

2MBI300XBE065-50

IGBT Modules

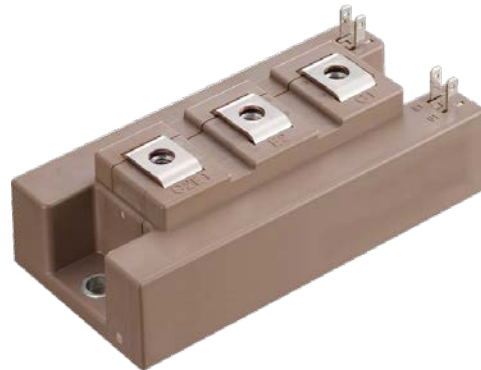
Power Module (X series)
650V / 300A / 2-in-1 package

■ Features

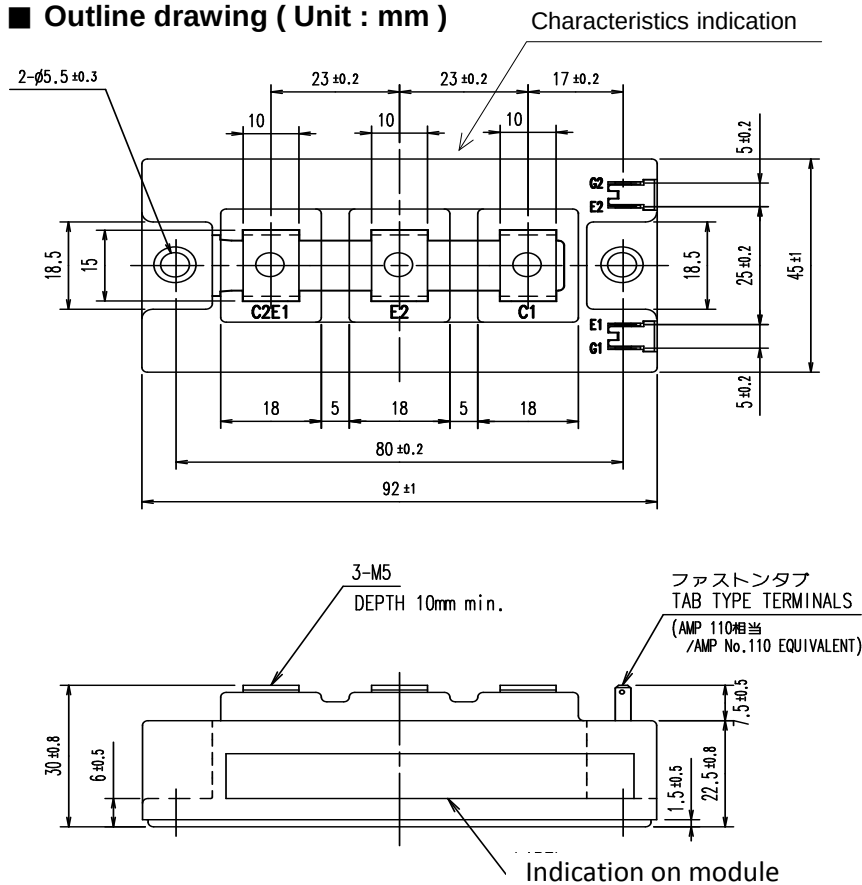
- Low $V_{CE(sat)}$
- High speed switching
- Low Inductance Module structure

■ Applications

- Inverter for Motor Drives, AC and DC Servo Drives
- Uninterruptible Power Supply Systems,
- Industrial machines, such as Welding machines

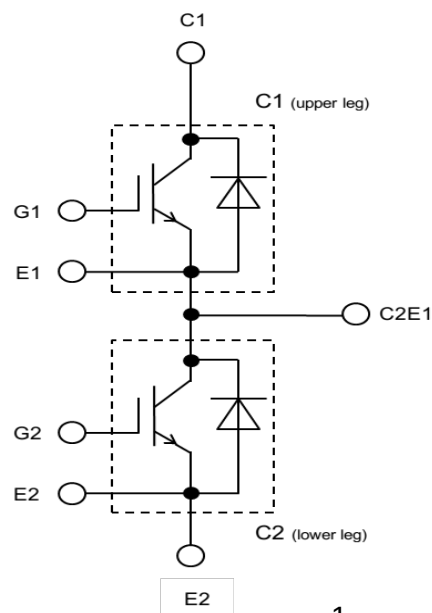


■ Outline drawing (Unit : mm)



