

4MBI340VF-120R-50

IGBT Modules

IGBT Power Module (V series)

1200V/340A/IGBT, ±600V/340A/RB-IGBT, 4-in-1 package

■ **Features**

- Higher efficiency
- Optimized Advanced T-type circuit
- Low inductance module structure

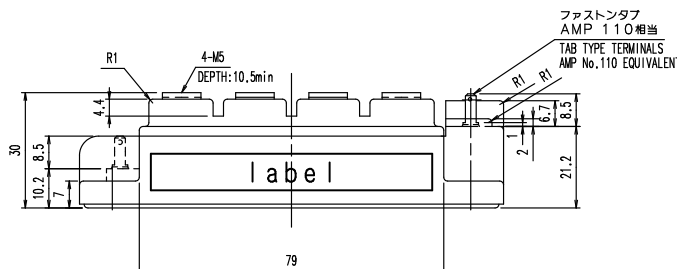
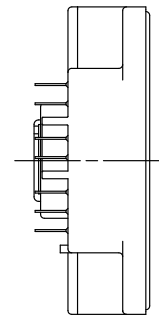
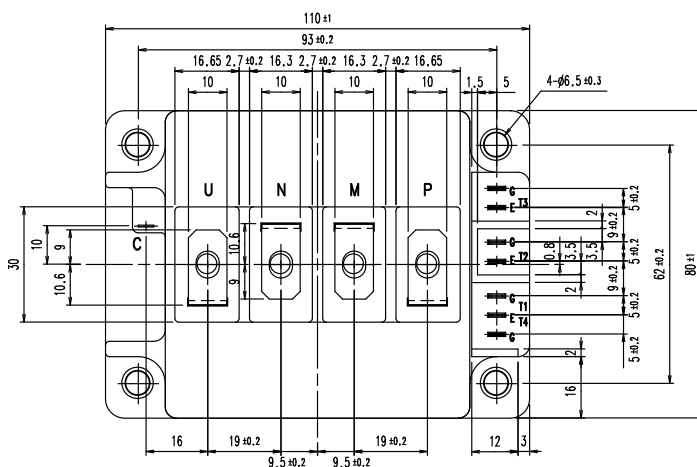
■ **Applications**

- Inverter for motor drive
- Uninterruptible powre supply
- Power conditioner



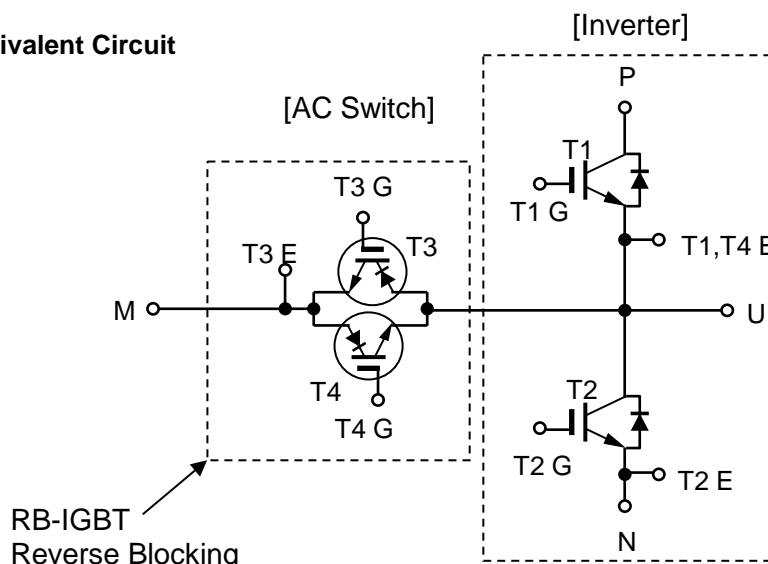
■ **Outline drawing**

(Unit : mm)



Weight: 460g (typ.)

■ **Equivalent Circuit**



4MBI340VF-120R-50

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

Item		Symbol	Condition		Maximum Rating	Unit	
Inverter	Collector-Emitter voltage	V_{CES}			1200	V	
	Gate-Emitter voltage	V_{GES}			± 20	V	
	Collector current	IGBT	I_C	Continuous	$T_c = 80^\circ\text{C}$	340	A
			I_C pulse	1ms	$T_c = 80^\circ\text{C}$	600	
		FWD	$-I_C$			340	
			$-I_C$ pulse			600	
	Collector power dissipation	P_C	1 device		1500	W	
	Junction temperature	T_{vj}			175	$^\circ\text{C}$	
Operating temperature (under switching conditions)	T_{vjop}			150			
AC Switch	Collector-Emitter voltage	V_{CES}			± 600	V	
	Gate-Emitter voltage	V_{GES}			± 20	V	
	Collector current	I_C	Continuous	$T_c = 80^\circ\text{C}$	340	A	
		I_C pulse	1ms	$T_c = 80^\circ\text{C}$	600		
	Collector power dissipation	P_C	1 device		1500	W	
	Junction temperature	T_{vj}			150	$^\circ\text{C}$	
	Operating temperature (under switching conditions)	T_{vjop}			125		
	Case temperature	T_c			125		
Storage temperature	T_{stg}			$-40 \sim +125$			
Isolation voltage	between terminal and copper base (*1)	V_{iso}	AC : 1min.		2500	VAC	
Screw torque	Mounting (*2)	-	M5 or M6		3.5	Nm	
	Terminal (*3)	-	M5		3.5		

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

(*2) Recommendable value : 2.5-3.5 Nm (M5 or M6)

(*3) Recommendable value : 2.5-3.5 Nm (M5)

