

# 7MBR30XKA065-50

IGBT Modules

**Power Module(X series)**  
650V / 30A / PIM

**Features**

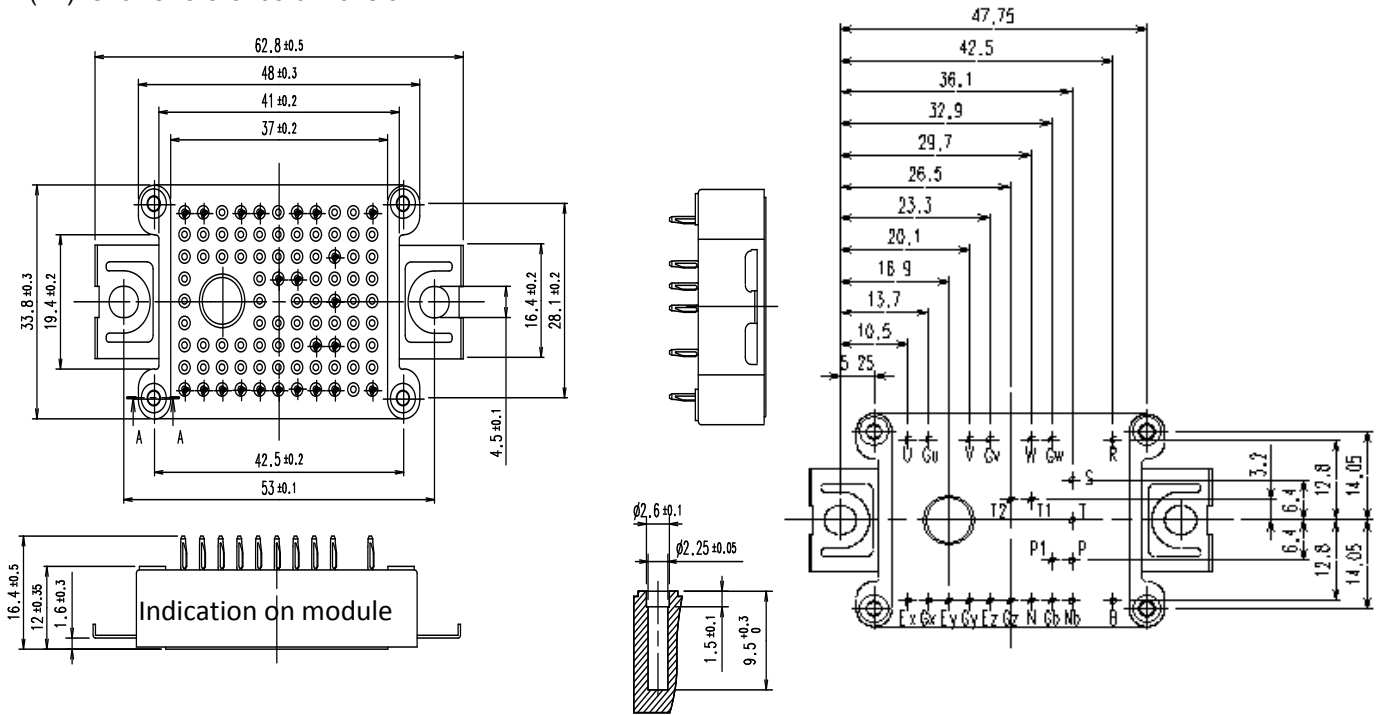
- Low  $V_{CE(sat)}$
- Compact Package
- P.C.Board Mount Module
- Converter Diode Bridge Dynamic Brake Circuit
- RoHS compliant Product

**Applications**

- Inverter for Motor Drive
- AC and DC Servo Drive Amplifier
- Uninterruptible Power Supply

**Outline drawing ( Unit : mm )**

shows theoretical dimension.  
( ) shows reference dimension.

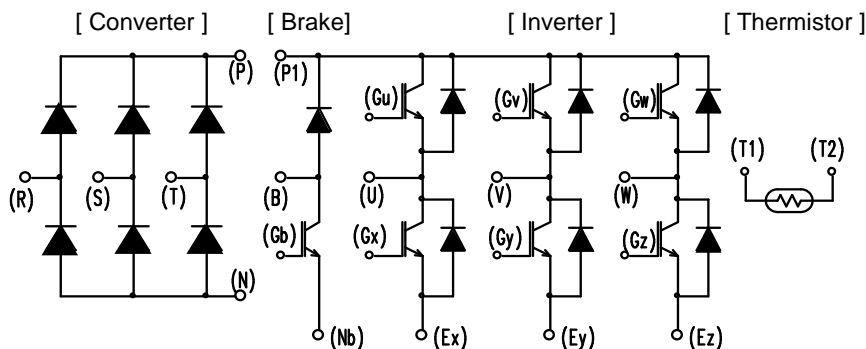


断面A-A (1.5:1)  
SECTION A-A

Weight: 25 g (typ.)

**Equivalent circuit**

PIN POSITIONS WITH TOLERANCE  $\pm \phi 0.4$



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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, gate-emitter short-circuited	$V_{CES}$			650	V	
	Gate-emitter voltage, collector-emitter short-circuited	$V_{GES}$			$\pm 20$	V	
	Collector current	$I_C$	Continuous	$T_c = 100^\circ\text{C}$	30	A	
	Repetitive peak collector current	$I_{CRM}$	1ms		60		
	Forward current	$I_F$	Continuous		30		
	Repetitive peak forward current	$I_{FRM}$	1ms		60		
	Total power dissipation		$P_{tot}$	1 device		180	W
Brake IGBT	Collector-emitter voltage, gate-emitter short-circuited	$V_{CES}$			650	V	
	Gate-emitter voltage, collector-emitter short-circuited	$V_{GES}$			$\pm 20$	V	
	Collector current	$I_C$	Continuous	$T_c = 100^\circ\text{C}$	30	A	
	Repetitive peak collector current	$I_{CRM}$	1ms		60		
	Total power dissipation		$P_{tot}$	1 device		180	W
Brake FWD	Forward current	$I_F$	Continuous		10	A	
	Repetitive peak forward current	$I_{FRM}$	1ms		20		
	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	$T_c = 80^\circ\text{C}$	30	A
	Surge forward current (Non-Repetitive) (*1)		$I_{FSM}$	$t = 10\text{ms}$ , Half sine wave form	$T_{vj} = 25^\circ\text{C}$	390	A
					$T_{vj} = 150^\circ\text{C}$	340	
	$I^2t$ (Non-Repetitive) (*1)		$I^2t$		$T_{vj} = 25^\circ\text{C}$	760	$\text{A}^2\text{s}$
				$T_{vj} = 150^\circ\text{C}$	585		
Virtual Junction temperature		$T_{vj}$	Inverter, Brake		175	$^\circ\text{C}$	
			Converter		150		
Operating Virtual junction temperature (under switching conditions)		$T_{vjop}$	Inverter, Brake		175		
			Converter		150		
Case temperature		$T_c$			125		
Storage temperature		$T_{stg}$			-40 ~ 125		
Isolation voltage	between terminals and copper base (*2) between thermistor and others (*3)	$V_{isol}$	A.C. : 1min.		2500	Vrms	
Screw torque (*4)	Mounting torque of screws to heat sink	$M_s$	M4		1.7	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.

