

1MBI400V-170-50

IGBT Modules

Power Module (V series)
1700V / 400A / 1-in-one package

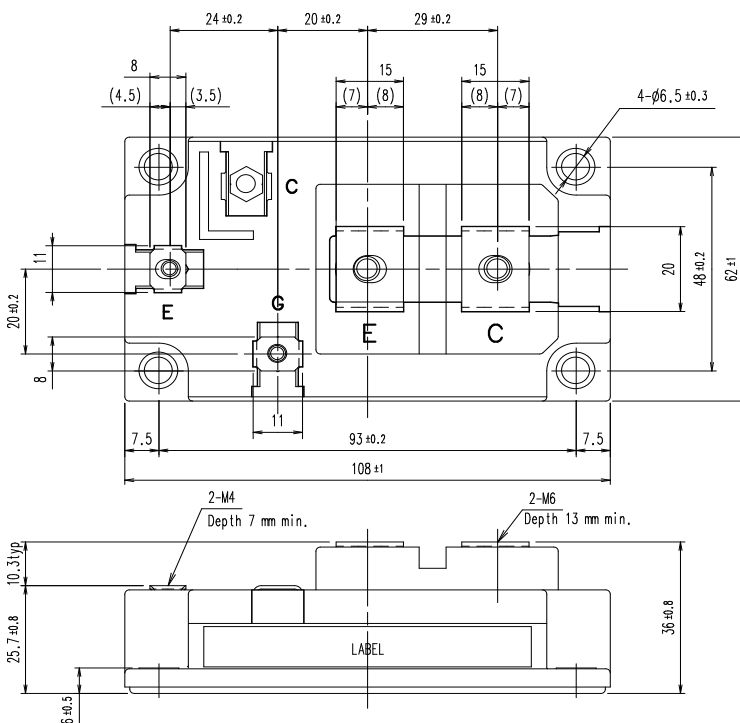
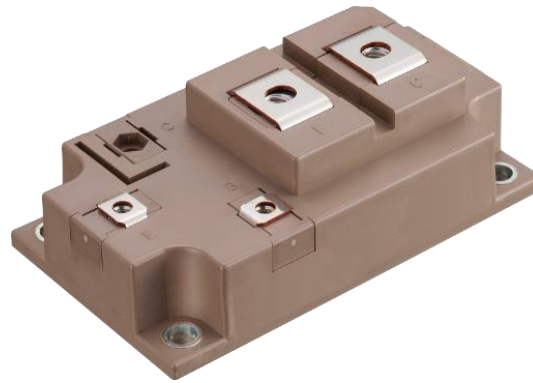
■ **Features**

- High speed switching
- Voltage drive
- Low Inductance module structure

■ **Applications**

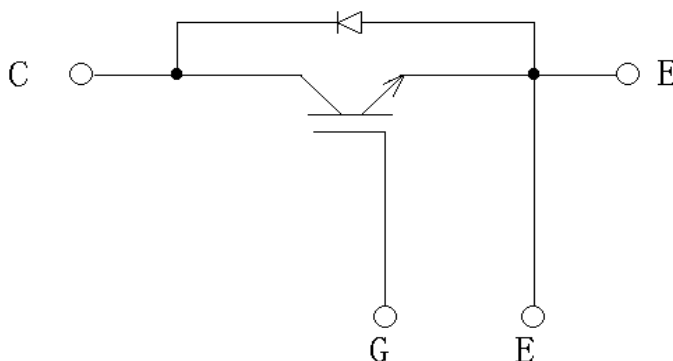
- Inverter DB for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply
- Industrial machines, such as Welding machines

■ **Outline drawing (Unit : mm)**



Weight: 380g (typ.)

■ **Equivalent Circuit**



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■ Absolute Maximum Ratings (at $T_c = 25^\circ\text{C}$ unless otherwise specified)

Items		Symbols	Conditions	Maximum Ratings	Units	
Collector-Emitter voltage		V_{CES}		1700	V	
Gate-Emitter voltage		V_{GES}		± 20	V	
Collector current	I_C		Continuous	$T_c = 100^\circ\text{C}$	400	A
				$T_c = 25^\circ\text{C}$	480	
	I_C pulse	1ms		800		
	$-I_C$			400		
	$-I_C$ pulse		1ms		800	
Collector power dissipation		P_C	1 device	2500	W	
Junction temperature		T_j		175	°C	
Operating junction temperature (under switching conditions)		T_{jop}		150		
Case temperature		T_c		125		
Storage temperature		T_{stg}		-40 ~ 125		
Isolation voltage	between terminal and copper base (*1)	V_{iso}	AC: 1min.	4000	VAC	
Screw Torque	Mounting (*2)	M5 or M6		6.0	N m	
	Terminals (*3)	M4		2.0		
		M6		5.0		

(*1) All terminals should be connected together during the test.