Weight: 270 g(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
Inverter	Collector-Emitter voltage	V_{CES}		650	V
	Gate-Emitter voltage	V_{GES}		± 20	V
	Collector current	I_C	Continuous $T_c = 100^\circ\text{C}$	300	A
	Repetitive peak collector current	I_{CRM}	1ms	600	
	Forward current	I_F		300	
	Repetitive peak forward current	I_{FRM}	1ms	600	
	Total power dissipation	P_{tot}	1 device	1160	
	Virtual junction temperature	T_{vj}		175	W
	Operating virtual junction temperature	T_{vjop}		175	$^\circ\text{C}$
	Case temperature	T_c		125	
Storage temperature		T_{stg}		-40 ~ 125	
Isolation voltage	between terminal and copper base (*1)	V_{iso}	AC: 1min.	4000	Vrms
Mounting torque of screws to heat sink(*2)		M_s	M5	3.5	N m
Mounting torque of screws to terminals(*2)		M_t	M5	3.5	

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

(*2) Recommendable Value: Heat sink 2.5 ~ 3.5 N·m (M5)

Recommendable Value: Terminals 2.5 ~ 3.5 N·m (M5)

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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	Collector-Emitter cut-off current Gate-Emitter short-circuited	I_{CES}	$V_{GE} = 0V$ $V_{CE} = 650V$		-	-	100	mA	
	Gate leakage current, Collector-Emitter short-circuited	I_{GES}	$V_{CE}=0V, V_{GE}=\pm 20V$		-	-	200	nA	
	Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V$ $I_C = 300mA$		6.0	6.5	7.0	V	
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 300A$	$T_{vj}=25^{\circ}C$	-	1.50	1.95	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	-		
				$T_{vj}=175^{\circ}C$	-	1.55	-		
	Internal gate	R_G	-			-	2.25	-	Ω
	Capacitance	C_{ies}	$V_{CE}=10V, V_{GE}=0V, f=1MHz$			-	34	-	nF
		C_{oes}				-	1.3	-	
		C_{res}				-	0.47	-	
	Gate charge	Q_G	$V_{CC} = 300V, I_C = 300A$ $V_{GE} = -15 \rightarrow +15V$			-	2.4	-	μC
	Forward on voltage	V_F (terminal)	$V_{GE} = 0V$ $I_F= 300A$	$T_{vj}=25^{\circ}C$	-	1.75	2.20	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	-		
				$T_{vj}=175^{\circ}C$	-	1.45	-		
	Switching time (*1)	$t_{d(on)}$	$V_{CC} = 300V$ $I_C, I_F= 300A$ $V_{GE} = +15/-15V$ $R_G = 4.7 \Omega$ $L_S = 30 nH$	$T_{vj}= 25^{\circ}C$	-	0.37	-	μs	
				$T_{vj}=125^{\circ}C$	-	0.41	-		
				$T_{vj}=150^{\circ}C$	-	0.42	-		
				$T_{vj}=175^{\circ}C$	-	0.43	-		
		t_r		$T_{vj}= 25^{\circ}C$	-	0.12	-		
				$T_{vj}=125^{\circ}C$	-	0.14	-		
				$T_{vj}=150^{\circ}C$	-	0.14	-		
				$T_{vj}=175^{\circ}C$	-	0.15	-		
		$t_{d(off)}$		$T_{vj}= 25^{\circ}C$	-	0.35	-		
				$T_{vj}=125^{\circ}C$	-	0.37	-		
				$T_{vj}=150^{\circ}C$	-	0.38	-		
				$T_{vj}=175^{\circ}C$	-	0.38	-		
		t_f		$T_{vj}= 25^{\circ}C$	-	0.07	-		
				$T_{vj}=125^{\circ}C$	-	0.09	-		
				$T_{vj}=150^{\circ}C$	-	0.10	-		
				$T_{vj}=175^{\circ}C$	-	0.10	-		
	Reverse recovery time	t_{rr}	$T_{vj}= 25^{\circ}C$	-	0.08	-			
			$T_{vj}=125^{\circ}C$	-	0.15	-			
			$T_{vj}=150^{\circ}C$	-	0.16	-			
			$T_{vj}=175^{\circ}C$	-	0.18	-			