4MBI340VF-120R-50

IGBT Modules

■ 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}	$V_{GE} = 0V$ $V_{CE} = 1200V$	-	-	2.0	mA	
	Gate-Emitter leakage current	I_{GES}	$V_{GE} = 0V$ $V_{GE} = \pm 20V$	-	-	400	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	$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_C = 300A$	$T_{vj} = 25^{\circ}\text{C}$	-	1.85	2.10	V
				$T_{vj} = 125^{\circ}\text{C}$	-	2.20	-	
		$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 300A$	$T_{vj} = 25^{\circ}\text{C}$	-	2.05	2.35	
				$T_{vj} = 125^{\circ}\text{C}$	-	2.40	-	
	Internal gate resistance	r_g	-	-	2.50	-	Ω	
	Input capacitance	C_{ies}	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	-	25.2	-	nF	
	Turn-on time	t_{on}	SW mode : A $V_{cc} = 400V$ $I_C = 300A$	-	0.75	1.30	μs	
				-	0.45	0.80		
				-	0.15	-		
	Turn-off time	t_{off}	$V_{GE} = \pm 15V$ $R_G = +10/-1 \Omega$	-	0.60	1.00	μs	
				-	0.10	0.35		
Forward on voltage	V_F (chip)	$I_F = 300A$	$T_{vj} = 25^{\circ}\text{C}$	-	1.70	1.95	V	
			$T_{vj} = 125^{\circ}\text{C}$	-	1.85	-		
			$T_{vj} = 150^{\circ}\text{C}$	-	1.80	-		
	V_F (terminal)	$I_F = 300A$	$T_{vj} = 25^{\circ}\text{C}$	-	1.95	2.25		
$T_{vj} = 125^{\circ}\text{C}$			-	2.10	-			
Reverse recovery time	t_{rr}	SW mode : B $V_{cc} = 400V$ $I_F = 300A$ $V_{GE} = \pm 15V$ $R_G = +8.2/-39 \Omega$	-	-	0.3	μs		
AC Switch	Zero gate voltage collector current	I_{CES}	$V_{GE} = 0V$ $V_{CE} = 600V$	-	-	3.0	mA	
	Gate-Emitter leakage current	I_{GES}	$V_{CE} = 0V$ $V_{GE} = \pm 20V$	-	-	600	nA	
	Gate-Emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 20V$ $I_C = 300mA$	5.5	6.5	7.5	V	
	Collector-Emitter saturation voltage	$V_{CE(sat)}$ (chip)	$V_{GE} = 15V$ $I_C = 300A$	$T_{vj} = 25^{\circ}\text{C}$	-	2.45	2.80	V
				$T_{vj} = 125^{\circ}\text{C}$	-	2.60	-	
	$V_{CE(sat)}$ (terminal)	$V_{GE} = 15V$ $I_C = 300A$	$V_{GE} = 15V$ $I_C = 300A$	$T_{vj} = 25^{\circ}\text{C}$	-	2.55	2.95	
				$T_{vj} = 125^{\circ}\text{C}$	-	2.70	-	
	Internal gate resistance	r_g	-	-	2.93	-	Ω	
	Input capacitance	C_{ies}	$V_{CE} = 10V, V_{GE} = 0V, f = 1MHz$	-	0.5	1.05	nF	
	Turn-on time	t_{on}	SW mode : B $V_{cc} = 400V$ $I_C = 300A$	-	0.27	0.53	μs	
				-	0.12	-		
				-	1.32	3.00		
	Turn-off time	t_{off}	$V_{GE} = \pm 15V$ $R_G = +8.2/-39 \Omega$	-	0.11	0.35	μs	
				-	0.05	-		
Reverse recovery time	t_{rr}	SW mode : A $V_{cc} = 400V$ $I_C = 300A$ $V_{GE} = \pm 15V$ $R_G = +10/-1 \Omega$	-	-	0.3	μs		
Internal inductance	L	P-N	-	40	-	nH		
		P-M	-	33	-			
		M-N	-	33	-			

■ Thermal resistance characteristics

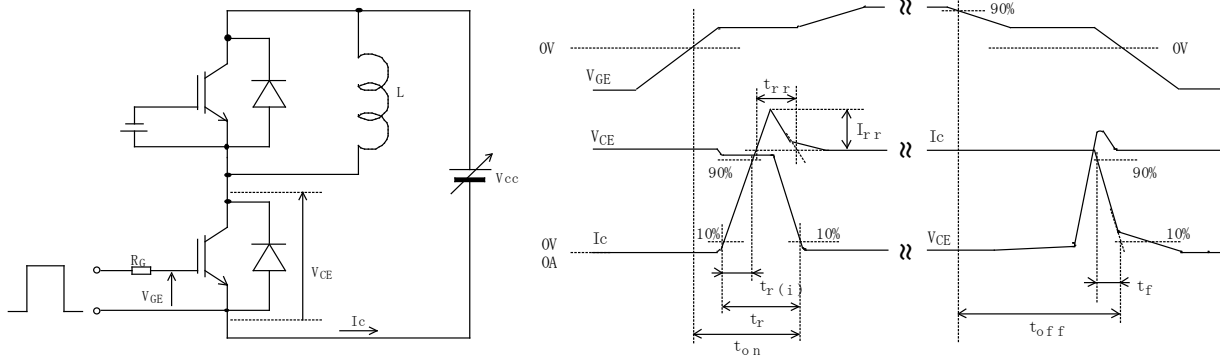
Item	Symbol	Condition	Characteristics			Units
			min.	typ.	max.	
Thermal resistance (1device)	$R_{th(j-c)}$	T1, T2 IGBT	-	-	0.075	$^{\circ}\text{C/W}$
		T1, T2 FWD	-	-	0.112	
		T3, T4 RB-IGBT	-	-	0.084	
Contact thermal resistance (1device) (*1)	$R_{th(c-f)}$	T1, T2	-	0.025	-	$^{\circ}\text{C/W}$
		T3, T4	-	0.017	-	