(*2) Recommendable Value : 3.0-6.0 Nm (M5 or M6)

(*3) Recommendable Value : 1.1-2.0 Nm (M4)

Recommendable Value : 2.5-5.0 Nm (M6)

1MBI400V-170-50

IGBT Modules
■ Electrical characteristics (at $T_j=25^\circ\text{C}$ unless otherwise specified)

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Zero gate voltage Collector current	I_{CES}	$V_{GE}=0\text{V}, V_{CE}=1700\text{V}$	-	-	4.0	mA	
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}$	-	-	1600	nA	
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=20\text{V}, I_C=400\text{mA}$	6.0	6.5	7.0	V	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE}=15\text{V}, I_C=400\text{A}$	$T_j=25^\circ\text{C}$	-	2.10	2.55	V
			$T_j=125^\circ\text{C}$	-	2.55	-	
			$T_j=150^\circ\text{C}$	-	2.65	-	
	$V_{CE(sat)}$ (chip)	$V_{GE}=15\text{V}, I_C=400\text{A}$	$T_j=25^\circ\text{C}$	-	2.00	2.45	
			$T_j=125^\circ\text{C}$	-	2.45	-	
			$T_j=150^\circ\text{C}$	-	2.55	-	
Internal gate resistance	$R_{G(int)}$	-	-	1.9	-	Ω	
Input capacitance	C_{ies}	$V_{CE}=10\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$	-	37.6	-	nF	
Turn-on time	t_{on}	$V_{CC}=900\text{V}, I_C=400\text{A}, V_{GE}=\pm 15\text{V}, R_G=1.8\Omega, T_j=150^\circ\text{C}, L_S=40\text{nH}$	-	700	-	nsec	
	t_r		-	300	-		
	$t_{r(i)}$		-	60	-		
Turn-off time	t_{off}		-	800	-	nsec	
	t_f		-	140	-		
Forward on voltage	V_F (terminal)	$V_{GE}=0\text{V}, I_F=400\text{A}$	$T_j=25^\circ\text{C}$	-	1.90	2.35	V
			$T_j=125^\circ\text{C}$	-	2.15	-	
			$T_j=150^\circ\text{C}$	-	2.15	-	
	V_F (chip)	$V_{GE}=0\text{V}, I_F=400\text{A}$	$T_j=25^\circ\text{C}$	-	1.80	2.25	
			$T_j=125^\circ\text{C}$	-	2.05	-	
			$T_j=150^\circ\text{C}$	-	2.05	-	
Reverse recovery time	t_{rr}	$I_F=400\text{A}$	-	220	-	nsec	

■ Thermal resistance characteristics

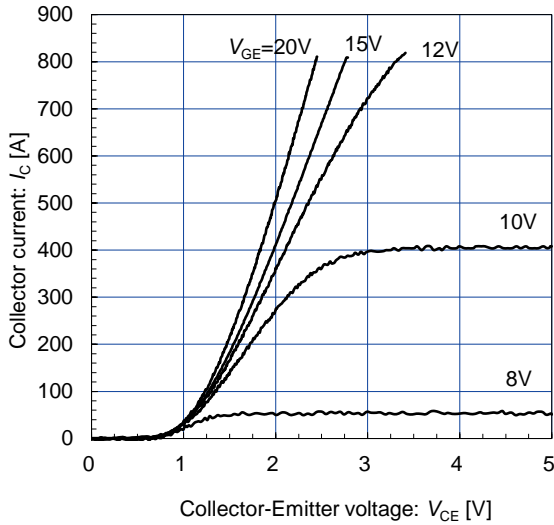
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	IGBT	-	-	0.060	$^\circ\text{C/W}$
		FWD	-	-	0.097	
Contact thermal resistance	$R_{th(c-f)}$	with Thermal Compound	-	0.0063	-	$^\circ\text{C/W}$

(*1) This is the value which is defined mounting on the additional cooling fin with thermal compound.

