

7MBR75XPA065-50

IGBT Modules

Power Module(X series)
650V / 75A / PIM

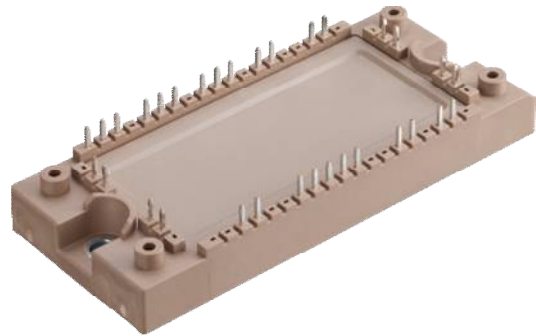
■ Features

Low $V_{CE(sat)}$
Compact Package
P.C.Board Mount Module
Converter Diode Bridge Dynamic Brake Circuit
RoHS compliant Product

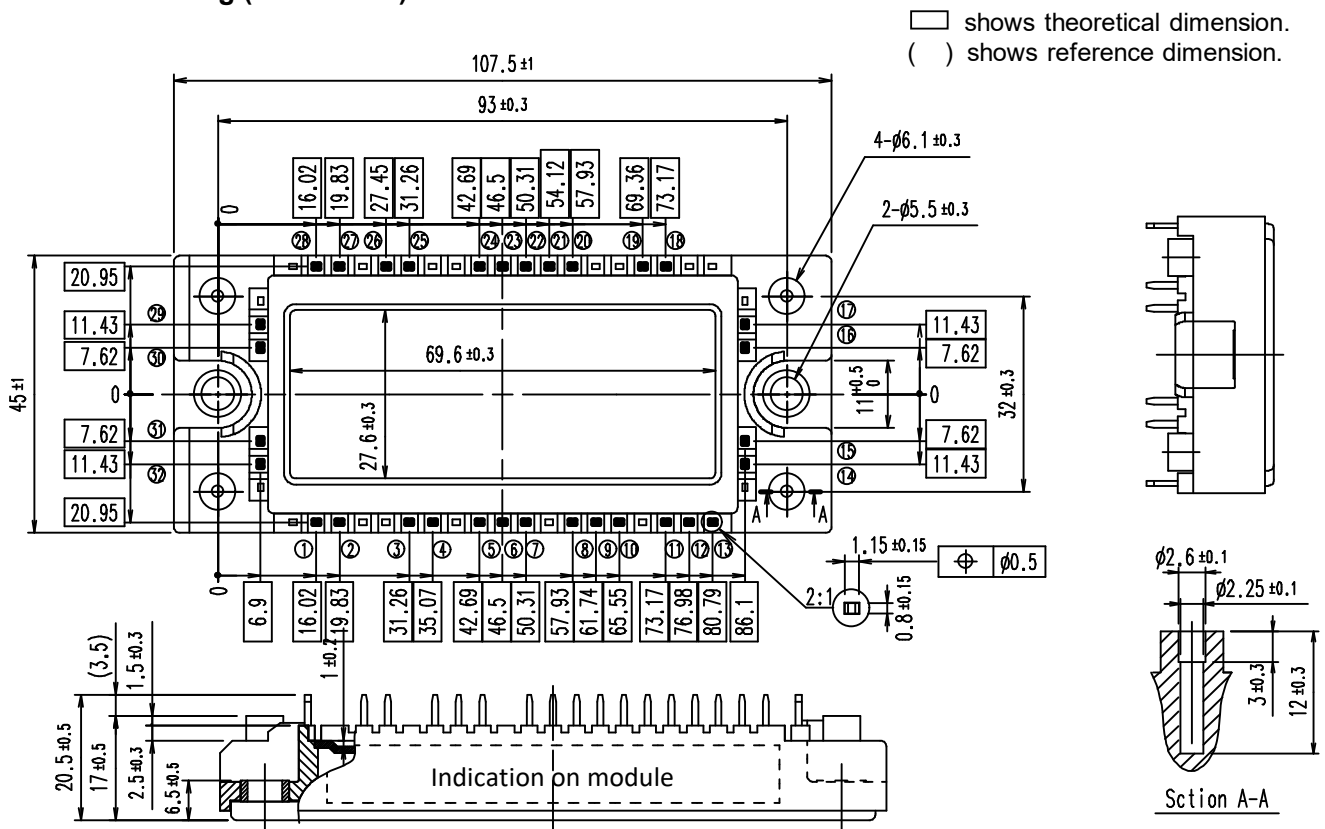
■ Applications

Inverter for Motor Drive
AC and DC Servo Drive Amplifier
Uninterrupted Power Supply

■ Typical appearance

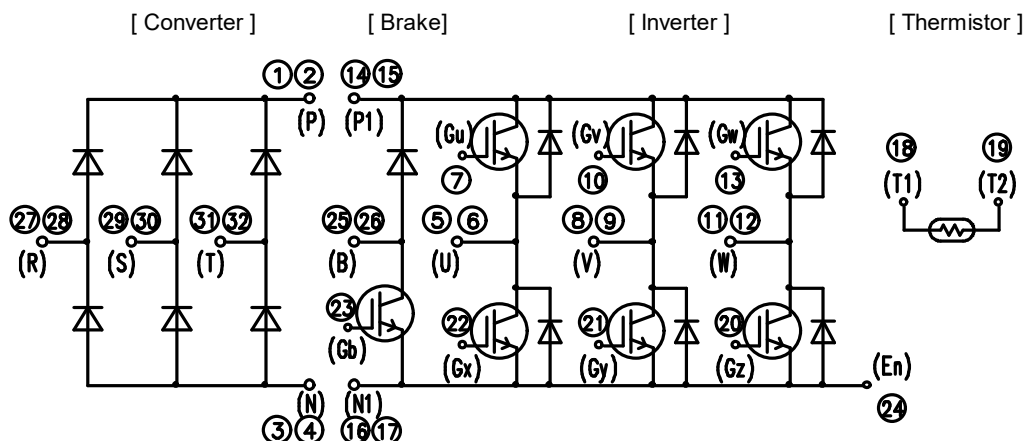


■ Outline drawing (Unit : mm)



Weight: 200 g (typ.)

