

# 2MBI1800XF170-50

IGBT Modules

**Power Module (X series)**  
**1700V / 1800A / 2-in-1 package**

■ **Features**

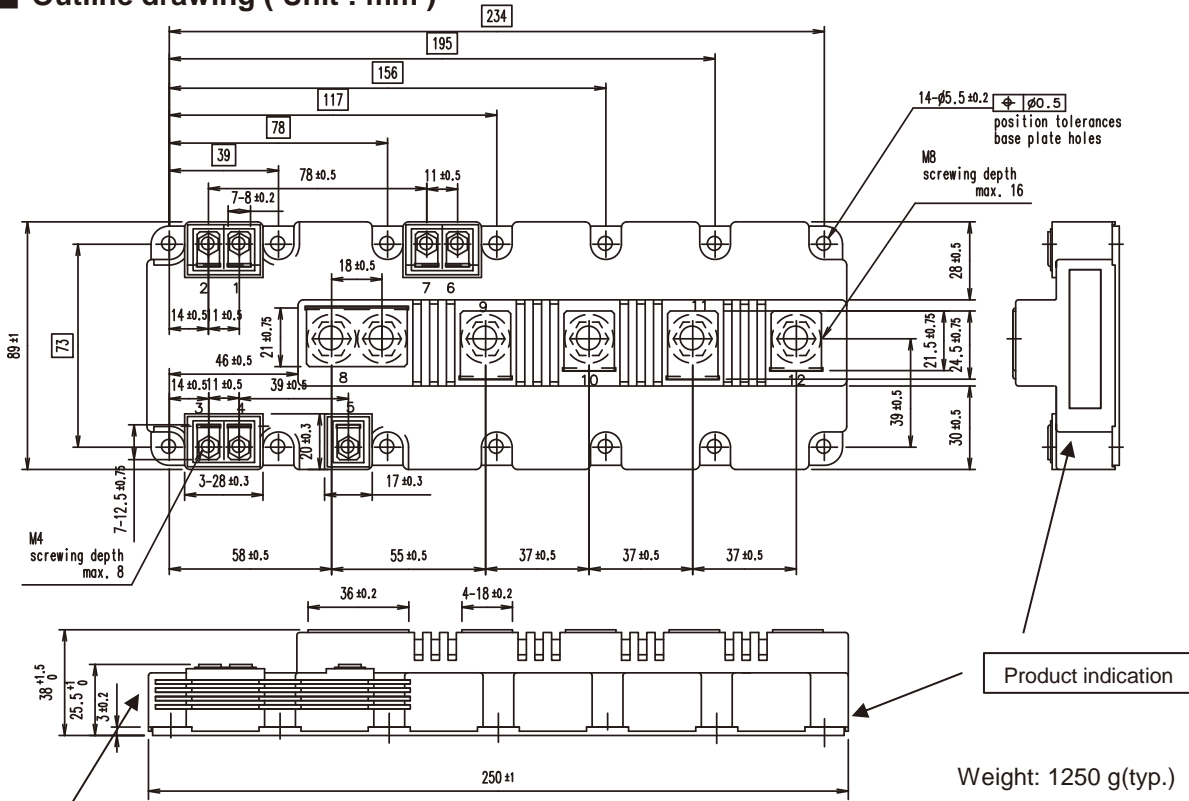
- LOW  $V_{CE(sat)}$
- Low Inductance Module structure

