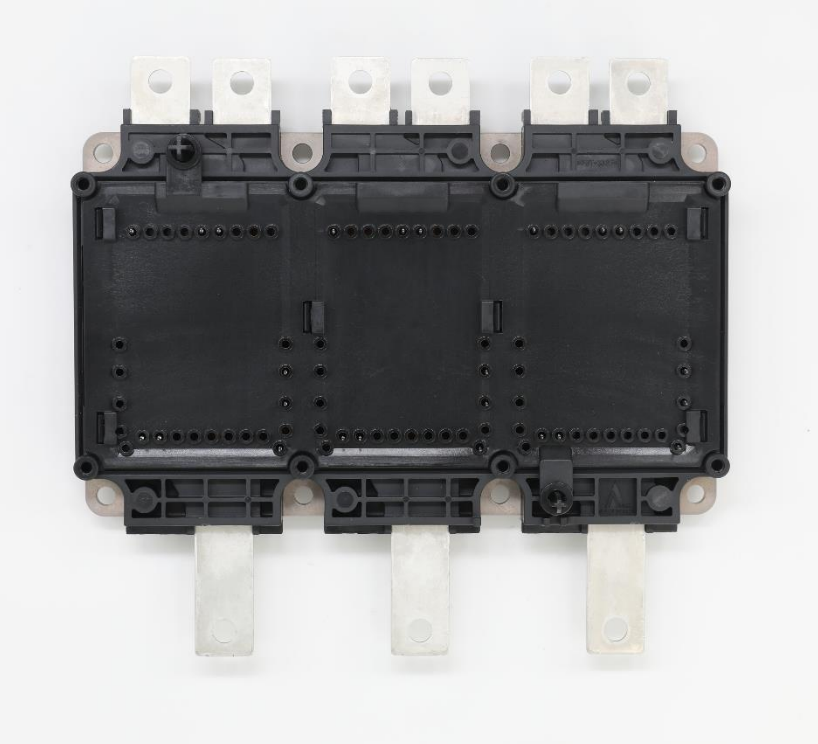
Power Module

AEP820B08TFLT

DATASHEET

V1.1, 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

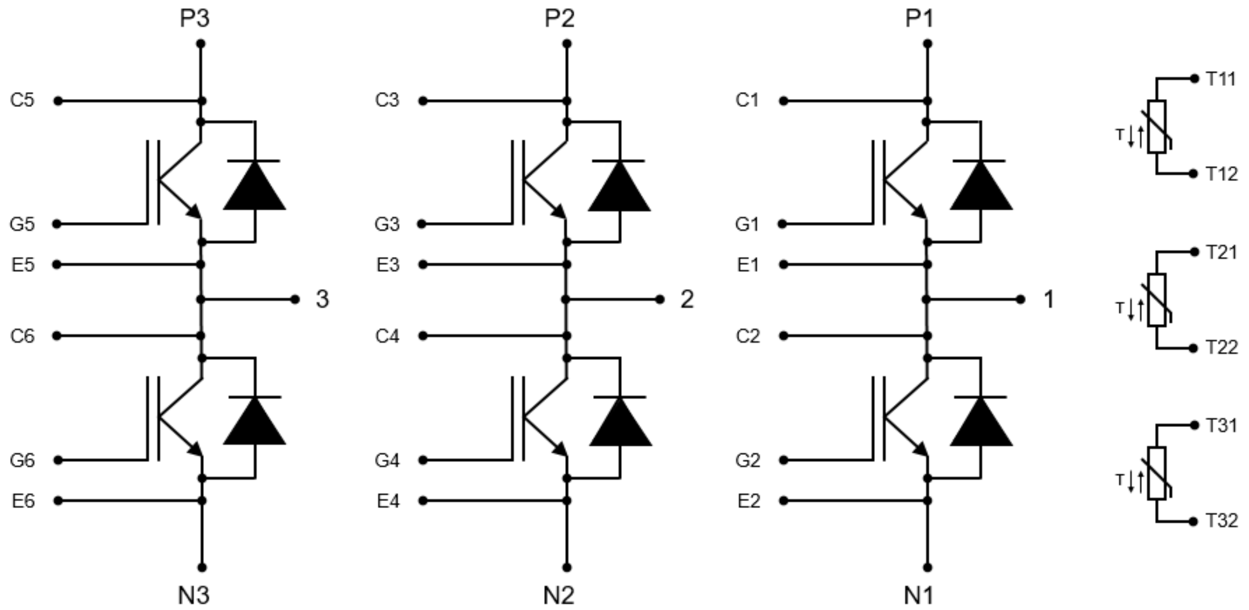
Mechanical Features

- 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}	820	A
Continuous DC collector current	T_F = 70°C, T_j = 175°C	$I_{C\ nom}$	450	A
Repetitive peak collector current	t_p = 1 ms	I_{CRM}	1640	A
Maximum Junction Temperature		$T_{j,max}$	175	ºC

Characteristics Values

Parameter	Conditions		Symbol	Min.	Typ.	Max.	Unit
Collector-emitter saturation voltage	I_C = 450A, V_{GE} = 15V	T_j = 25°C	$V_{CE,sat}$		1.15	1.45	V
	I_C = 450A, V_{GE} = 15V	T_j = 150°C			1.25		
	I_C = 450A, V_{GE} = 15V	T_j = 175°C			1.30		
	I_C = 820A, V_{GE} = 15V	T_j = 25°C			1.40		
	I_C = 820A, V_{GE} = 15V	T_j = 150°C			1.60		
	I_C = 820A, V_{GE} = 15V	T_j = 175°C			1.70		
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			4.20		
	I_C = 9.6 mA, V_{CE} = V_{GE}	T_j = 175°C			3.95		
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		2.2		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}		45		nF
Output capacitance	f = 1MHz, V_{CE} = 50 V, V_{GE} = 0V	T_j = 25°C	C_{oes}		2.8		nF
Reverse transfer capacitance	f = 1MHz, V_{CE} = 50 V, V_{GE} = 0V	T_j = 25°C	C_{res}		1.5		nF

Parameter	Conditions		Symbol	Min.	Typ.	Max.	Unit
