

# 2MBI450VN-120S-50

IGBT Modules

**Power Module (V series)**  
**1200V / 450A / 2-in-1 package**

## ■ Features

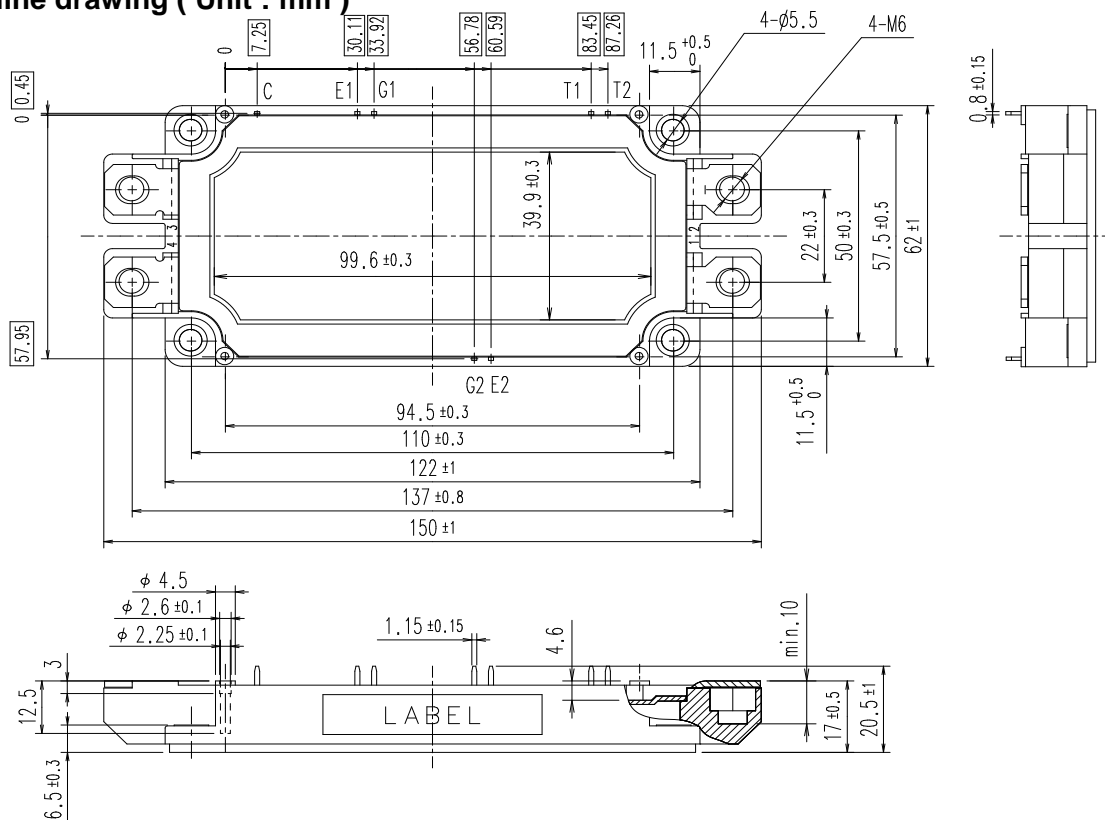
- Low  $V_{CE(sat)}$
- Low Inductance Module structure
- Solderless press-fit terminals

## ■ Applications

- Inverter for Motor Drives, AC and DC Servo Drives
- Uninterruptible Power Supply Systems, Wind Turbines, PV Power Conditioning Systems



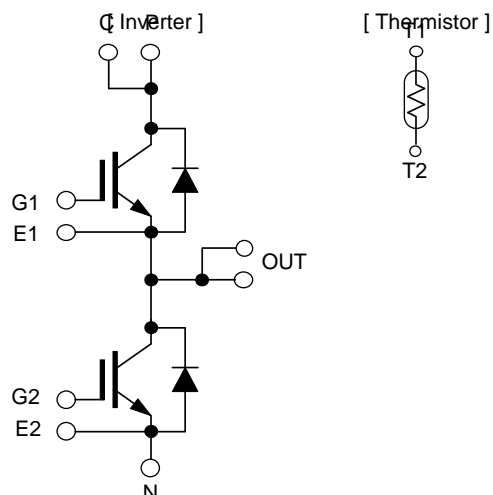
## ■ Outline drawing ( Unit : mm )



