

1MBI400V-170-50

IGBT Modules

Power Module (V series)

1700V / 400A / 1-in-one package

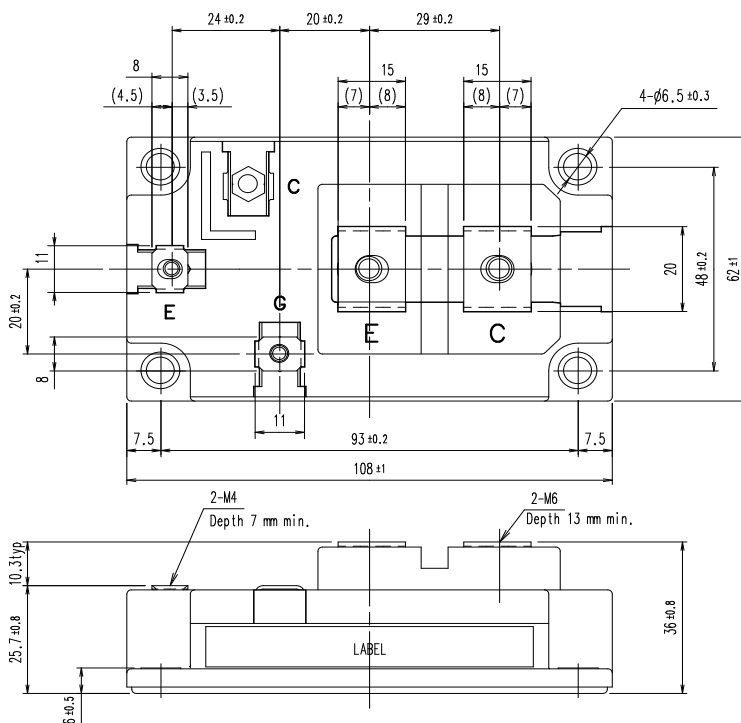
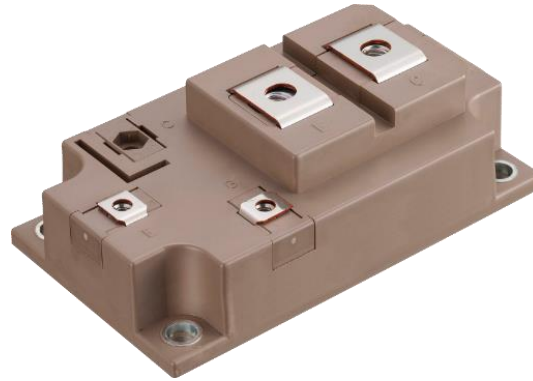
■ Features

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

■ Applications

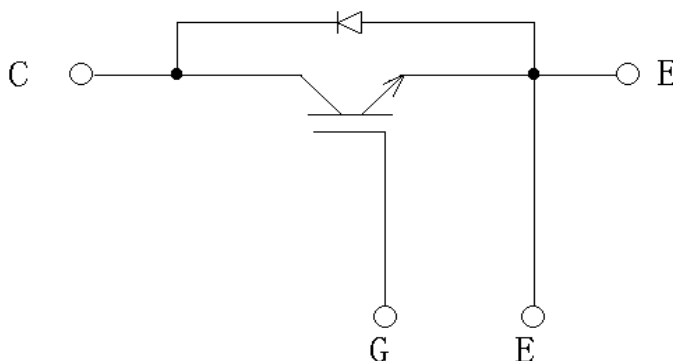
- Inverter DB for Motor Drive
AC and DC Servo Drive Amplifier
Uninterruptible Power Supply
Industrial machines, such as Welding machines

■ **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	$T_c = 100^\circ\text{C}$ $T_c = 25^\circ\text{C}$	400 480
		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	$^\circ\text{C}$
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)

