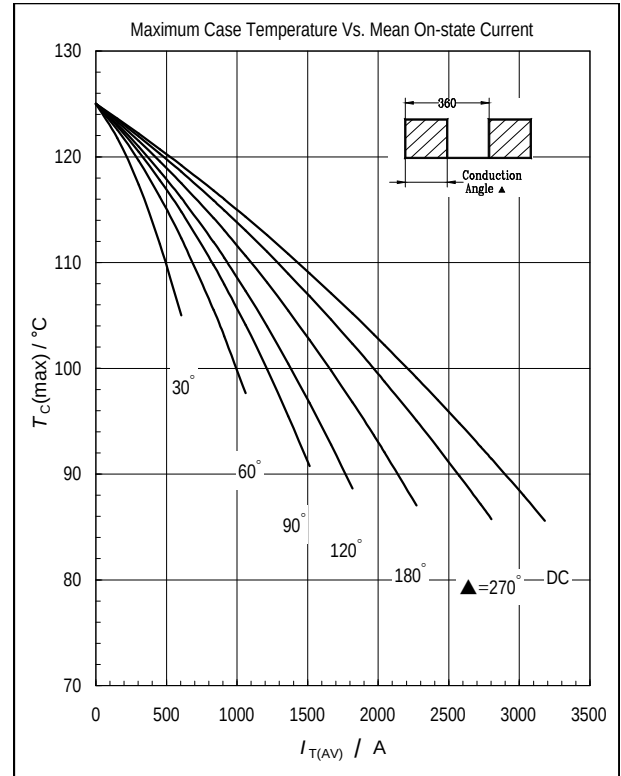


Fig6. Maximum Case Temperature Vs. Mean On-state Current

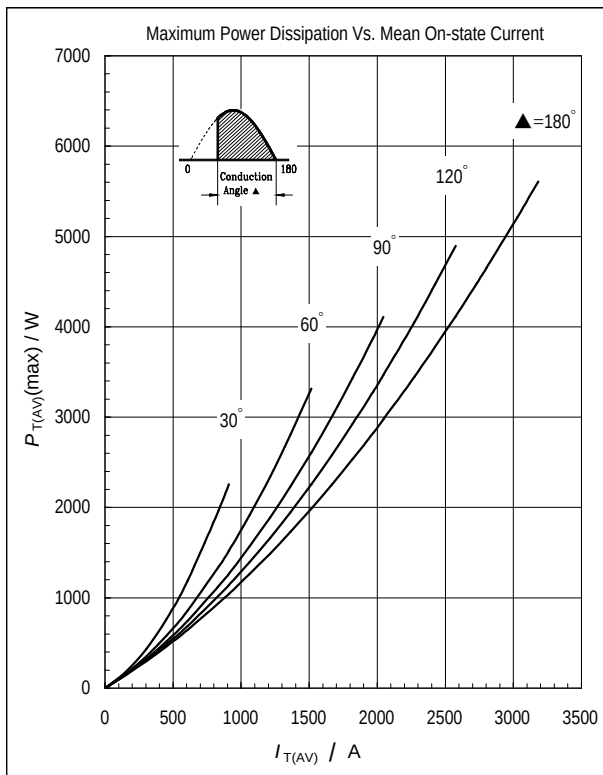


Fig7. Maximum Power Dissipation Vs. Mean On-state Current

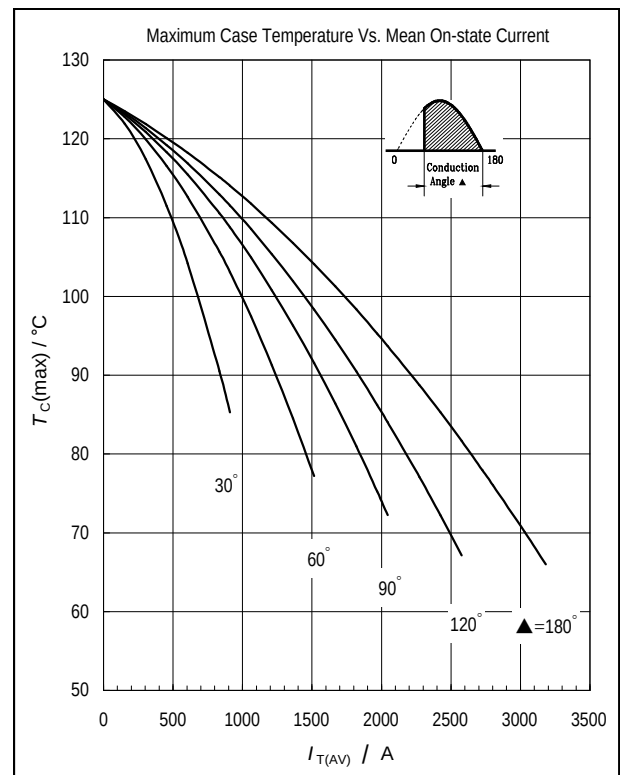


Fig8. Maximum Case Temperature Vs. Mean On-state Current

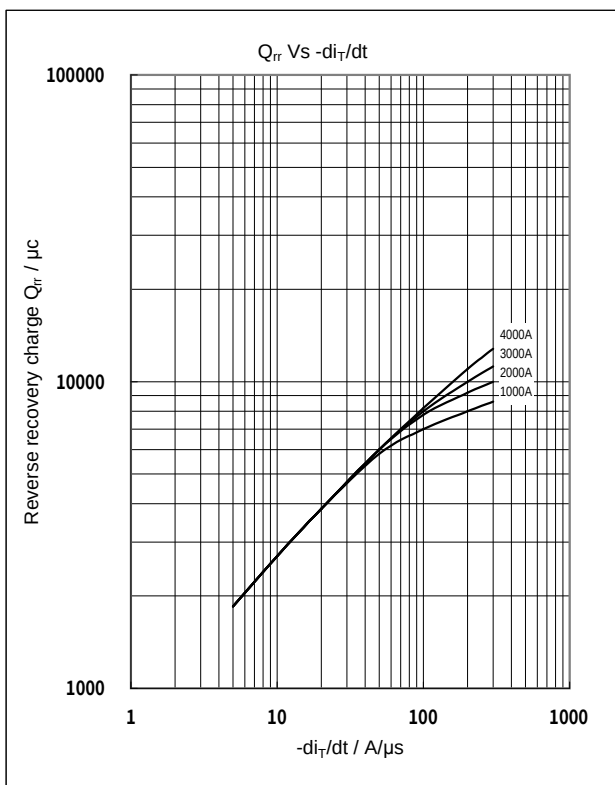