Turn-on delay time, inductive load	I_C = 450A, 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	$t_{d(on)}$		0.14 0.11 0.11		µs
Rise time, inductive load	I_C = 450A, 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		0.069 0.070 0.072		µs
Turn-on energy loss per pulse	I_C = 450A, V_{CE} = 400V, L_S = 30nH V_{GE} = -8 V / + 15 V, R_{GON} = 2.5 Ω di/dt = 5500 A/µs (25°C) di/dt = 5100 A/µs (150°C)	T_j = 25°C T_j = 150°C T_j = 175°C	E_{on}		13.5 15.5 17.5		mJ
Turn-off delay time, inductive load	I_C = 450A, 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	$t_{d(off)}$		0.55 0.56 0.57		µs
Fall time, inductive load	I_C = 450A, 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 0.45		µs
Turn-off energy loss per pulse	I_C = 450A, V_{CE} = 400V, L_S = 30nH V_{GE} = -8 V / + 15 V, R_{Goff} = 5.0 Ω dv/dt = 2500 V/µs (25°C) dv/dt = 2200 V/µs (150°C)	T_j = 25°C T_j = 150°C T_j = 175°C	E_{off}		35.5 45.5 50.5		mJ
SC data	V_{GE} ≦ 15 V, V_{CC} = 400 V t_p ≦ 6 µs t_p ≦ 3 µs	T_j = 25°C T_j = 175°C	I_{SC}		4800 3800		A
Thermal resistance, junction to cooling fluid	Per IGBT; dV/dT = 10 dm³/min, T_F = 70°C		R_{thJF}		0.120	0.140	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}	820	A
Continuous DC forward current		I_F	450	A
Repetitive peak forward current	t_p = 1 ms	I_{FRM}	1640	A
I^2t (value)	V_R = 0 V, t_p = 10 ms, T_j = 150°C	I^2t	19000	A^2s