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■ 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}	$V_{GE}=0V, V_{CE}=1700V$	-	-	4.0	mA
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$	-	-	1600	nA
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=20V, I_C=400mA$	6.0	6.5	7.0	V
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE}=15V, I_C=400A$	$T_j=25^\circ\text{C}$	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)	$V_{GE}=15V, I_C=400A$	$T_j=25^\circ\text{C}$	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}	$V_{CE}=10V, V_{GE}=0V, f=1MHz$	-	37.6	-	nF
Turn-on time	t_{on}	$V_{CC}=900V, I_C=400A, V_{GE}=\pm 15V, R_G=1.8\Omega, T_j=150^\circ\text{C}, L_S=40nH$	-	700	-	nsec
	t_r		-	300	-	
	$t_{r(l)}$		-	60	-	
Turn-off time	t_{off}		-	800	-	
	t_f		-	140	-	
Forward on voltage	V_F (terminal)	$V_{GE}=0V, I_F=400A$	$T_j=25^\circ\text{C}$	1.90	2.35	V
			$T_j=125^\circ\text{C}$	2.15	-	
			$T_j=150^\circ\text{C}$	2.15	-	
	V_F (chip)	$V_{GE}=0V, I_F=400A$	$T_j=25^\circ\text{C}$	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}	$I_F=400A$	-	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	-	

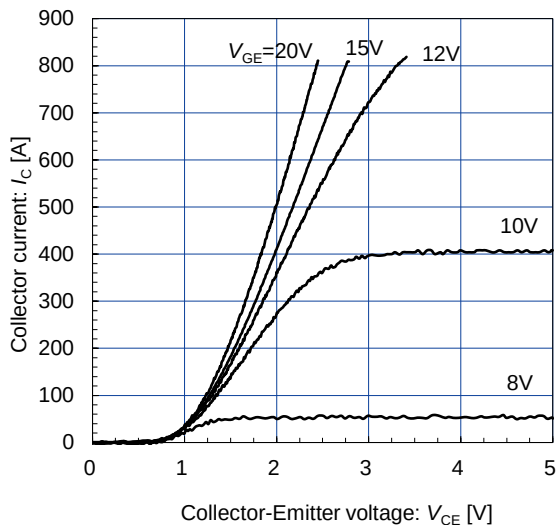
(*1) This is the value which is defined mounting on the additional cooling fin with thermal compound.

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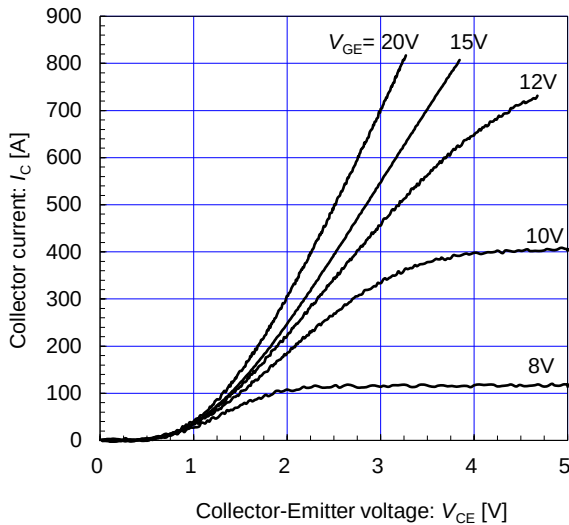
Collector current vs. Collector-Emittor voltage (typ.)

$T_j = 25^\circ\text{C}$ / chip



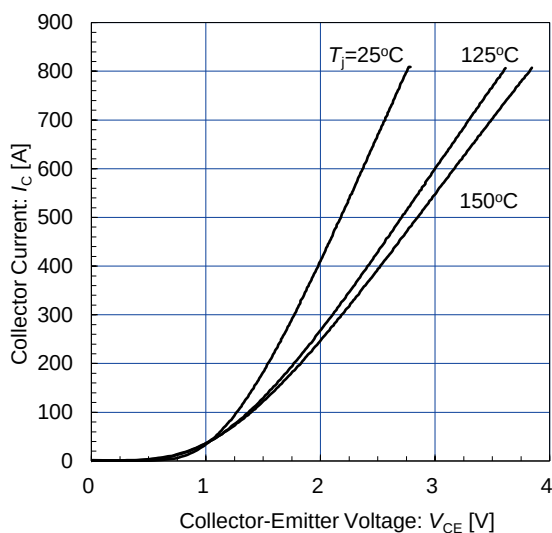
Collector current vs. Collector-Emittor voltage (typ.)

