1MBI400VH-060L-50

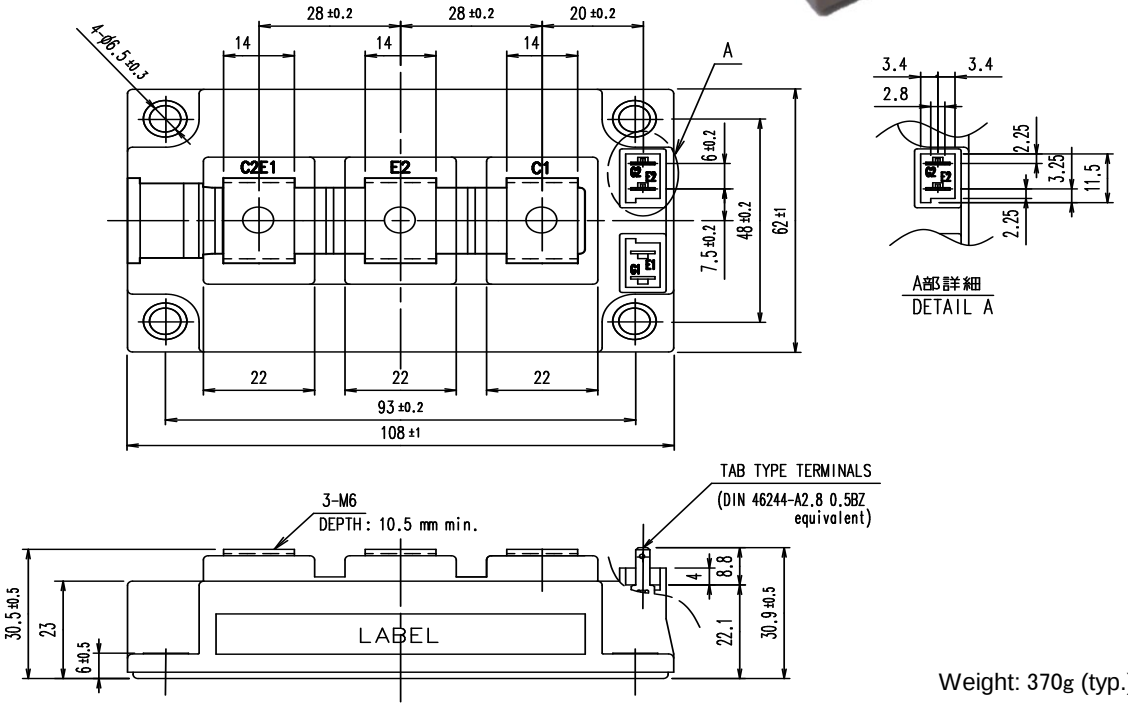
IGBT Modules

Power Module (V series)
600V / 400A / 1-in-one package

■ Features
High speed switching
Voltage drive
Low Inductance module structure

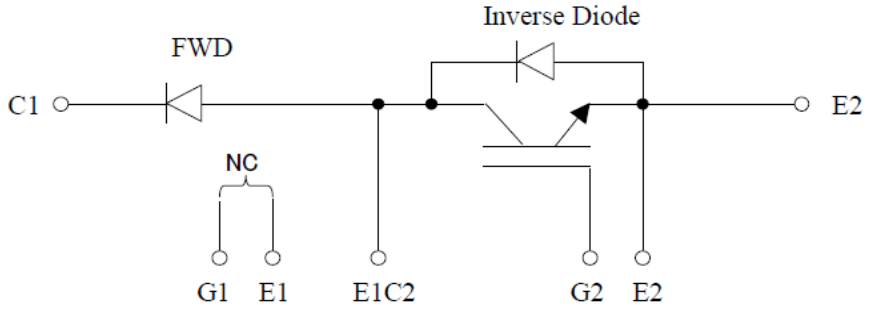
■ Applications
Inverter DB for Motor Drive
AC and DC Servo Drive Amplifier(DB)
Active PFC
Industrial machines

■ Outline drawing (Unit : mm)



Weight: 370g (typ.)