■ Equivalent circuit



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IGBT Modules
■ Maximum ratings (at $T_c = 25^\circ\text{C}$ unless otherwise specified)

Items		Symbols	Conditions		Maximum ratings	Units
Inverter	Collector-Emitter voltage	V_{CES}			650	V
	Gate-Emitter voltage	V_{GES}			±20	V
	Collector current	I_{C}	Continuous	T_{c} =80°C	75	A
		I_{C} pulse	1ms		150	
	Forward current	I_{F}	Continuous		75	
		I_{F} pulse	1ms		150	
Collector power dissipation		P_{C}	1 device		270	W
Brake IGBT	Collector-Emitter voltage	V_{CES}			650	V
	Gate-Emitter voltage	V_{GES}			±20	V
	Collector current	I_{C}	Continuous	T_{c} =80°C	50	A
		I_{C} pulse	1ms		100	
Collector power dissipation		P_{C}	1 device		210	W
Brake FWD	Forward current	I_{F}	Continuous		20	A
		I_{FRM}	1ms		40	
	Repetitive peak reverse voltage	V_{RRM}			650	V
Converter	Repetitive peak reverse voltage	V_{RRM}			800	V
	Average output current	I_{O}	Three-phase full wave rectified current	T_{c} =80°C	75	A
	Surge current (Non-Repetitive) (*1)	I_{FSM}	t =10ms, Half sine wave form	T_{vj} =25°C	580	A
				T_{vj} =150°C	505	
	I^2t (Non-Repetitive) (*1)	I^2t		T_{vj} =25°C	1690	A ² s
T_{vj} =150°C				1300		
Junction temperature		T_{vj}	Inverter, Brake		175	°C
			Converter		150	
Operating junction temperature (under switching conditions)		T_{vjop}	Inverter, Brake		175	
			Converter		150	
Case temperature		T_{c}			125	
Storage temperature		T_{slg}			-40 ~ 125	
Isolation voltage	between terminals and copper base (*2)	V_{isol}	A.C. : 1min.		2500	Vrms
	between thermistor and others (*3)					
Screw torque	Mounting torque of screws to heat sink	M_5	M5		2.5~6.0	N·m

(*1) T_{vj} : Temperature at test start.

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

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

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

Items		Symbols	Conditions		Characteristics			Units
					min.	typ.	max.	
Inverter	Zero gate voltage collector current	I_{CES}	$V_{GE} = 0V$ $V_{CE} = 650V$		-	-	50	μA
	Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0V$ $V_{GE} = +20/-20V$		-	-	100	nA
	Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V$ $I_C = 75mA$		6.0	6.5	7.0	V
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 75A$	$T_{vj}=25^{\circ}C$	-	1.50	2.00	V
		$V_{CE(sat)}$ (chip)		$T_{vj}=25^{\circ}C$	-	1.30	1.75	
				$T_{vj}=125^{\circ}C$	-	1.45	-	
				$T_{vj}=150^{\circ}C$	-	1.50	-	
				$T_{vj}=175^{\circ}C$	-	1.55	-	
	Internal gate resistance	r_g	-		-	0.0	-	Ω
	Capacitance	C_{ies}	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$		-	8.6	-	nF
		C_{oes}			-	0.33	-	
		C_{res}			-	0.12	-	
	Gate charge	Q_G	$V_{cc} = 300V$ $V_{GE} = -15 \rightarrow +15V$ $I_C = 75A$		-	610	-	nC
	Forward voltage	V_F (terminal)	$I_F = 75A$	$T_{vj}=25^{\circ}C$	-	1.75	2.25	V
		V_F (chip)		$T_{vj}=25^{\circ}C$	-	1.55	2.00	
$T_{vj}=125^{\circ}C$				-	1.50	-		
$T_{vj}=150^{\circ}C$				-	1.50	-		
$T_{vj}=175^{\circ}C$				-	1.45	-		
Switching time (*1)	$t_{d(on)}$	$V_{cc} = 300V$ $I_C, I_F = 75A$ $L_s = 30nH$ $V_{GE} = +15/-15V$ $R_G = 43\Omega$	$T_{vj}=25^{\circ}C$	-	0.34	-	μs	
			$T_{vj}=125^{\circ}C$	-	0.35	-		
			$T_{vj}=150^{\circ}C$	-	0.35	-		
			$T_{vj}=175^{\circ}C$	-	0.35	-		
	t_r	$V_{cc} = 300V$ $I_C, I_F = 75A$ $L_s = 30nH$ $V_{GE} = +15/-15V$ $R_G = 43\Omega$	$T_{vj}=25^{\circ}C$	-	0.10	-		
			$T_{vj}=125^{\circ}C$	-	0.13	-		
			$T_{vj}=150^{\circ}C$	-	0.13	-		
			$T_{vj}=175^{\circ}C$	-	0.14	-		
	$t_{d(off)}$	$V_{cc} = 300V$ $I_C, I_F = 75A$ $L_s = 30nH$ $V_{GE} = +15/-15V$ $R_G = 43\Omega$	$T_{vj}=25^{\circ}C$	-	0.49	-		
			$T_{vj}=125^{\circ}C$	-	0.51	-		
			$T_{vj}=150^{\circ}C$	-	0.53	-		
			$T_{vj}=175^{\circ}C$	-	0.52	-		
t_f	$V_{CC} = 300V$ $I_C, I_F = 75A$ $L_s = 30nH$ $V_{GE} = +15/-15V$ $R_G = 43\Omega$	$T_{vj}=25^{\circ}C$	-	0.04	-			
		$T_{vj}=125^{\circ}C$	-	0.04	-			
		$T_{vj}=150^{\circ}C$	-	0.04	-			
		$T_{vj}=175^{\circ}C$	-	0.04	-			
Reverse recovery time	t_{rr}	$V_{cc} = 300V$ $I_C, I_F = 75A$ $L_s = 30nH$ $V_{GE} = +15/-15V$ $R_G = 43\Omega$	$T_{vj}=25^{\circ}C$	-	0.09	-		
			$T_{vj}=125^{\circ}C$	-	0.22	-		
			$T_{vj}=150^{\circ}C$	-	0.24	-		
			$T_{vj}=175^{\circ}C$	-	0.29	-		