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

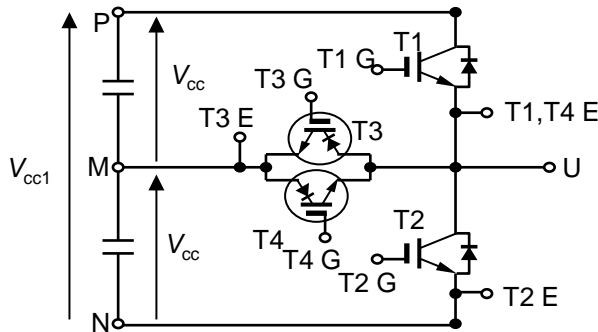
4MBI340VF-120R-50

IGBT Modules

Definitions of switching time



Definitions of switching mode



SW mode	Load L	T1	T2	T3	T4
A	M-U	SW	OFF	OFF	ON
	M-U	OFF	SW	ON	OFF
B	P-U	OFF	OFF	SW	ON
	U-N	OFF	OFF	ON	SW

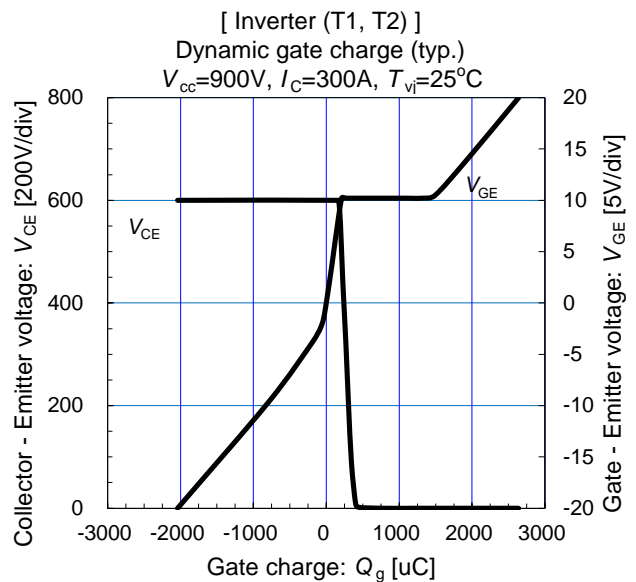
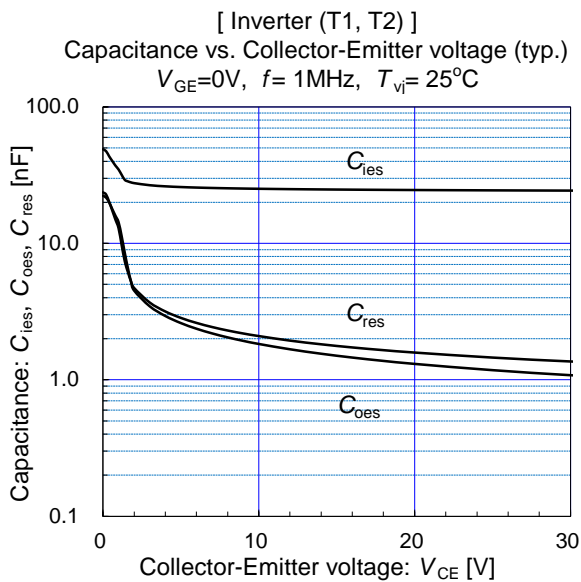
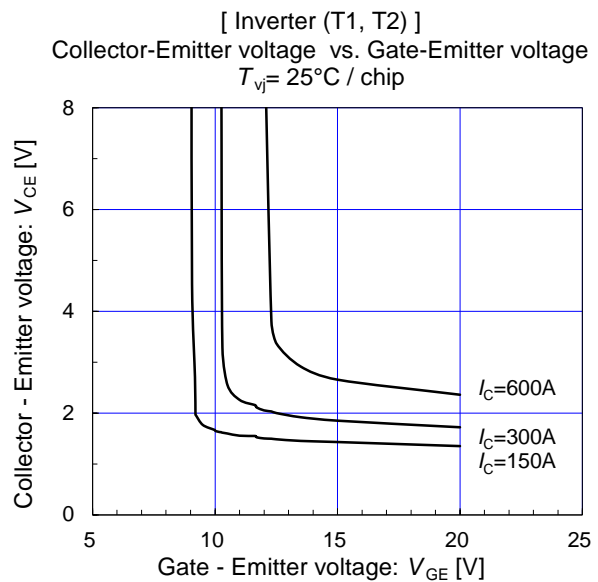
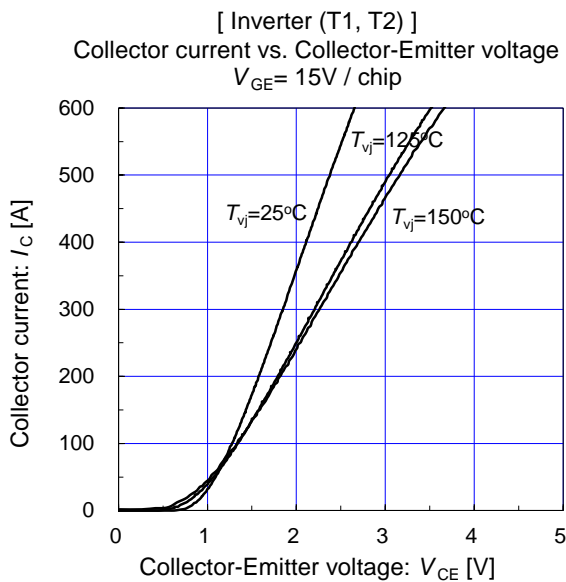
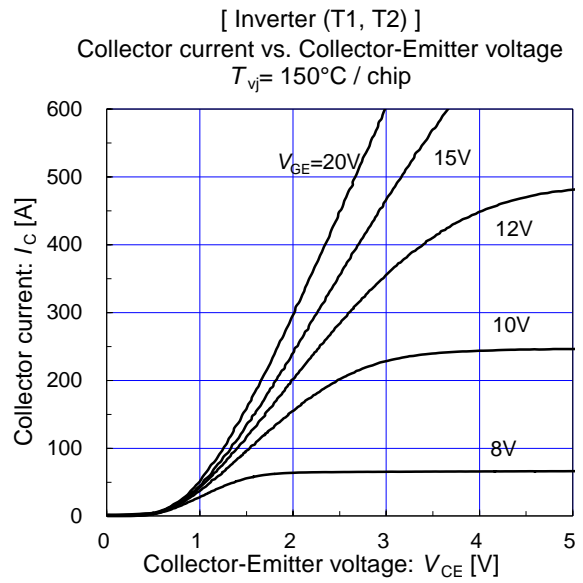
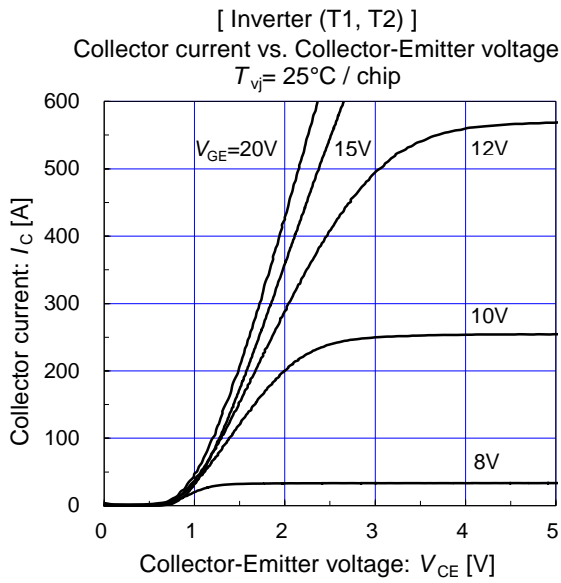
SW: Connect to drive circuit and input gate signal
 ON: Bias voltage of gate +15V
 OFF: Reverse bias voltage of gate -15V
 $V_{cc1} = 2 \times V_{cc}$