(*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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■ 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}	$V_{\text{CC}} = 300\text{V}$	$T_{\text{vj}}=25^{\circ}\text{C}$	-	8.9	-	mJ
			$I_{\text{C}}, I_{\text{F}} = 300\text{A}$	$T_{\text{vj}}=125^{\circ}\text{C}$	-	16.1	-	
			$V_{\text{GE}} = +15/ -15\text{V}$	$T_{\text{vj}}=150^{\circ}\text{C}$	-	17.9	-	
			$R_{\text{G}} = 4.7\ \Omega$	$T_{\text{vj}}=175^{\circ}\text{C}$	-	19.7	-	
		E_{off}	$L_{\text{S}} = 30\ \text{nH}$	$T_{\text{vj}}=25^{\circ}\text{C}$	-	12.5	-	
				$T_{\text{vj}}=125^{\circ}\text{C}$	-	13.8	-	
				$T_{\text{vj}}=150^{\circ}\text{C}$	-	14.1	-	
				$T_{\text{vj}}=175^{\circ}\text{C}$	-	14.4	-	
		E_{rr}		$T_{\text{vj}}=25^{\circ}\text{C}$	-	1.5	-	
				$T_{\text{vj}}=125^{\circ}\text{C}$	-	2.5	-	
				$T_{\text{vj}}=150^{\circ}\text{C}$	-	2.8	-	
				$T_{\text{vj}}=175^{\circ}\text{C}$	-	3.1	-	

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.