(\*4) Recommendable value : Mounting 1.3 ~ 1.7 N·m (M4)

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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.					
Collector-emitter cut-off current, gate-emitter short-circuited	$I_{CES}$	$V_{GE} = 0\text{V}$ $V_{CE} = 650\text{V}$	-	-	50	$\mu\text{A}$				
Gate leakage current, collector-emitter short-circuited	$I_{GES}$	$V_{CE} = 0\text{V}$ $V_{GE} = +20/-20\text{V}$	-	-	100	nA				
Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20\text{V}$ $I_C = 30\text{mA}$	6.0	6.5	7.0	V				
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15\text{V}$ $I_C = 30\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	1.55	2.05	V			
			$T_{vj}=25^{\circ}\text{C}$	-	1.30	1.75				
	$T_{vj}=125^{\circ}\text{C}$		-	1.45	-					
	$T_{vj}=150^{\circ}\text{C}$		-	1.50	-					
	$T_{vj}=175^{\circ}\text{C}$		-	1.55	-					
Internal Gate resistance	$r_g$	-	-	0	-	$\Omega$				
			Capacitance	$C_{ies}$	$V_{CE} = 10\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$	-	3.4	-	nF	
						$C_{oes}$	-	0.13		-
						$C_{res}$	-	0.05		-
Gate charge	$Q_G$	$V_{CC} = 300\text{V}$ $V_{GE} = -15 \rightarrow +15\text{V}$ $I_C = 30\text{A}$	-	240	-	nC				
Forward voltage	$V_F$ (terminal)	$I_F = 30\text{A}$	$T_{vj}=25^{\circ}\text{C}$	-	2.10	2.60	V			
	$V_F$ (chip)		$T_{vj}=25^{\circ}\text{C}$	-	1.85	2.30				
			$T_{vj}=125^{\circ}\text{C}$	-	1.90	-				
			$T_{vj}=150^{\circ}\text{C}$	-	1.85	-				
			$T_{vj}=175^{\circ}\text{C}$	-	1.85	-				
Switching time (*1)	$t_{d(on)}$	$V_{CC} = 300\text{V}$ $I_C, I_F = 30\text{A}$ $L_s = 30\text{nH}$ $V_{GE} = +15/-15\text{V}$ $R_G = 15\ \Omega$	$T_{vj}=25^{\circ}\text{C}$	-	0.06	-	$\mu\text{s}$			
			$T_{vj}=125^{\circ}\text{C}$	-	0.06	-				
			$T_{vj}=150^{\circ}\text{C}$	-	0.06	-				
			$T_{vj}=175^{\circ}\text{C}$	-	0.06	-				
	$t_r$	$V_{CC} = 300\text{V}$ $I_C, I_F = 30\text{A}$ $L_s = 30\text{nH}$ $V_{GE} = +15/-15\text{V}$ $R_G = 15\ \Omega$	$T_{vj}=25^{\circ}\text{C}$	-	0.02	-				
			$T_{vj}=125^{\circ}\text{C}$	-	0.03	-				
			$T_{vj}=150^{\circ}\text{C}$	-	0.03	-				
			$T_{vj}=175^{\circ}\text{C}$	-	0.03	-				
	$t_{d(off)}$	$V_{CC} = 300\text{V}$ $I_C, I_F = 30\text{A}$ $L_s = 30\text{nH}$ $V_{GE} = +15/-15\text{V}$ $R_G = 15\ \Omega$	$T_{vj}=25^{\circ}\text{C}$	-	0.16	-				
			$T_{vj}=125^{\circ}\text{C}$	-	0.18	-				
			$T_{vj}=150^{\circ}\text{C}$	-	0.19	-				
			$T_{vj}=175^{\circ}\text{C}$	-	0.19	-				
$t_f$	$V_{CC} = 300\text{V}$ $I_C, I_F = 30\text{A}$ $L_s = 30\text{nH}$ $V_{GE} = +15/-15\text{V}$ $R_G = 15\ \Omega$	$T_{vj}=25^{\circ}\text{C}$	-	0.04	-					
		$T_{vj}=125^{\circ}\text{C}$	-	0.04	-					
		$T_{vj}=150^{\circ}\text{C}$	-	0.04	-					
		$T_{vj}=175^{\circ}\text{C}$	-	0.04	-					
Reverse recovery time	$t_{rr}$	$V_{CC} = 300\text{V}$ $I_C, I_F = 30\text{A}$ $L_s = 30\text{nH}$ $V_{GE} = +15/-15\text{V}$ $R_G = 15\ \Omega$	$T_{vj}=25^{\circ}\text{C}$	-	0.07	-				
			$T_{vj}=125^{\circ}\text{C}$	-	0.11	-				
			$T_{vj}=150^{\circ}\text{C}$	-	0.12	-				
			$T_{vj}=175^{\circ}\text{C}$	-	0.14	-				