■ **Applications**

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

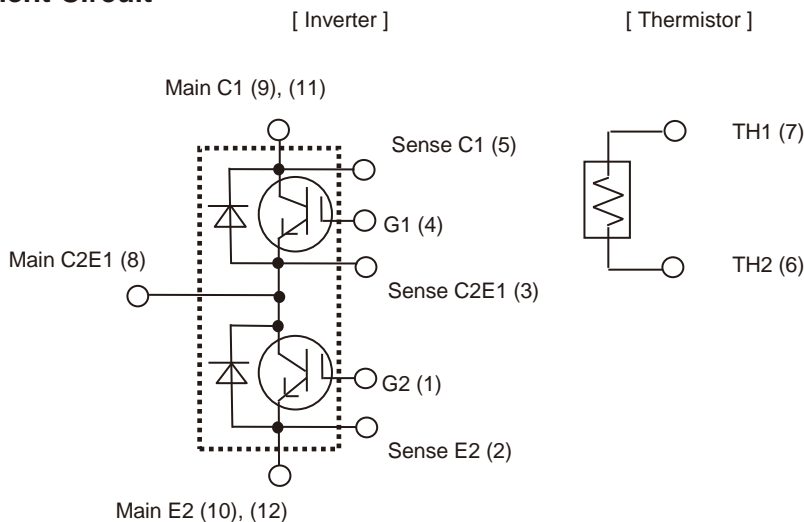


■ **Outline drawing ( Unit : mm )**



Characteristics indication

■ **Equivalent Circuit**



# 2MBI1800XF170-50

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

Items		Symbols	Conditions	Maximum Ratings	Units
Inverter	Collector-Emitter voltage, Gate-Emitter short-circuited	$V_{CES}$		1700	V
	Gate-Emitter voltage, Collector-Emitter short-circuited	$V_{GES}$		$\pm 20$	V
	Collector current	$I_C$	Continuous   $T_c=100^\circ\text{C}$	1800	A
	Repetitive peak collector current	$I_{CRM}$	1ms	3600	
	Forward current	$I_F$		1800	
	Repetitive peak forward current	$I_{FRM}$	1ms	3600	
	Total power dissipation	$P_{tot}$	1 device	13	
	Virtual junction temperature	$T_{vj}$		175	
	Operating virtual junction temperature (under switching conditions)	$T_{vjop}$		175	
	Case temperature	$T_c$		150	
Storage temperature		$T_{stg}$		-40 ~ 150	°C
Isolation voltage	between terminal and copper base (*1)	$V_{isol}$	AC: 1min.	4000	
	between thermistor and others (*2)				
Mounting torque of screws to heatsink (*3)		$M_s$	M5	6.0	N·m
Mounting torque of screws to main terminals (*3)		$M_t$	M8	10.0	
Mounting torque of screws to sense terminals (*3)			M4	2.1	

(\*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:       : Mounting torque of screws to heatsink       3.0 ~ 6.0 N·m (M5)  
   : Mounting torque of screws to main terminals   8.0~ 10.0 N·m (M8)  
   : Mounting torque of screws to sense terminals 1.8~ 2.1 N·m (M4)

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

Items	Symbols	Conditions	Characteristics			Units			
			min.	typ.	max.				
Collector-Emitter cut-off current, Gate-Emitter short-circuited	$I_{CES}$	$V_{GE} = 0\text{V}$ $V_{CE} = 1700\text{V}$	-	-	600	$\mu\text{A}$			
Gate leakage current, Collector-Emitter short-circuited	$I_{GES}$	$V_{CE}=0\text{V}, V_{GE}=\pm 20\text{V}$	-	-	1200	nA			
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20\text{V}$ $I_C = 1800\text{mA}$	6.0	6.5	7.0	V			
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15\text{V}$ $I_C = 1800\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	1.75	2.20	V		
			$T_{vj}=25^{\circ}\text{C}$	-	1.70	2.15			
	$T_{vj}=125^{\circ}\text{C}$		-	2.10	-				
	$T_{vj}=150^{\circ}\text{C}$		-	2.20	-				
	$T_{vj}=175^{\circ}\text{C}$		-	2.30	-				
Internal gate resistance	$r_g$	-	-	2.08	-	$\Omega$			
			Capacitance	$C_{ies}$	$V_{CE}=10\text{V}, V_{GE}=0\text{V}, f=1\text{MHz}$	-	280	-	nF
						$C_{oes}$	-	7.3	
$C_{res}$	-	2.2				-			
Gate charge	$Q_G$	$V_{CC} = 900\text{V}, I_C = 1800\text{A}$ $V_{GE} = -15 \rightarrow +15\text{V}$	-	14.3	-	$\mu\text{C}$			
Forward voltage	$V_F$ (terminal)	$V_{GE} = 0\text{V}$ $I_F = 1800\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	1.80	2.25	V		
			$T_{vj}=25^{\circ}\text{C}$	-	1.75	2.20			
	$T_{vj}=125^{\circ}\text{C}$		-	1.95	-				
	$T_{vj}=150^{\circ}\text{C}$		-	1.95	-				
	$T_{vj}=175^{\circ}\text{C}$		-	1.90	-				
Switching time (*1)	$t_{d(on)}$	$V_{CC} = 900\text{V}$ $I_C, I_F = 1800\text{A}$ $V_{GE} = \pm 15\text{V}$ $R_G = +0.22/-0.68\Omega$ $L_S = 40\text{ nH}$	$T_{vj}=25^{\circ}\text{C}$	-	1.11	-	$\mu\text{s}$		
			$T_{vj}=125^{\circ}\text{C}$	-	1.09	-			
			$T_{vj}=150^{\circ}\text{C}$	-	1.09	-			
			$T_{vj}=175^{\circ}\text{C}$	-	1.09	-			
	$t_r$		$T_{vj}=25^{\circ}\text{C}$	-	0.16	-			
			$T_{vj}=125^{\circ}\text{C}$	-	0.18	-			
			$T_{vj}=150^{\circ}\text{C}$	-	0.18	-			
			$T_{vj}=175^{\circ}\text{C}$	-	0.18	-			
	$t_{d(off)}$		$T_{vj}=25^{\circ}\text{C}$	-	1.02	-			
			$T_{vj}=125^{\circ}\text{C}$	-	1.07	-			
			$T_{vj}=150^{\circ}\text{C}$	-	1.09	-			
			$T_{vj}=175^{\circ}\text{C}$	-	1.10	-			
	$t_f$		$T_{vj}=25^{\circ}\text{C}$	-	0.20	-			
$T_{vj}=125^{\circ}\text{C}$		-	0.44	-					
$T_{vj}=150^{\circ}\text{C}$		-	0.50	-					
$T_{vj}=175^{\circ}\text{C}$		-	0.56	-					
Reverse recovery time	$t_{rr}$	$T_{vj}=25^{\circ}\text{C}$	-	0.38	-				
		$T_{vj}=125^{\circ}\text{C}$	-	0.52	-				
		$T_{vj}=150^{\circ}\text{C}$	-	0.56	-				
		$T_{vj}=175^{\circ}\text{C}$	-	0.60	-				