(*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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Items		Symbols	Conditions		Characteristics			Units
					min.	typ.	max.	
Inverter	Switching loss (per pulse)	E_{on}	$V_{cc} = 300V$	$T_{vj}=25^{\circ}C$	-	3.32	-	mJ
			$I_C, I_F = 75A \quad L_s = 30nH$	$T_{vj}=125^{\circ}C$	-	4.52	-	
			$V_{GE} = +15/-15 V$	$T_{vj}=150^{\circ}C$	-	5.07	-	
			$R_G = 43 \Omega$	$T_{vj}=175^{\circ}C$	-	5.53	-	
		E_{off}	$V_{cc} = 300V$	$T_{vj}=25^{\circ}C$	-	2.27	-	
			$I_C, I_F = 75A \quad L_s = 30nH$	$T_{vj}=125^{\circ}C$	-	2.84	-	
			$V_{GE} = +15/-15 V$	$T_{vj}=150^{\circ}C$	-	3.06	-	
			$R_G = 43 \Omega$	$T_{vj}=175^{\circ}C$	-	3.21	-	
		E_{rr}	$V_{cc} = 300V$	$T_{vj}=25^{\circ}C$	-	0.32	-	
			$I_C, I_F = 75A \quad L_s = 30nH$	$T_{vj}=125^{\circ}C$	-	0.51	-	
			$V_{GE} = +15/-15 V$	$T_{vj}=150^{\circ}C$	-	0.57	-	
			$R_G = 43 \Omega$	$T_{vj}=175^{\circ}C$	-	0.69	-	
Zero gate voltage collector current	I_{CES}	$V_{GE} = 0V$ $V_{CE} = 650V$		-	-	50	μA	
Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0V, \quad V_{GE} = +20/-20V$		-	-	100	nA	
Brake	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 50A$	$T_{vj}=25^{\circ}C$	-	1.45	1.90	V
		$V_{CE(sat)}$ (chip)	$T_{vj}=25^{\circ}C$	-	1.30	1.75		
			$T_{vj}=125^{\circ}C$	-	1.45	-		
			$T_{vj}=150^{\circ}C$	-	1.50	-		
			$T_{vj}=175^{\circ}C$	-	1.55	-		
	Internal gate resistance	r_g	-		-	0	-	Ω
	Switching time (*1)	$t_{d(on)}$	$V_{cc} = 300V$	$T_{vj}=25^{\circ}C$	-	0.34	-	μs
			$I_C = 50A \quad L_s = 30nH$	$T_{vj}=125^{\circ}C$	-	0.34	-	
			$V_{GE} = +15/-15 V$	$T_{vj}=150^{\circ}C$	-	0.35	-	
			$R_G = 68 \Omega$	$T_{vj}=175^{\circ}C$	-	0.34	-	
		t_r	$V_{CC} = 300V$	$T_{vj}=25^{\circ}C$	-	0.11	-	
			$I_C = 50A \quad L_s = 30nH$	$T_{vj}=125^{\circ}C$	-	0.13	-	
$V_{GE} = +15/-15 V$			$T_{vj}=150^{\circ}C$	-	0.14	-		
$R_G = 68 \Omega$			$T_{vj}=175^{\circ}C$	-	0.15	-		
$t_{d(off)}$		$V_{cc} = 300V$	$T_{vj}=25^{\circ}C$	-	0.48	-		
		$I_C = 50A \quad L_s = 30nH$	$T_{vj}=125^{\circ}C$	-	0.51	-		
		$V_{GE} = +15/-15 V$	$T_{vj}=150^{\circ}C$	-	0.53	-		
		$R_G = 68 \Omega$	$T_{vj}=175^{\circ}C$	-	0.56	-		
t_f		$V_{cc} = 300V$	$T_{vj}=25^{\circ}C$	-	0.04	-		
		$I_C = 50A \quad L_s = 30nH$	$T_{vj}=125^{\circ}C$	-	0.04	-		
		$V_{GE} = +15/-15 V$	$T_{vj}=150^{\circ}C$	-	0.04	-		
		$R_G = 68 \Omega$	$T_{vj}=175^{\circ}C$	-	0.04	-		
Reverse current	I_{RRM}	$V_R = 650V$		-	-	50	μA	
Forward voltage	V_F (terminal)	$I_F = 20A$	$T_{vj}=25^{\circ}C$	-	1.70	2.15	V	
	V_F (chip)	$I_F = 20A$	$T_{vj}=25^{\circ}C$	-	1.55	2.00		
			$T_{vj}=125^{\circ}C$	-	1.50	-		
			$T_{vj}=150^{\circ}C$	-	1.50	-		
Converter	Reverse current	I_{RRM}	$V_R = 800V$		-	-	50	μA
	Forward voltage	V_{FM}	$I_F = 75A$	terminal	-	1.35	1.85	V
			chip	-	1.15	1.60		
Thermistor	Resistance	R	$T = 25^{\circ}C$		-	5000	-	Ω
			$T = 100^{\circ}C$		465	495	520	
	B value	B	$T = 25/ 50^{\circ}C$		3305	3375	3450	K

(*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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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 (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.55	°C/W
		Inverter FWD	-	-	0.69	
		Brake IGBT	-	-	0.71	
		Brake FWD	-	-	1.60	
		Converter Diode	-	-	0.67	
Contact thermal resistance (1 IGBT+1 FWD) (*1)	$R_{th(c-f)}$	with 1 W/(m·K) thermal grease	-	0.05	-	

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

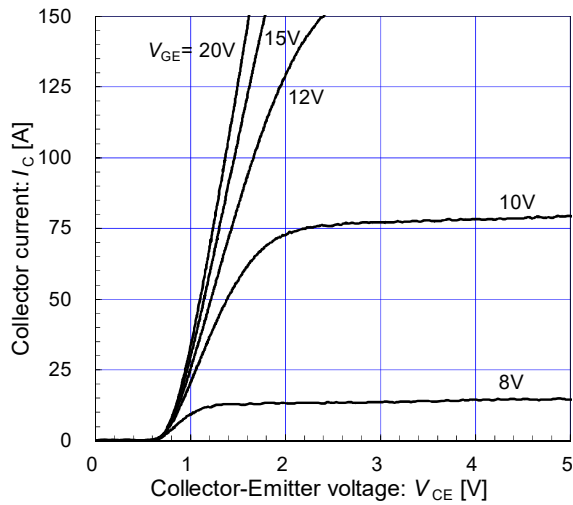
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[Inverter]