 (\*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**

Items	Symbols	Conditions	Characteristics			Units	
			min.	typ.	max.		
Inverter Switching loss (per pulse)	$E_{on}$	$V_{CC} = 300V$ $I_C, I_F = 30A$ $L_s = 30nH$ $V_{GE} = +15/-15 V$ $R_G = 15 \Omega$	$T_{vj} = 25^\circ C$	-	0.44	-	mJ
			$T_{vj} = 125^\circ C$	-	0.63	-	
			$T_{vj} = 150^\circ C$	-	0.71	-	
			$T_{vj} = 175^\circ C$	-	0.78	-	
	$E_{off}$	$V_{CC} = 300V$ $I_C, I_F = 30A$ $L_s = 30nH$ $V_{GE} = +15/-15 V$ $R_G = 15 \Omega$	$T_{vj} = 25^\circ C$	-	0.82	-	
			$T_{vj} = 125^\circ C$	-	1.04	-	
			$T_{vj} = 150^\circ C$	-	1.12	-	
			$T_{vj} = 175^\circ C$	-	1.15	-	
	$E_{rr}$	$V_{CC} = 300V$ $I_C, I_F = 30A$ $L_s = 30nH$ $V_{GE} = +15/-15 V$ $R_G = 15 \Omega$	$T_{vj} = 25^\circ C$	-	0.24	-	
			$T_{vj} = 125^\circ C$	-	0.38	-	
			$T_{vj} = 150^\circ C$	-	0.42	-	
			$T_{vj} = 175^\circ C$	-	0.50	-	
Collector-emitter cut-off current, gate-emitter short-circuited	$I_{CES}$	$V_{GE} = 0V$ $V_{CE} = 650V$	-	-	50	$\mu A$	
Gate leakage current, collector-emitter short-circuited	$I_{GES}$	$V_{CE} = 0V, V_{GE} = +20/-20V$	-	-	100	nA	
Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 30A$	$T_{vj} = 25^\circ C$	-	1.55	2.05	V
			$T_{vj} = 25^\circ C$	-	1.30	1.75	
	$V_{CE(sat)}$ (chip)		$T_{vj} = 125^\circ C$	-	1.45	-	
			$T_{vj} = 150^\circ C$	-	1.50	-	
Internal Gate resistance	$r_g$	-	-	0	-	$\Omega$	
Brake Switching time (*1)	$t_{d(on)}$	$V_{CC} = 300V$ $I_C = 30A$ $L_s = 30nH$ $V_{GE} = +15/-15 V$ $R_G = 15 \Omega$	$T_{vj} = 25^\circ C$	-	0.06	-	$\mu s$
			$T_{vj} = 125^\circ C$	-	0.06	-	
			$T_{vj} = 150^\circ C$	-	0.06	-	
			$T_{vj} = 175^\circ C$	-	0.06	-	
	$t_r$	$V_{CC} = 300V$ $I_C = 30A$ $L_s = 30nH$ $V_{GE} = +15/-15 V$ $R_G = 15 \Omega$	$T_{vj} = 25^\circ C$	-	0.02	-	
			$T_{vj} = 125^\circ C$	-	0.03	-	
			$T_{vj} = 150^\circ C$	-	0.03	-	
			$T_{vj} = 175^\circ C$	-	0.03	-	
	$t_{d(off)}$	$V_{CC} = 300V$ $I_C = 30A$ $L_s = 30nH$ $V_{GE} = +15/-15 V$ $R_G = 15 \Omega$	$T_{vj} = 25^\circ C$	-	0.16	-	
			$T_{vj} = 125^\circ C$	-	0.18	-	
			$T_{vj} = 150^\circ C$	-	0.19	-	
			$T_{vj} = 175^\circ C$	-	0.19	-	
	$t_f$	$V_{CC} = 300V$ $I_C = 30A$ $L_s = 30nH$ $V_{GE} = +15/-15 V$ $R_G = 15 \Omega$	$T_{vj} = 25^\circ C$	-	0.04	-	
			$T_{vj} = 125^\circ C$	-	0.04	-	
			$T_{vj} = 150^\circ C$	-	0.04	-	
			$T_{vj} = 175^\circ C$	-	0.04	-	
Reverse current	$I_{RRM}$	$V_R = 650V$	-	-	50	$\mu A$	
Forward voltage	$V_F$ (terminal)	$I_F = 10A$	$T_{vj} = 25^\circ C$	-	1.80	2.30	V
			$T_{vj} = 25^\circ C$	-	1.55	2.00	
	$V_F$ (chip)		$T_{vj} = 125^\circ C$	-	1.50	-	
			$T_{vj} = 150^\circ C$	-	1.50	-	
Thermistor Converter	$R$	$T = 25^\circ C$ $T = 100^\circ C$	-	5000	-	$\Omega$	
			465	495	520		
Thermistor Converter	$B$	$T = 25/50^\circ C$	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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**IGBT Modules**
**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	-	-	0.82	°C/W
		Inverter FWD	-	-	1.50	
		Brake IGBT	-	-	0.82	
		Brake FWD	-	-	1.92	
		Converter Diode	-	-	0.75	
Thermal resistance case to heat sink(*1) (1 device)	$R_{th(c-s)}$	Inverter IGBT	-	0.75	-	
		Inverter FWD	-	0.92	-	
		Brake IGBT	-	0.78	-	
		Brake FWD	-	0.80	-	
		Converter Diode	-	0.79	-	

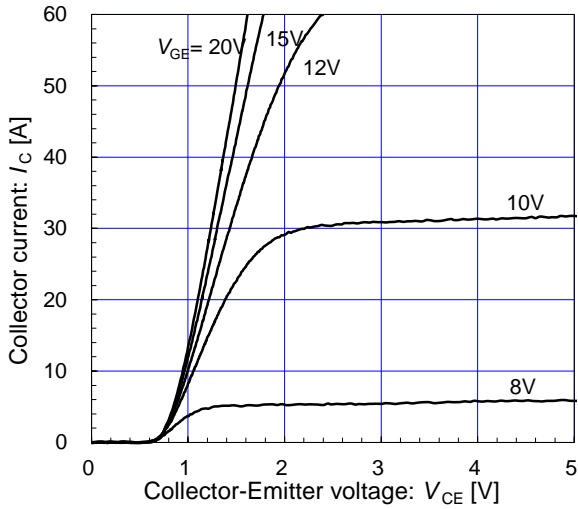
(\*1) This is the value which is defined mounting on the additional cooling fin with 1 W/(m·K) thermal grease.