(\*1) Turn on time ( $t_{on}$ ) =  $t_{d(on)} + t_r$ , Turn off time ( $t_{off}$ ) =  $t_{d(off)} + t_f$

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

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Inverter Switching loss (per pulse)	$E_{on}$	$V_{CC} = 900\text{V}$ $I_C, I_F = 1800\text{A}$ $V_{GE} = \pm 15\text{V}$ $R_G = +0.22/-0.68\Omega$ $L_S = 40\text{nH}$	$T_{vj}=25^{\circ}\text{C}$	-	424	-	mJ
			$T_{vj}=125^{\circ}\text{C}$	-	540	-	
			$T_{vj}=150^{\circ}\text{C}$	-	574	-	
			$T_{vj}=175^{\circ}\text{C}$	-	612	-	
	$E_{off}$		$T_{vj}=25^{\circ}\text{C}$	-	459	-	
			$T_{vj}=125^{\circ}\text{C}$	-	585	-	
			$T_{vj}=150^{\circ}\text{C}$	-	621	-	
			$T_{vj}=175^{\circ}\text{C}$	-	651	-	
	$E_{rr}$		$T_{vj}=25^{\circ}\text{C}$	-	284	-	
			$T_{vj}=125^{\circ}\text{C}$	-	410	-	
			$T_{vj}=150^{\circ}\text{C}$	-	464	-	
			$T_{vj}=175^{\circ}\text{C}$	-	517	-	
Thermistor Resistance	$R$	$T = 25^{\circ}\text{C}$	-	5000	-	$\Omega$	
		$T = 100^{\circ}\text{C}$	465	495	520		
Thermistor B value	$B$	$T = 25/50^{\circ}\text{C}$	3305	3375	3450	K	

**NOTICE:**

The external gate resistance ( $R_G$ ) shown above is one of our recommended 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.

