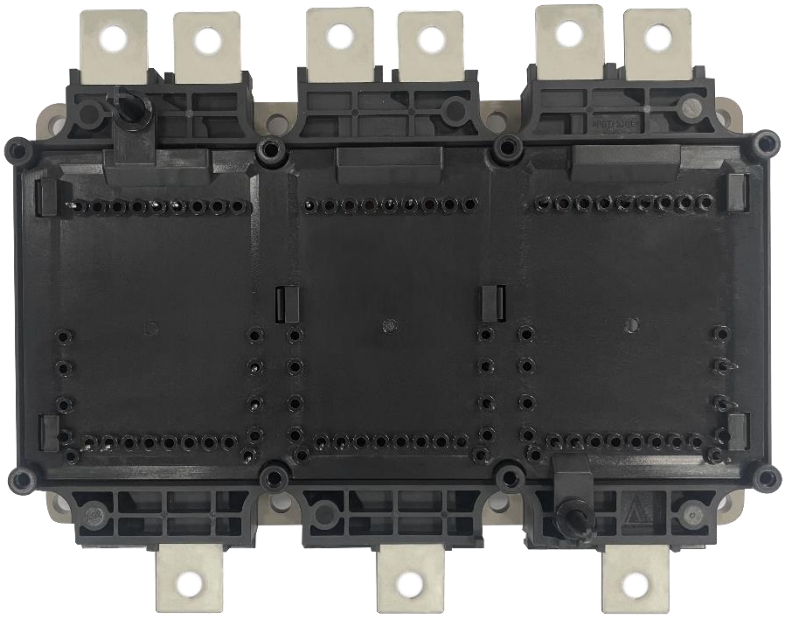
Power Module

AEP550B08TFST

DATASHEET

V1.0, 2022/12



Applications

- Motor Drives
- All-Terrain Vehicles
- Automotive Applications
- Hybrid Electrical Vehicles (H) EV
- Commercial Agriculture Vehicles

Electrical Features

- Low Q_g
- $T_{j,op}$ = 150°C
- Low Inductive Design
- Blocking voltage 750V
- Fast and soft reverse recovery
- Low V_{CEsat} and Switching Losses