■ Equivalent Circuit



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■ Absolute Maximum Ratings (at T_c= 25°C unless otherwise specified)

Items		Symbols	Conditions	Maximum Ratings	Units
Collector-Emitter voltage		V_{CES}		600	V
Gate-Emitter voltage		V_{GES}		±20	V
Collector current		I_C	Continuous T_c=100°C	400	A
		I_C pulse	1ms	800	
		$-I_C$		400	
		$-I_C$ pulse	1ms	800	
Collector power dissipation		P_C	1 device	1250	W
Reverse voltage for FWD		V_R		600	V
Forward current for FWD		I_F		600	A
		I_F pulse	1ms	1200	
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.	2500	VAC
Screw Torque	Mounting (*2)	-		5.0	N m
	Terminals (*3)	-		5.0	

(*1) All terminals should be connected together when isolation test will be done. .
(*2) Recommendable Value : 3.0-5.0 Nm (M5 or M6)
(*3) Recommendable Value : 2.5-5.0 Nm (M6)

■ **Electrical characteristics (at T_j= 25°C unless otherwise specified)**

	Items	Symbols	Conditions		Characteristics min.	Characteristics typ.	Characteristics max.	Units
IGBT+Inverse Diode	Zero gate voltage Collector current	I_{CES}	V_{GE}=0V, V_{CE}=600V		-	-	2.0	mA
	Gate-Emitter leakage current	I_{GES}	V_{CE}=0V, V_{GE}=±20V		-	-	800	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$	V_{CE}=20V,I_C400mA		6.2	6.7	7.2	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	V_{GE}=15V, I_C=400A	T_j=25°C	-	1.70	2.40	V
				T_j=125°C	-	2.00	-	
				T_j=150°C	-	2.20	-	
		$V_{CE(sat)}$ (chip)	V_{GE}=15V, I_C=400A	T_j=25°C	-	1.60	2.05	
				T_j=125°C	-	1.90	-	
				T_j=150°C	-	2.10	-	
	Internal gate resistance	$R_{G(int)}$	-		-	2.3	-	Ω
	Input capacitance	C_{ies}	V_{CE}=10V, V_{GE}=0V, f=1MHz		-	25.6	-	nF
	Turn-on time	t_{on}			-	730	-	nsec
		t_r	V_{CC}=300V.I_C=400A V_{GE}=±15V		-	360	-	
		$t_{r(i)}$	R_{g_on}=R_{g_off}=4.7Ω		-	135	-	
	Turn-off time	t_{off}	T_j=150°C,L s=30nH		-	610	-	
		t_f			-	70	-	
	Forward on voltage	V_F (terminal)	V_{GE}=0V, I_F=400A	T_j=25°C	-	1.70	2.30	V
				T_j=125°C	-	1.60		
				T_j=150°C	-	1.55	-	
		V_F (chip)	V_{GE}=0V, I_F=400A	T_j=25°C	-	1.60	2.05	
				T_j=125°C	-	1.50		
				T_j=150°C	-	1.45	-	
FWD	Reverse Cuurent	I_R	V_{CE}=600V		-	-	1.0	mA
	Forward on voltage	V_F (terminal)	V_{GE}=0V, I_F=600A	T_j=25°C	-	1.75	2.50	V
				T_j=125°C	-	1.65		
				T_j=150°C	-	1.62	-	
		V_F (chip)	V_{GE}=0V, I_F=600A	T_j=25°C	-	1.60	2.05	
				T_j=125°C	-	1.50	-	
				T_j=150°C	-	1.45	-	
	Reverse recovery time	t_{rr}	I_F=400A		-	260	-	nsec

5. Thermal resistance characteristics

Items	Symbols	Conditions	Characteristics min.	Characteristics typ.	Characteristics max.	Units
Thermal resistance (1device)	$R_{th(j-c)}$	IGBT	-	-	0.12	°C/W
		Inverse Diode	-	-	0.20	
		FWD	-	-	0.16	
Contact thermal resistance	$R_{th(c-f)}$	with Thermal Compound	-	0.0125	-	