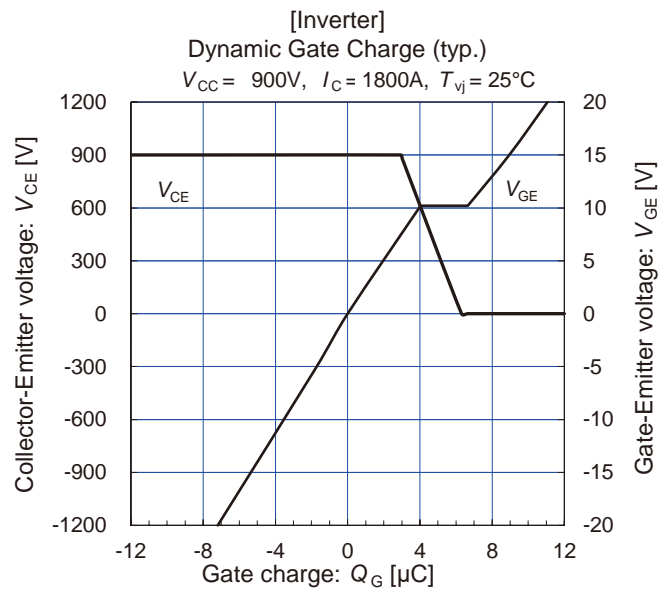
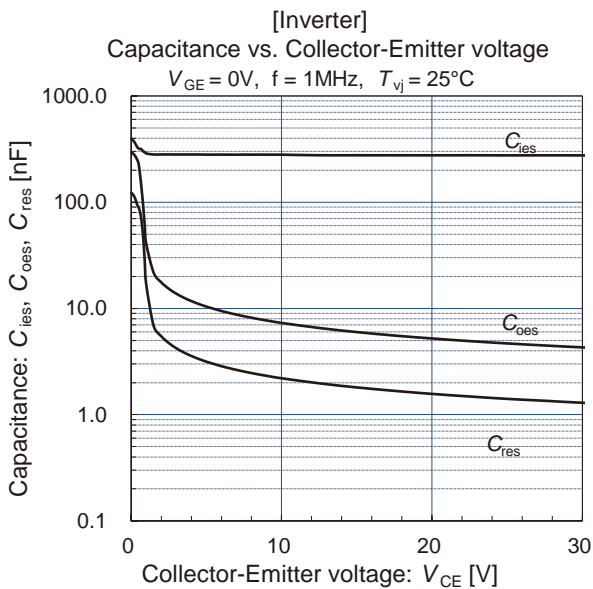
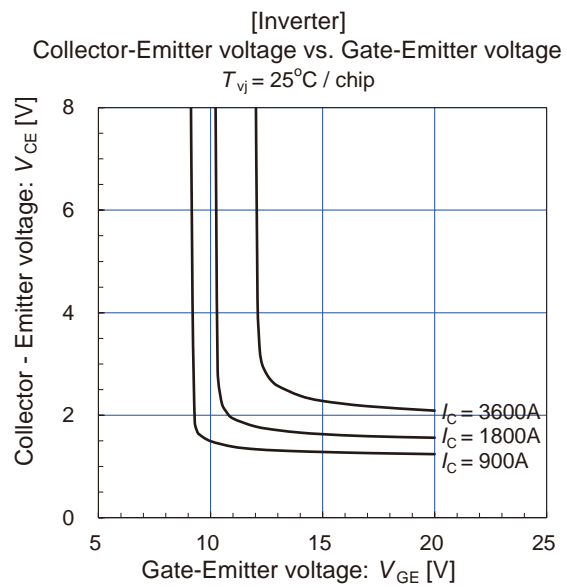
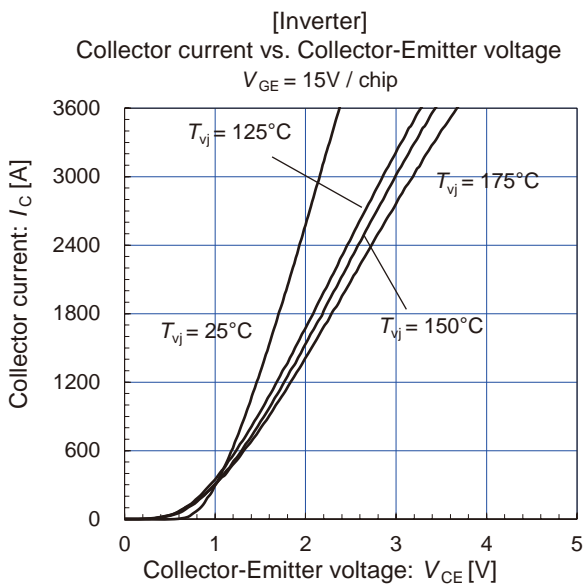
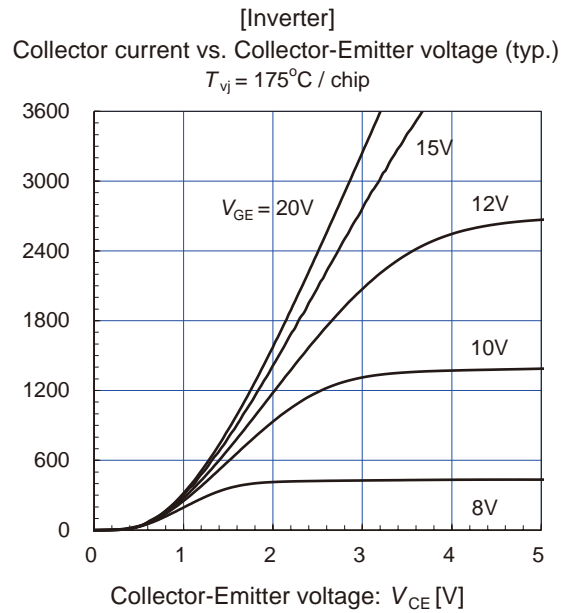
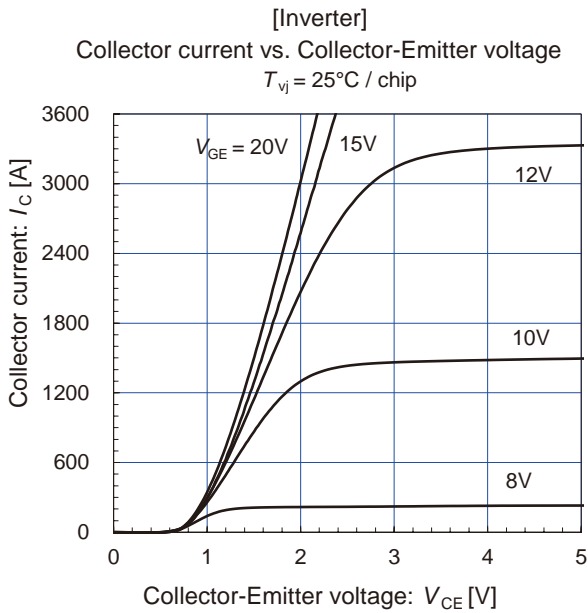
**■ Thermal resistance characteristics**

Items	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance junction to case(1 device)	$R_{th(j-c)}$	Inverter IGBT	-	-	11.5	K/kW
		Inverter FWD	-	-	22.0	
Thermal resistance case to heatsink(1 IGBT+1 FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	4.2	-	

(\*1) This is the value which is defined mounting on the additional heatsink with thermal grease.