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

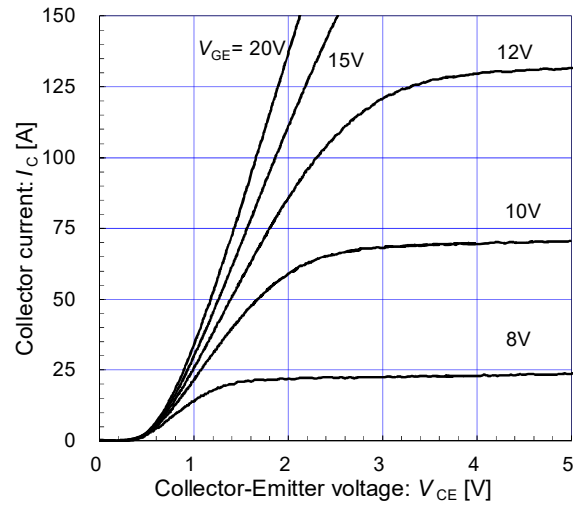
$T_{vj} = 25^\circ\text{C} / \text{chip}$



[Inverter]

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

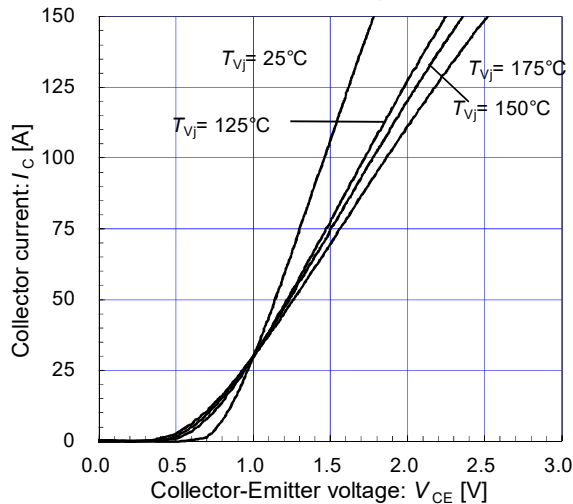
$T_{vj} = 175^\circ\text{C} / \text{chip}$



[Inverter]

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

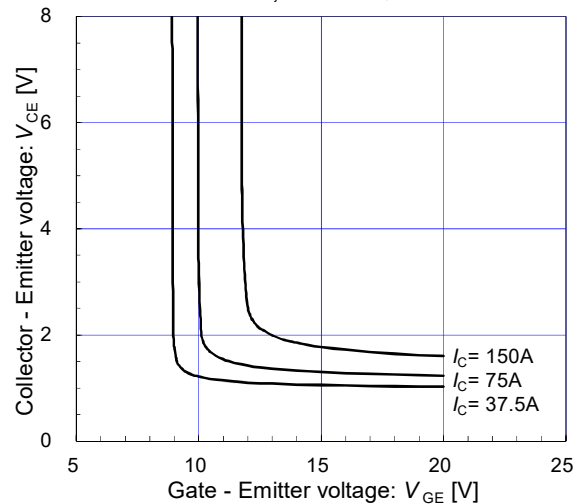
$V_{GE} = 15\text{V} / \text{chip}$



[Inverter]

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

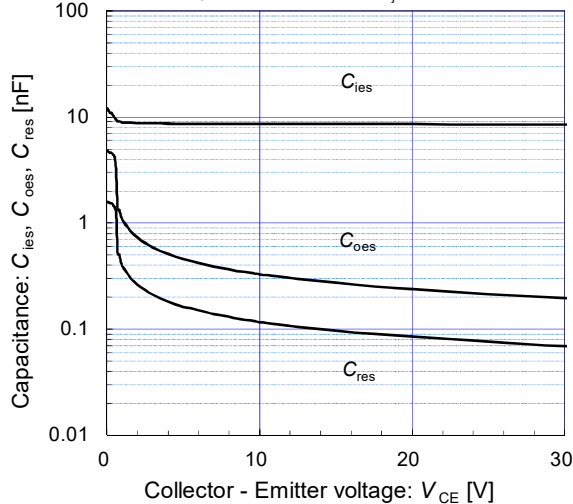
$T_{vj} = 25^\circ\text{C} / \text{chip}$



[Inverter]

Capacitance vs. Collector-Emmitter voltage (typ.)

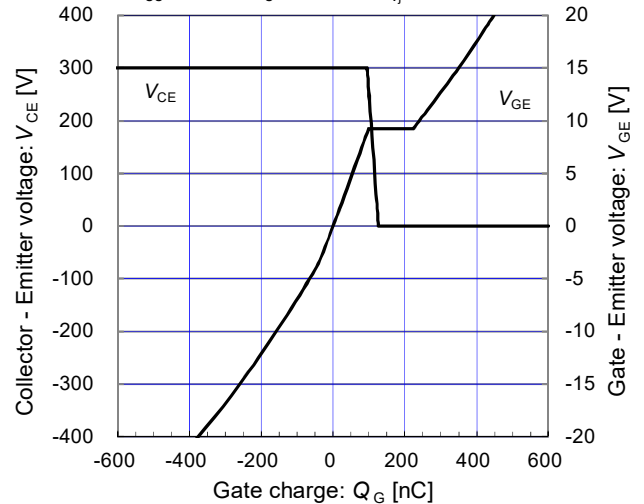
$V_{GE} = 0\text{V}, f = 1\text{MHz}, T_{vj} = 25^\circ\text{C}$



[Inverter]