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

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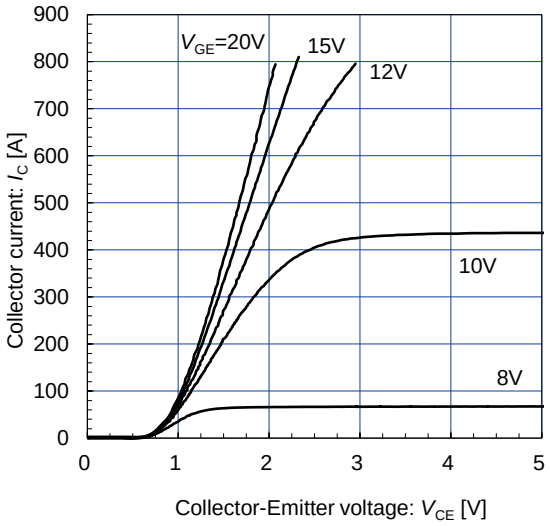
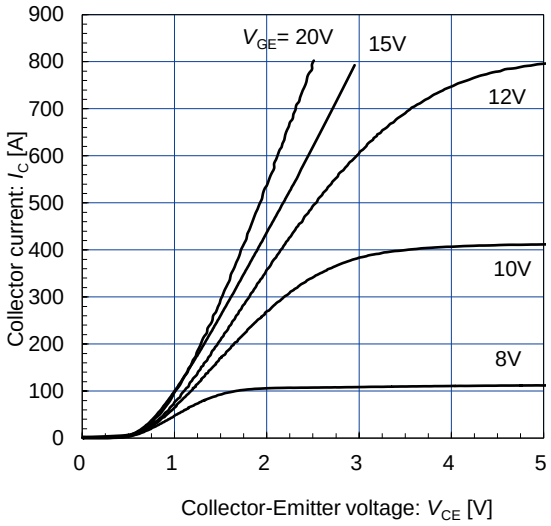
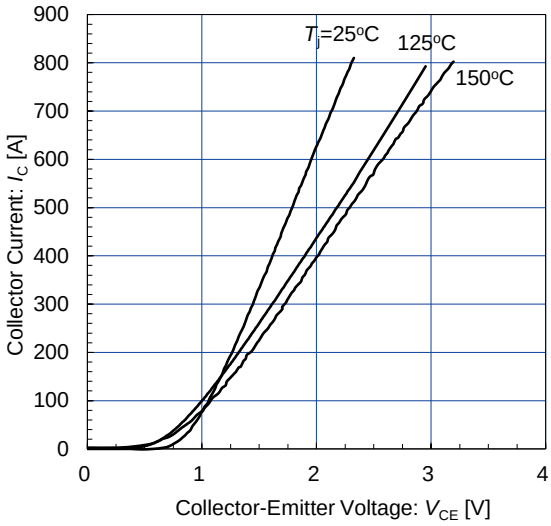
Collector current vs. Collector-Emitter voltage (typ.)
T_j = 25°C / chip



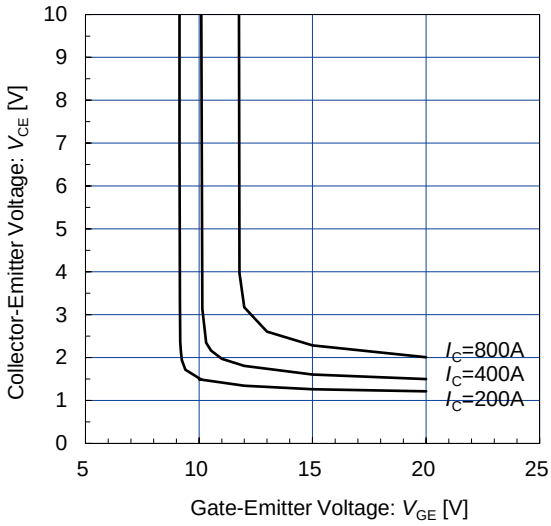
Collector current vs. Collector-Emitter voltage (typ.)
T_j = 125°C / chip



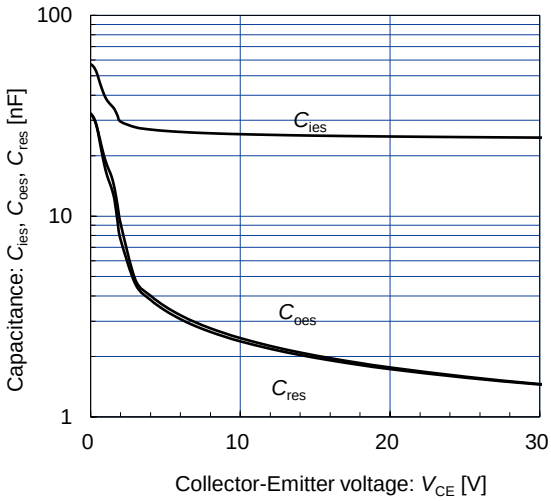
Collector current vs. Collector-Emitter voltage (typ.)
V_{GE}= 15V / chip