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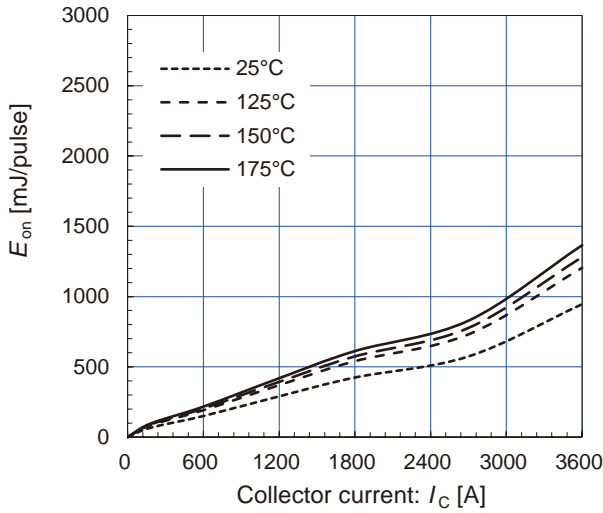


# 2MBI1800XF170-50

[Inverter]

$E_{on}$  vs. Collector current (typ.)

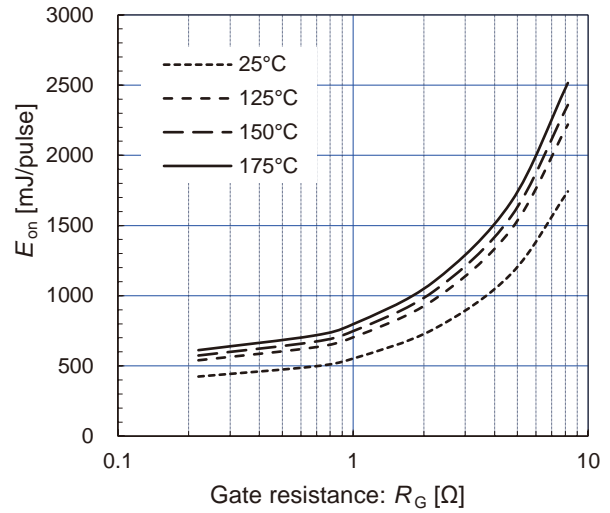
$V_{CC} = 900V, V_{GE} = \pm 15V, R_G = +0.22/-0.68\Omega$



[Inverter]

$E_{on}$  vs. Gate resistance (typ.)

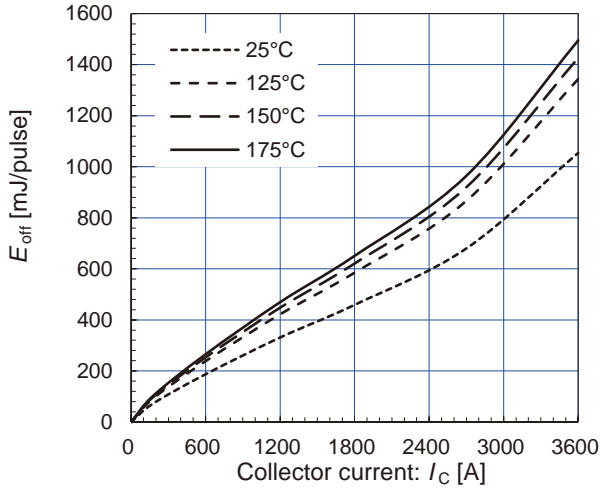
$V_{CC} = 900V, V_{GE} = \pm 15V, I_C = 1800A$



[Inverter]

$E_{off}$  vs. Collector current (typ.)

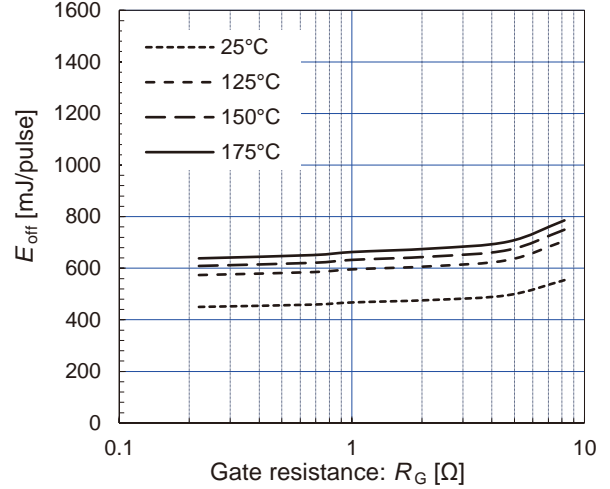
$V_{CC} = 900V, V_{GE} = \pm 15V, R_G = +0.22/-0.68\Omega$



[Inverter]

$E_{off}$  vs. Gate resistance (typ.)