NOTE)   shows theoretical demension and tolerance is  $\oplus \ominus \phi 0.5$

Weight: 300g (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		$V_{CES}$		1200	V
Gate-Emitter voltage		$V_{GES}$		$\pm 20$	V
Collector current		$I_C$	Continuous	$T_C = 25^\circ\text{C}$ $T_C = 100^\circ\text{C}$	600 450
		$I_C$ pulse	1ms		900
		$-I_C$			450
		$-I_C$ pulse	1ms		900
Collector power dissipation		$P_C$	1 device	3000	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
	between thermistor and others (*2)				
Screw Torque	Mounting (*3)	-		3.5	N m
	Terminals (*4)	-		4.5	

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

(\*2) Two thermistor terminals should be connected together, other terminals should be connected together and shorted to base plate during the test.

(\*3) Recommendable Value : 2.5-3.5 Nm (M5)

(\*4) Recommendable Value : 3.5-4.5 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 <sub>CES</sub>	V <sub>GE</sub> =0V, V <sub>CE</sub> = 1200V		-	-	3.0	mA
Gate-Emitter leakage current	I <sub>GES</sub>	V <sub>CE</sub> =0V, V <sub>GE</sub> =±20V		-	-	600	nA
Gate-Emitter threshold voltage	V <sub>GE(th)</sub>	V <sub>CE</sub> =20V, I <sub>C</sub> = 450mA		6.0	6.5	7.0	V
Collector-Emitter saturation voltage	V <sub>CE(sat)</sub> (terminal)	V <sub>GE</sub> = 15V I <sub>C</sub> = 450A	T <sub>J</sub> =25°C	-	2.35	2.80	V
			T <sub>J</sub> =125°C	-	2.65	-	
			T <sub>J</sub> =150°C	-	2.70	-	
	V <sub>CE(sat)</sub> (chip)		T <sub>J</sub> =25°C	-	1.75	2.20	
			T <sub>J</sub> =125°C	-	2.05	-	
			T <sub>J</sub> =150°C	-	2.10	-	
Internal gate resistance	R <sub>G(int)</sub>	-		-	1.67	-	Ω
Input capacitance	C <sub>ies</sub>	V <sub>CE</sub> =10V, V <sub>GE</sub> =0V, f=1MHz		-	41	-	nF
Turn-on time	t <sub>on</sub>	V <sub>CC</sub> = 600V      I <sub>C</sub> = 450A V <sub>GE</sub> = ±15V      R <sub>G</sub> = 0.52Ω L <sub>s</sub> = 30nH	-	470	-	nsec	
	t <sub>r</sub>		-	120	-		
	t <sub>r(i)</sub>		-	60	-		
Turn-off time	t <sub>off</sub>		-	700	-		
	t <sub>f</sub>		-	70	-		
Forward on voltage	V <sub>F</sub> (terminal)	V <sub>GE</sub> = 0V I <sub>F</sub> = 450A	T <sub>J</sub> =25°C	-	2.30	2.75	V
			T <sub>J</sub> =125°C	-	2.45	-	
			T <sub>J</sub> =150°C	-	2.40	-	
	V <sub>F</sub> (chip)		T <sub>J</sub> =25°C	-	1.70	2.15	
			T <sub>J</sub> =125°C	-	1.85	-	
			T <sub>J</sub> =150°C	-	1.80	-	
Reverse recovery time	t <sub>rr</sub>	I <sub>F</sub> = 450A		-	200	-	nsec
Thermistor Resistance	R	T=25°C		-	5000	-	Ω
		T=100°C		465	495	520	
Thermistor B value	B	T=25/50°C		3305	3375	3450	K