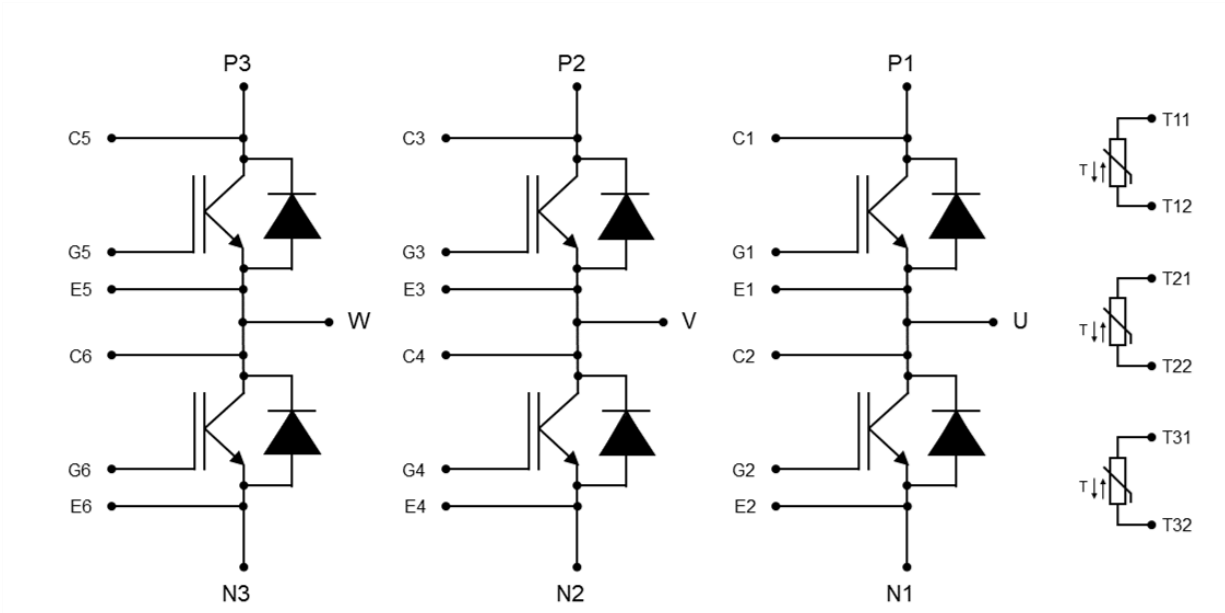
Mechanical Features

- Compact Design
- 4.2KV DC Insulation
- UL 94 V0 Module Frame
- Temperature Sense Included
- Direct Water Cooling Base Plate
- Easy to Integrate 6-pack Topology
- Pb-free device and RoHS compliant
- Guiding Elements for PCB and cooler assembly

FEATURES

- High speed, low loss IGBT module
- High reliability, high durability module

Circuit Diagram



IGBT Inverter

Maximum Rated Values

Parameter	Conditions	Symbol	Values	Unit
Collector-emitter voltage	T_j = 25°C	V_{CES}	750	V
Gate-emitter peak voltage		V_{GES}	±20	V
Implemented collector current		I_{CN}	550	A
Continuous DC collector current	T_F = 70°C, T_j = 175°C	$I_{C\ nom}$	300	A
Repetitive peak collector current	t_p = 1 ms	I_{CRM}	1100	A
Maximum Junction Temperature		$T_{j,max}$	175	°C

Characteristics Values

Parameter	Conditions		Symbol	Min.	Typ.	Max.	Unit
Collector-emitter saturation voltage	I_C = 300A, V_{GE} = 15V	T_j = 25°C	$V_{CE,sat}$		1.20	1.50	V
	I_C = 300A, V_{GE} = 15V	T_j = 150°C			1.30		
	I_C = 300A, V_{GE} = 15V	T_j = 175°C			1.35		
	I_C = 550A, V_{GE} = 15V	T_j = 25°C			1.40		
	I_C = 550A, V_{GE} = 15V	T_j = 150°C			1.55		
	I_C = 550A, V_{GE} = 15V	T_j = 175°C			1.65		
Gate threshold voltage	I_C = 9.6 mA, V_{CE} = V_{GE}	T_j = 25°C	V_{GEth}	5.10	5.70	6.50	V
	I_C = 9.6 mA, V_{CE} = V_{GE}	T_j = 150°C			4.00		
	I_C = 9.6 mA, V_{CE} = V_{GE}	T_j = 175°C			3.30		
Collector-emitter cut-off current	V_{CE} = 750V, V_{GE} = 0V	T_j = 25°C	I_{CES}			1.0	mA
	V_{CE} = 750V, V_{GE} = 0V	T_j = 150°C			5.0		
	V_{CE} = 750V, V_{GE} = 0V	T_j = 175°C			10.0		
Gate-emitter leakage current	V_{CE} = 0V, V_{GE} = 20V	T_j = 25°C	I_{GES}			400	nA
Gate Charge	V_{GE} = -8 V / + 15 V, V_{CE} = 400V	T_j = 25°C	Q_g		1.5		µC
Internal gate resistor		T_j = 25°C	R_{Gint}		1.7		Ω
Input capacitance	f = 1MHz, V_{CE} = 50 V, V_{GE} = 0V	T_j = 25°C	C_{ies}		29.0		nF
Output capacitance	f = 1MHz, V_{CE} = 50 V, V_{GE} = 0V	T_j = 25°C	C_{oes}		1.0		nF