$T_j = 150^\circ\text{C}$ / chip



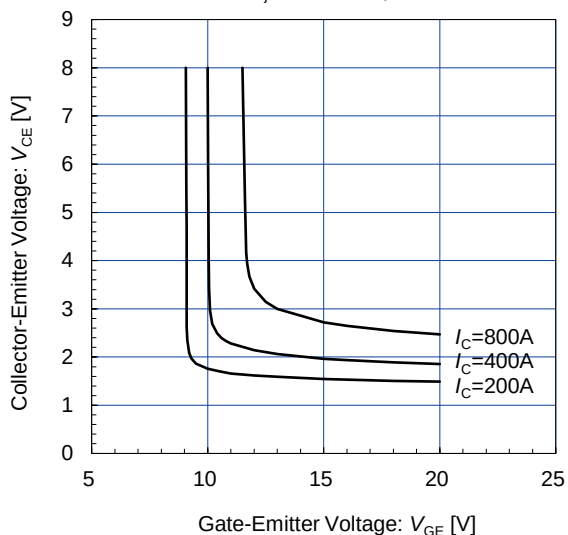
Collector current vs. Collector-Emittor voltage (typ.)

$V_{GE} = 15\text{V}$ / chip



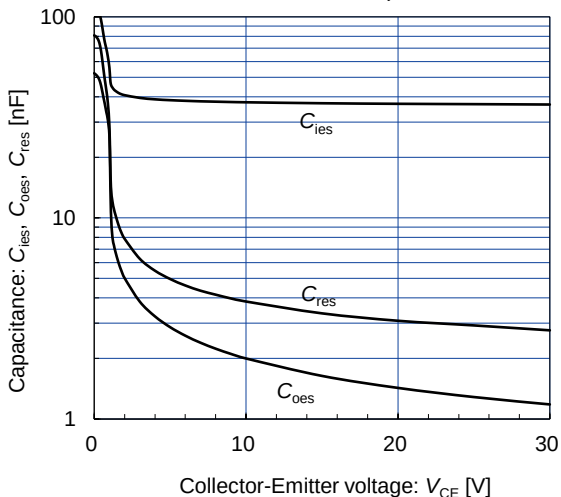
Collector-Emittor voltage vs. Gate-Emittor voltage (typ.)

$T_j = 25^\circ\text{C}$ / chip



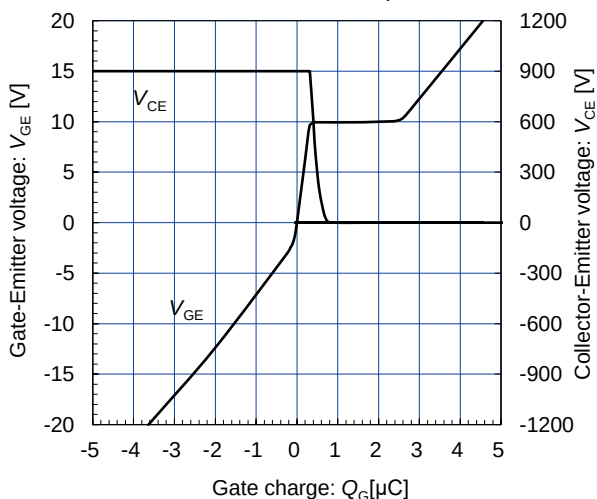
Capacitance vs. Collector-Emittor Voltage (typ.)

$V_{GE} = 0\text{V}$, $f = 1\text{MHz}$, $T_j = 25^\circ\text{C}$



Dynamic Gate Charge (typ.)