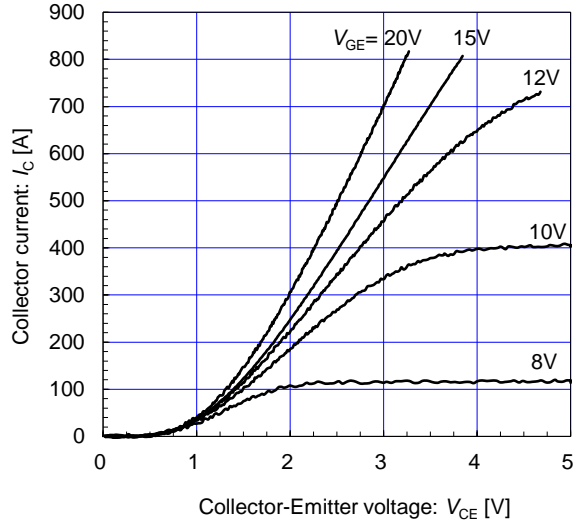
1MBI400V-170-50

IGBT Modules

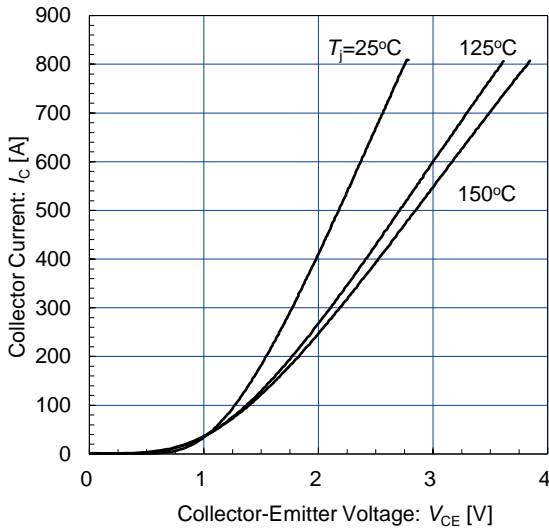
Collector current vs. Collector-Emitter voltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



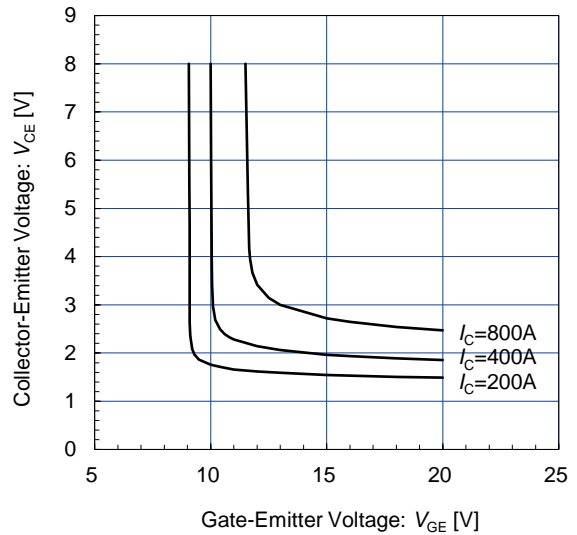
Collector current vs. Collector-Emitter voltage (typ.)
 $T_j = 150^\circ\text{C}$ / chip



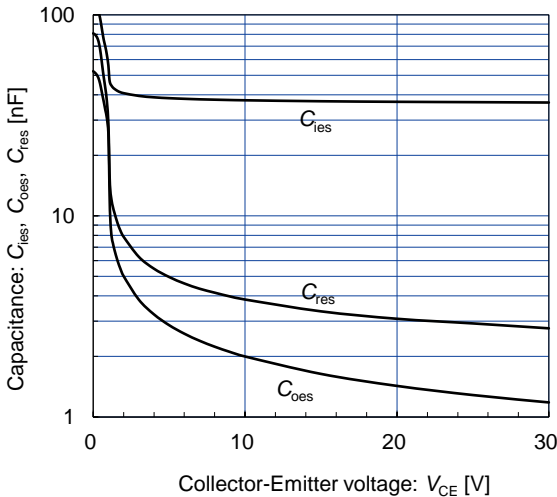
Collector current vs. Collector-Emitter voltage (typ.)
 $V_{GE} = 15\text{V}$ / chip