Parameter	Conditions		Symbol	Min.	Typ.	Max.	Unit
Reverse transfer capacitance	f = 1MHz, V_{CE} = 50 V, V_{GE} = 0V	T_j = 25°C	C_{res}		0.5		nF
Turn-on delay time, inductive load	I_C = 300A, V_{CE} = 400V, V_{GE} = -8 V / + 15 V R_{GON} = 2.5 Ω	T_j = 25°C T_j = 150°C T_j = 175°C	$t_{d(on)}$		0.085 0.090 0.095		µs
Rise time, inductive load	I_C = 300A, V_{CE} = 400V, V_{GE} = -8 V / + 15 V R_{GON} = 2.5 Ω	T_j = 25°C T_j = 150°C T_j = 175°C	t_r		0.057 0.060 0.061		µs
Turn-on energy loss per pulse	I_C = 300A, V_{CE} = 400V, L_S = 30nH V_{GE} = -8 V / + 15 V, R_{GON} = 2.5 Ω di/dt = 4200 A/µs (25°C) di/dt = 3900 A/µs (175°C)	T_j = 25°C T_j = 150°C T_j = 175°C	E_{on}		9.0 11.3 12.1		mJ
Turn-off delay time, inductive load	I_C = 300A, V_{CE} = 400V, V_{GE} = -8 V / + 15 V R_{Goff} = 5.0 Ω	T_j = 25°C T_j = 150°C T_j = 175°C	$t_{d(off)}$		0.37 0.42 0.43		µs
Fall time, inductive load	I_C = 300A, V_{CE} = 400V, V_{GE} = -8 V / + 15 V R_{Goff} = 5.0 Ω	T_j = 25°C T_j = 150°C T_j = 175°C	t_f		0.27 0.42 0.43		µs
Turn-off energy loss per pulse	I_C = 300A, V_{CE} = 400V, L_S = 30nH V_{GE} = -8 V / + 15 V, R_{Goff} = 5.0 Ω dv/dt = 3300 V/µs (25°C) dv/dt = 2650 A/µs (175°C)	T_j = 25°C T_j = 150°C T_j = 175°C	E_{off}		19.0 24.5 25.4		mJ
SC data	$V_{GE} \leqq$ 15 V, V_{CC} = 400 V $t_p \leqq$ 6 µs $t_p \leqq$ 3 µs	T_j = 25°C T_j = 175°C	I_{SC}		4200 3500		A
Thermal resistance, junction to cooling fluid	Per IGBT; dv/dT = 10 dm^3/min, T_F = 70°C		R_{thJF}		0.145	0.170	K/W

Diode Inverter

Maximum Rated Values

Parameter	Conditions	Symbol	Values	Unit
Repetitive peak reverse voltage	T_j = 25°C	V_{RRM}	750	V
Implemented forward current		I_{FN}	550	A
Continuous DC forward current	T_F = 70°C, Tj = 175°C	$I_{C\ nom}$	300	A
Repetitive peak forward current	t_p = 1 ms	I_{FRM}	1100	A

Characteristics Values

Parameter	Conditions		Symbol	Typ.	Max.	Unit
Forward voltage	I_F = 300A, V_{GE} = 0V	T_j = 25°C	V_F	1.50	1.70	V
	I_F = 300A, V_{GE} = 0V	T_j = 150°C		1.55		
	I_F = 300A, V_{GE} = 0V	T_j = 175°C		1.60		
	I_F = 550A, V_{GE} = 0V	T_j = 25°C		1.80		
	I_F = 550A, V_{GE} = 0V	T_j = 150°C		2.00		
	I_F = 550A, V_{GE} = 0V	T_j = 175°C		2.10		
Peak reverse recovery current	I_F = 300A, V_R = 400V, V_{GE} = -8V, $-di_F/dt$ = 4200 A/µs (25°C) $-di_F/dt$ = 3300 A/µs (175°C)	T_j = 25°C	I_{RM}	195		A
		T_j = 150°C		235		
		T_j = 175°C		250		
Recovered charge	I_F = 300A, V_R = 400V, V_{GE} = -8V, $-di_F/dt$ = 4200 A/µs (25°C) $-di_F/dt$ = 3300 A/µs (175°C)	T_j = 25°C	Q_{rr}	10.8		µC
		T_j = 150°C		17.8		
		T_j = 175°C		20.1		
Reverse recovery energy	I_F = 300A, V_R = 400V, V_{GE} = -8V $-di_F/dt$ = 4200 A/µs (25°C) $-di_F/dt$ = 3300 A/µs (175°C)	T_j = 25°C	E_{rec}	2.9		mJ
		T_j = 150°C		5.0		
		T_j = 175°C		5.7		
Thermal resistance, junction to cooling fluid	Per diode; dV/dT = 10 dm^3/min, T_F = 70°C		R_{thJF}	0.255	0.290	K/W