$V_{CC} = 900\text{V}$, $I_C = 400\text{A}$, $T_j = 25^\circ\text{C}$

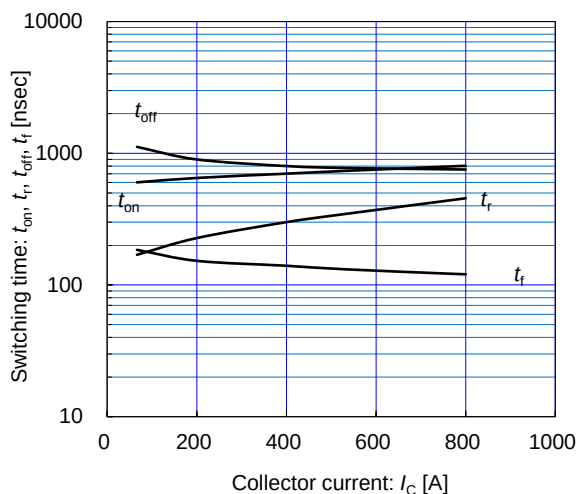


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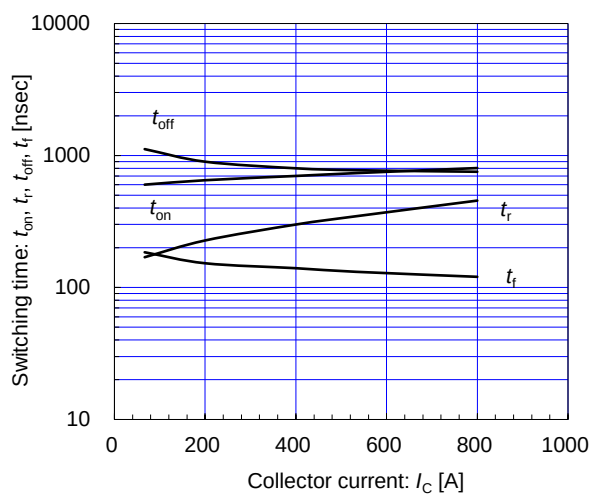
Switching time vs. Collector current (typ.)

$V_{CC}=900V, V_{GE}=\pm 15V, R_G=1.8\Omega, T_J=125^\circ C$



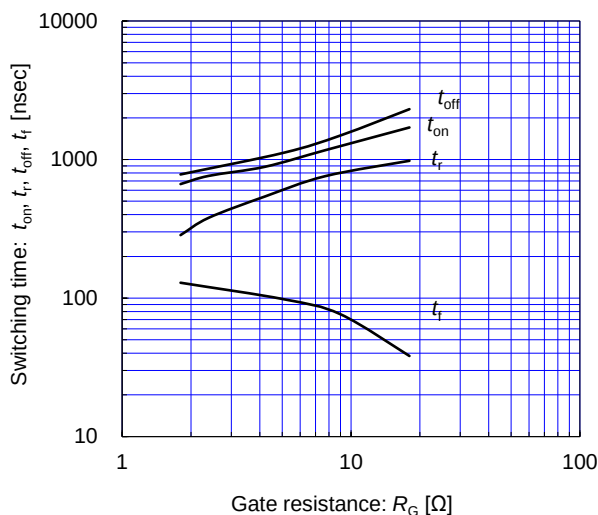
Switching time vs. Collector current (typ.)

$V_{CC}=900V, V_{GE}=\pm 15V, R_G=1.8\Omega, T_J=150^\circ C$



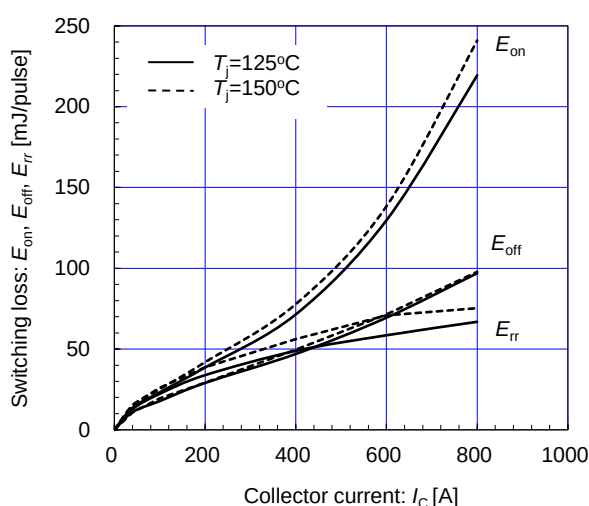
Switching time vs. Gate resistance (typ.)