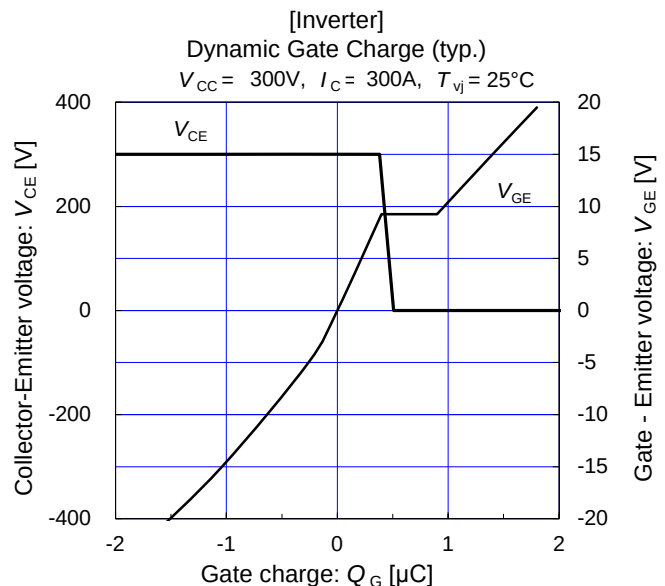
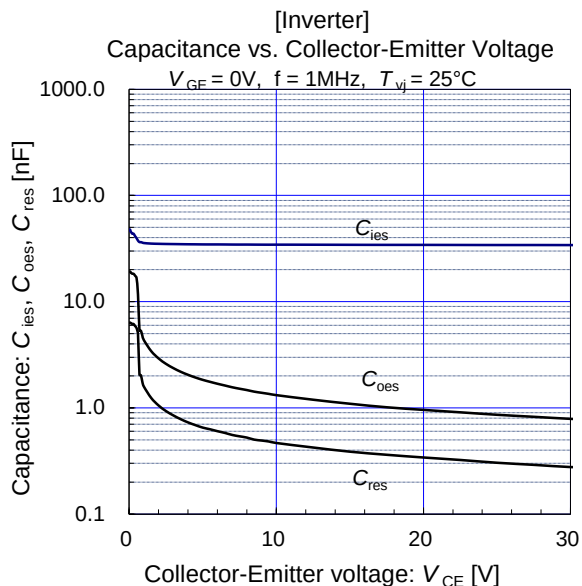
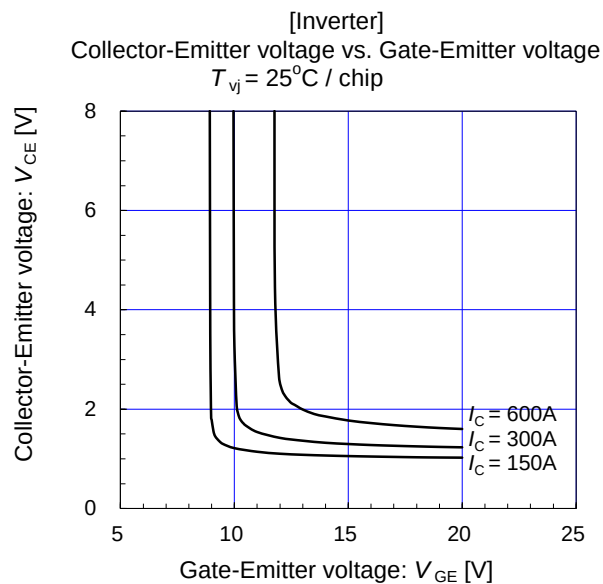
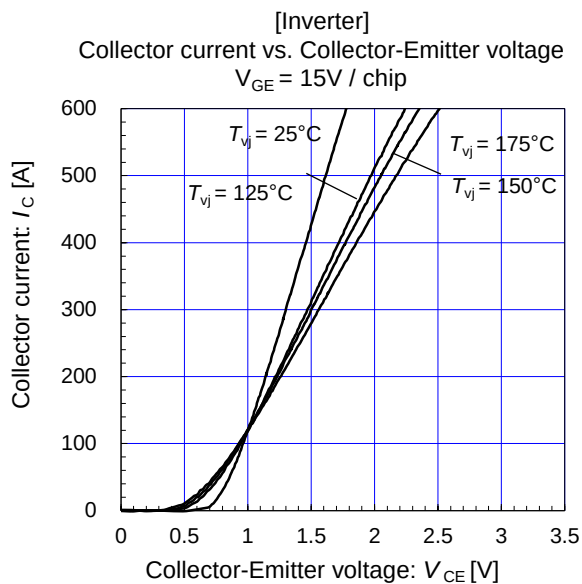
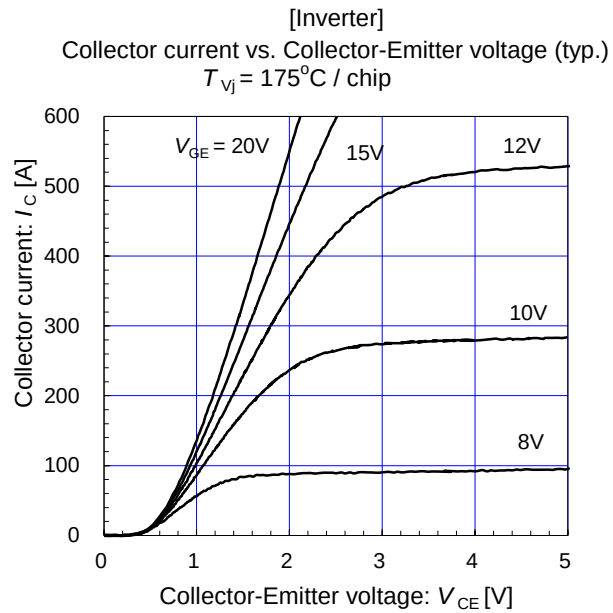
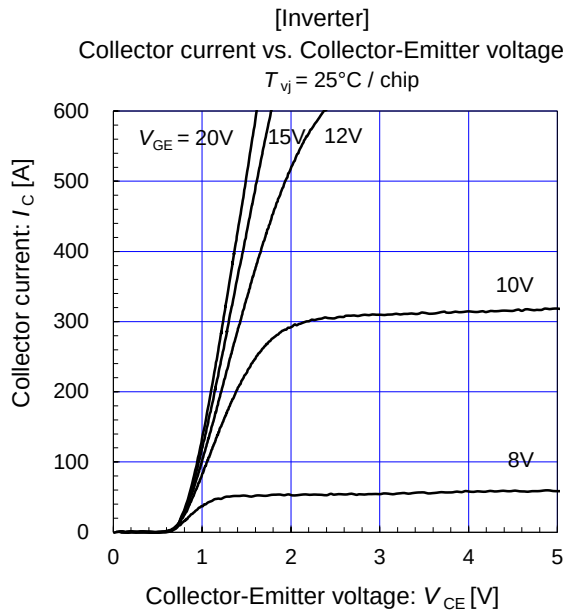
■ Thermal resistance characteristics