NTC-Thermistor

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Rated resistance	T_c = 25°C	R_{25}		5.0		kΩ
Resistance tolerance	T_c = 100°C, R_{100}=493Ω	△R/R	5		5	%
B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 – 1/(298\ K))]$	$B_{25/50}$		3375		K
B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 – 1/(298\ K))]$	$B_{25/80}$		3411		K
B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 – 1/(298\ K))]$	$B_{25/100}$		3433		K

Module

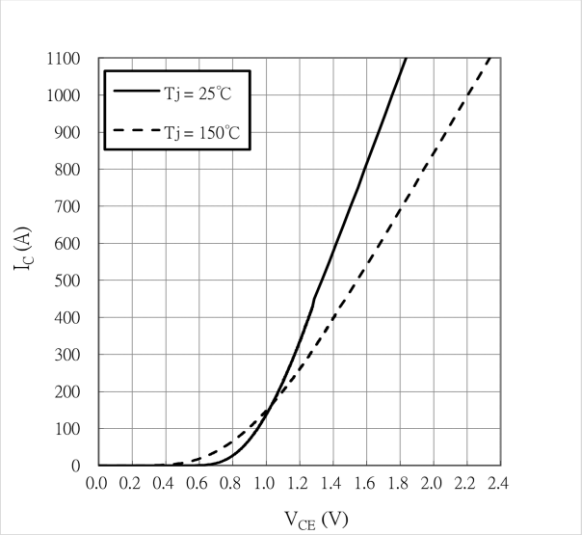
Parameter	Conditions	Symbol	Value	Unit
Isolation test voltage	RMS, f = 0 Hz, t = 1 sec	V_{ISOL}	4.2	kV
Module baseplate material			Cu + Ni	
Module internal isolation material			Al_2O_3	
Creepage distance	Terminal to Heat sink Terminal to Terminal	d_{cree}	9.0 9.0	mm
Clearance	Terminal to heat sink Terminal to Terminal	d_{clear}	4.5 4.5	mm
Comparative tracking index [1)]		CTI	> 200	

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Module stray inductance		L_{sCE}		8		nH
Storage temperature		T_{stg}	-40		125	°C
Weight		G		750		g