Warning

When reverse voltage is applied to C-E of RB-IGBT without forward gate bias voltage (+VGE), the reverse leakage current at C-E will be large. In order to reduce the reverse leakage current, +VGE should be applied to G-E of RB-IGBT when reverse voltage is being applied to C-E. (Recommended value : +VGE=15V)

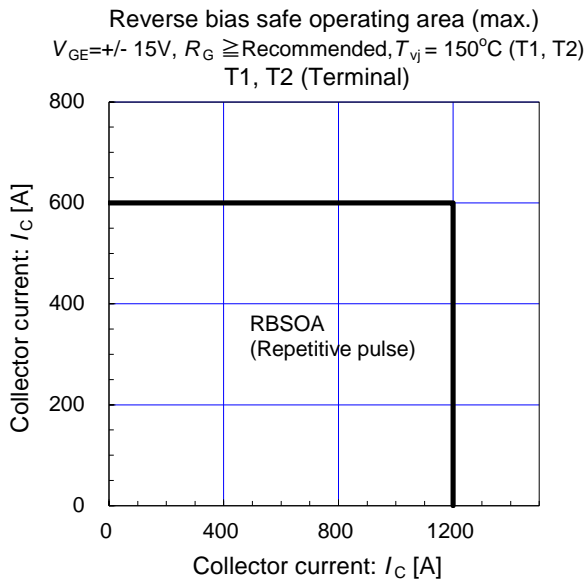
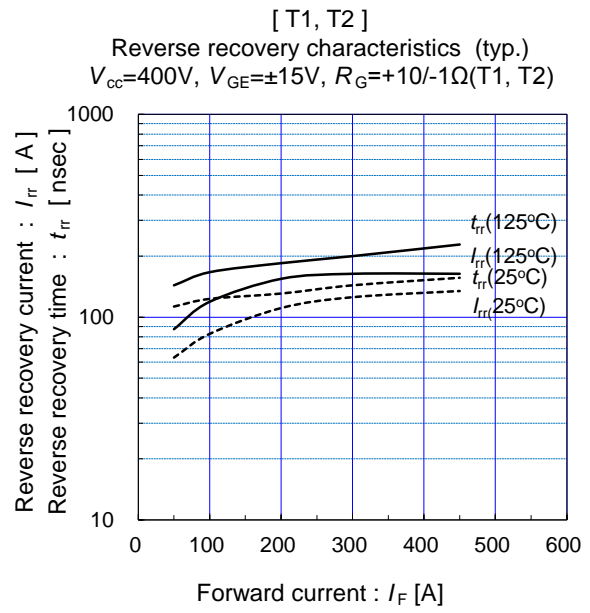
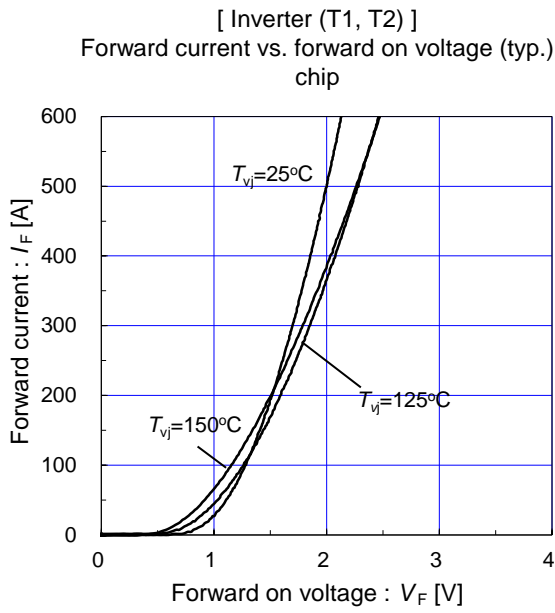
4MBI340VF-120R-50