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**IGBT Modules**

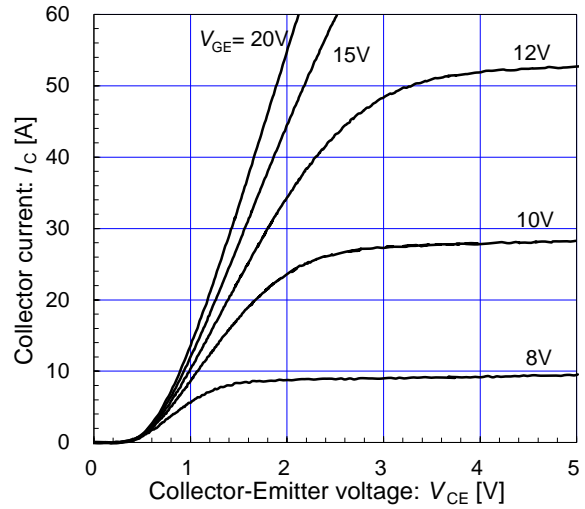
[ Inverter ]

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



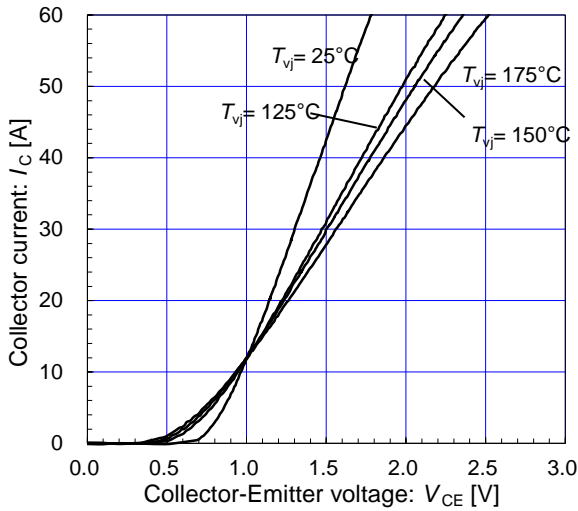
[ Inverter ]

Collector current vs. Collector-Emitter voltage (typ.)  
 $T_{vj} = 175^{\circ}\text{C} / \text{chip}$



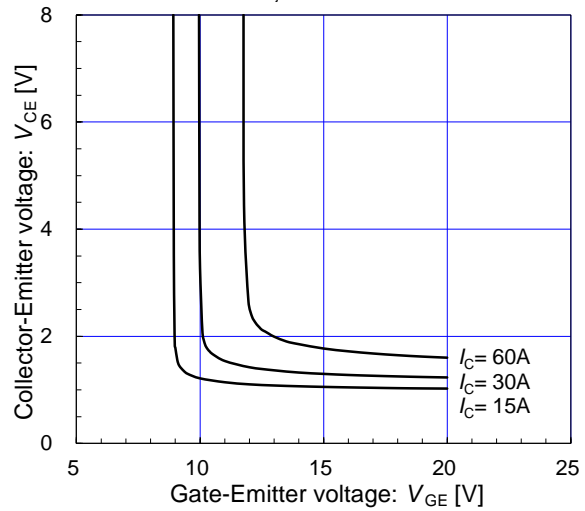
[ Inverter ]

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



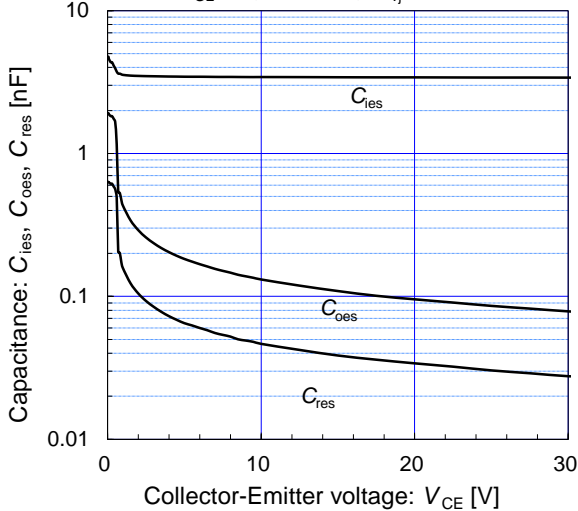
[ Inverter ]

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



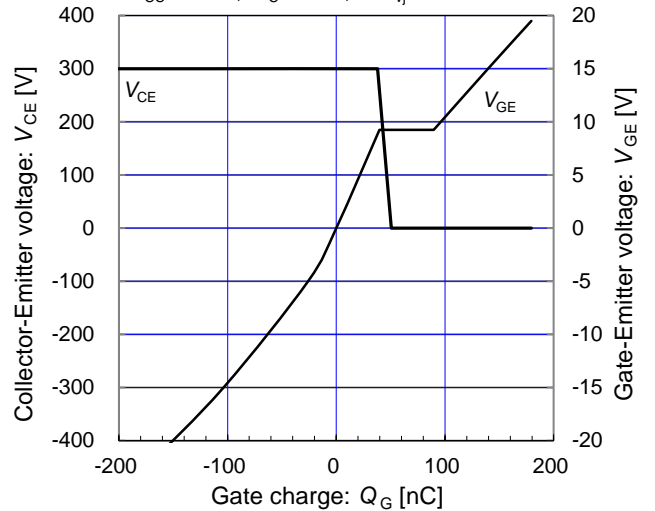
[ Inverter ]

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



[ Inverter ]

Dynamic Gate charge (typ.)  
 $V_{CC} = 300\text{V}, I_C = 30\text{A}, T_{vj} = 25^{\circ}\text{C}$

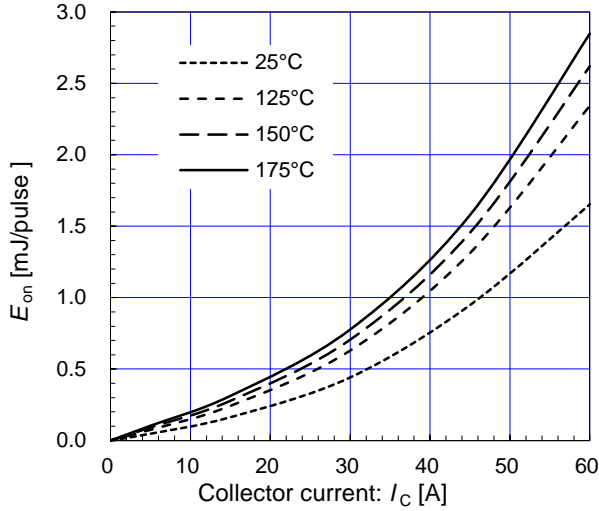


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[ Inverter ]