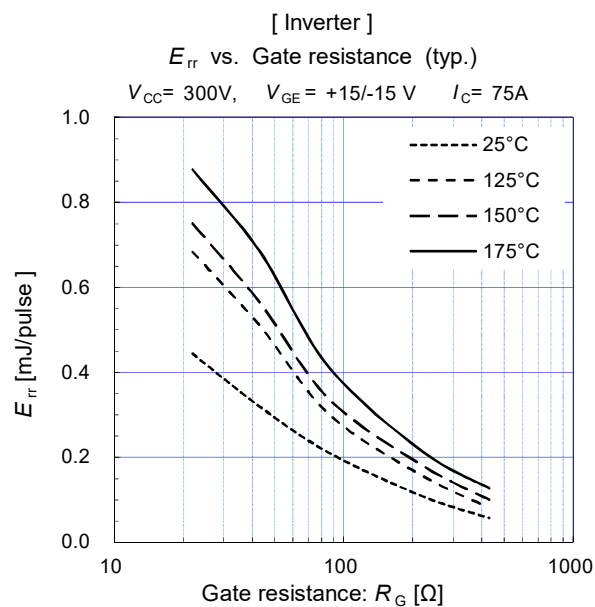
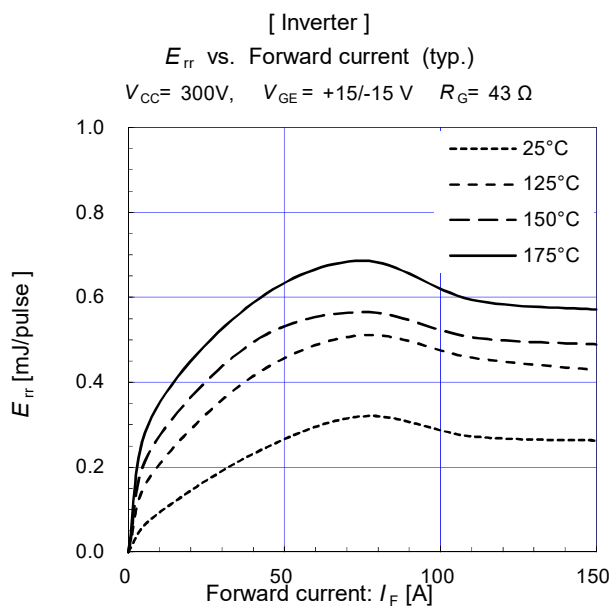
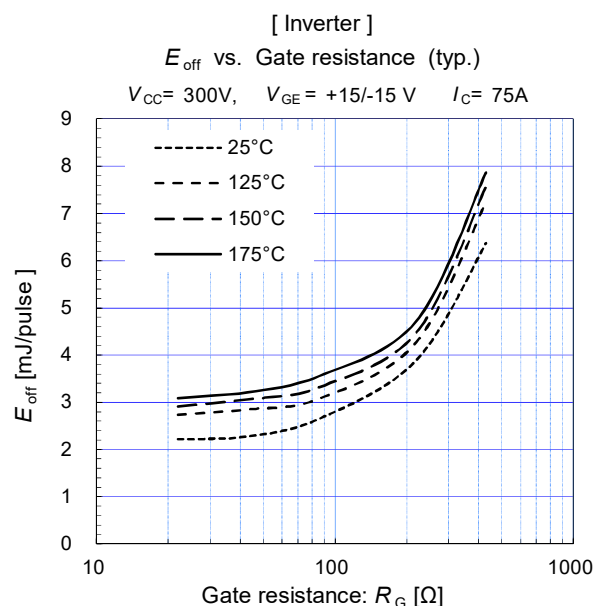
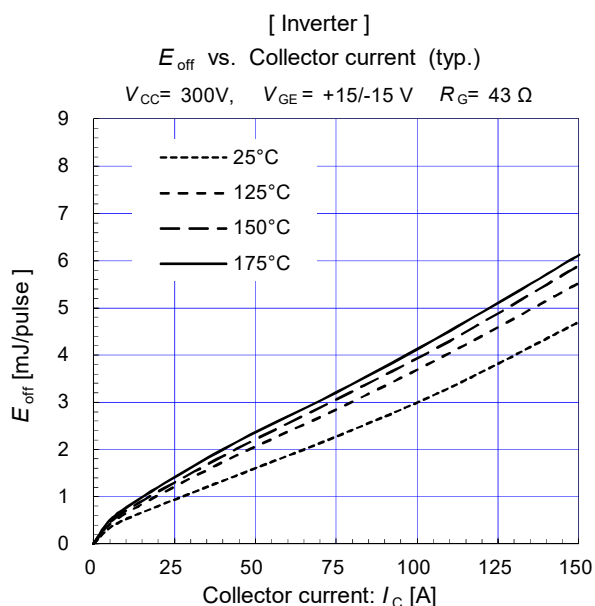
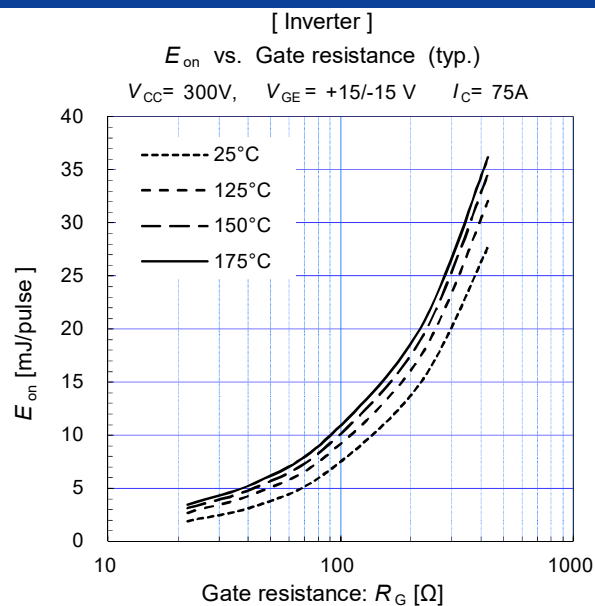
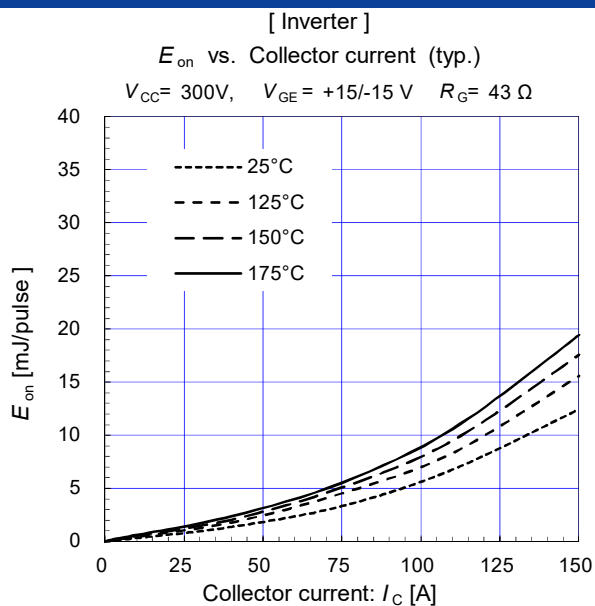
Dynamic gate charge (typ.)