$V_{CC}=900V, I_C=400A, V_{GE}=\pm 15V, T_J=125^\circ C$



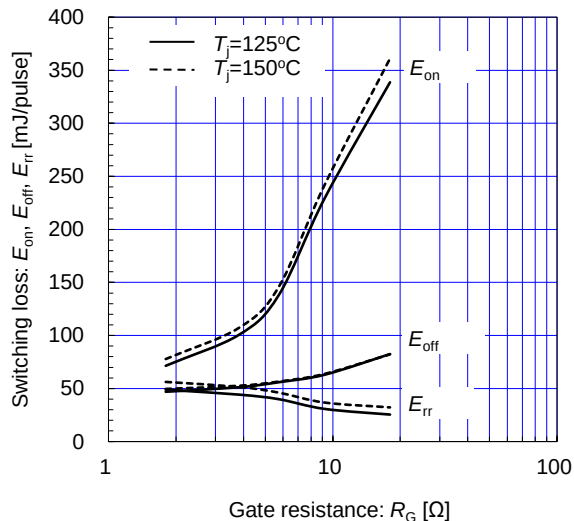
Switching loss vs. Collector current (typ.)

$V_{CC}=900V, V_{GE}=\pm 15V, R_G=1.8\Omega, T_J=125, 150^\circ C$



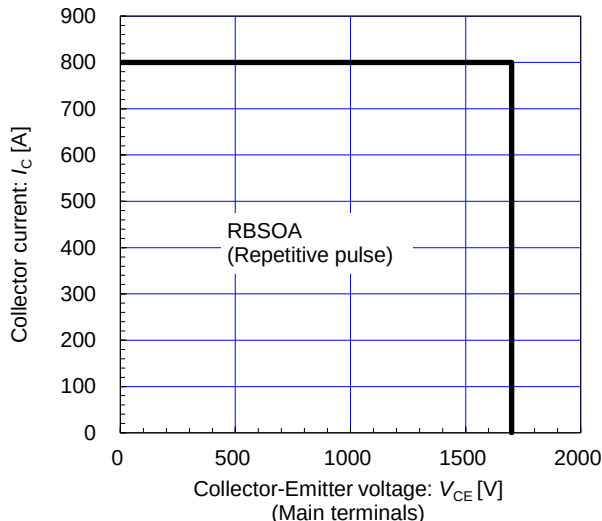
Switching loss vs. Gate resistance (typ.)

$V_{CC}=900V, I_C=400A, V_{GE}=\pm 15V, T_J=125, 150^\circ C$



Reverse bias safe operating area (max.)

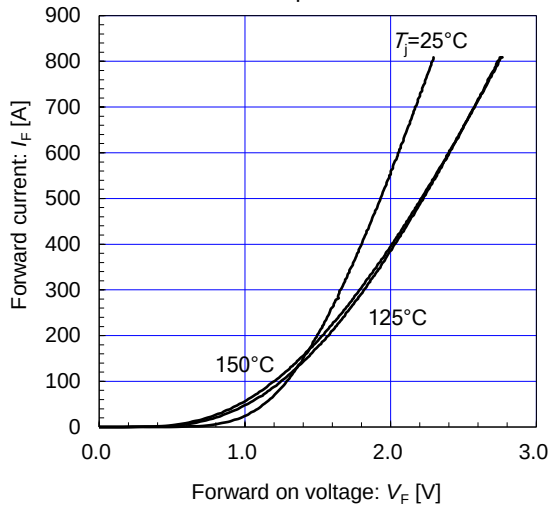
$V_{GE}=\pm 15V, R_G=1.8\Omega, T_J=150^\circ C, L_S=40nH$



