

2MBI400VB-060-50

IGBT Modules

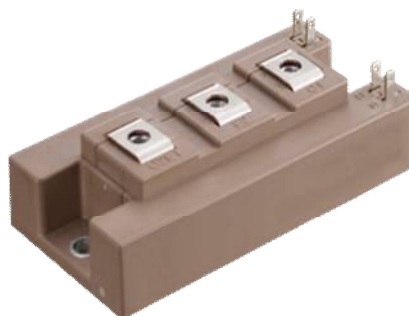
Power Module (V series)
600V / 400A / 2-in-1 package

■ Features

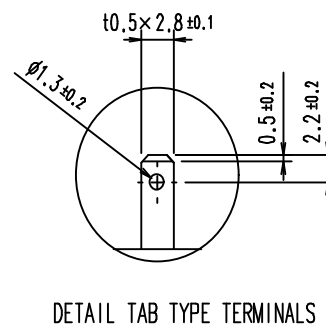
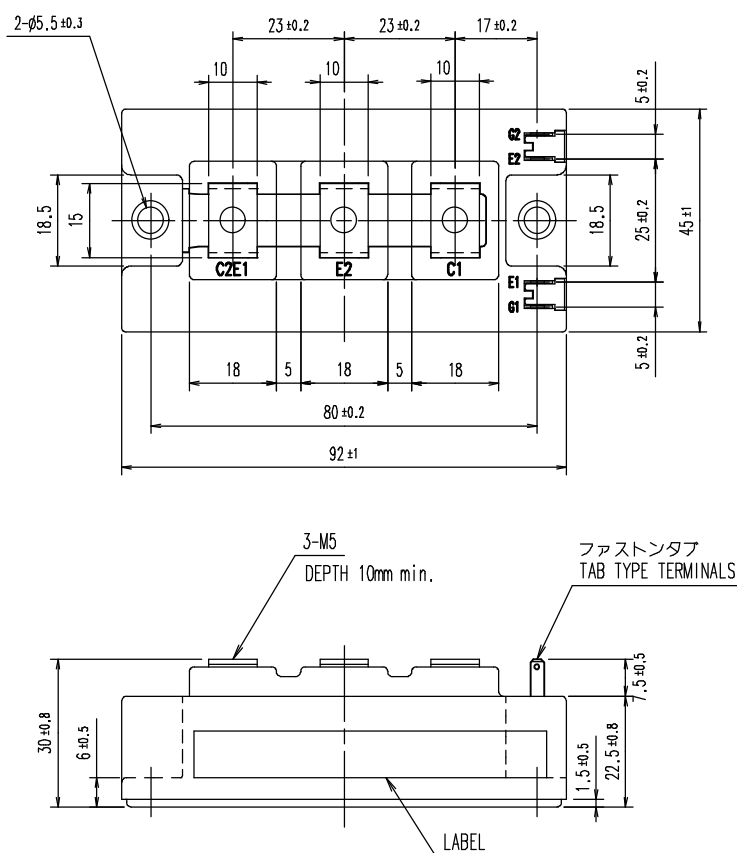
- AC-switch
- High speed switching
- Voltage drive
- Low Inductance module structure

■ Applications

AC-switch for UPS, PCS and etc.

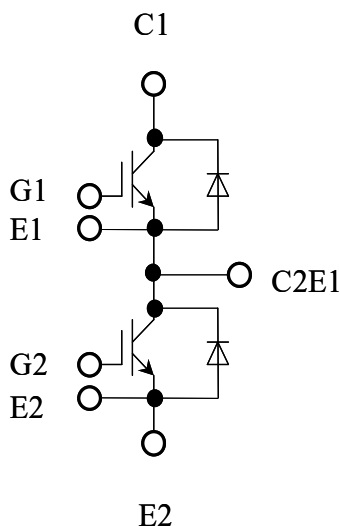


■ Outline drawing (Unit : mm)



Weight: 240g (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}		600	V
Gate-Emitter voltage		V_{GES}		± 20	V
Collector current		I_C	Continuous $T_C = 80^\circ\text{C}$	400	A
		I_C pulse	1ms	800	
		$-I_C$		400	
		$-I_C$ pulse	1ms	800	
Collector power dissipation		P_C	1 device	1970	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.	2500	VAC
Screw torque	Mounting	-	M5	2.5 ~ 3.5	N m
	Terminals	-	M5	2.5 ~ 3.5	

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

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

NOTICE:

The external gate resistance (R_g) shown below is one of our recommend value for the purpose of minimum switching loss. However the optimum R_g depends on circuit configuration and/or environment. We recommend that the R_g has to be carefully chosen based on consideration if IGBT module matches design criteria, for example, switching loss, EMC/EMI, spike voltage, surge current and no unexpected oscillation and so on.