IGBT Modules



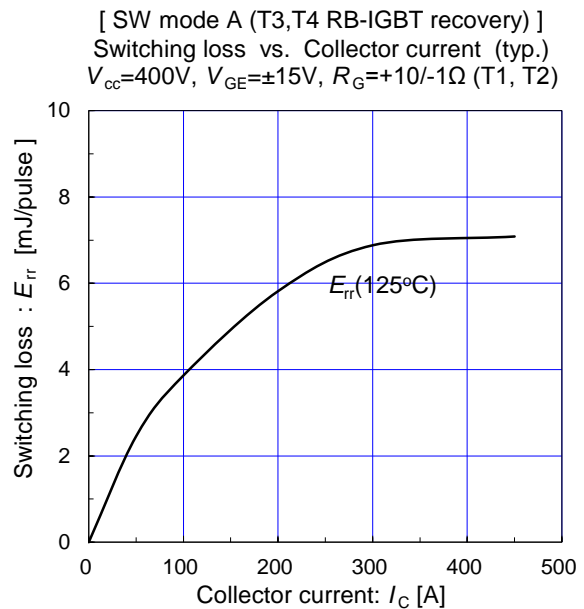
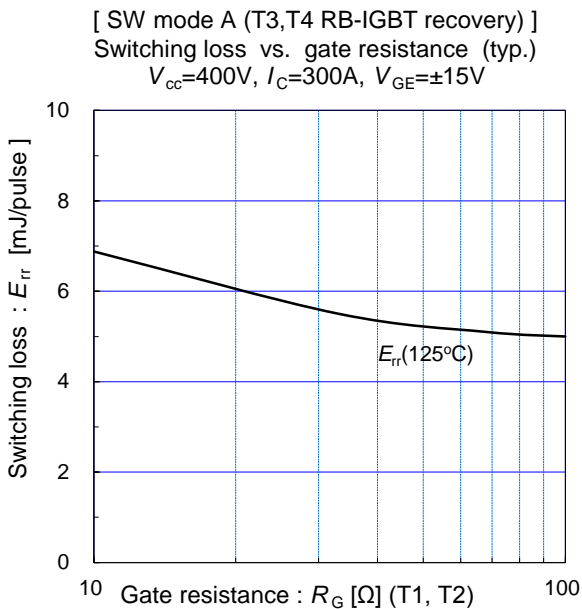
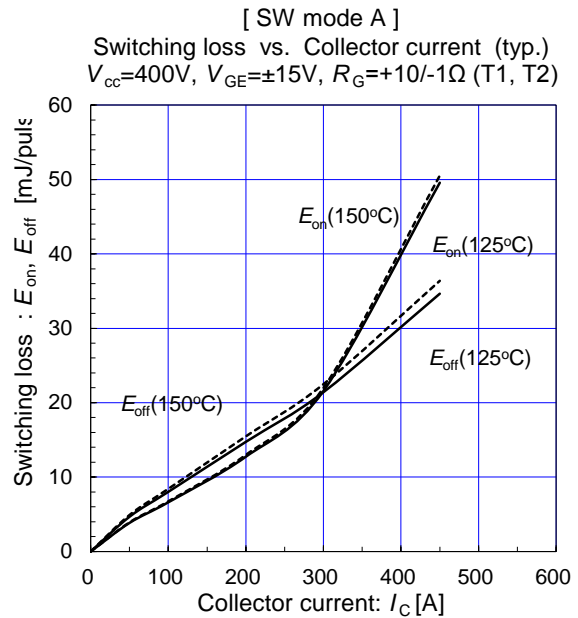
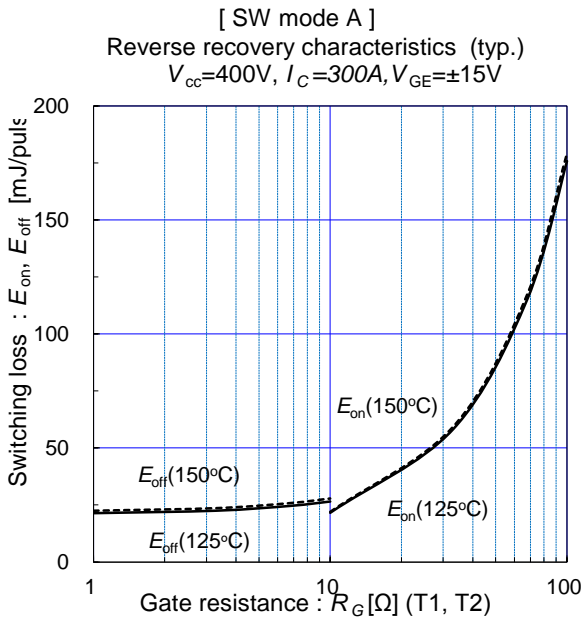
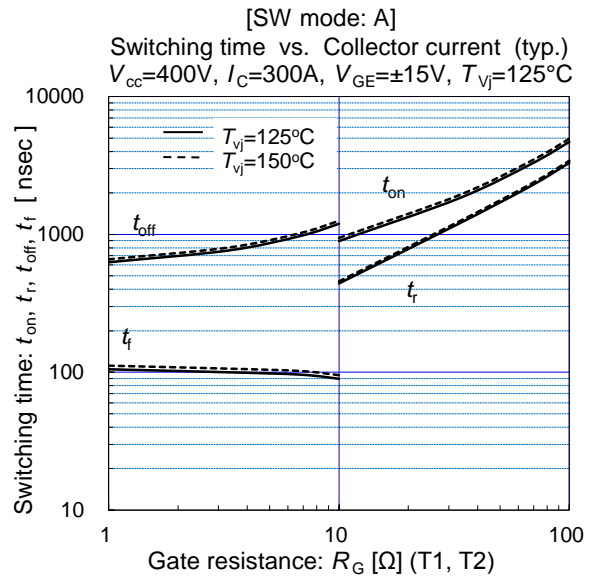
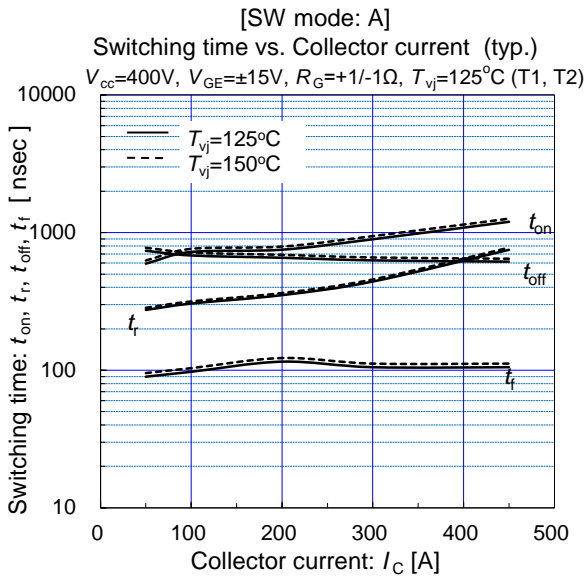
4MBI340VF-120R-50