	Symbols	Conditions	Characteristics			Units
			min.	typ.	max.	
Thermal resistance junction to case (1device)	$R_{th(j-c)}$	Inverter IGBT	-	-	0.129	$^{\circ}\text{C/W}$
		Inverter FWD	-	-	0.174	
Thermal resistance case to heat sink (1 IGBT + 1FWD) (*1)	$R_{th(c-s)}$	with 1 W/(m·K) thermal grease	-	0.0250	-	

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

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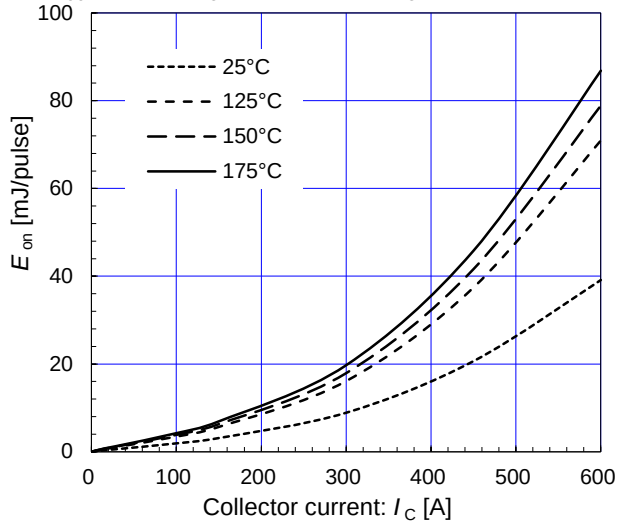
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[Inverter]

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

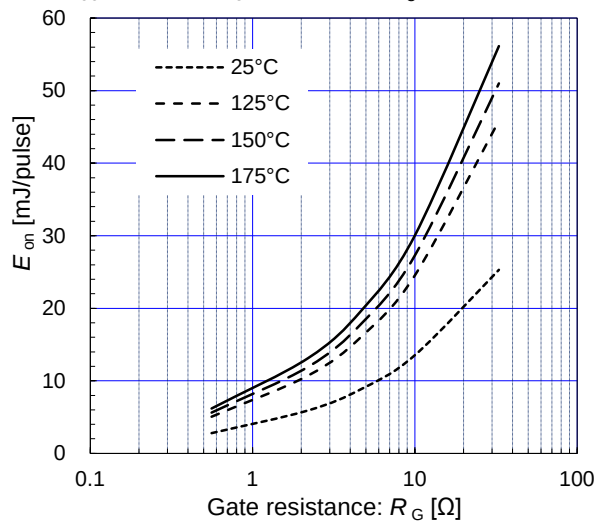
$V_{CC} = 300V$, $V_{GE} = +15/-15V$, $R_G = 4.7 \Omega$



[Inverter]

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

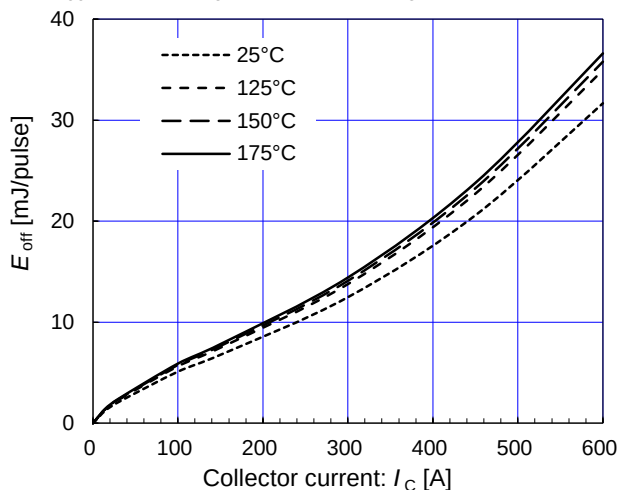
$V_{CC} = 300V$, $V_{GE} = +15/-15V$, $I_C = 300A$



[Inverter]