$V_{CC} = 300\text{V}, I_c = 75\text{A}, T_{vj} = 25^\circ\text{C}$



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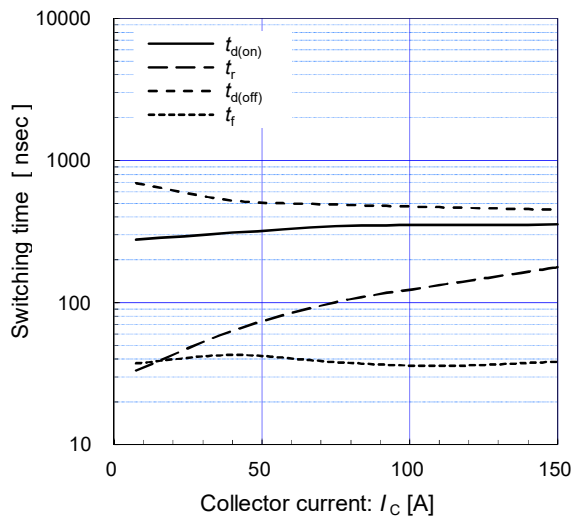
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[Inverter]

Switching time vs. Collector current (typ.)

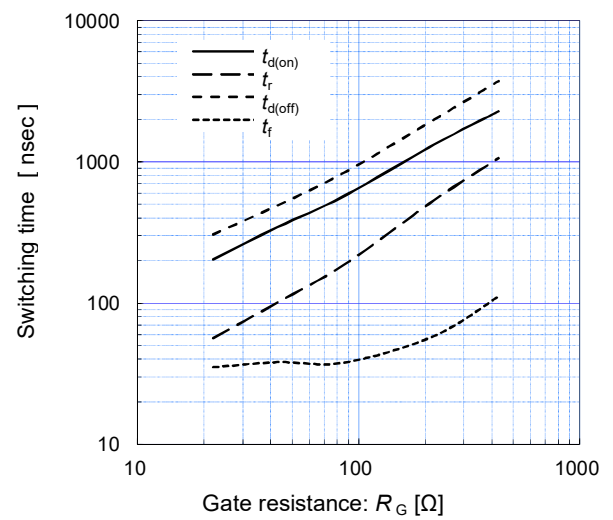
$V_{CC}=300V$, $R_G=43\Omega$ $V_{GE}=+15/-15V$, $T_{Vj}=25^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

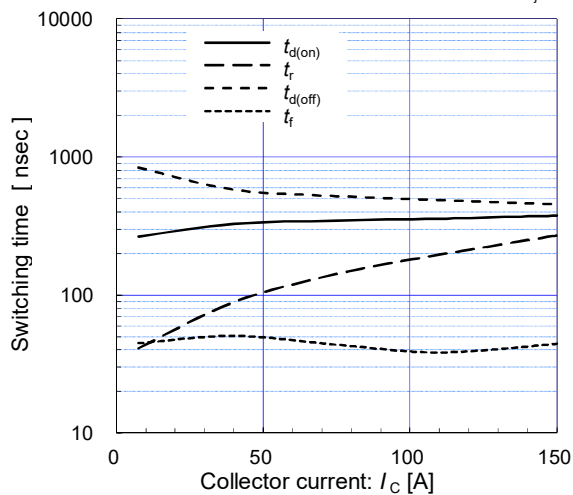
$V_{CC}=300V$, $I_C=75A$, $V_{GE}=+15/-15V$, $T_{Vj}=25^\circ C$



[Inverter]

Switching time vs. Collector current (typ.)

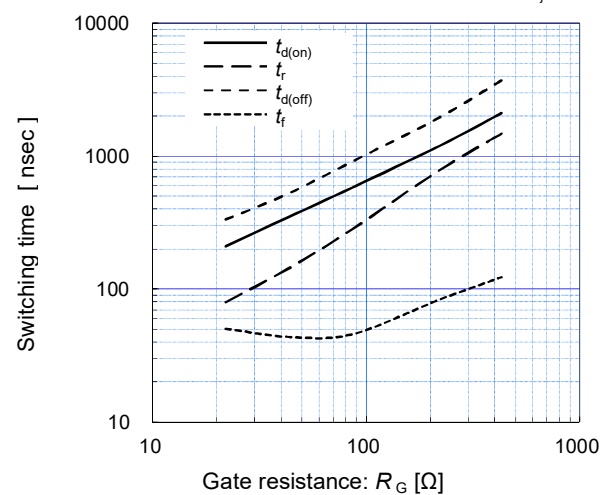
$V_{CC}=300V$, $R_G=43\Omega$ $V_{GE}=+15/-15V$, $T_{Vj}=175^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

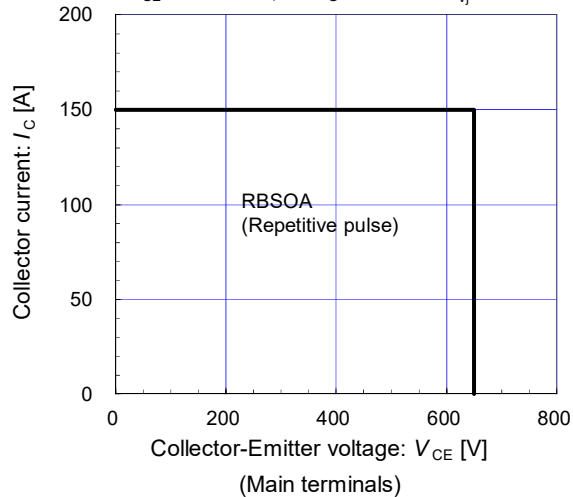
$V_{CC}=300V$, $I_C=75A$, $V_{GE}=+15/-15V$, $T_{Vj}=175^\circ C$



[Inverter]