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

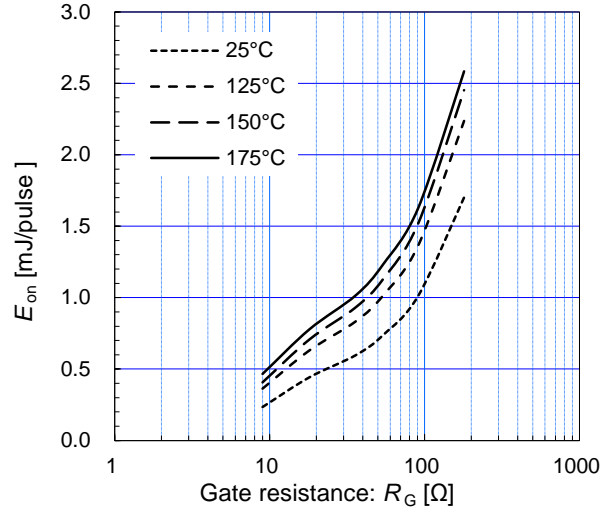
$V_{CC}=300V, V_{GE}=+15/-15V, R_G=15\Omega$



[ Inverter ]

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

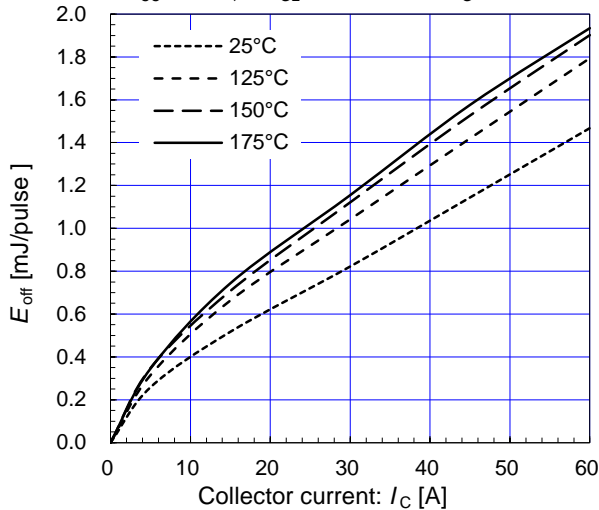
$V_{CC}=300V, V_{GE}=+15/-15V, I_C=30A$



[ Inverter ]

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

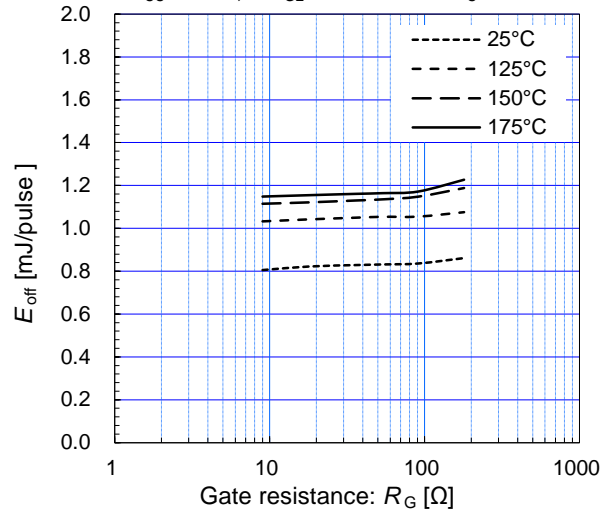
$V_{CC}=300V, V_{GE}=+15/-15V, R_G=15\Omega$



[ Inverter ]

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

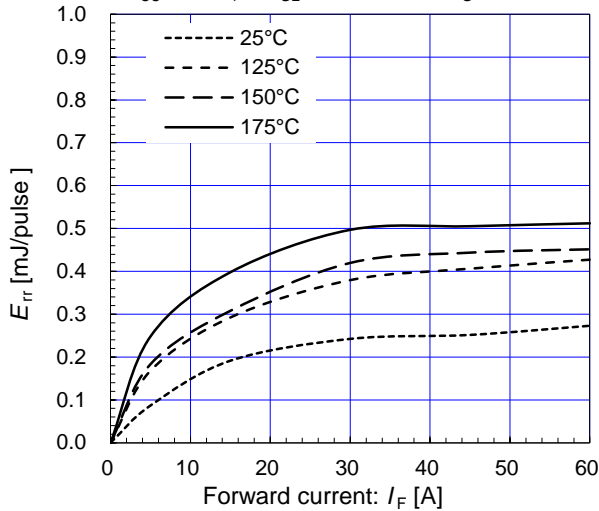
$V_{CC}=300V, V_{GE}=+15/-15V, I_C=30A$



[ Inverter ]

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

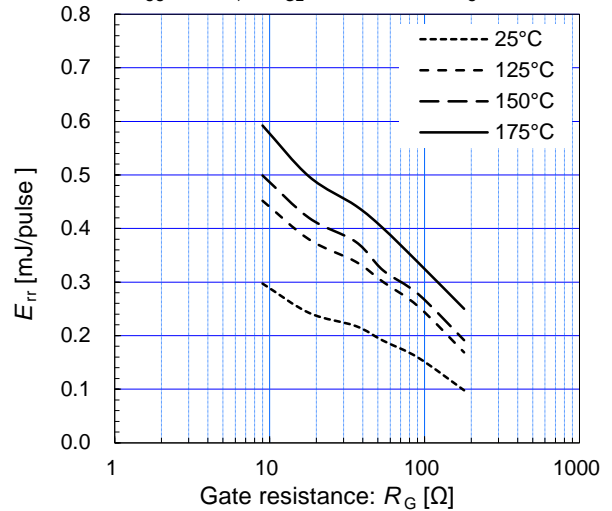
$V_{CC}=300V, V_{GE}=+15/-15V, R_G=15\Omega$



[ Inverter ]