Fig9. Reverse recovery charge Vs. $-di_T/dt$

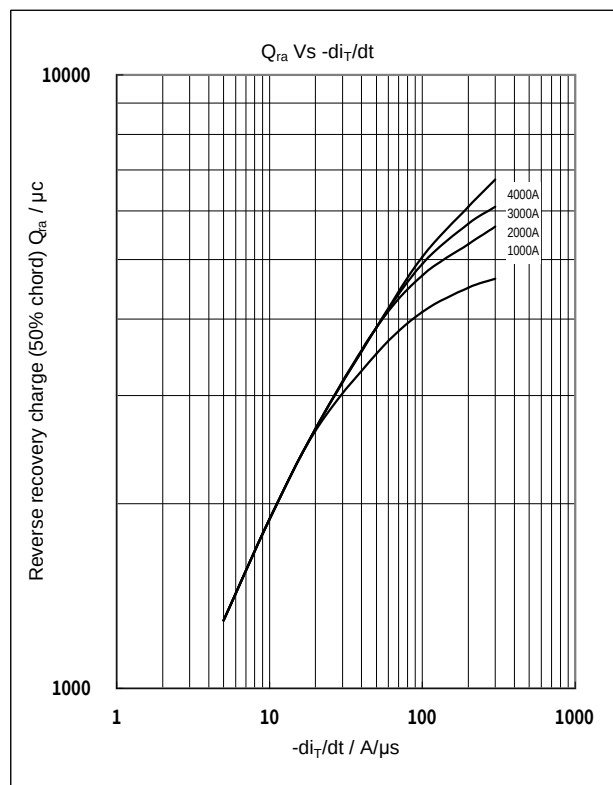


Fig10. Reverse recovery charge (50% chord) Vs. $-di_T/dt$

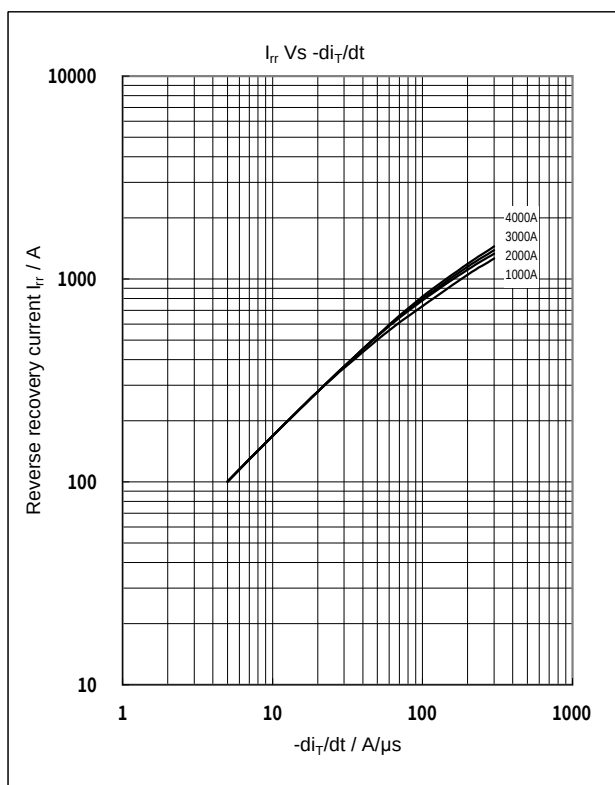


Fig11. Reverse recovery current Vs. $-di_T/dt$

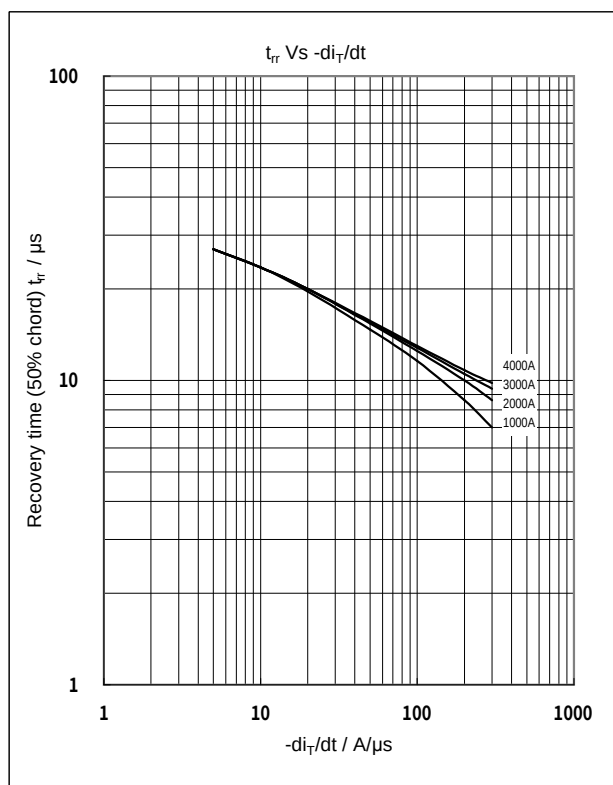


Fig12. Reverse recovery time Vs. $-di_T/dt$