## 5. Thermal resistance characteristics

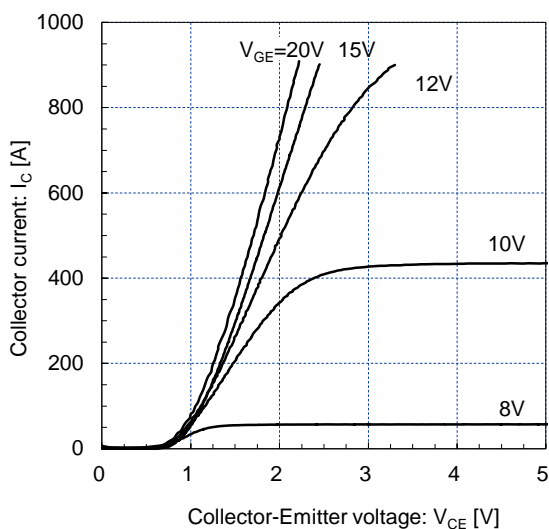
Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	IGBT	-	-	0.050	$^\circ\text{C/W}$
		FWD	-	-	0.078	
Contact thermal resistance (1device) (*1)	$R_{th(c-f)}$	with thermal compound	-	0.0167	-	

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

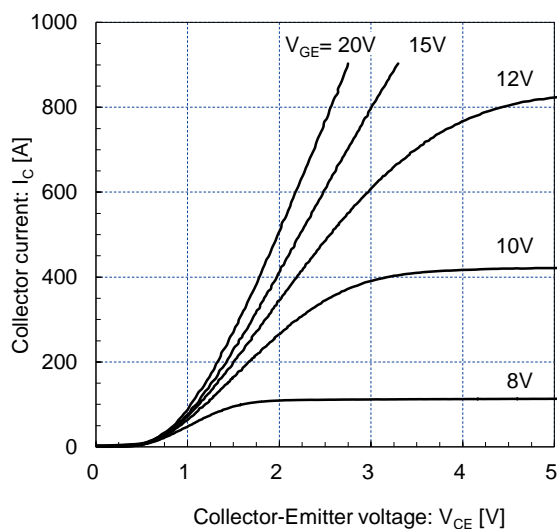
# 2MBI450VN-120S-50

IGBT Modules

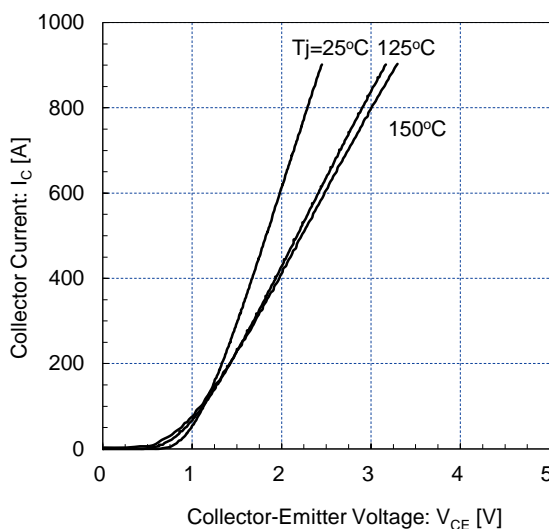
Collector current vs. Collector-Emmitter voltage  
 $T_j = 25^\circ\text{C}$  / chip



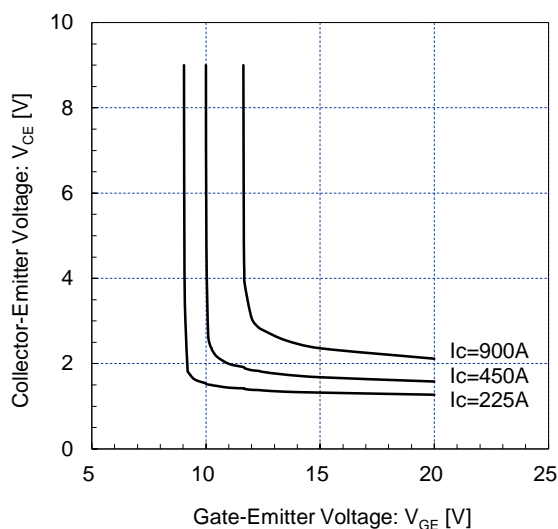
Collector current vs. Collector-Emmitter voltage (typ.)  
 $T_j = 150^\circ\text{C}$  / chip