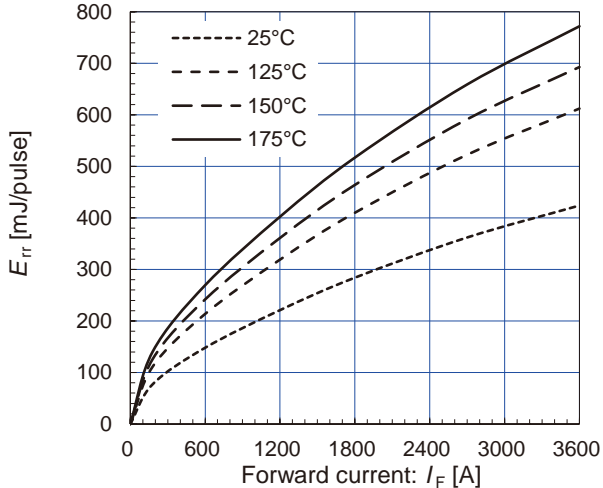
$V_{CC} = 900V, V_{GE} = \pm 15V, I_C = 1800A$



[Inverter]

$E_{rr}$  vs. Forward current (typ.)

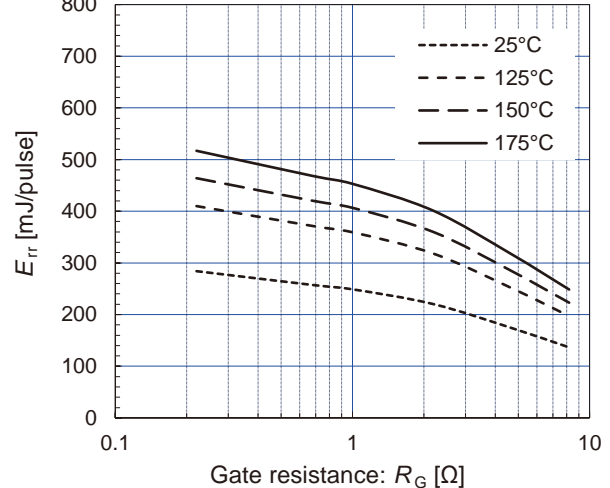
$V_{CC} = 900V, V_{GE} = \pm 15V, R_G = +0.22/-0.68\Omega$



[Inverter]

$E_{rr}$  vs. Gate resistance (typ.)

$V_{CC} = 900V, V_{GE} = \pm 15V, I_F = 1800A$



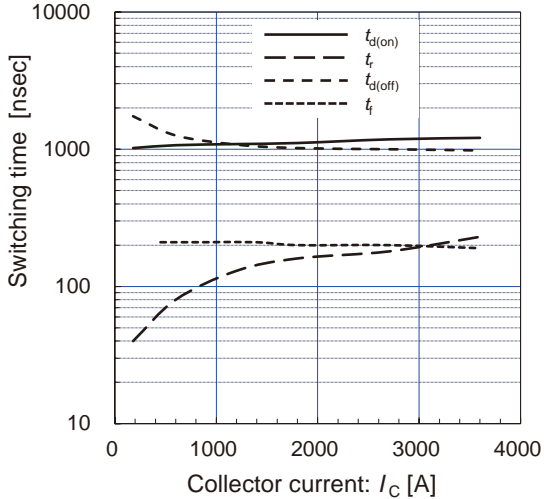
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[Inverter]

Switching time vs. Collector current (typ.)

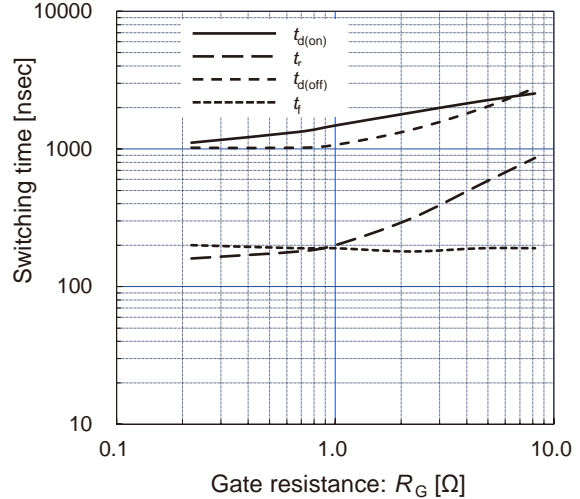
$V_{CC} = 900V, R_G = +0.22/-0.68\Omega, V_{GE} = \pm 15V, T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

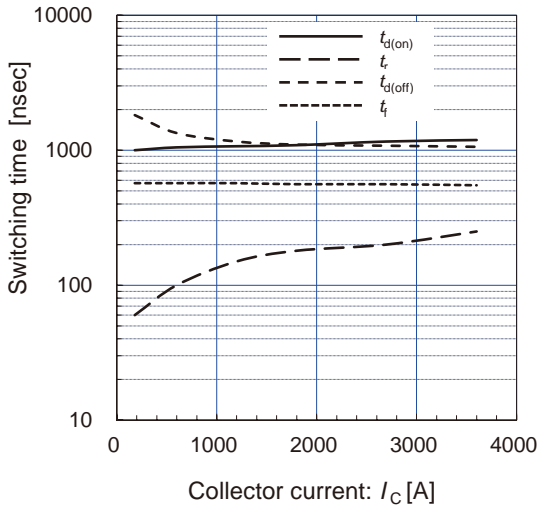
$V_{CC} = 900V, I_C = 1800A, V_{GE} = \pm 15V, T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Collector current (typ.)