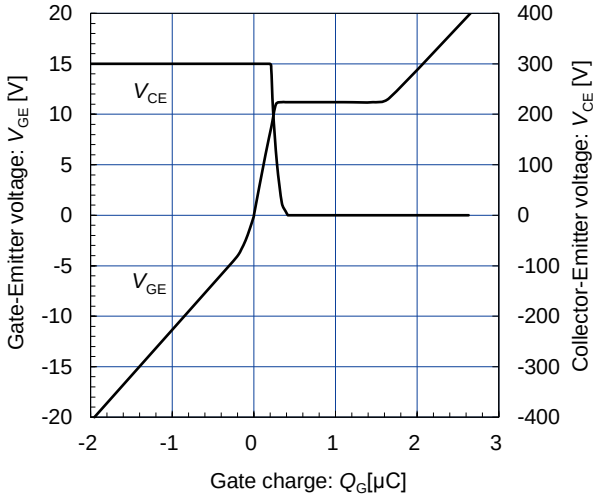
Collector-Emitter voltage vs. Gate-Emitter voltage (typ.)
T_j = 25°C / chip



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



Dynamic Gate Charge (typ.)
V_{cc}=300V, I_C=400A, T_j=25°C



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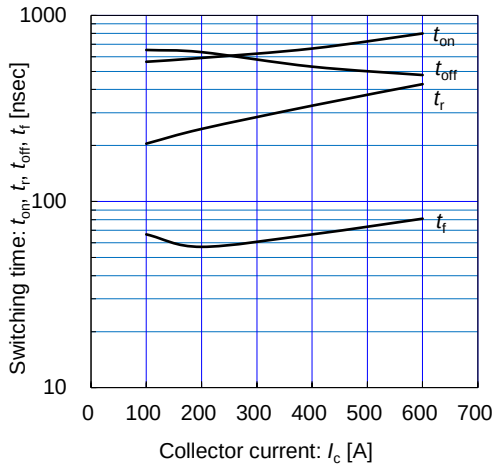
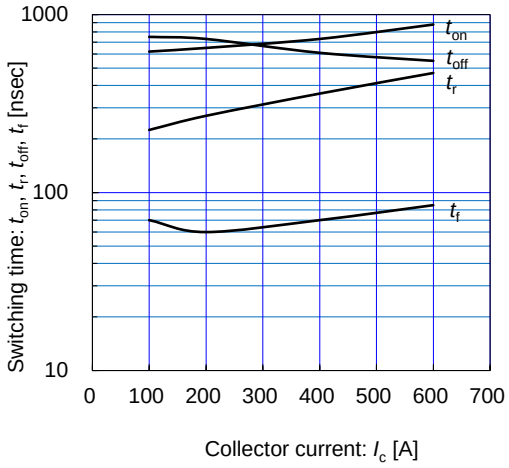
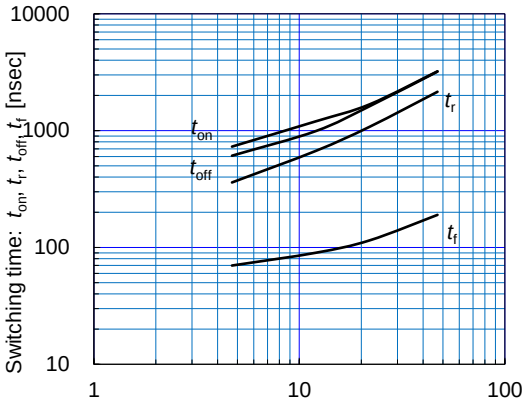
Switching time vs. Collector current (typ.)
V_{cc}=300V, V_{GE}=±15V, R_G=4.7Ω, T_j=125°C