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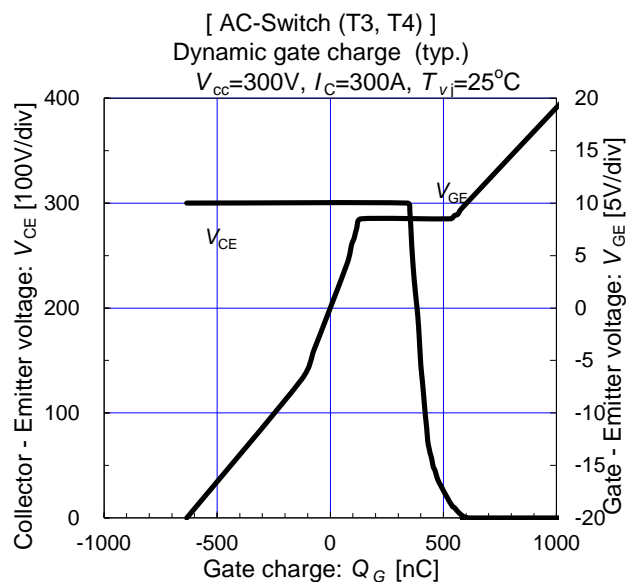
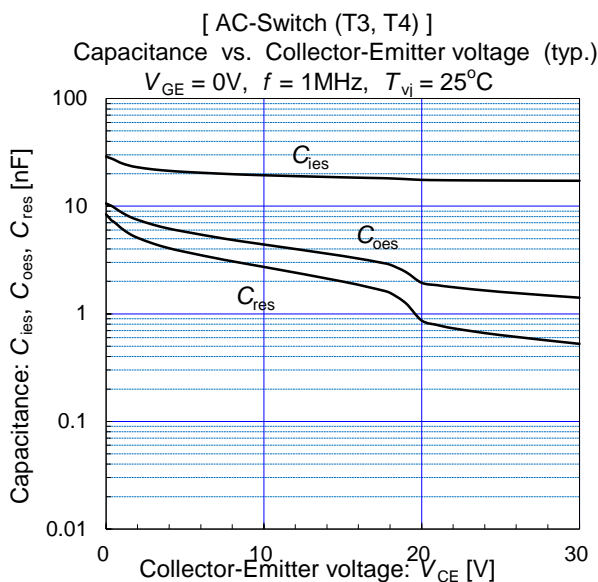
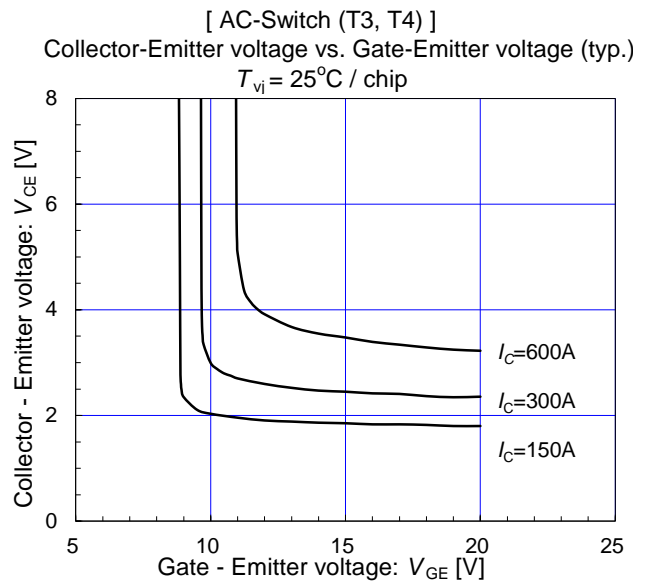
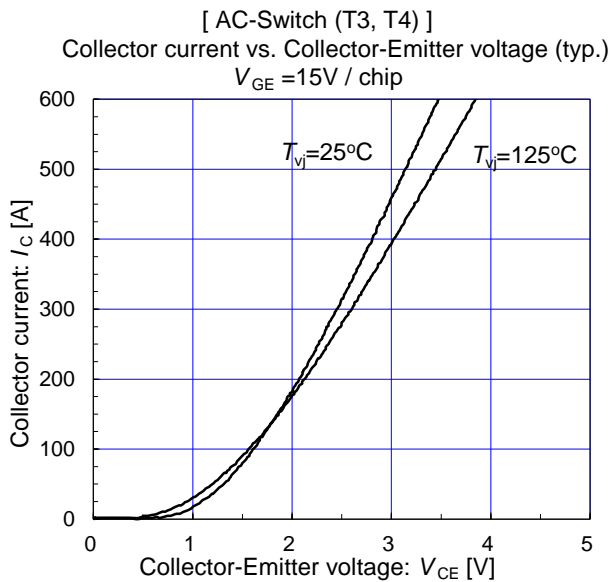
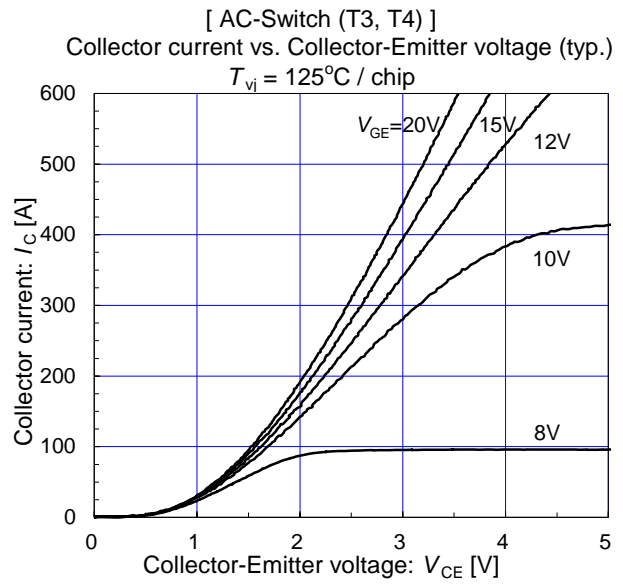
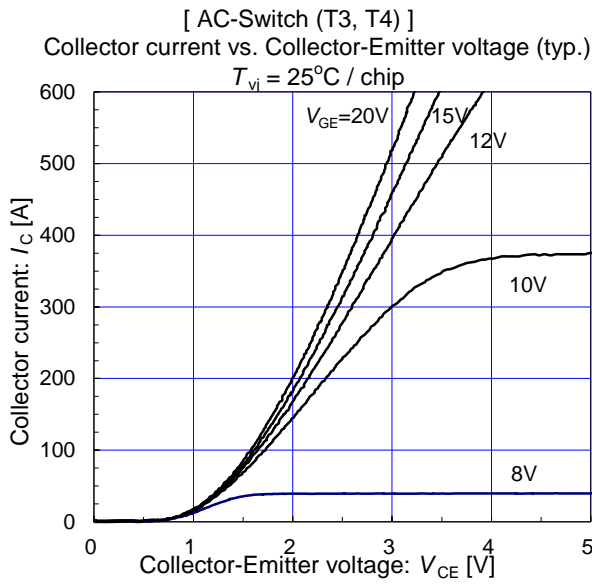
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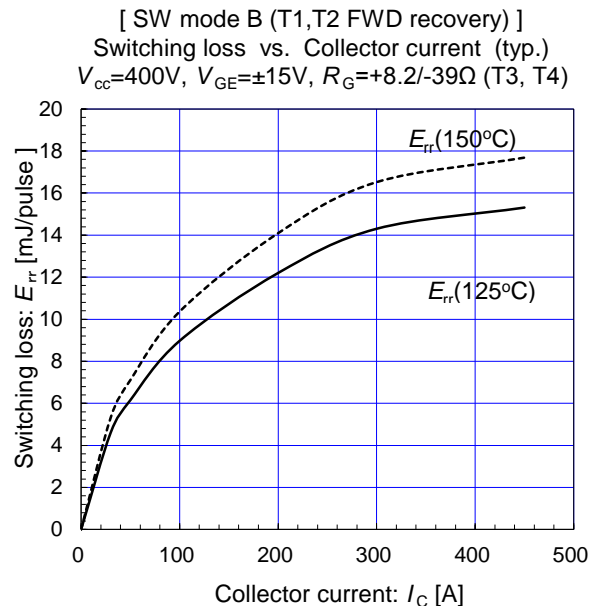
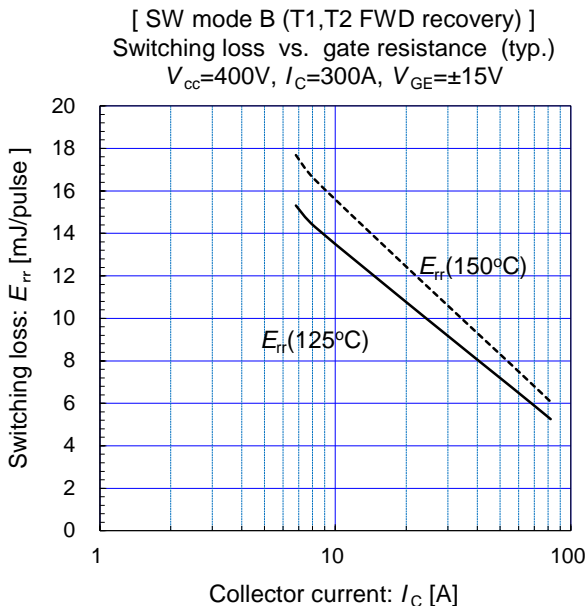
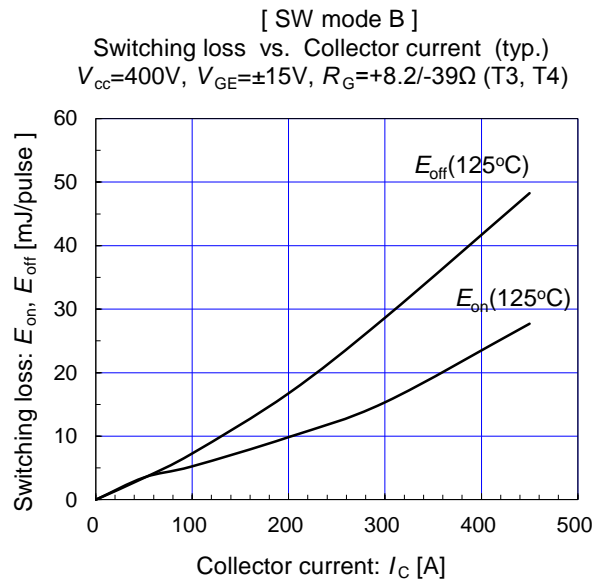
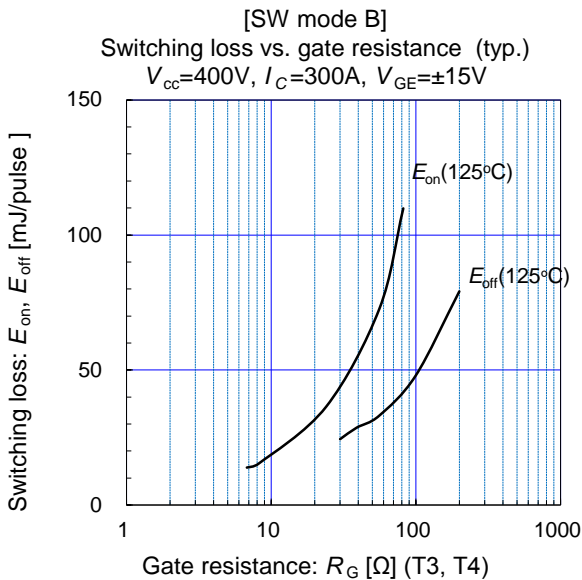
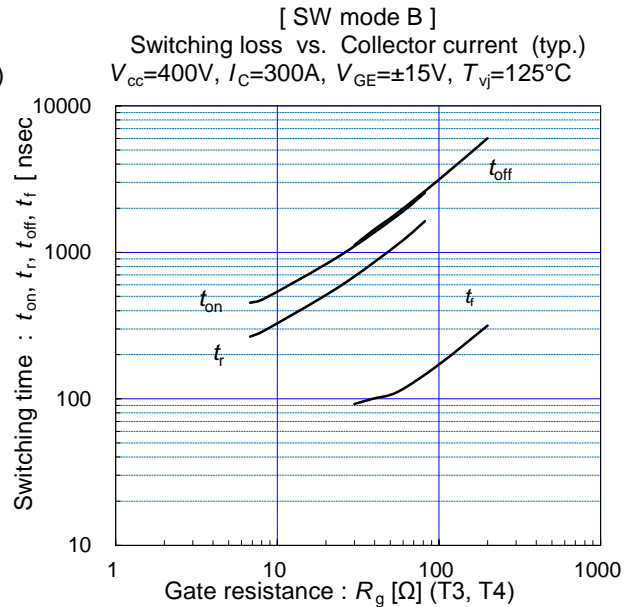
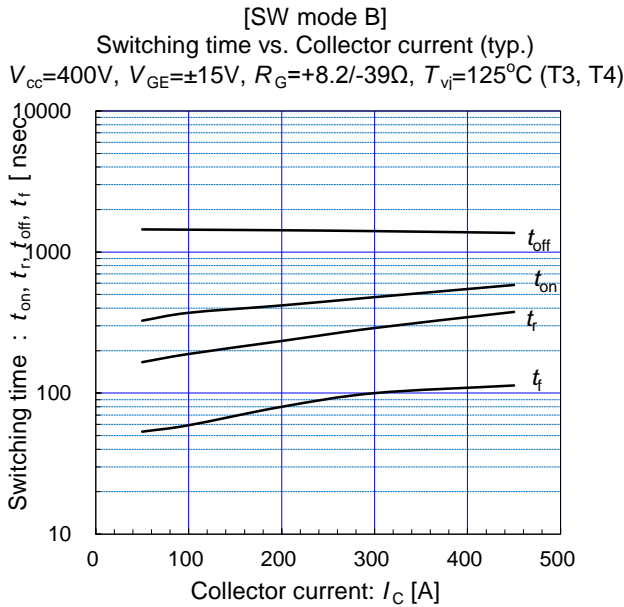
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IGBT Modules