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Zero gate voltage collector current	I_{CES}	$V_{GE}=0V, V_{CE}=600V$	-	-	2.0	mA
Gate-Emitter leakage current	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$	-	-	400	nA
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=20V, I_C=400mA$	6.2	6.7	7.2	V
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE}=15V, I_C=400A$	$T_j=25^\circ\text{C}$	1.90	2.35	V
			$T_j=125^\circ\text{C}$	2.20	-	
			$T_j=150^\circ\text{C}$	2.30	-	
	$V_{CE(sat)}$ (chip)	$V_{GE}=15V, I_C=400A$	$T_j=25^\circ\text{C}$	1.60	2.05	
			$T_j=125^\circ\text{C}$	1.90	-	
			$T_j=150^\circ\text{C}$	2.00	-	
Internal gate resistance	$R_{g(int)}$	-	-	2.0	-	Ω
Input capacitance	C_{ies}	$V_{CE}=10V, V_{GE}=0V, f=1\text{MHz}$	-	25.6	-	nF
Turn-on time	t_{on}	$V_{CC}=300V, I_C=400A, V_{GE}=\pm 15V, R_g=3.3\Omega, T_j=150^\circ\text{C}, L_s=30\text{nH}$	-	650	-	nsec
	t_r		-	300	-	
	$t_{r(l)}$		-	100	-	
Turn-off time	t_{off}		-	600	-	
	t_f		-	70	-	
Forward on voltage	V_F (terminal)	$V_{GE}=0V, I_F=400A$	$T_j=25^\circ\text{C}$	1.75	2.20	V
			$T_j=125^\circ\text{C}$	1.65	-	
			$T_j=150^\circ\text{C}$	1.62	-	
	V_F (chip)	$V_{GE}=0V, I_F=400A$	$T_j=25^\circ\text{C}$	1.60	2.05	
			$T_j=125^\circ\text{C}$	1.50	-	
			$T_j=150^\circ\text{C}$	1.47	-	
Reverse recovery time	t_{rr}	$I_F=400A$	-	200	-	nsec

■ Thermal resistance characteristics

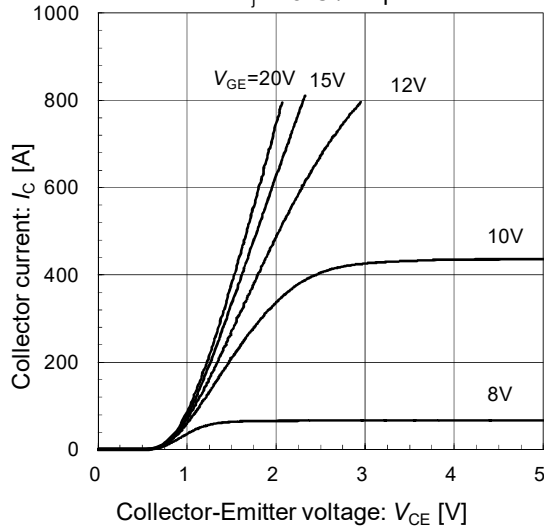
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	IGBT	-	-	0.076	$^\circ\text{C/W}$
		FWD	-	-	0.140	
Contact thermal resistance (1device) (*1)	$R_{th(c-f)}$	with thermal compound	-	0.025	-	