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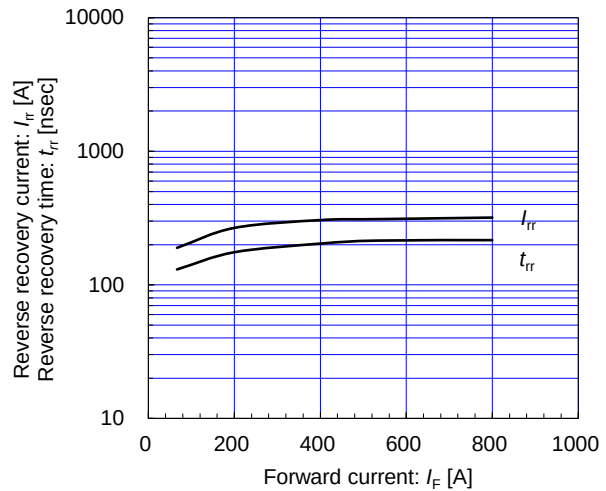
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Forward Current vs. Forward Voltage (typ.)
chip



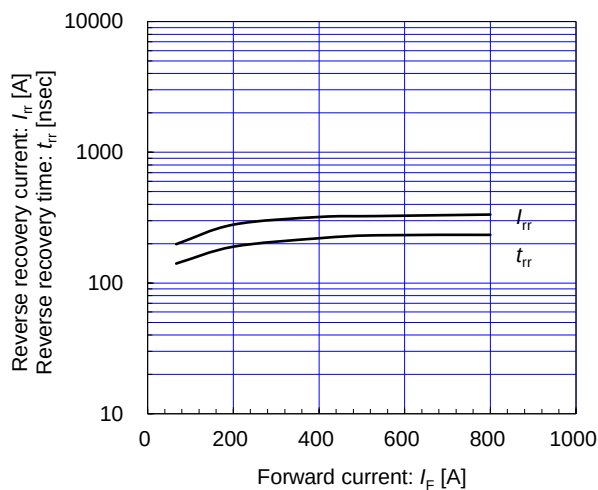
Reverse Recovery Characteristics (typ.)

$V_{CC}=900V, V_{GE}= \pm 15V, R_G=1.8\Omega, T_j=125^\circ C$

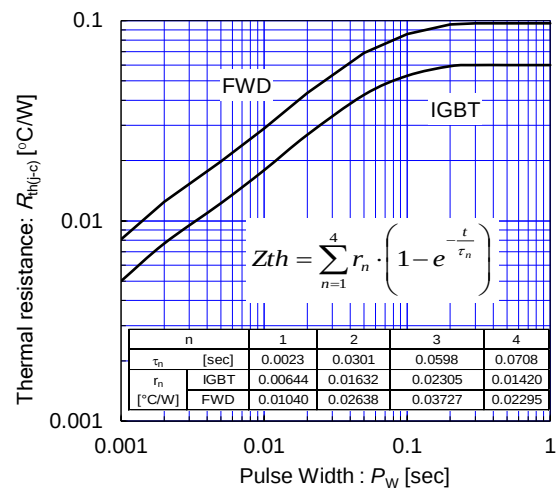


Reverse Recovery Characteristics (typ.)

$V_{CC}=900V, V_{GE}= \pm 15V, R_G=1.8\Omega, T_j=150^\circ C$

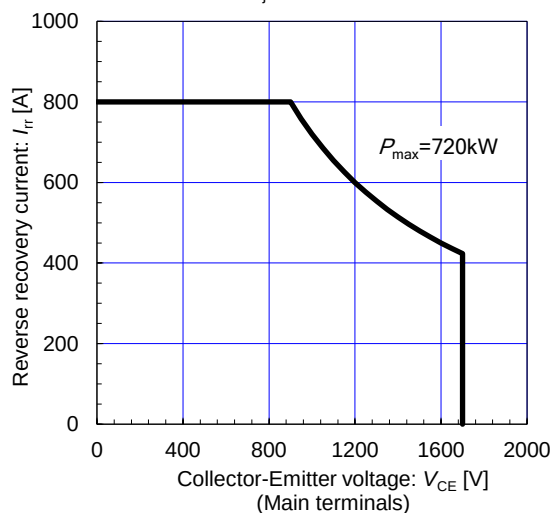


Transient Thermal Resistance(max.)



FWD safe operating area(max.)

$T_j=150^\circ C$



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