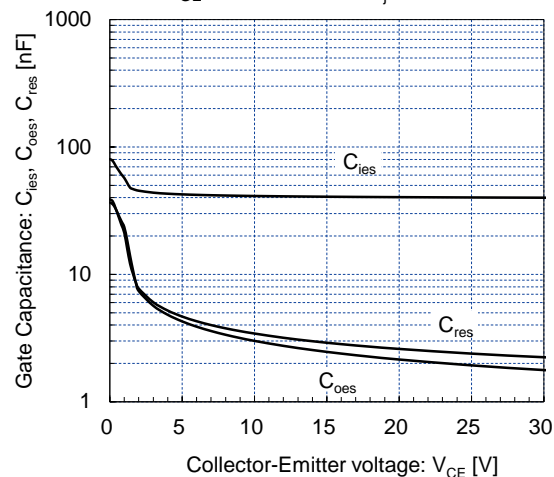
Collector current vs. Collector-Emmitter voltage  
 $V_{GE} = 15\text{V}$  / chip



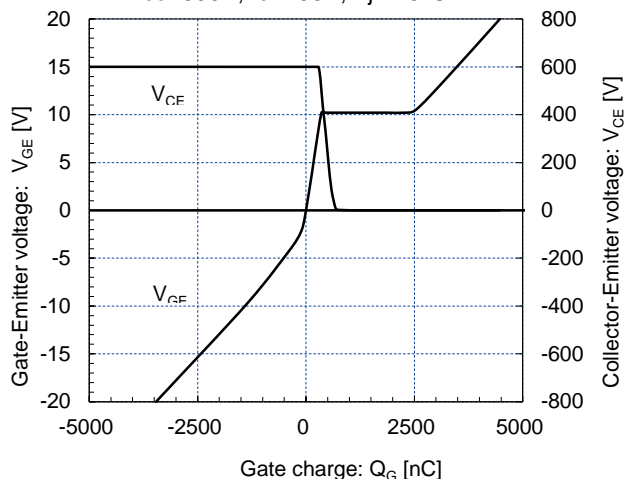
Collector-Emmitter voltage vs. Gate-Emmitter voltage  
 $T_j = 25^\circ\text{C}$  / chip



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



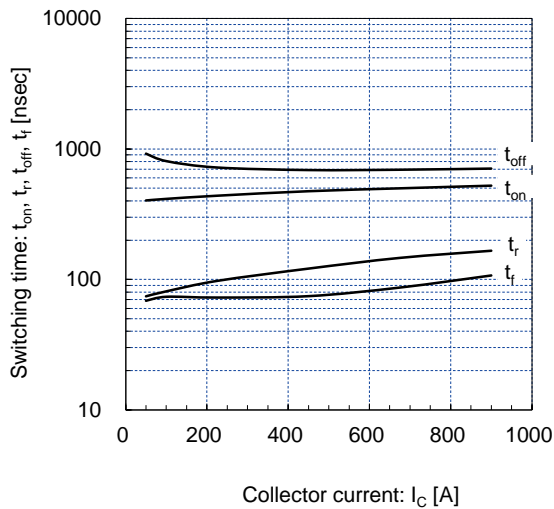
Dynamic Gate Charge (typ.)  
 $V_{CC} = 600\text{V}$ ,  $I_C = 450\text{A}$ ,  $T_j = 25^\circ\text{C}$