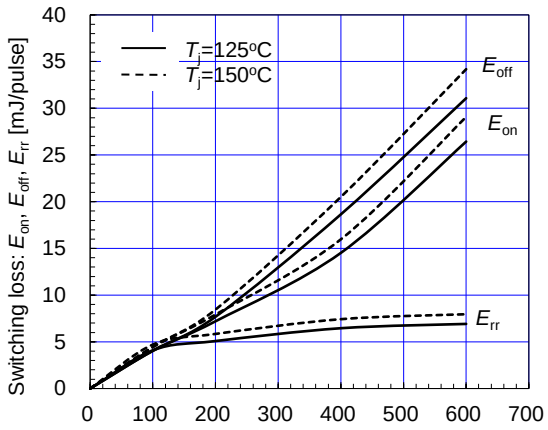
Switching time vs. Collector current (typ.)
V_{cc}=300V, V_{GE}=±15V, R_G=4.7Ω, T_j=150°C



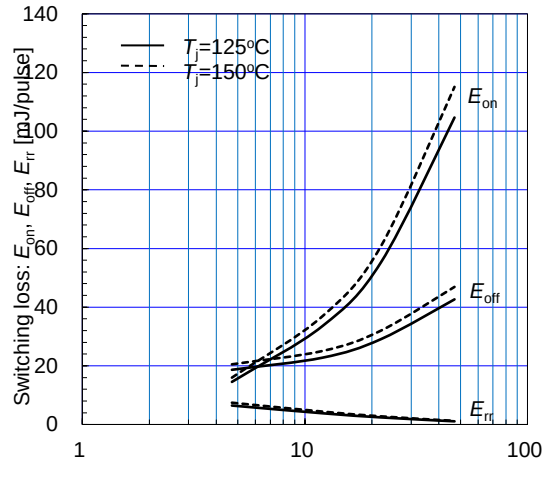
Switching time vs. Gate resistance (typ.)
V_{cc}=300V, I_C=400A, V_{GE}= ±15V, T_j=125°C



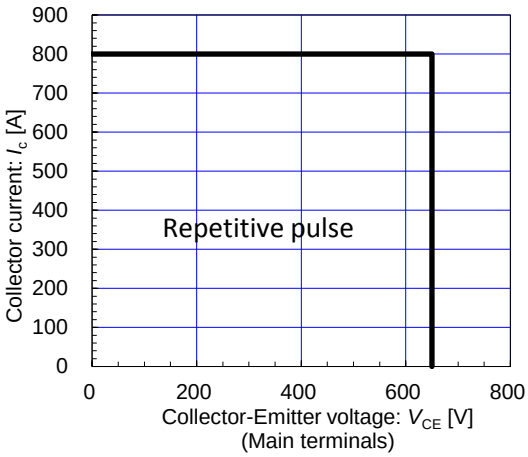
Switching loss vs. Collector current (typ.)
V_{cc}=300V, V_{GE}= ±15V, R_G= 4.7Ω, T_j=125°C,150°C



Switching loss vs. Gate resistance (typ.)
V_{cc}=300V, I_C=400A, V_{GE}=±15V, T_j=125,150°C



Reverse bias safe operating area (max.)
+V_{GE}=15V, -V_{GE}=15V, R_G=4.7Ω, T_j=150°C