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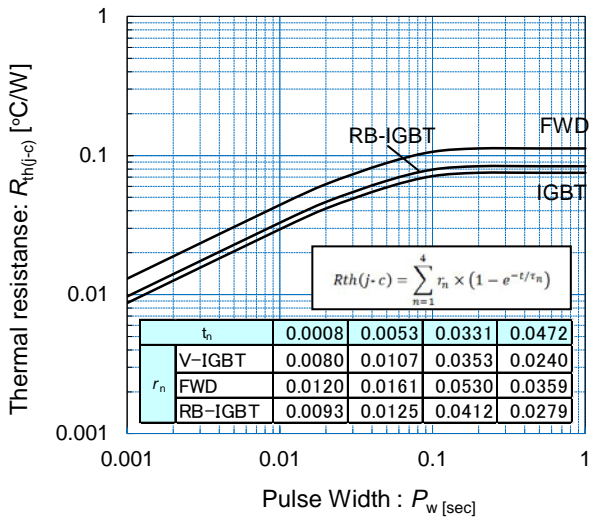
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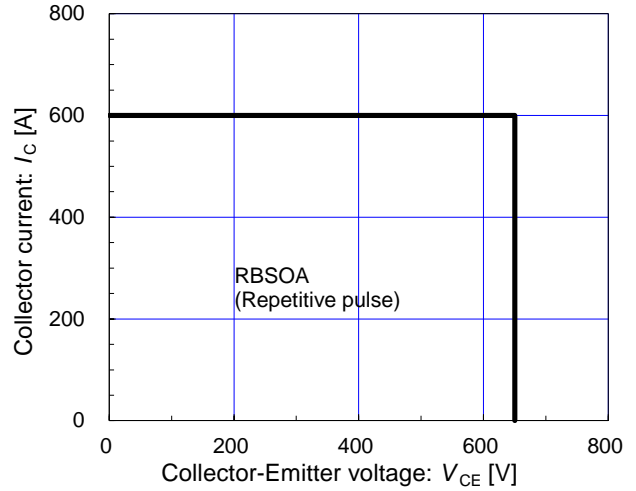
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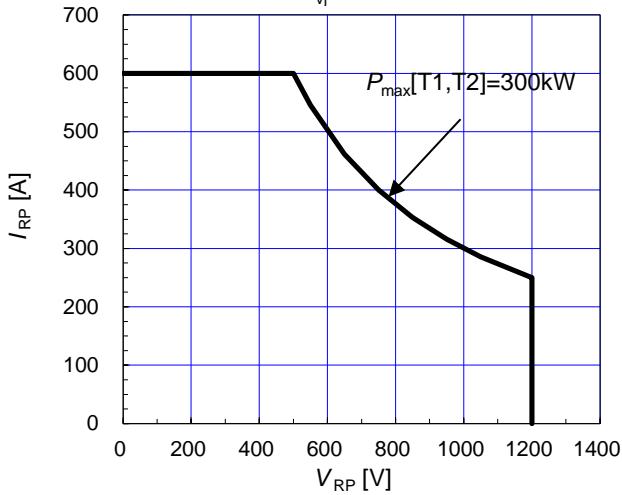
Transient Thermal Resistance (max.)