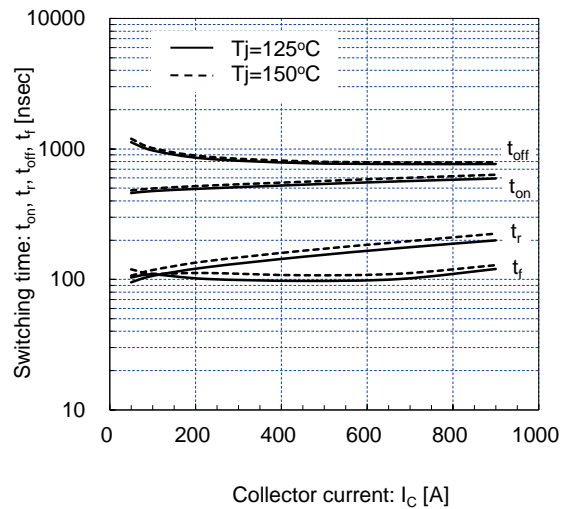
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## IGBT Modules

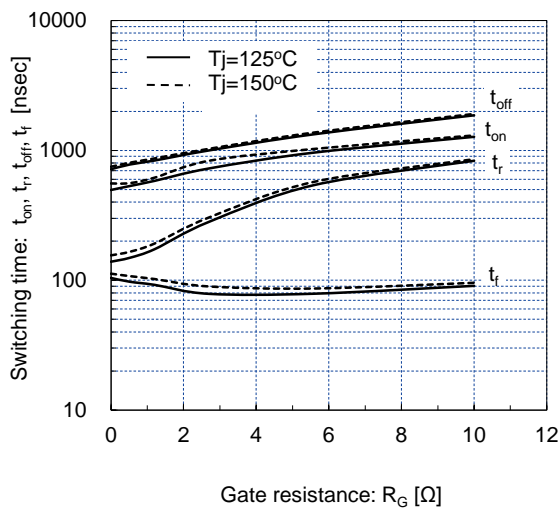
Switching time vs. Collector current (typ.)  
 $V_{cc}=600V$ ,  $V_{GE}=\pm 15V$ ,  $R_g=0.52\Omega$ ,  $T_j=25^\circ C$



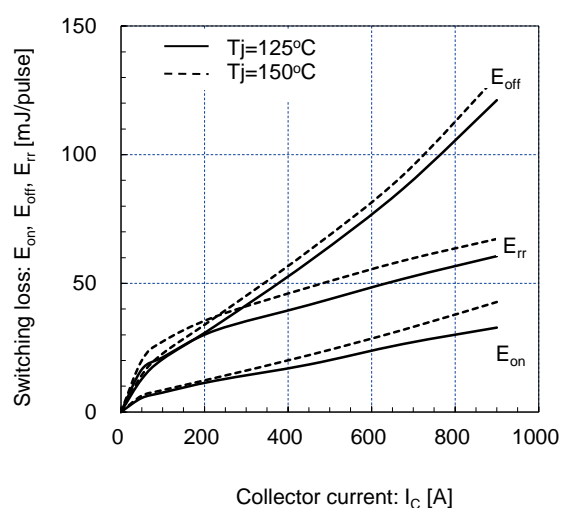
Switching time vs. Collector current (typ.)  
 $V_{cc}=600V$ ,  $V_{GE}=\pm 15V$ ,  $R_g=0.52\Omega$ ,  $T_j=125^\circ C$ ,  $150^\circ C$



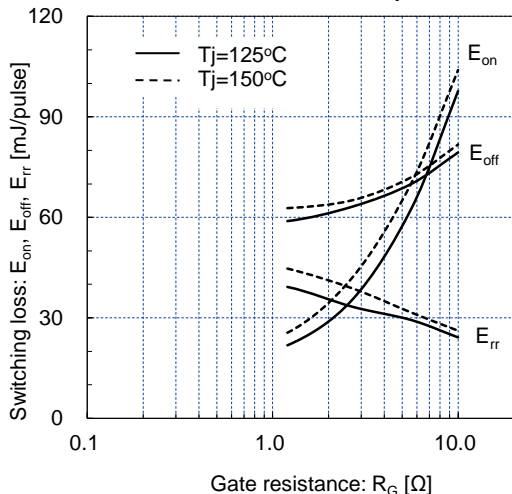
Switching time vs. Gate resistance (typ.)  
 $V_{cc}=600V$ ,  $I_C=450A$ ,  $V_{GE}=\pm 15V$ ,  $T_j=125^\circ C$ ,  $150^\circ C$