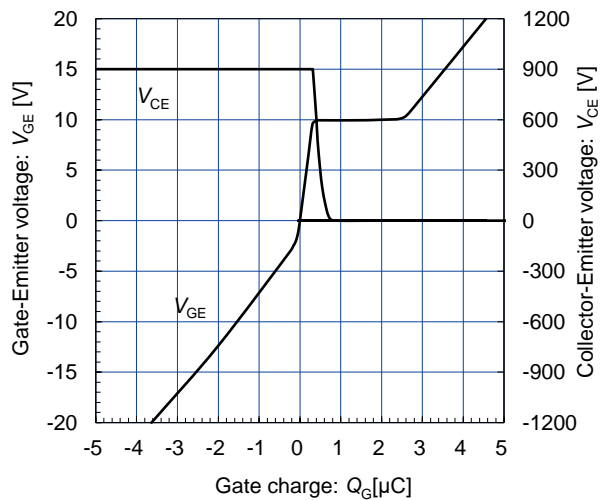
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



Capacitance vs. Collector-Emitter Voltage (typ.)
 $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$, $T_j = 25^\circ\text{C}$



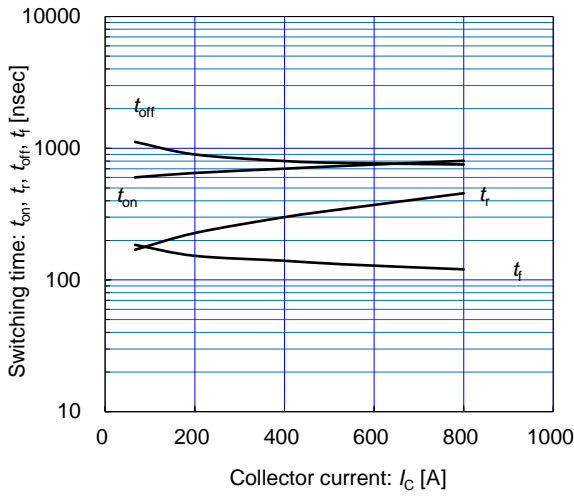
Dynamic Gate Charge (typ.)
 $V_{CC} = 900\text{V}$, $I_C = 400\text{A}$, $T_j = 25^\circ\text{C}$



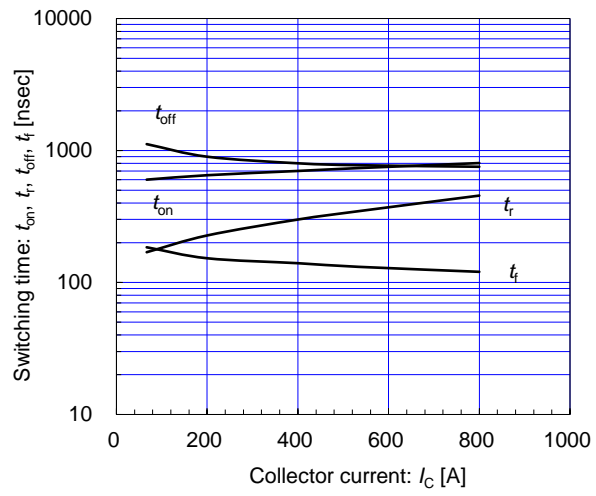
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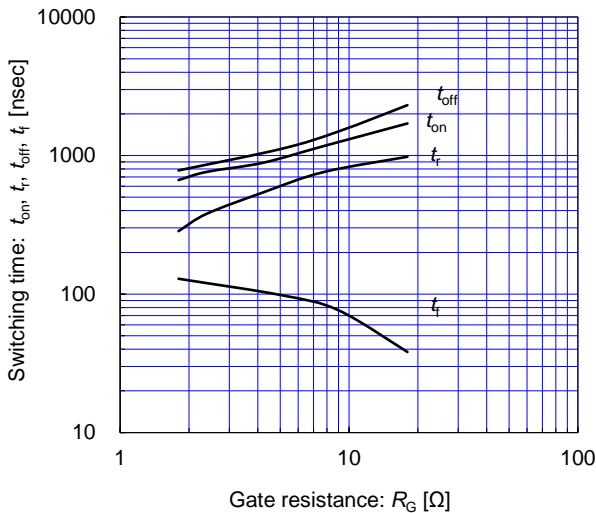
Switching time vs. Collector current (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=1.8\Omega, T_J=125^\circ C$