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

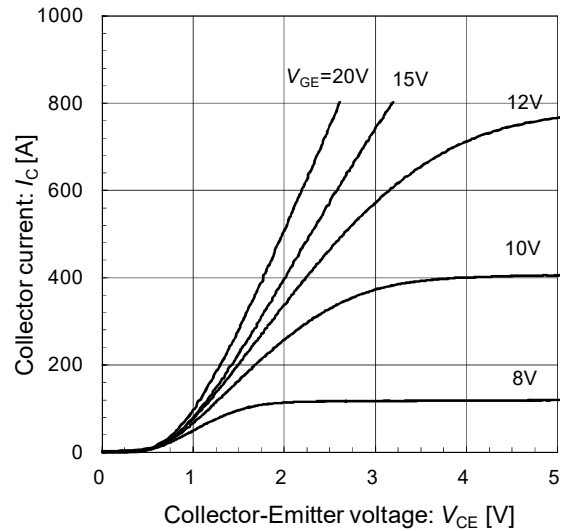
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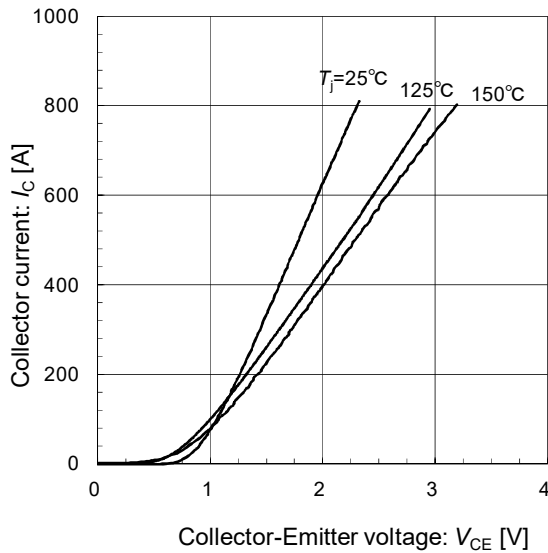
Collector current vs. Collector-Emitter voltage (typ.)
 $T_j = 25^\circ\text{C}$ / chip



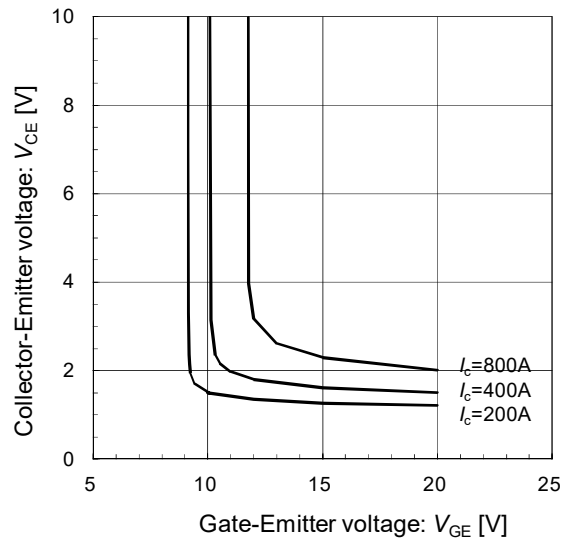
Collector current vs. Collector-Emitter voltage
 $T_j = 150^\circ\text{C}$ / chip



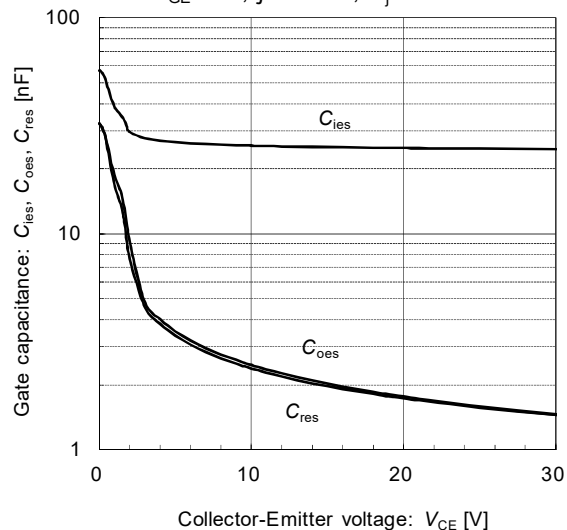
Collector current vs. Collector-Emitter voltage (typ.)
 $V_{GE} = 15\text{V}$ / chip