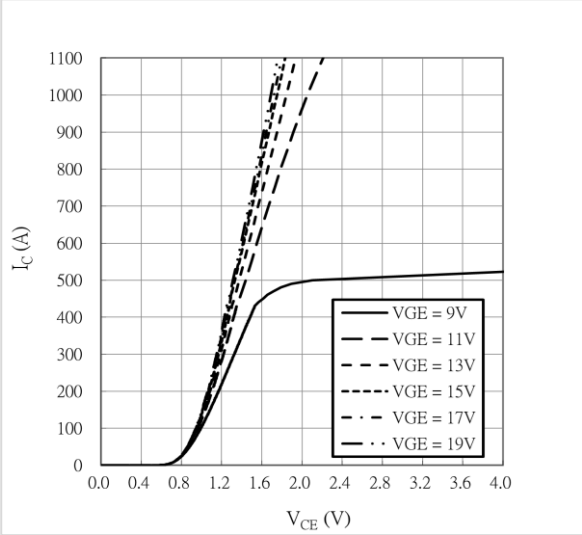
1) Extracted by following UL 746A

Characteristics Diagrams

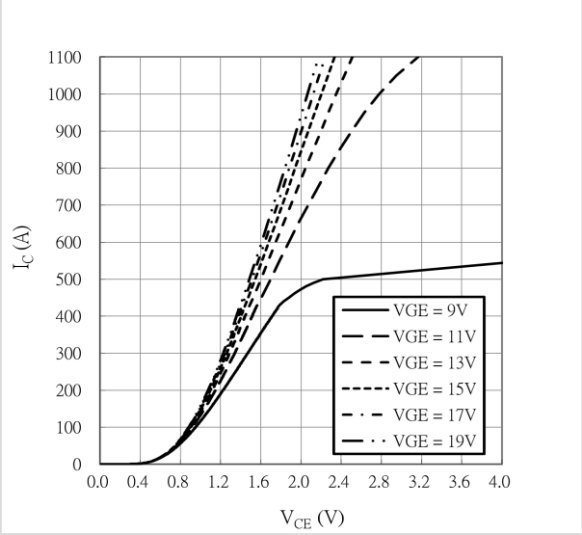
Output characteristics IGBT, Inverter
V_{GE} = 15 V, $I_C = f(V_{CE})$



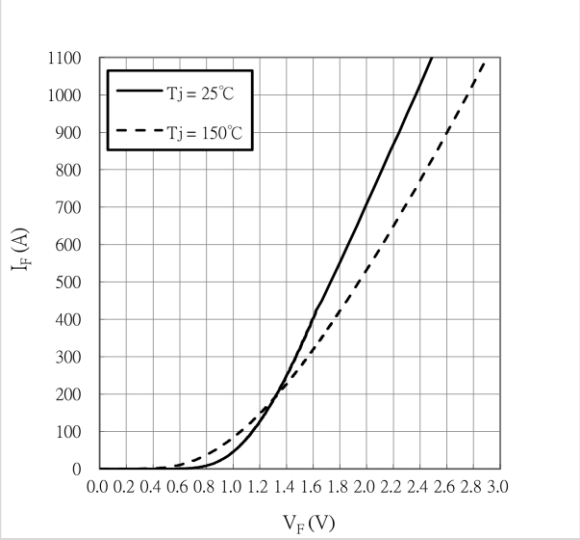
Output characteristics IGBT, Inverter
T_j = 25°C, $I_C = f(V_{CE})$



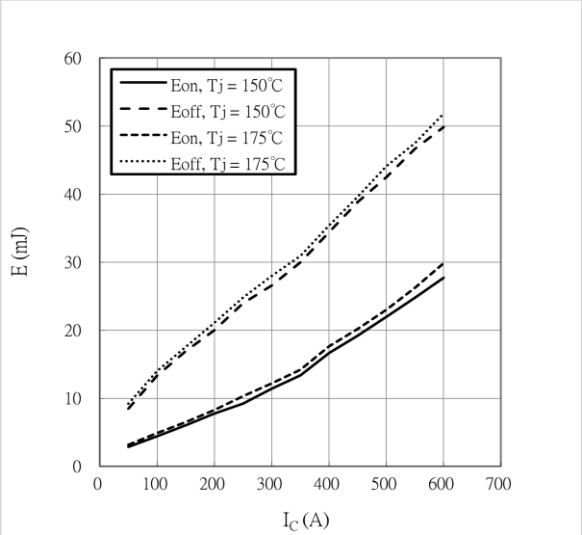
Output characteristics IGBT, Inverter
T_j = 150°C, $I_C = f(V_{CE})$