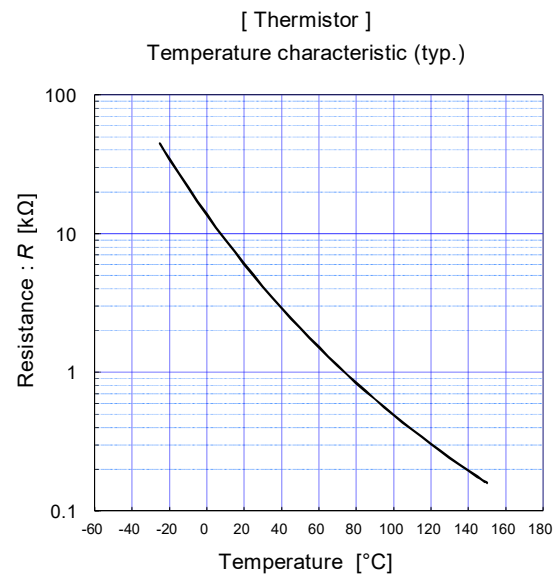
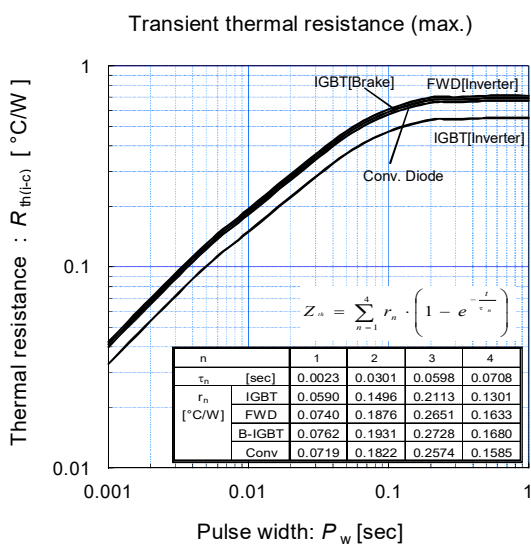
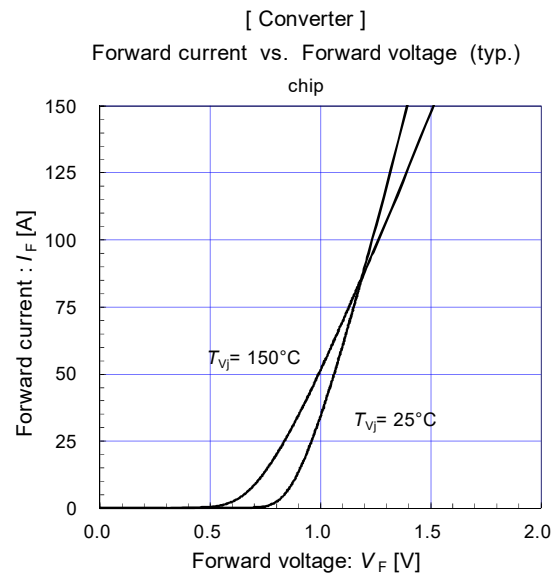
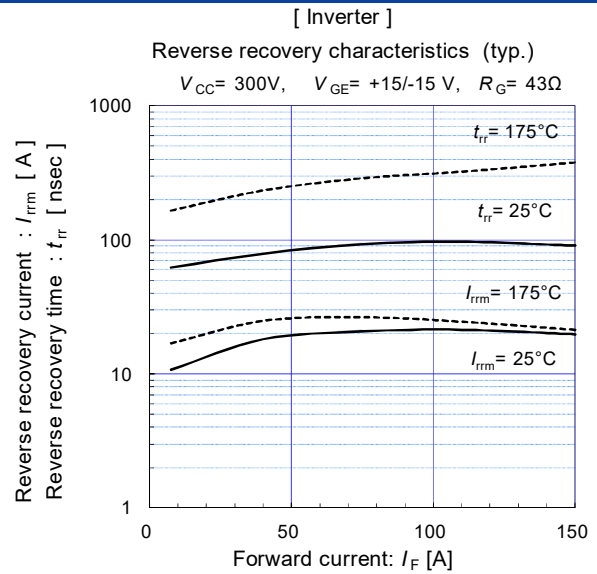
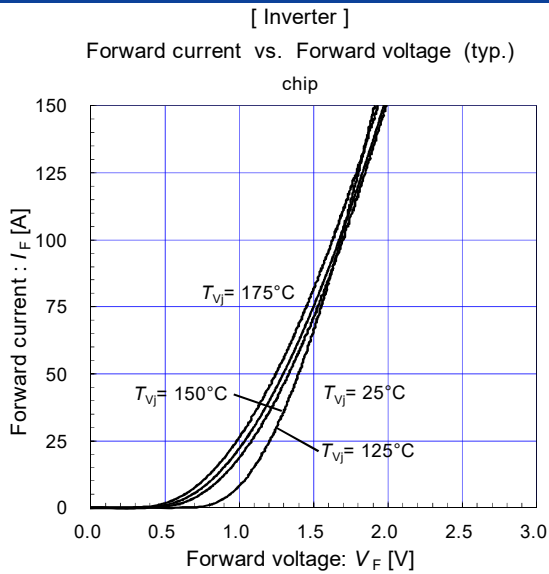
Reverse bias safe operating area (max.)