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

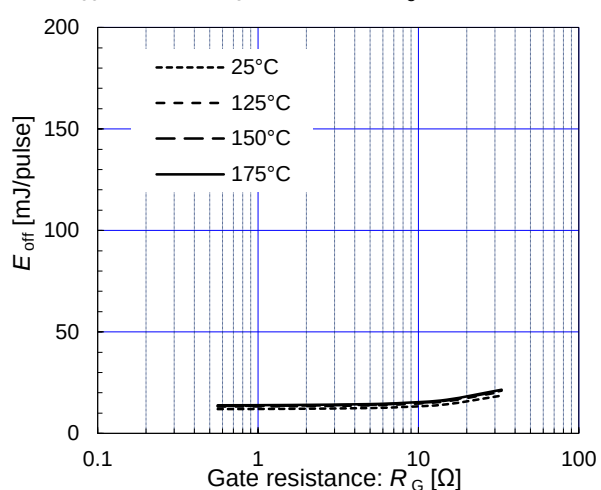
$V_{CC} = 300V$, $V_{GE} = +15/-15V$, $R_G = 4.7 \Omega$



[Inverter]

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

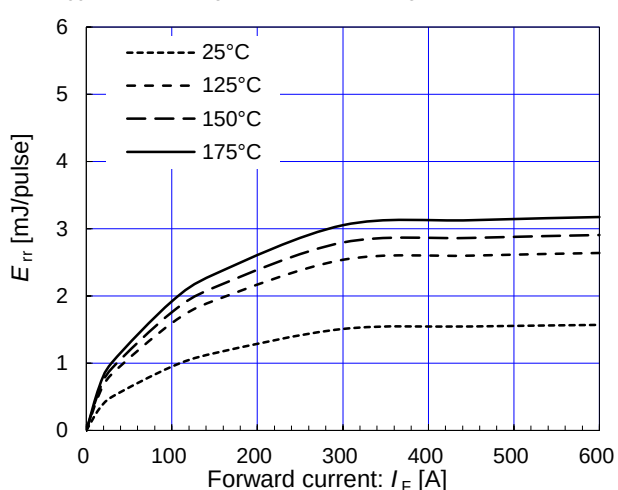
$V_{CC} = 300V$, $V_{GE} = +15/-15V$, $I_C = \#REF!$



[Inverter]

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

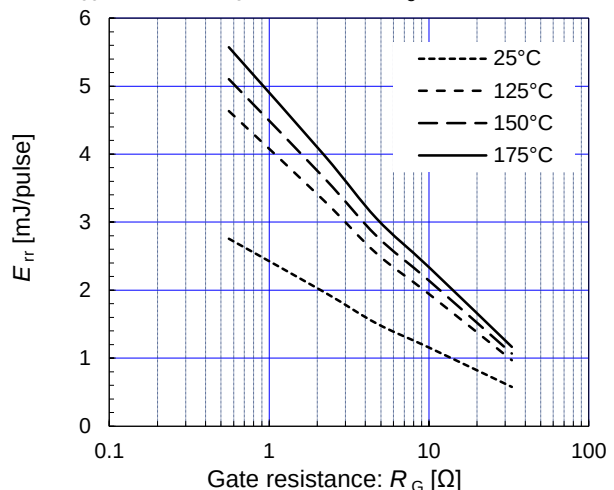
$V_{CC} = 300V$, $V_{GE} = +15/-15V$, $R_G = 4.7 \Omega$



[Inverter]

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

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



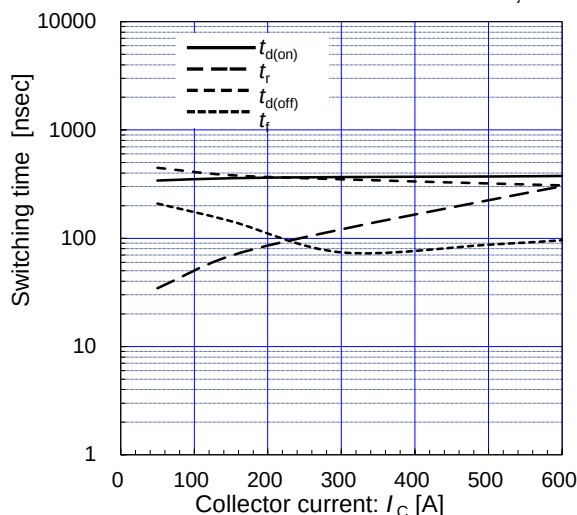
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[Inverter]

Switching time vs. Collector current (typ.)