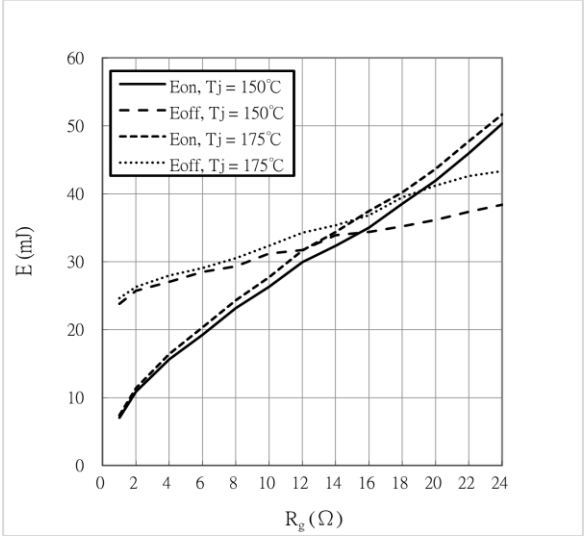
Forward characteristics of Diode, Inverter
$I_f = f(V_f)$



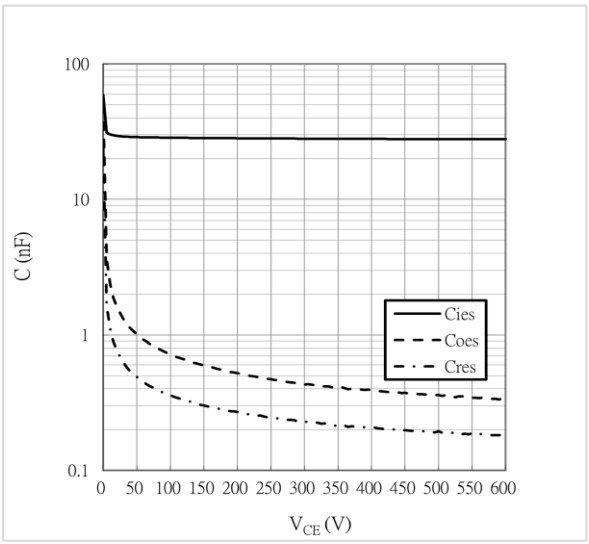
Switching losses IGBT, Inverter
V_{GE} = + 15 V / -8 V, R_{GON} = 2.5 Ω,
R_{Goff} = 5.0 Ω, V_{CE} = 400 V, E_{ON} & E_{off} = f(I_c)



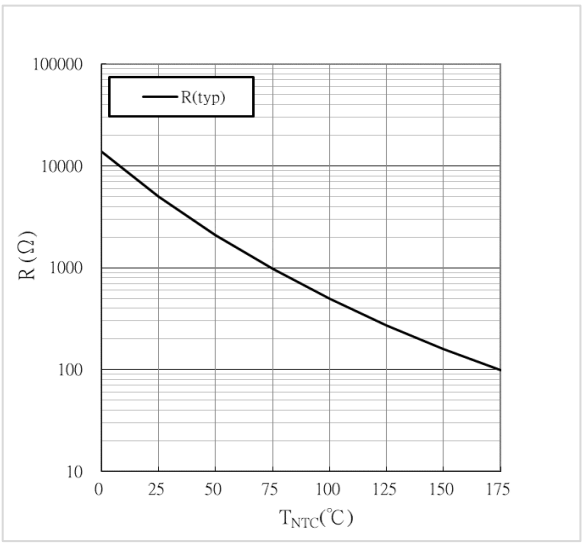
Switching losses IGBT, Inverter
V_{GE} = + 15 V / -8 V, V_{CE} = 400 V, I_C = 300 A
E_{ON} & E_{off} = f(R_g)