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

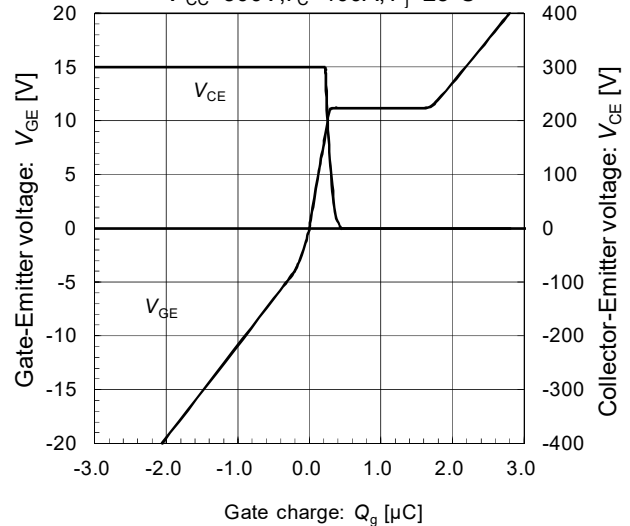


Gate capacitance vs. Collector-Emitter voltage (typ.)
 $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$, $T_j = 25^\circ\text{C}$



Dynamic gate charge (typ.)

$V_{CC} = 300\text{V}$, $I_C = 400\text{A}$, $T_j = 25^\circ\text{C}$

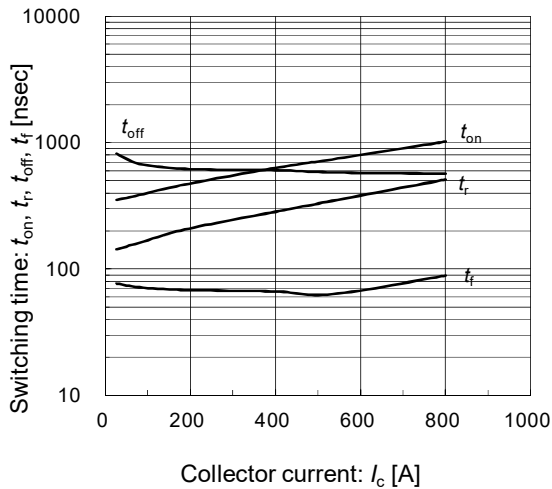


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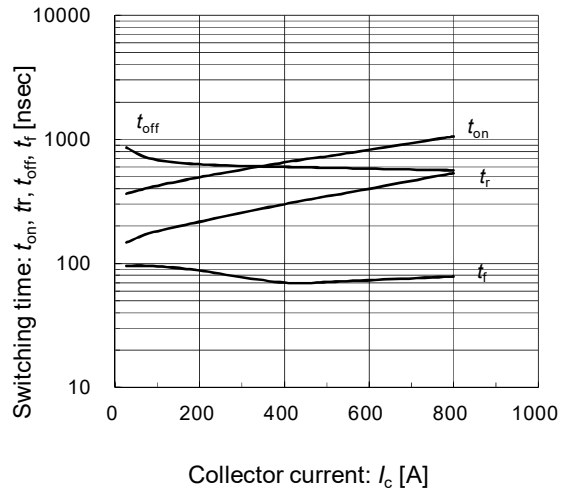
Switching time vs. Collector current (typ.)

$V_{CC}=300V, V_{GE}=\pm 15V, R_g=3.3\Omega, T_j=125^\circ C$



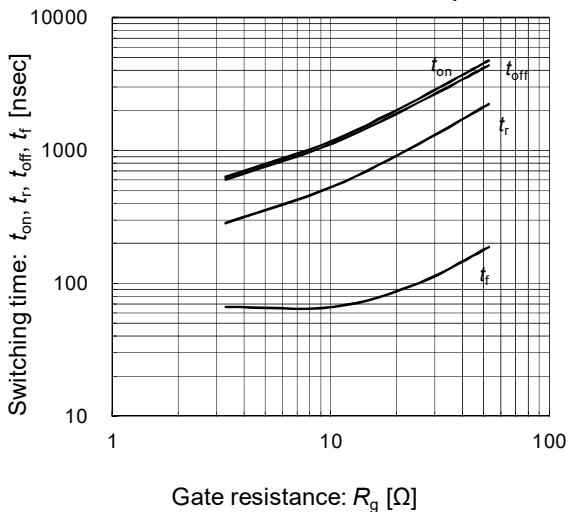
Switching time vs. Collector current (typ.)