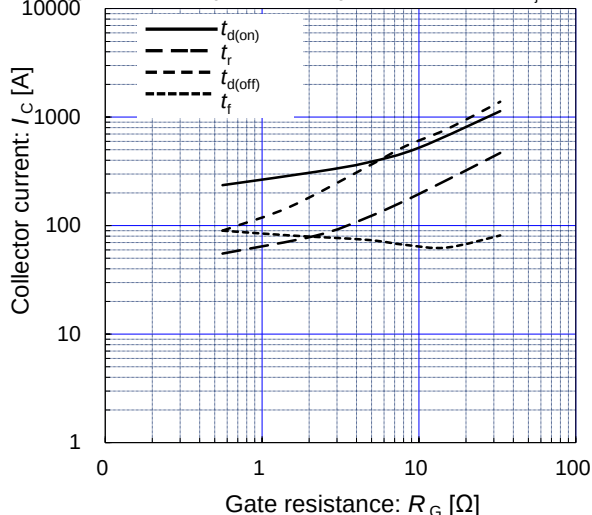
$V_{CC} = 300V$, $R_G = 4.7\Omega$, $V_{GE} = +15/-15V$, $T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

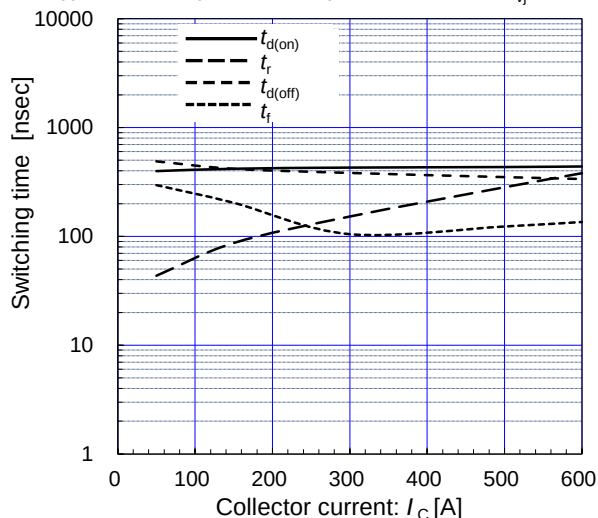
$V_{CC} = 300V$, $I_C = 300A$, $V_{GE} = +15/-15V$, $T_{vj} = 25^\circ C$



[Inverter]

Switching time vs. Collector current (typ.)

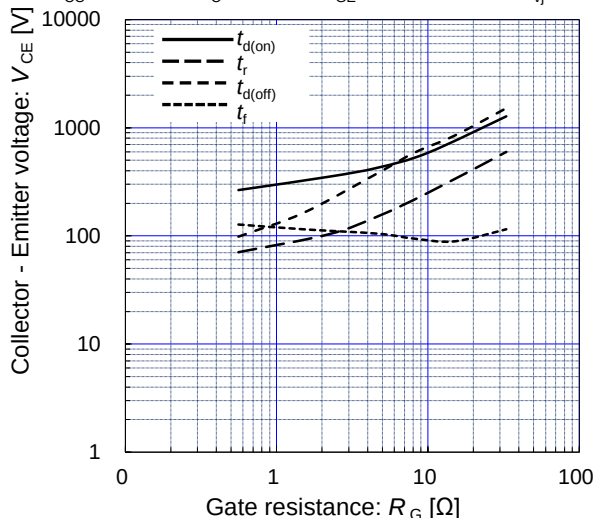
$V_{CC} = 300V$, $R_G = 4.7\Omega$, $V_{GE} = +15/-15V$, $T_{vj} = 175^\circ C$



[Inverter]

Switching time vs. Gate resistance (typ.)