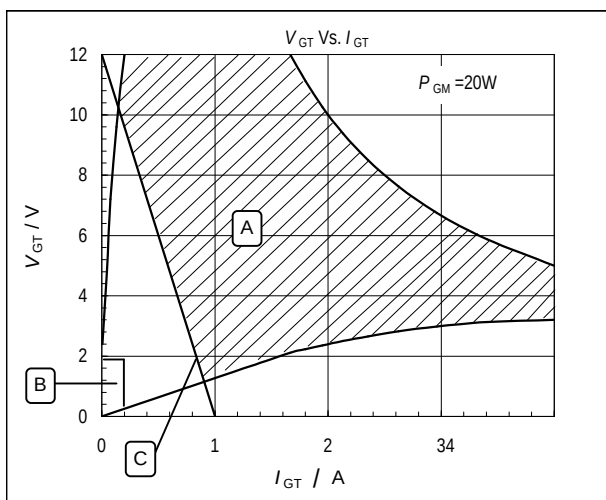
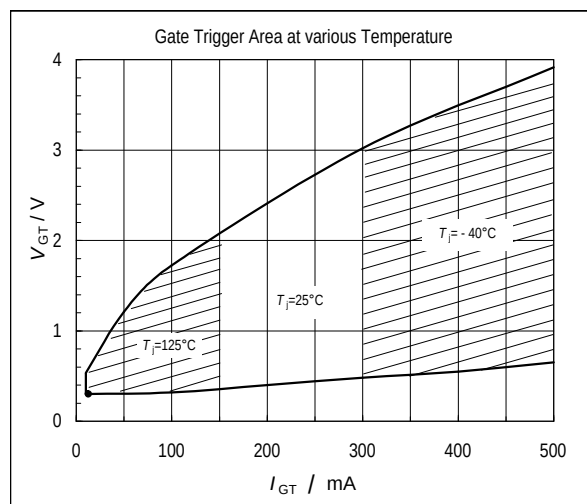
Fig13. V_{GT} Vs. I_{GT} 

Fig14. Gate Trigger Area at various Temperature

A is Recommended Triggering Area.

B is Unreliable Triggering Area.

C is Recommended Gate Load Line.

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