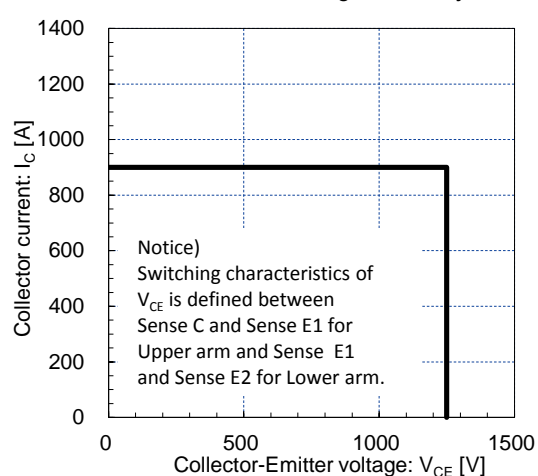
Switching loss vs. Collector current (typ.)  
 $V_{cc}=600V$ ,  $V_{GE}=\pm 15V$ ,  $R_g=0.52\Omega$ ,  $T_j=125^\circ C$ ,  $150^\circ C$



Switching loss vs. Gate resistance (typ.)  
 $V_{cc}=600V$ ,  $I_C=450A$ ,  $V_{GE}=\pm 15V$ ,  $T_j=125^\circ C$ ,  $150^\circ C$



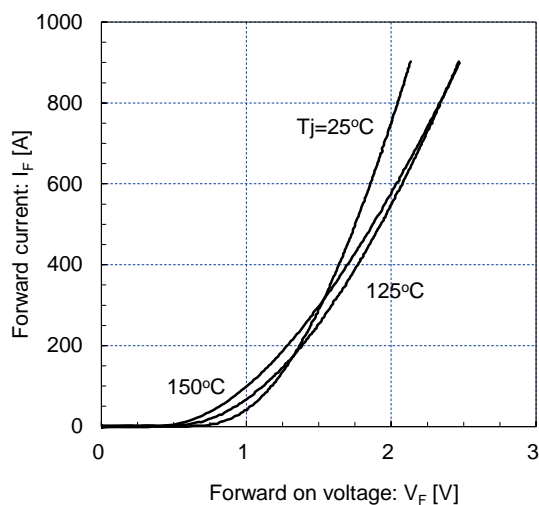
Reverse bias safe operating area (max.)  
 $+V_{GE}=15V$ ,  $-V_{GE}=15V$ ,  $R_g=0.52\Omega$ ,  $T_j=150^\circ C$



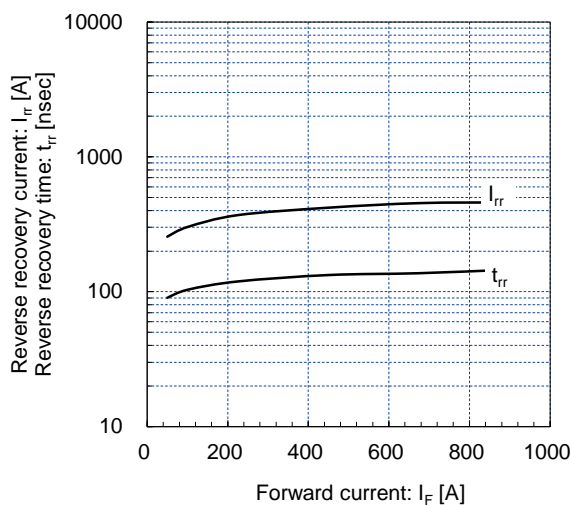
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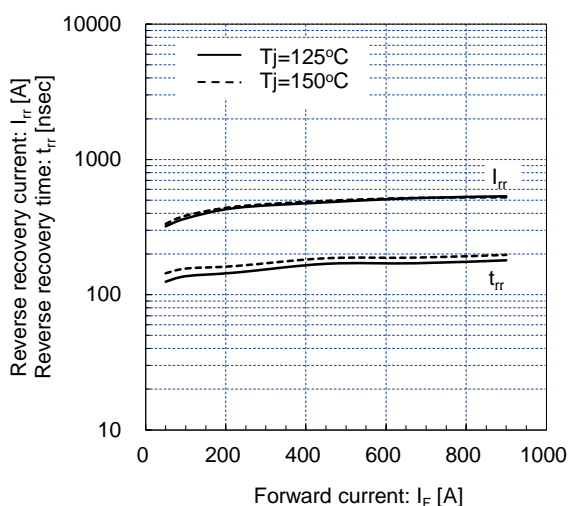
Forward current vs. Forward vltage (typ.)  
chip