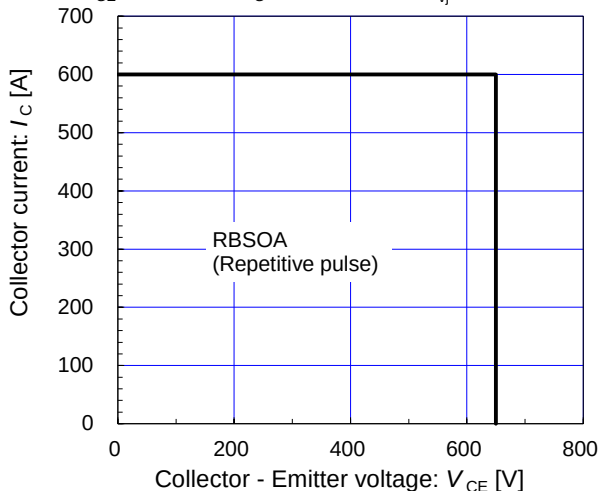
$V_{CC} = 300V$, $I_C = 300A$, $V_{GE} = +15/-15V$, $T_{vj} = 175^\circ C$



[Inverter]

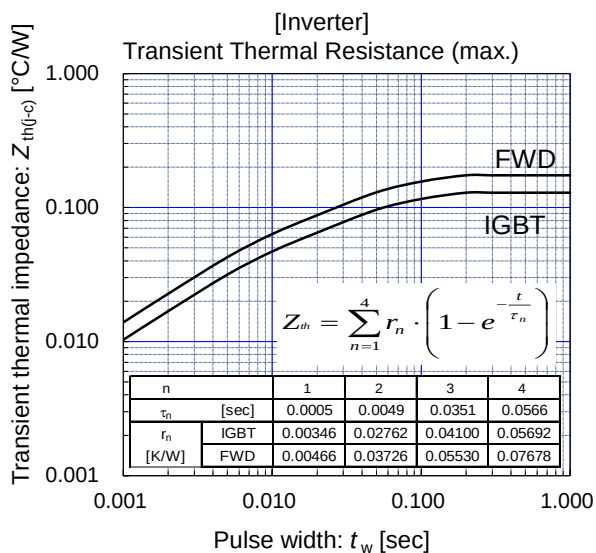
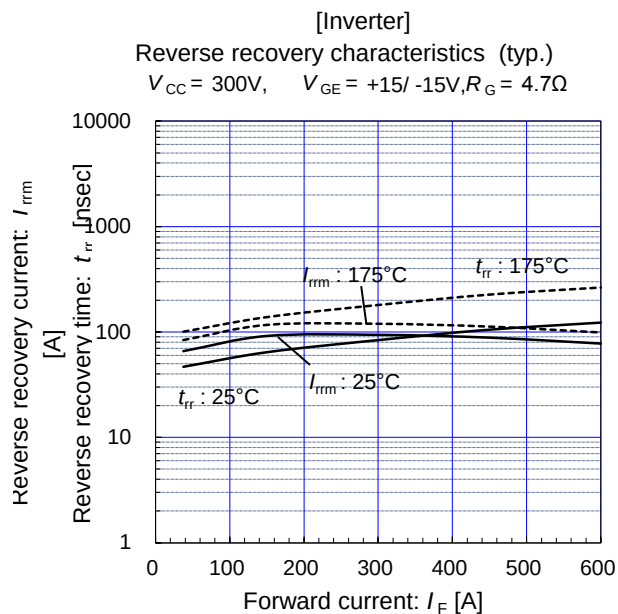
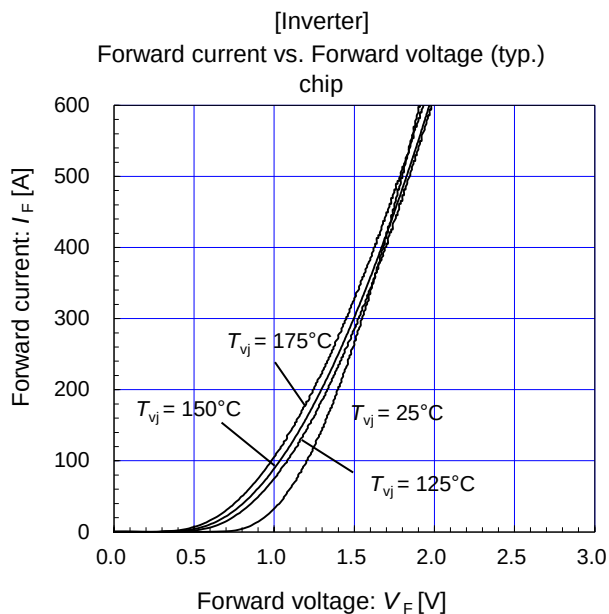
Reverse bias safe operating area (max.)

$V_{GE} = +15/-15$, $R_G = 4.7\Omega$, $T_{vj} = 175^\circ C$



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