$V_{CC}=300V, V_{GE}=\pm 15V, R_g=3.3\Omega, T_j=150^\circ C$



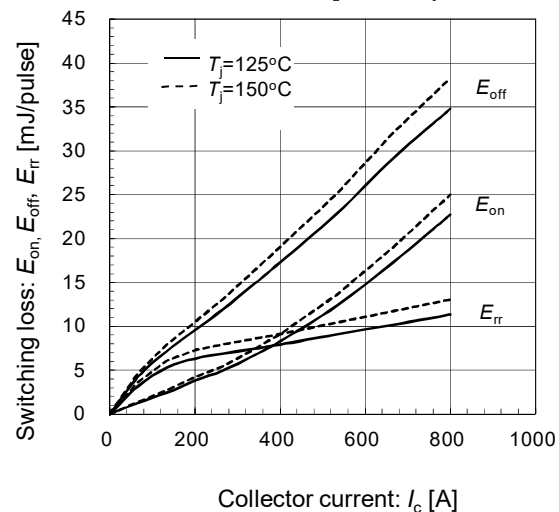
Switching time vs. Gate resistance (typ.)

$V_{CC}=300V, I_c=400A, V_{GE}=\pm 15V, T_j=125^\circ C$



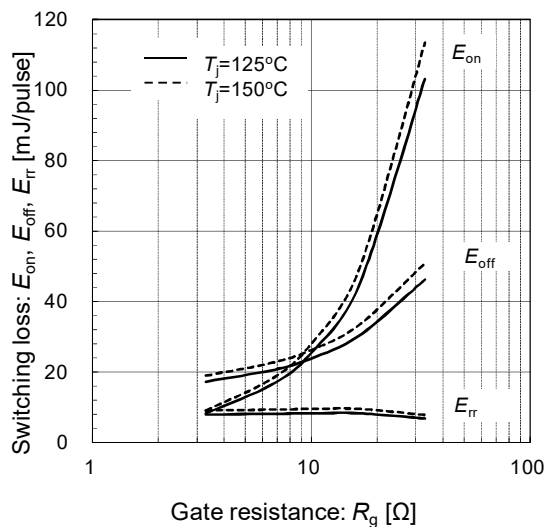
Switching loss vs. Collector current (typ.)

$V_{CC}=300V, V_{GE}=\pm 15V, R_g=3.3\Omega, T_j=125, 150^\circ C$



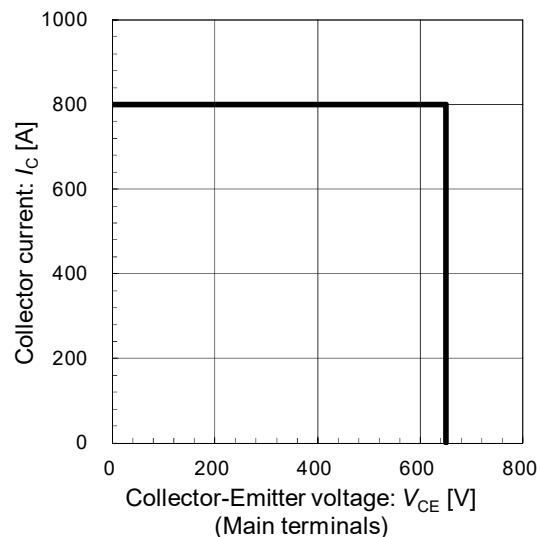
Switching loss vs. Gate resistance (typ.)

$V_{CC}=300V, I_c=400A, V_{GE}=\pm 15V, T_j=125, 150^\circ C$



Reverse bias safe operating area (max.)