Characteristics Values

Parameter	Conditions		Symbol	Typ.	Max.	Unit
Forward voltage	I_F = 450A, V_{GE} = 0V	T_j = 25°C	V_F	1.45	1.65	V
	I_F = 450A, V_{GE} = 0V	T_j = 150°C		1.50		
	I_F = 450A, V_{GE} = 0V	T_j = 175°C		1.55		
	I_F = 820A, V_{GE} = 0V	T_j = 25°C		1.80		
	I_F = 820A, V_{GE} = 0V	T_j = 150°C		1.85		
	I_F = 820A, V_{GE} = 0V	T_j = 175°C		1.90		
Peak reverse recovery current	I_F = 450A, V_R = 400V, V_{GE} = -8V, $-di_F/dt$ = 5000 A/µs (25°C) $-di_F/dt$ = 4100 A/µs (150°C)	T_j = 25°C T_j = 150°C T_j = 175°C	I_{RM}	225 275 290		A
Recovered charge	I_F = 450A, V_R = 400V, V_{GE} = -8V, $-di_F/dt$ = 5000 A/µs (25°C) $-di_F/dt$ = 4100 A/µs (150°C)	T_j = 25°C T_j = 150°C T_j = 175°C	Q_{rr}	14.0 26.5 31.0		µC
Reverse recovery energy	I_F = 450A, V_R = 400V, V_{GE} = -8V $-di_F/dt$ = 5000 A/µs (25°C) $-di_F/dt$ = 4100 A/µs (150°C)	T_j = 25°C T_j = 150°C T_j = 175°C	E_{rec}	3.5 8.3 9.6		mJ
Thermal resistance, junction to cooling fluid	Per diode; dV/dT = 10 dm³/min, T_F = 70°C		R_{thJF}	0.175	0.200	K/W

gNTC-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	$\Delta R/R$	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

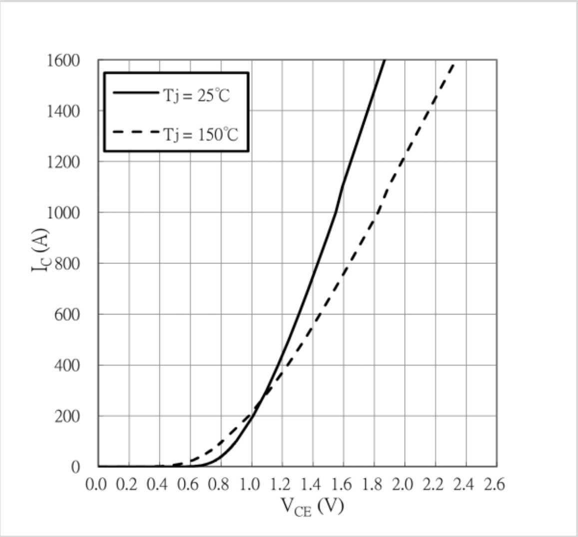
Parameter	Conditions	Symbol	Value	Unit
Isolation test voltage	RMS, f = 0 Hz, t = 1 sec	V_{ISOL}	4.2	kV
Module baseplate material			Cu + Ni	
Module internal isolation material			Al_2O_3	
Creepage distance	Terminal to Heat sink Terminal to Terminal	d_{cree}	9.0 9.0	mm
Clearance	Terminal to heat sink Terminal 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}		7		nH
Storage temperature		T_{stg}	-40		125	°C
Weight		G		750		g