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

$V_{CC}=300V, V_{GE}=+15/-15V, I_C=30A$



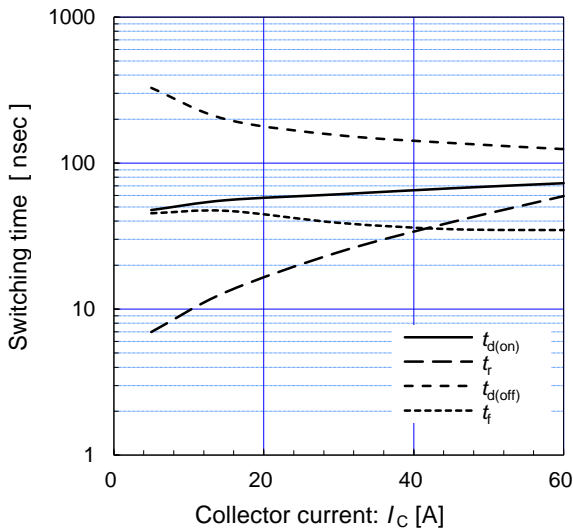
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**IGBT Modules**

[ Inverter ]

Switching time vs. Collector current (typ.)

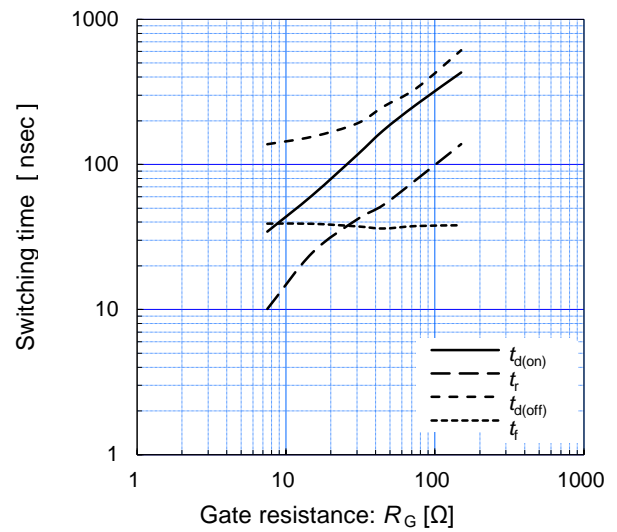
$V_{CC}=300V, R_G=15\Omega, V_{GE}=+15/-15V, T_{vj}=25^\circ C$



[ Inverter ]

Switching time vs. Gate resistance (typ.)

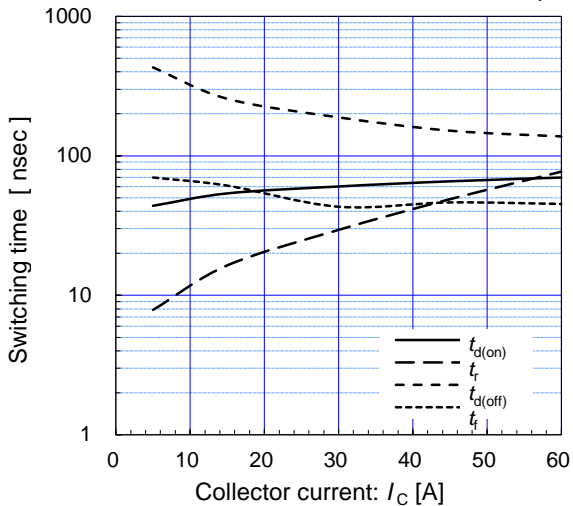
$V_{CC}=300V, I_C=30A, V_{GE}=+15/-15V, T_{vj}=25^\circ C$



[ Inverter ]

Switching time vs. Collector current (typ.)

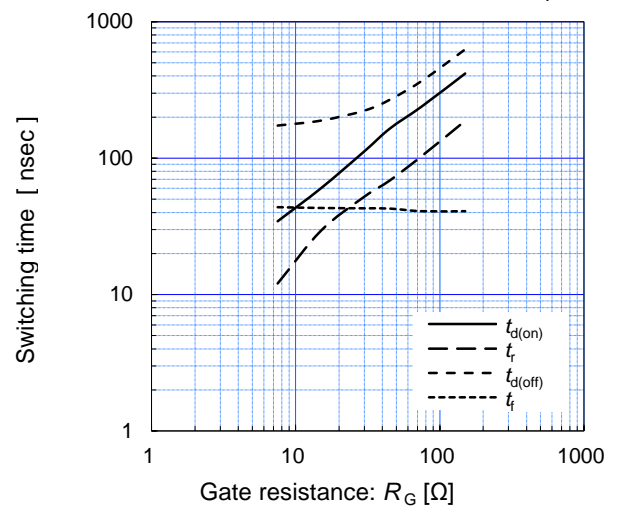
$V_{CC}=300V, R_G=15\Omega, V_{GE}=+15/-15V, T_{vj}=175^\circ C$



[ Inverter ]

Switching time vs. Gate resistance (typ.)

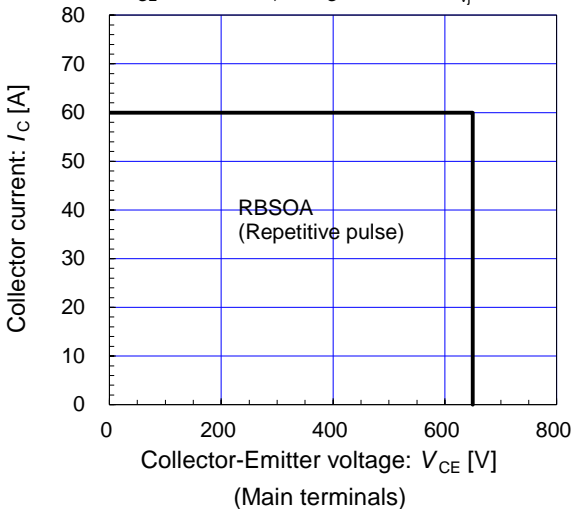
$V_{CC}=300V, I_C=30A, V_{GE}=+15/-15V, T_{vj}=175^\circ C$



[ Inverter ]

Reverse bias safe operating area (max.)