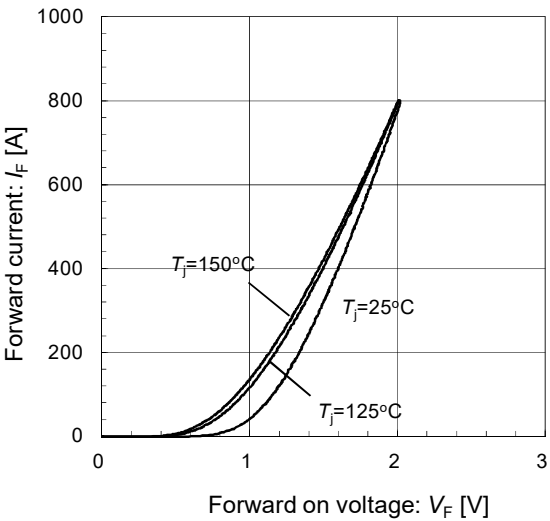
$+V_{GE}=15V, -V_{GE}=15V, R_g=3.3\Omega, T_j=150^\circ C$



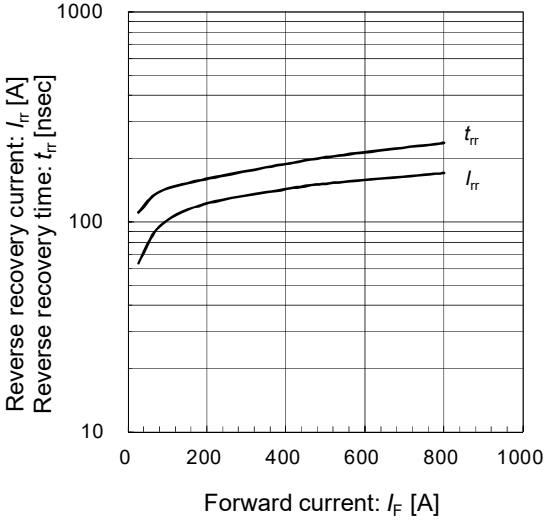
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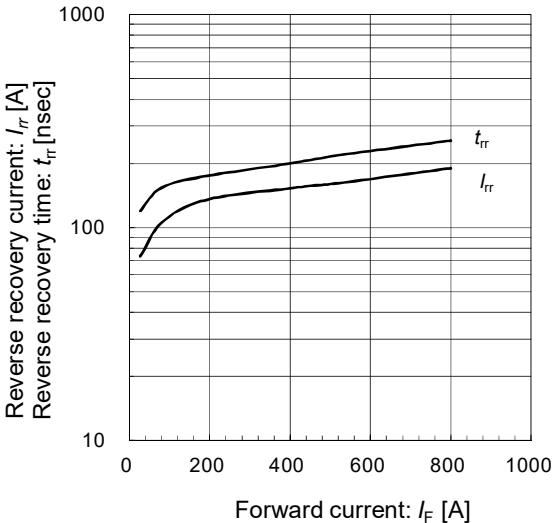
Forward current vs. Forward voltage (typ.)
chip



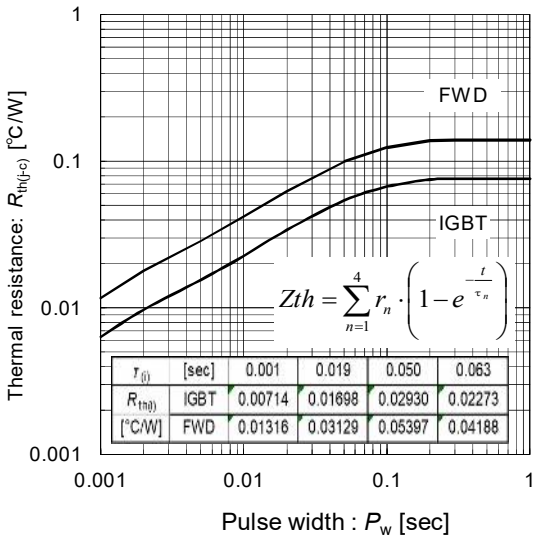
Reverse recovery characteristics (typ.)
 $V_{CC}=300\text{V}, V_{GE}=\pm 15\text{V}, R_g=3.3\Omega, T_j=125^{\circ}\text{C}$



Reverse recovery characteristics (typ.)
 $V_{CC}=300\text{V}, V_{GE}=\pm 15\text{V}, R_g=3.3\Omega, T_j=150^{\circ}\text{C}$



Transient thermal resistance (max.)



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