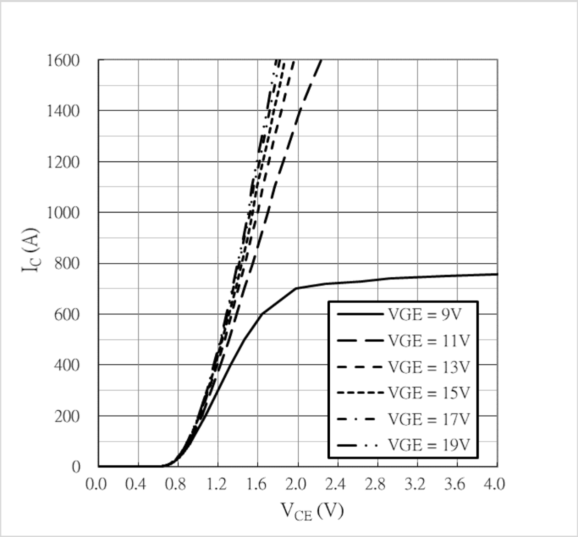
1) Extracted by following UL 746A

Characteristics Diagrams

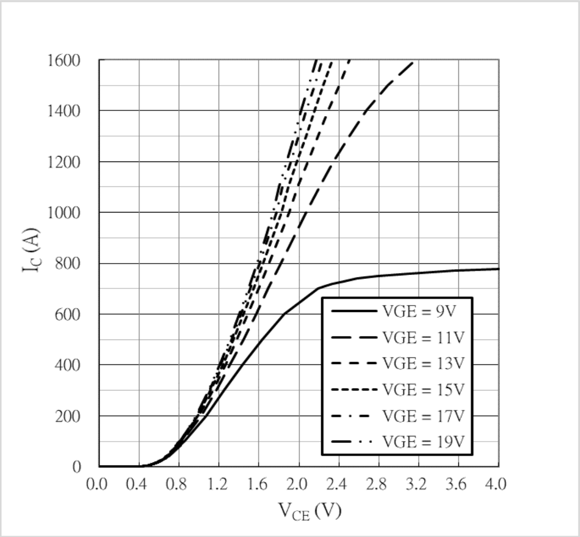
Output characteristics IGBT, Inverter
V_{GE} = 15 V, $I_C = f(V_{CE})$



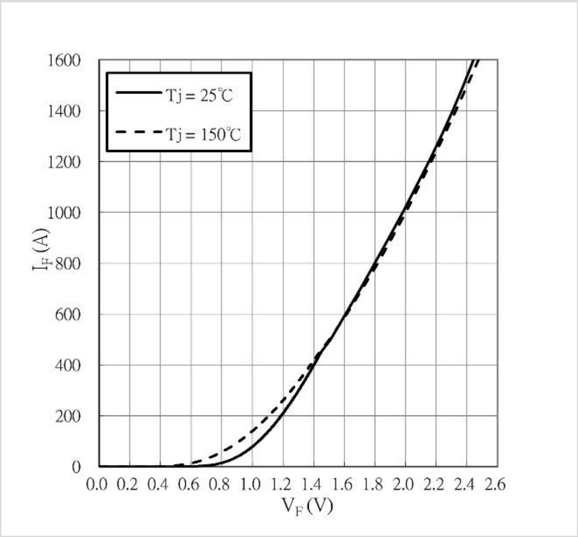
Output characteristics IGBT, Inverter
T_j = 25°C, $I_C = f(V_{CE})$



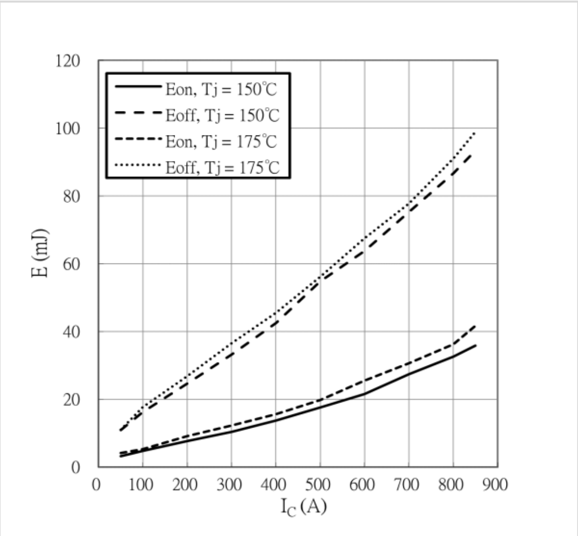
Output characteristics IGBT, Inverter
T_j = 150°C, $I_C = f(V_{CE})$