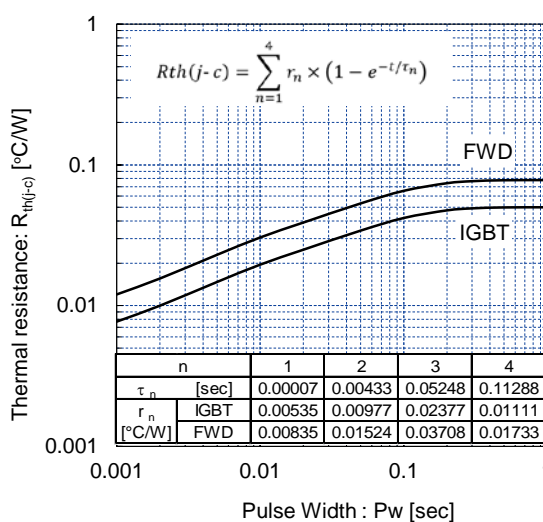
Reverse recovery characteristics (typ.)  
 $V_{CC}=600\text{V}$ ,  $V_{GE}=\pm 15\text{V}$ ,  $R_g=0.52\Omega$ ,  $T_J=25^\circ\text{C}$



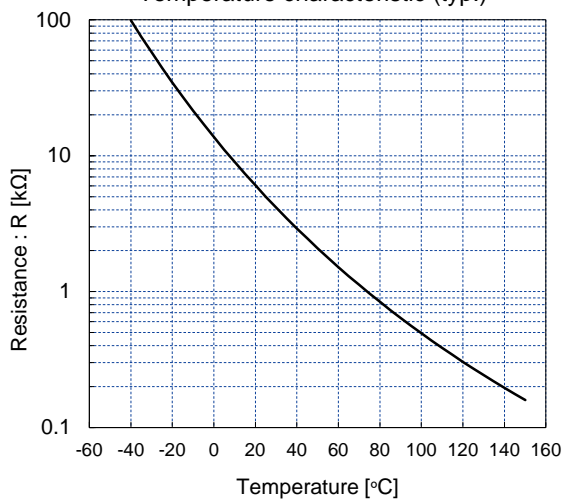
Reverse Recovery Characteristics (typ.)  
 $T_J=125^\circ\text{C}, 150^\circ\text{C}$



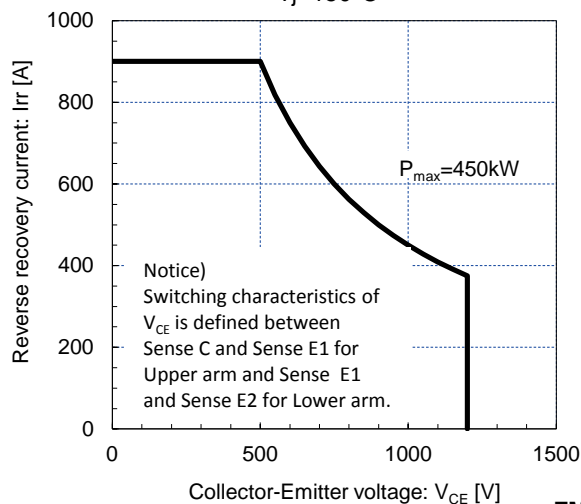
Transient Thermal Resistance (max.)



[THERMISTOR]  
Temperature characteristic (typ.)



FWD safe operating area (max.)  
 $T_J=150^\circ\text{C}$



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