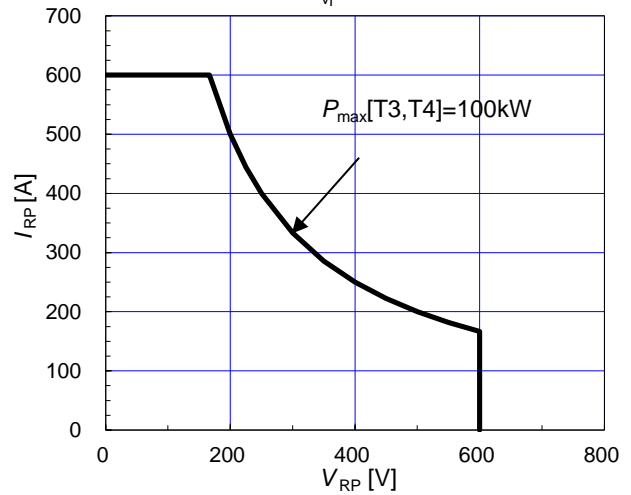
Reverse bias safe operating area (max.)
 $V_{GE} = \pm 15V$, $R_G \geq$ Recommended, $T_{vj} = 125^\circ C$ (T3, T4)
 T3, T4 (Terminal)



Reverse recovery withstand capability for FWD
 $T_{vj} = 150^\circ C$



Reverse recovery withstand capability for RB-IGBT
 $T_{vj} = 125^\circ C$



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