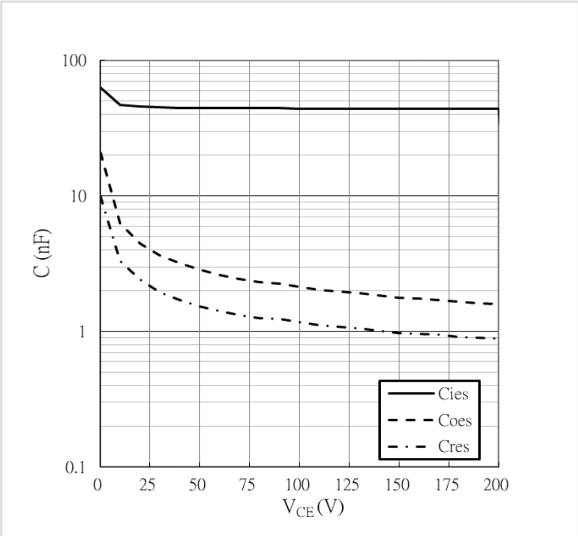
Forward characteristics of Diode, Inverter
$I_f = f(V_f)$



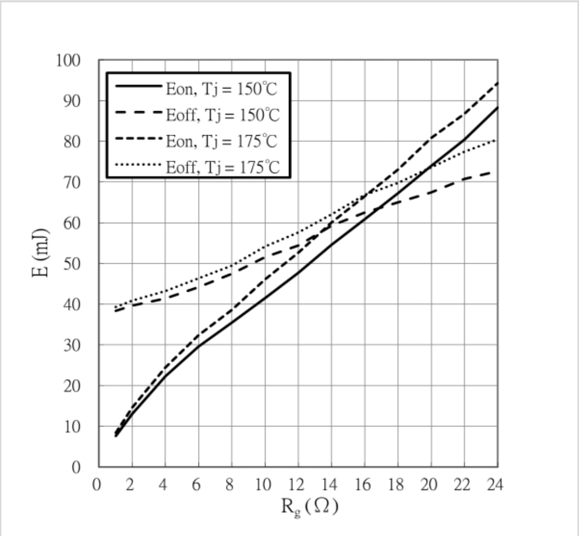
Switching losses IGBT, Inverter
V_{GE} = + 15 V / -8 V, R_{GON} = 2.5 Ω,
R_{Goff} = 5.0 Ω, V_{CE} = 400 V, E_{ON} & E_{off} = f(I_c)



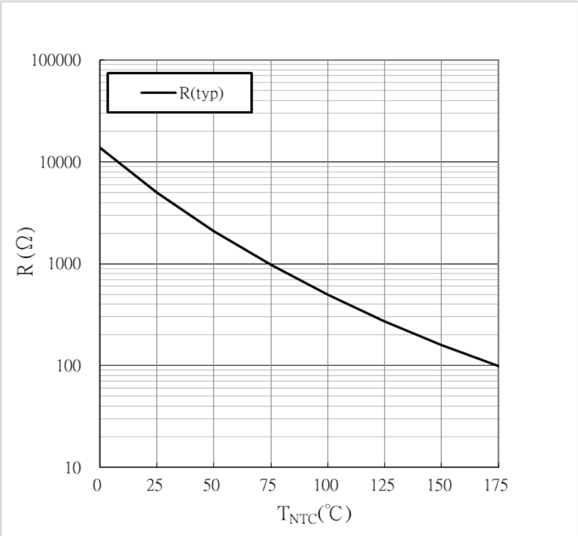
Capacitance characteristics IGBT, inverter
VGE = 0 V, T_j = 25°C, f = 1 MHz, C = f(V_{CE})