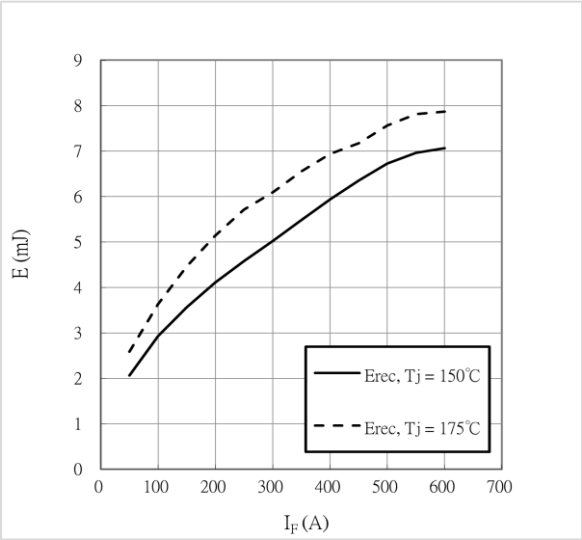
Capacitance characteristics IGBT, inverter
V_{GE} = 0 V, T_j = 25°C, f = 1 MHz, C = f(V_{CE})



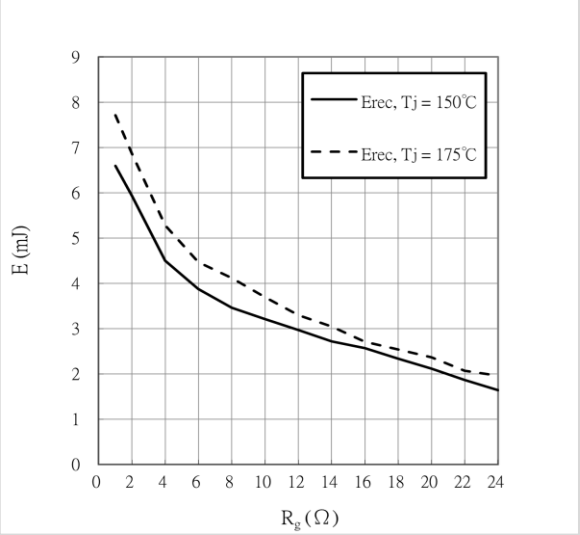
NTC-Thermistor-temperature characteristics



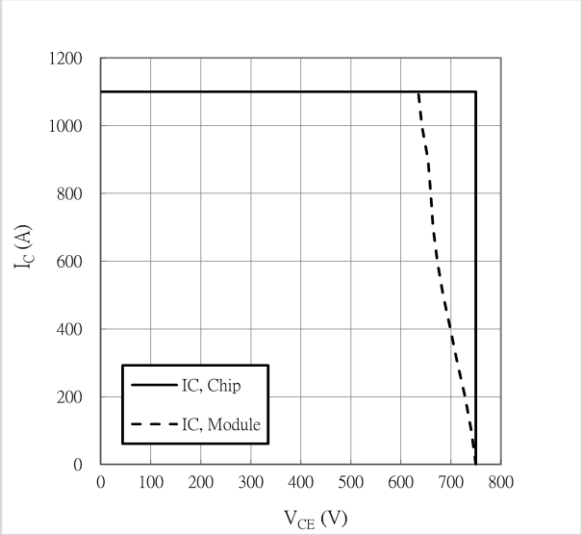
Switching losses Diode, Inverter
R_G = 2.5 Ω, V_R = 400 V, E_{rec} = f(I_f)