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



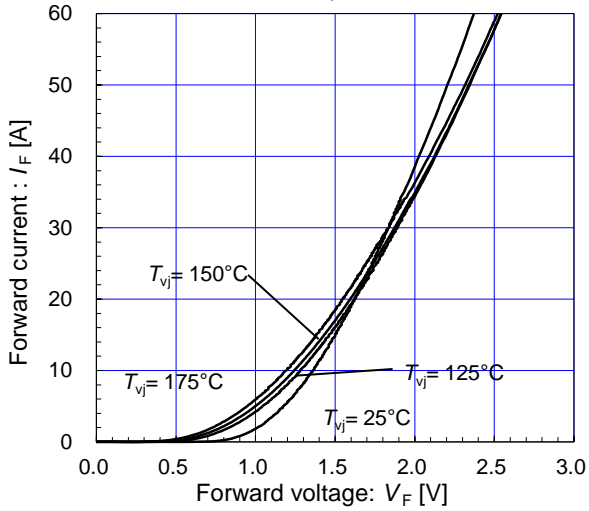


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[ Inverter ]

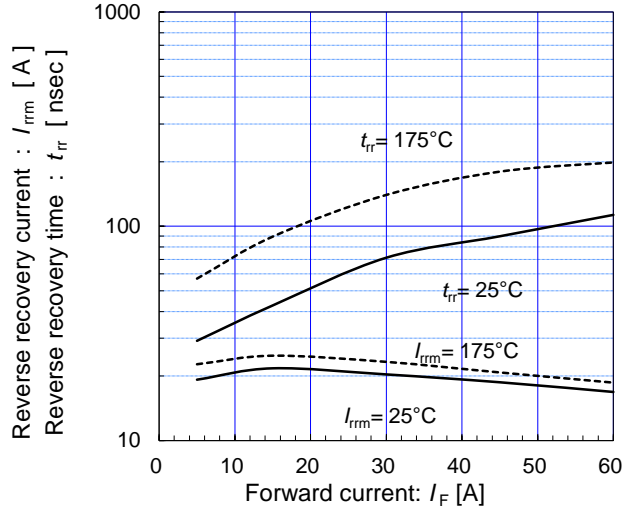
Forward current vs. Forward voltage (typ.)  
chip



[ Inverter ]

Reverse recovery characteristics (typ.)

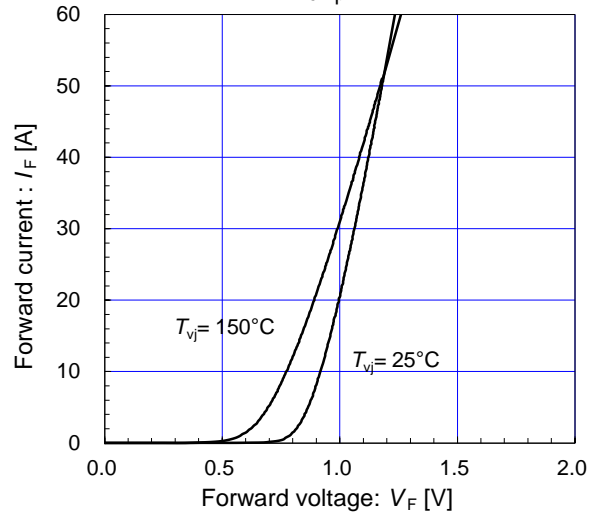
$V_{CC}= 300V, V_{GE}= +15/-15 V, R_G= 15\Omega$



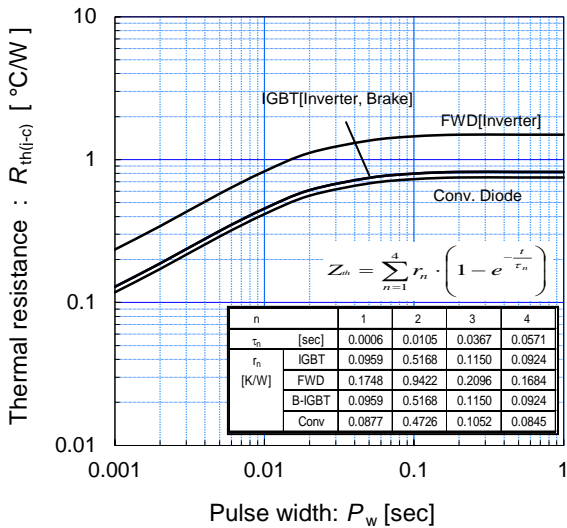
[ Converter ]

Forward current vs. Forward voltage (typ.)

chip

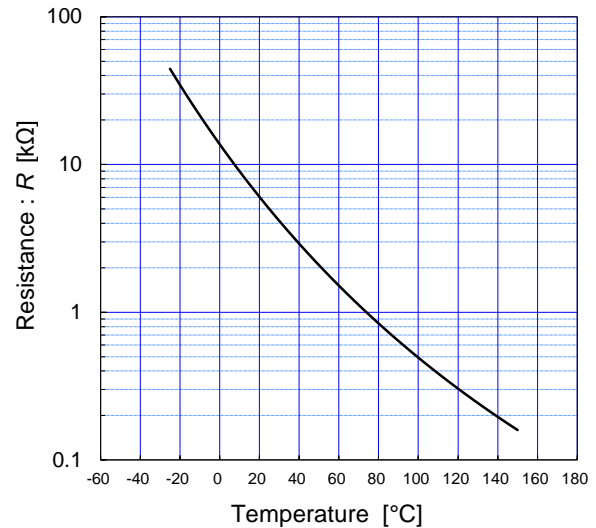


Transient thermal resistance (max.)



[ Thermistor ]

Temperature characteristic (typ.)