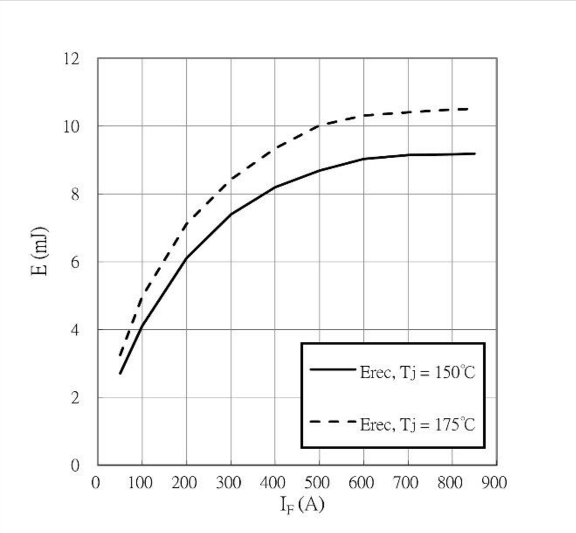
Switching losses IGBT, Inverter
V_{GE} = + 15 V / -8 V, V_{CE} = 400 V, I_C = 450 A
E_{ON} & E_{off} = f(R_g)



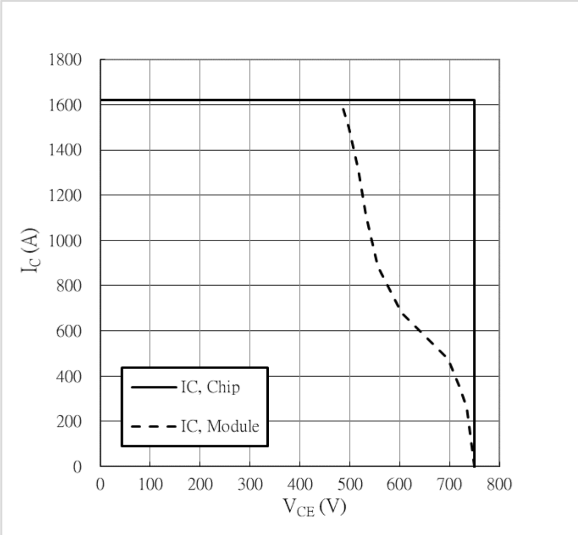
NTC-Thermistor-temperature characteristic



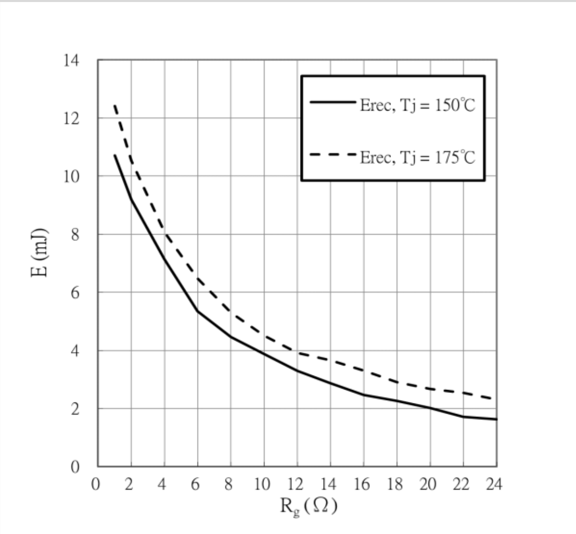
Switching losses Diode, Inverter
R_G = 2.5 Ω, V_R = 400 V, E_{rec} = f(I_f)