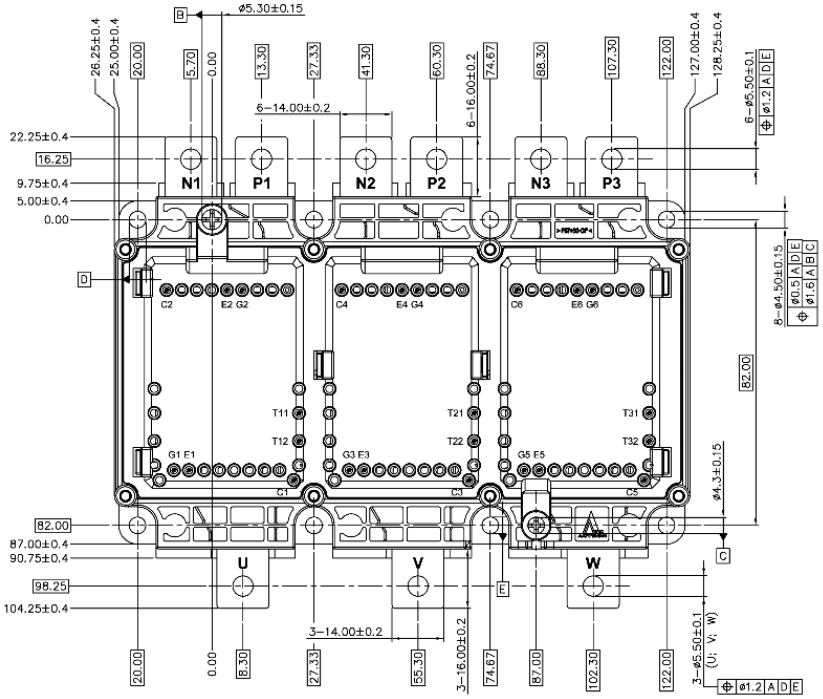
Switching losses Diode, Inverter
I_F = 300A, V_R = 400 V, E_{rec} = f(R_g)

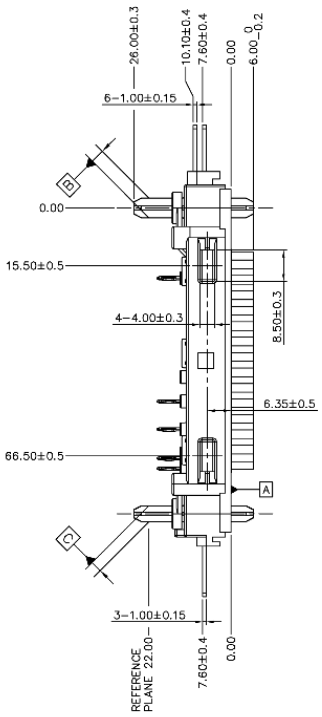


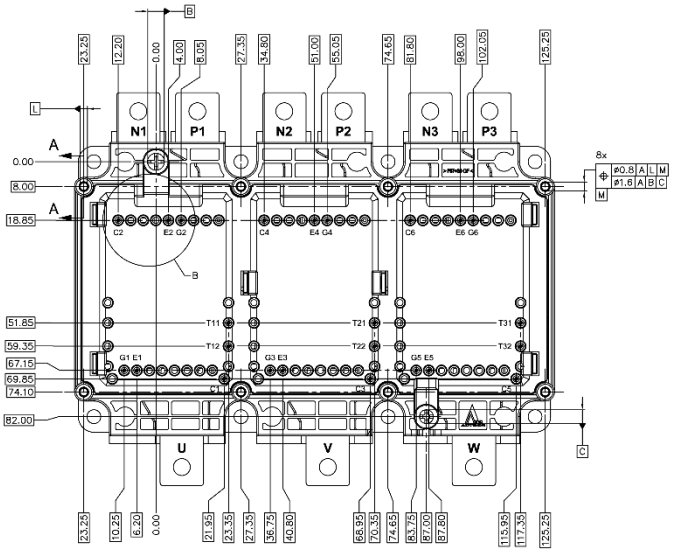
Reverse bias safe operating area (RBSOA)
V_{GE} = + 15 V / -8 V, R_{Goff} = 5.0 Ω, T_j = 175°C

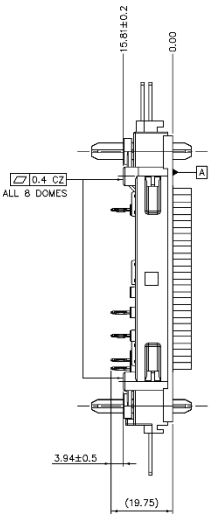


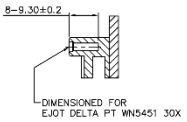
Package Outlines

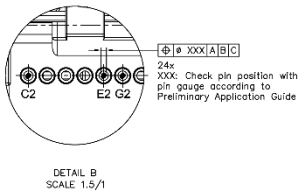












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