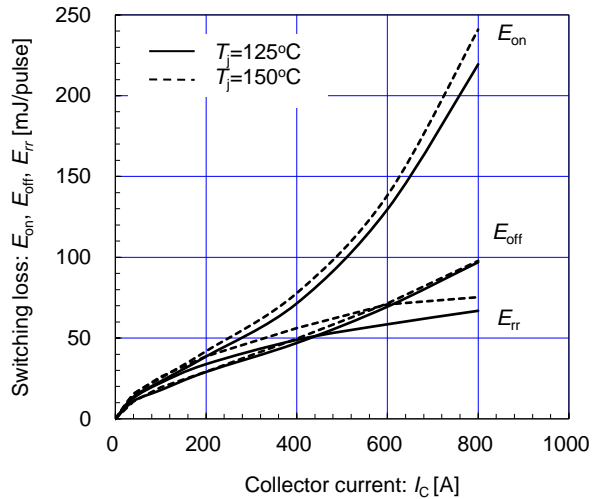
Switching time vs. Collector current (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=1.8\Omega, T_J=150^\circ C$



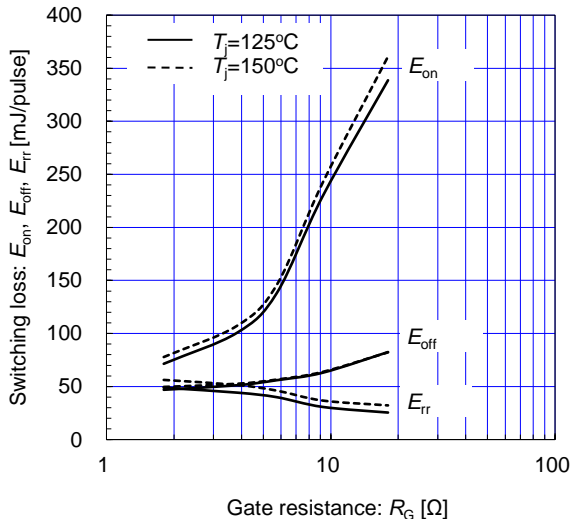
Switching time vs. Gate resistance (typ.)
 $V_{CC}=900V, I_C=400A, V_{GE}=\pm 15V, T_J=125^\circ C$



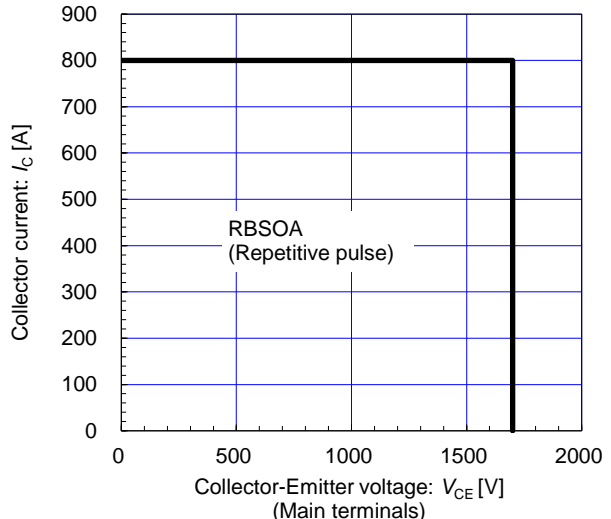
Switching loss vs. Collector current (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=1.8\Omega, T_J=125, 150^\circ C$



Switching loss vs. Gate resistance (typ.)
 $V_{CC}=900V, I_C=400A, V_{GE}=\pm 15V, T_J=125, 150^\circ C$



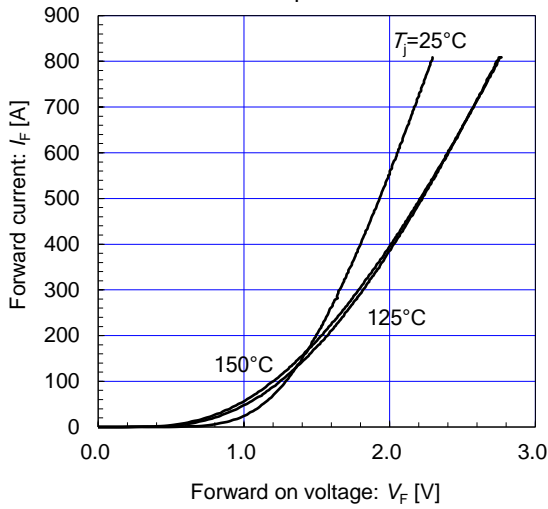
Reverse bias safe operating area (max.)
 $V_{GE}=\pm 15V, R_G=1.8\Omega, T_J=150^\circ C, L_S=40nH$