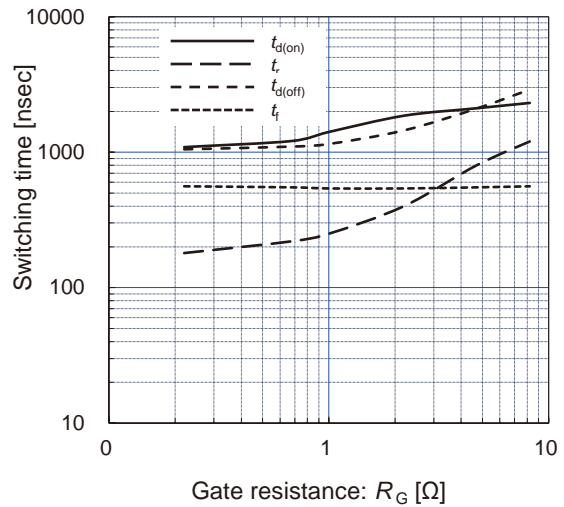
$V_{CC} = 900V, R_G = +0.22/-0.68\Omega, V_{GE} = \pm 15V, T_{vj} = 175^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

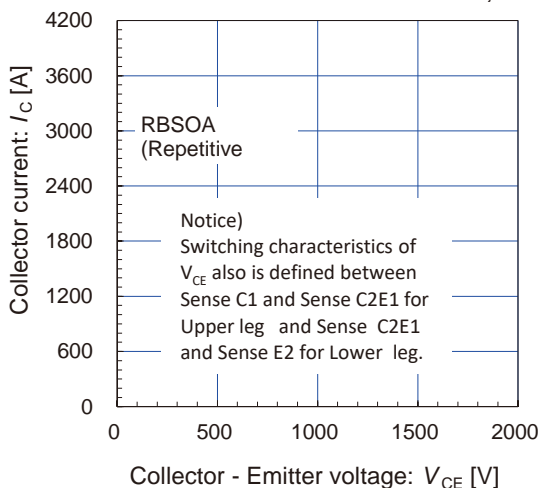
$V_{CC} = 900V, I_C = 1800A, V_{GE} = \pm 15V, T_{vj} = 175^\circ C$



[Inverter]