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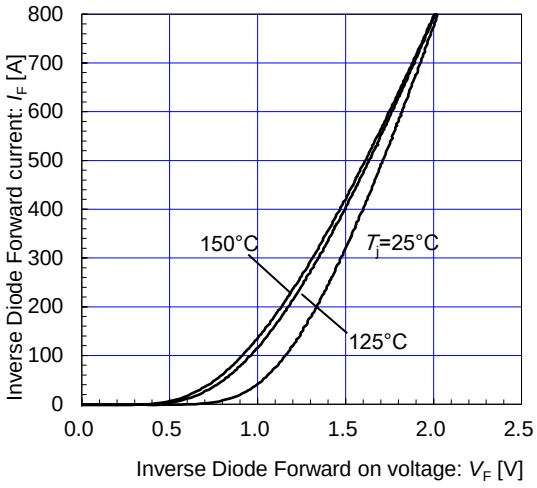
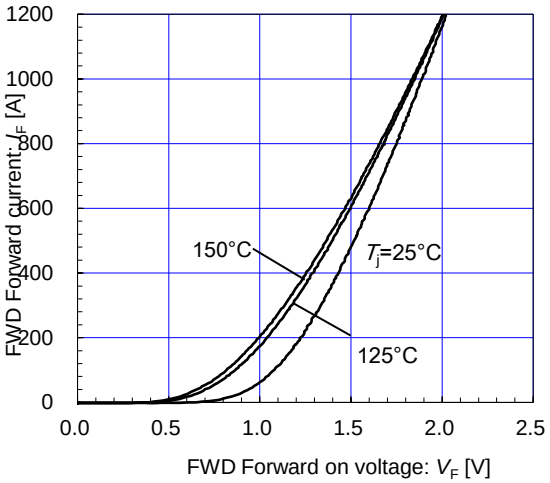
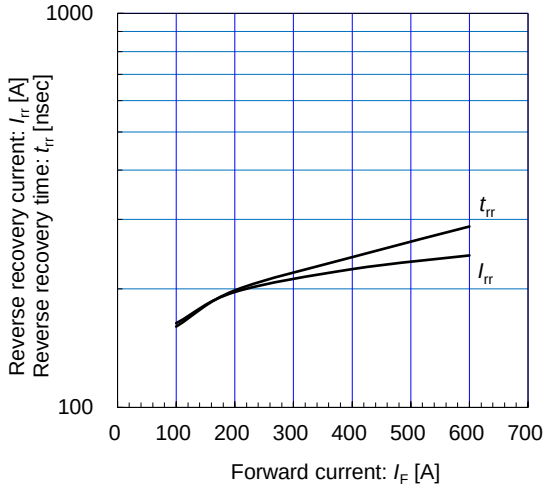
Inverse Diode
Forward Current vs. Forward Voltage (typ.) chip



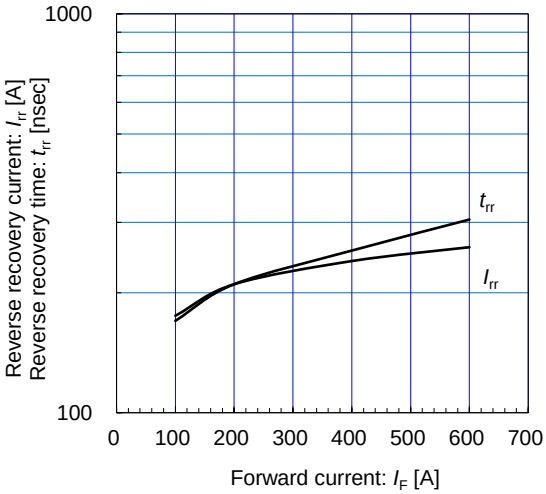
FWD
Forward Current vs. Forward Voltage (typ.) chip



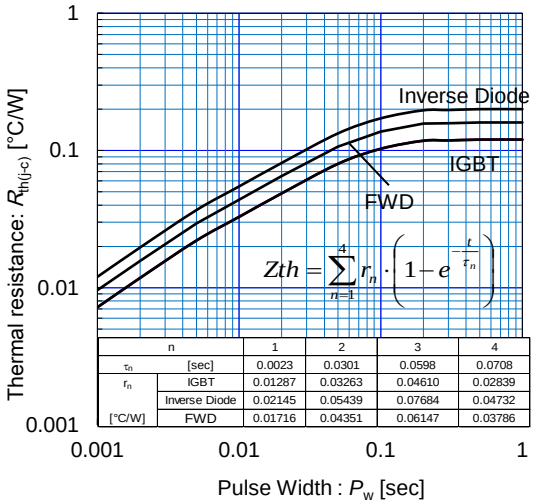
Reverse Recovery Characteristics (typ.)
V_{cc}=300V, V_{GE}= ±15V, R_G=4.7Ω, T_j=125°C



Reverse Recovery Characteristics (typ.)
V_{cc}=300V, V_{GE}= ±15V, R_G=4.7Ω, T_j=150°C



Transient thermal resistance (max.)



n		1	2	3	4
τ_n	[sec]	0.0023	0.0301	0.0598	0.0708
r_n	IGBT	0.01287	0.03263	0.04610	0.02839
	Inverse Diode	0.02145	0.05439	0.07684	0.04732
[°C/W]	FWD	0.01716	0.04351	0.06147	0.03786

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IGBT Modules

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