$V_{GE}=+15/-15V$, $R_G \geq 43\Omega$ $T_{Vj}=175^\circ C$



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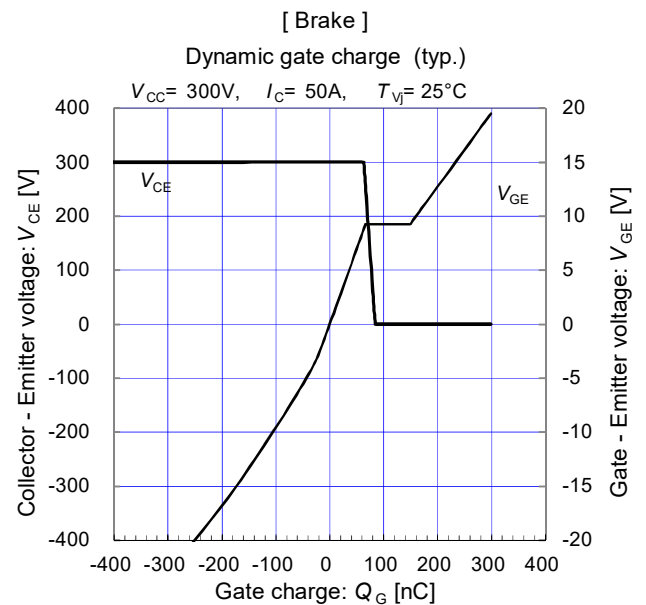
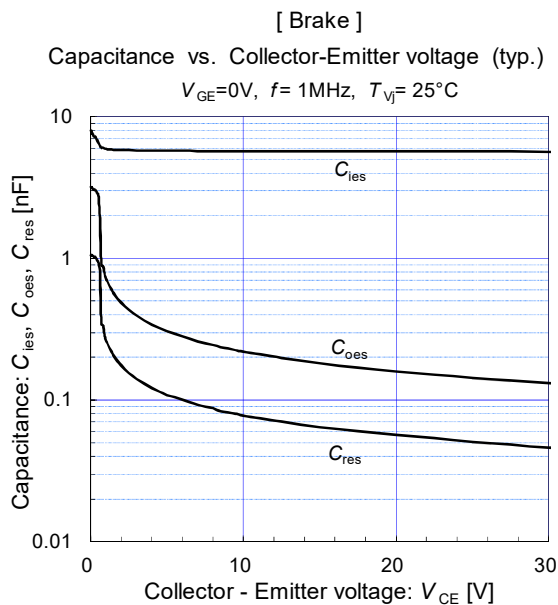
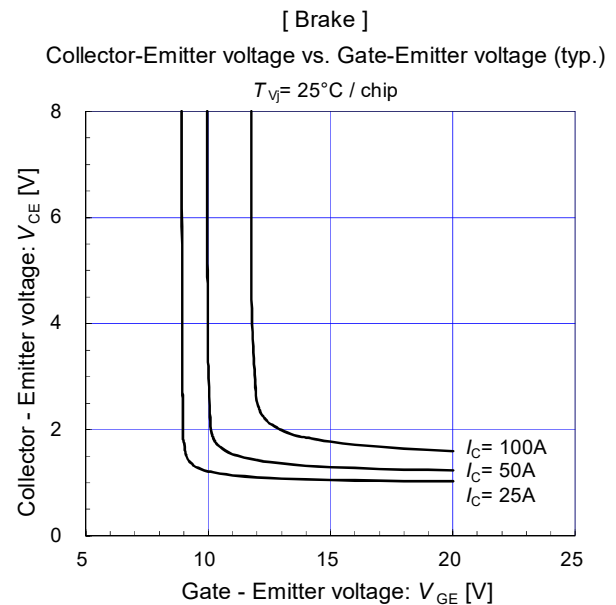
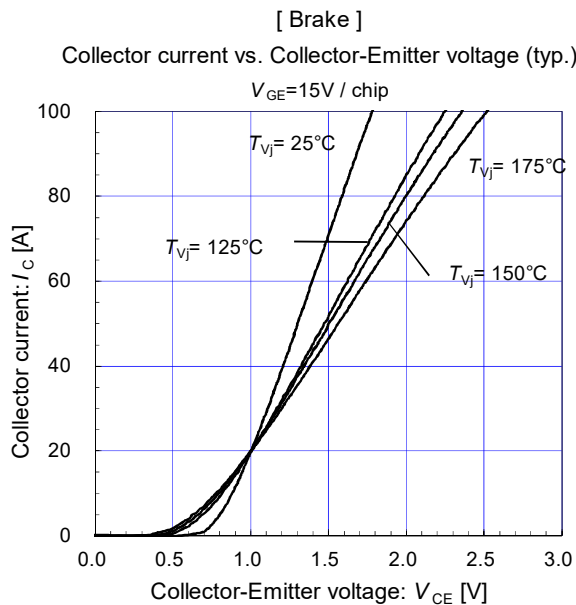
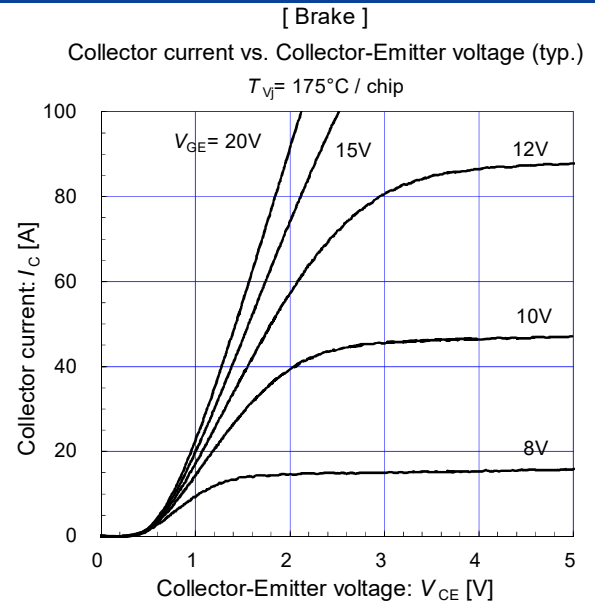
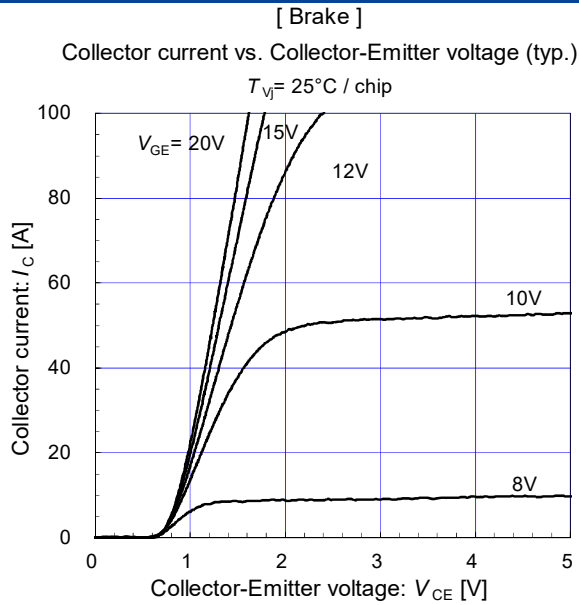


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Warnings

1. This Catalog contains the product specifications, characteristics, data, materials, and structures as of 3/2023.
The contents are subject to change without notice for specification changes or other reasons. When using a product listed in this Catalog, be sure to obtain the latest specifications.
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4. The products introduced in this Catalog are intended for use in the following electronic and electrical equipment which has normal reliability requirements.
 - Computers ·OA equipment ·Communications equipment (terminal devices) ·Measurement equipment
 - Machine tools ·Audiovisual equipment ·Electrical home appliances ·Personal equipment ·Industrial robots etc.
5. If you need to use a product in this Catalog for equipment requiring higher reliability than normal, such as for the equipment listed below, it is imperative to contact Fuji Electric Co., Ltd. to obtain prior approval. When using these products for such equipment, take adequate measures such as a backup system to prevent the equipment from malfunctioning even if a Fuji's product incorporated in the equipment becomes faulty.
 - Transportation equipment (mounted on cars and ships) ·Trunk communications equipment
 - Traffic-signal control equipment ·Gas leakage detectors with an auto-shut-off feature
 - Emergency equipment for responding to disasters and anti-burglary devices ·Safety devices ·Medical equipment
6. Do not use products in this Catalog for the equipment requiring strict reliability such as the following and equivalents to strategic equipment (without limitation).
 - Space equipment ·Aeronautic equipment ·Nuclear control equipment ·Submarine repeater equipment
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Technical Information

IGBT Modules

- Please refer to URLs below for further information about products, application manuals and design support.
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