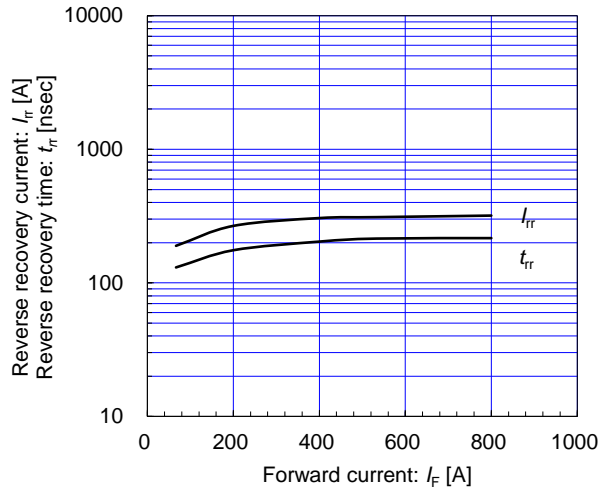
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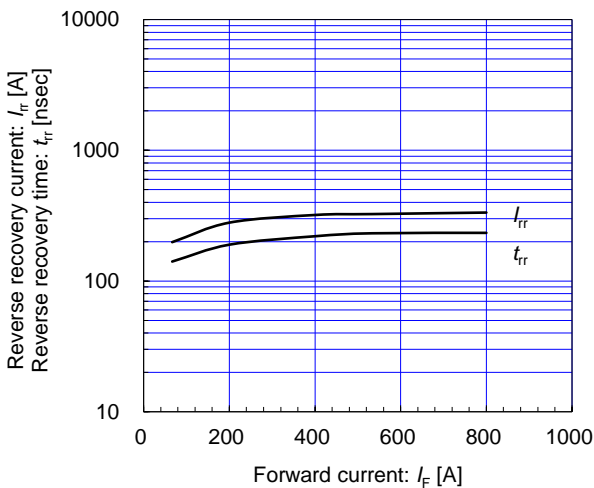
Forward Current vs. Forward Voltage (typ.)
chip



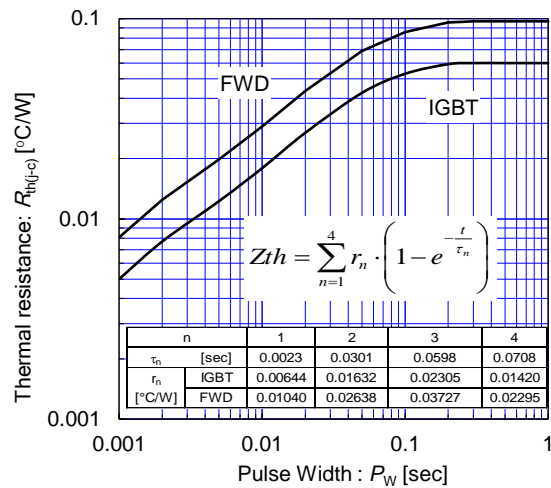
Reverse Recovery Characteristics (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=1.8\Omega, T_j=125^\circ C$



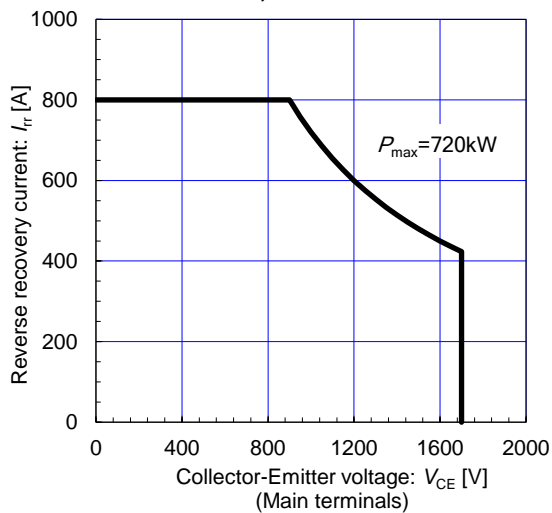
Reverse Recovery Characteristics (typ.)
 $V_{CC}=900V, V_{GE}=\pm 15V, R_G=1.8\Omega, T_j=150^\circ C$



Transient Thermal Resistance (max.)



FWD safe operating area (max.)
 $T_j=150^\circ C$



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IGBT Modules

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