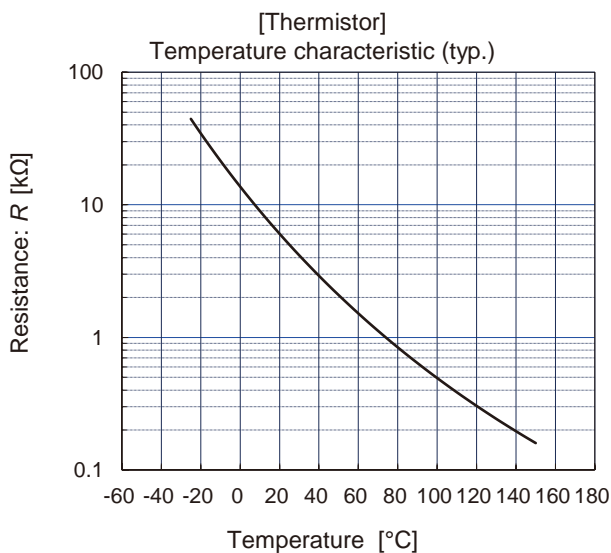
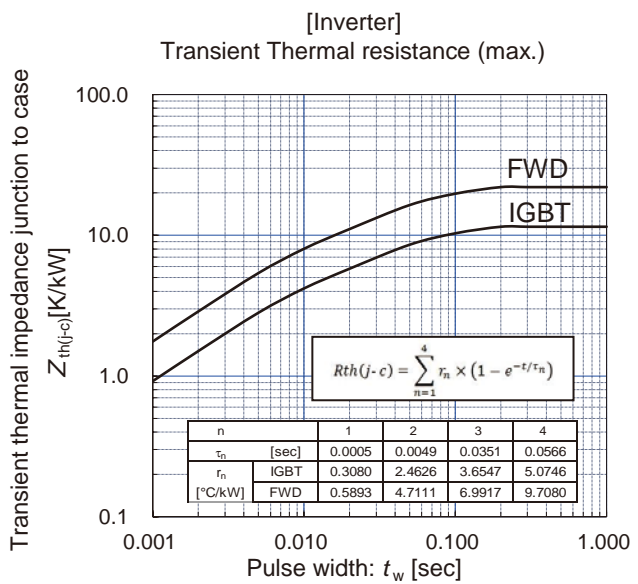
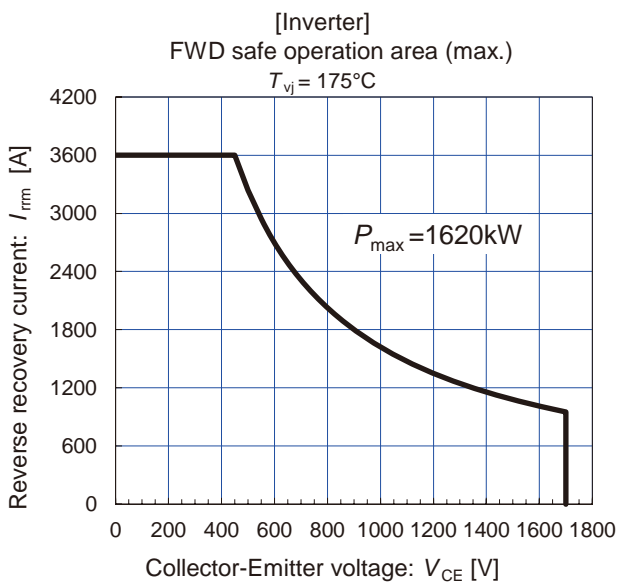
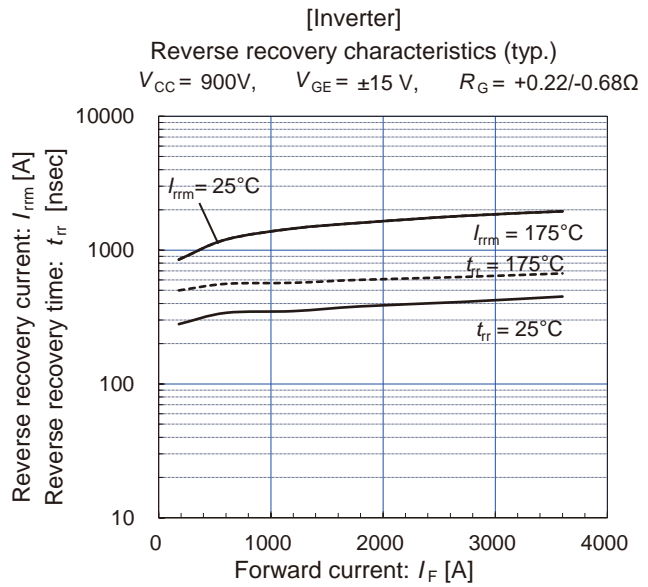
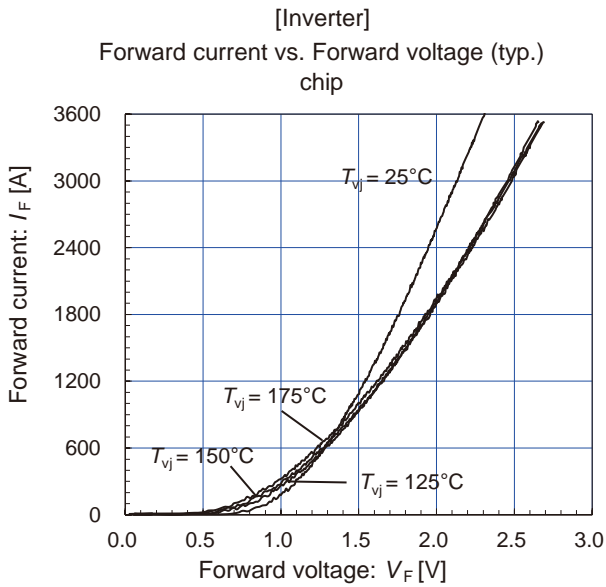
Reverse bias safe operating area (max.)

$V_{GE} = \pm 15V, R_G = +0.22/-0.68\Omega, T_{vj} = 175^\circ C$



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3 应用手册	<a href="http://www.fujielectric.com.cn/products/semiconductor/model/igbt/application/">www.fujielectric.com.cn/products/semiconductor/model/igbt/application/</a>
4 技术信息	<a href="http://www.fujielectric.com.cn/products/semiconductor/model/igbt/technical/">www.fujielectric.com.cn/products/semiconductor/model/igbt/technical/</a>
5 安装说明书	<a href="http://www.fujielectric.com.cn/products/semiconductor/model/igbt/mounting/">www.fujielectric.com.cn/products/semiconductor/model/igbt/mounting/</a>
6 IGBT 损耗模拟软件	<a href="http://www.fujielectric.com.cn/products/semiconductor/model/igbt/simulation/">www.fujielectric.com.cn/products/semiconductor/model/igbt/simulation/</a>
7 富士电机技报	<a href="http://www.fujielectric.com.cn/products/semiconductor/journal/">www.fujielectric.com.cn/products/semiconductor/journal/</a>
8 产品咨询	<a href="http://www.fujielectric.com/contact/">www.fujielectric.com/contact/</a>
9 产品更改和停产信息	<a href="http://www.fujielectric.com.cn/products/semiconductor/discontinued/">www.fujielectric.com.cn/products/semiconductor/discontinued/</a>