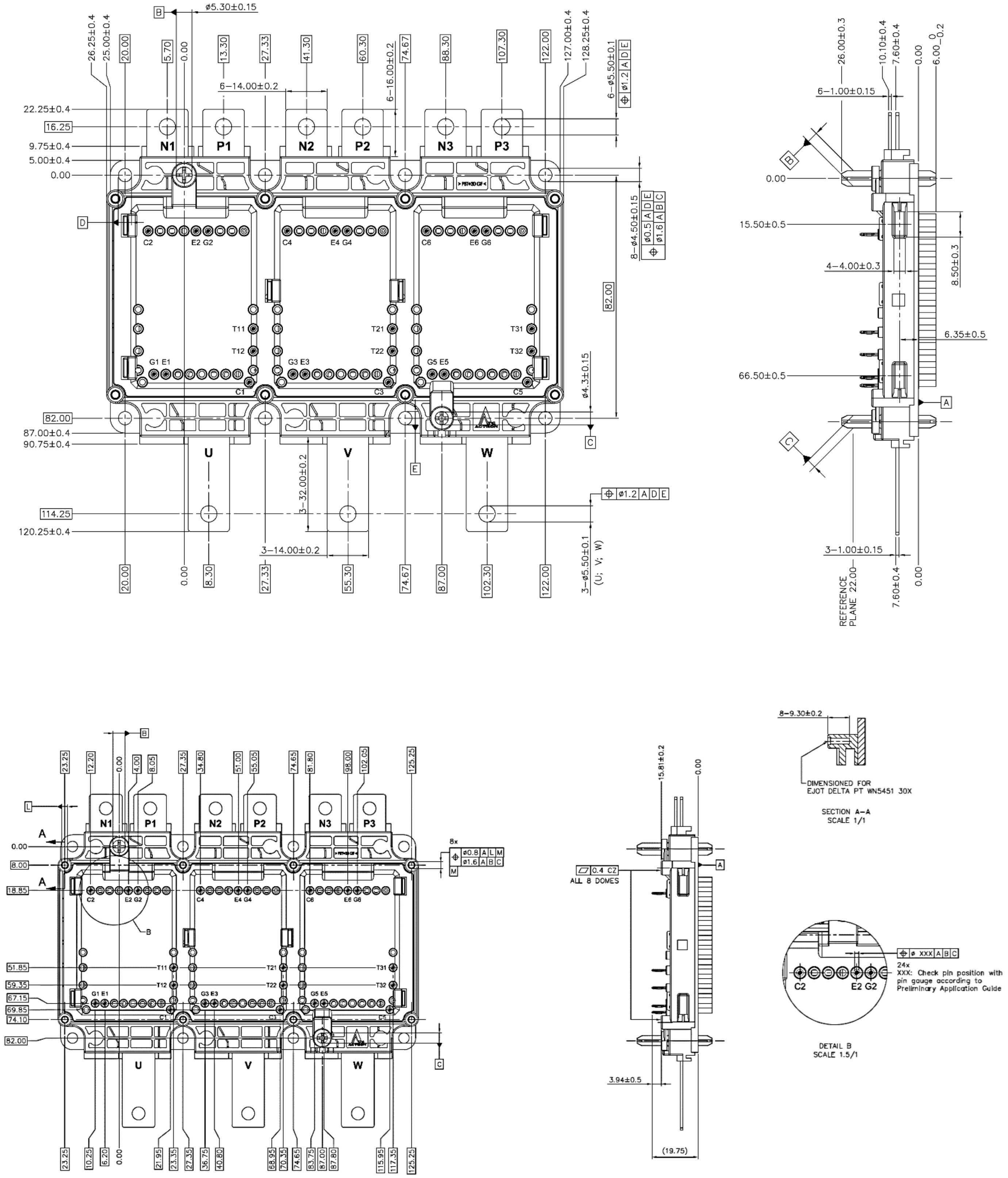
Reverse bias safe operating area (RBSOA)
V_{GE} = + 15 V / -8 V, R_{Goff} = 5.0 Ω, T_j = 175°C



Switching losses Diode, Inverter
I_F = 450A, V_R = 400 V, E_{rec} = f(R_g)



Package Outlines



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