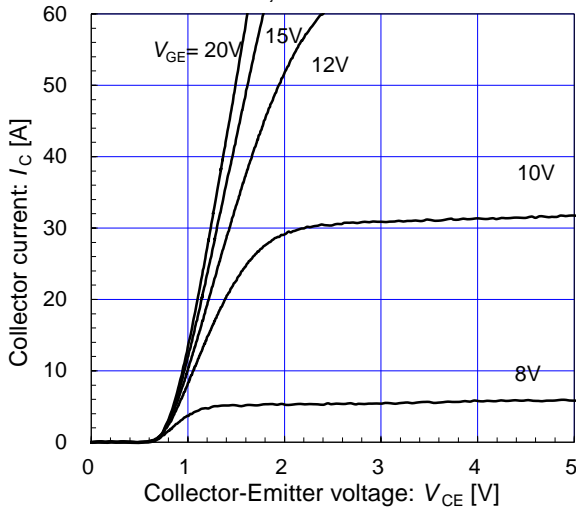
# 7MBR30XKA065-50

**IGBT Modules**

[ Brake ]

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

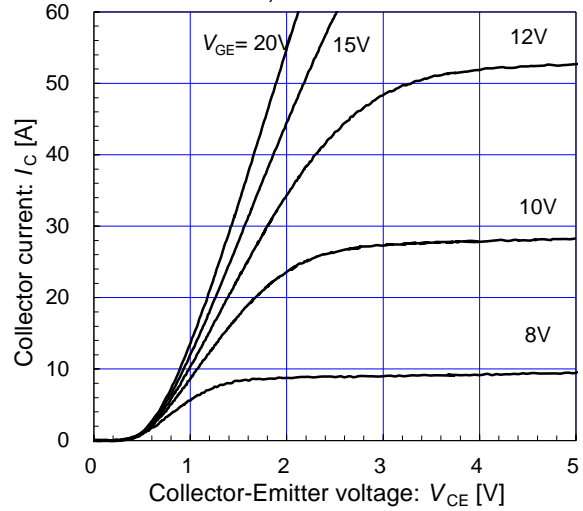
$T_{vj} = 25^{\circ}\text{C} / \text{chip}$



[ Brake ]

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

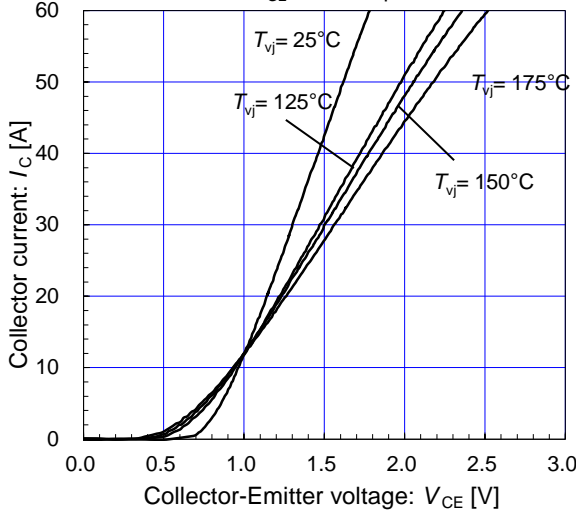
$T_{vj} = 175^{\circ}\text{C} / \text{chip}$



[ Brake ]

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

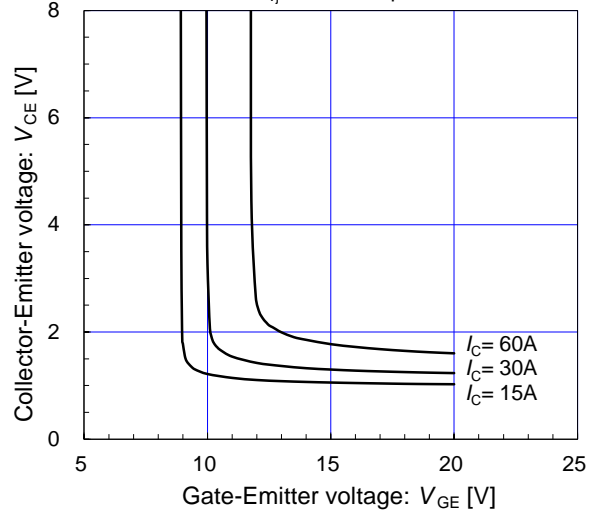
$V_{GE} = 15\text{V} / \text{chip}$



[ Brake ]

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

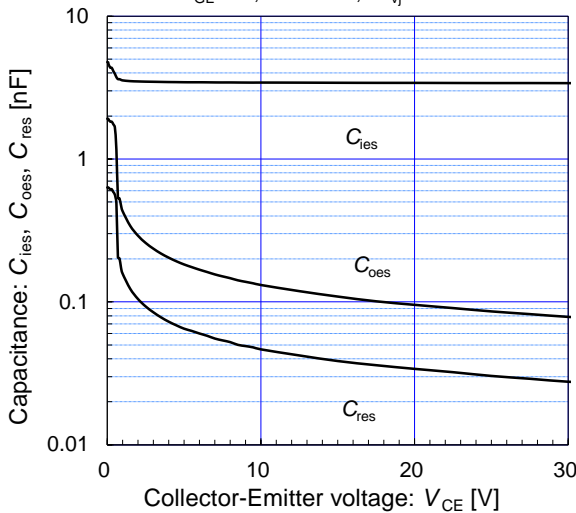
$T_{vj} = 25^{\circ}\text{C} / \text{chip}$



[ Brake ]

Capacitance vs. Collector-Emittor voltage (typ.)

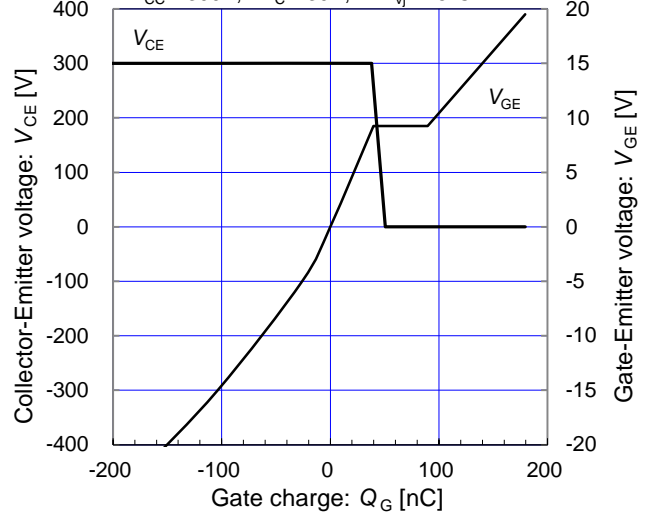
$V_{GE} = 0\text{V}, f = 1\text{MHz}, T_{vj} = 25^{\circ}\text{C}$



[ Brake ]

Dynamic Gate charge (typ.)

$V_{CC} = 300\text{V}, I_c = 30\text{A}, T_{vj} = 25^{\circ}\text{C}$



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# Technical Information

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## FUJI ELECTRIC Power Semiconductor WEB site

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