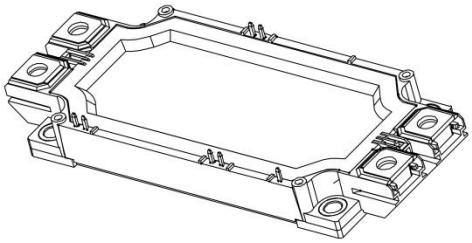
Half-Bridge IGBT Module
Edual3
1200 V, 450 A
ED450X12T4AHN



PIM11, 152.00 × 62.00 × 20.90

CASE 180HT

General Description

The ED450X12T4AHN is a 1200 V 450 A rated half bridge IGBT power module. The integrated Filed Stop Trench IGBTs and diodes provide lower conduction losses and switching losses, enabling designers to achieve high efficiency and superior reliability.

Features

- 1200 V, 450 A Half Bridge IGBT Power Module
- Field Stop Trench IGBTs & Diodes
- NTC Thermistor
- Isolated Base Plate
- Solderable Pins
- Low Inductive Layout

Typical Applications

- Motor Drives
- Servo Drives
- Solar Drives
- Uninterruptible Power Supply Systems (UPS)

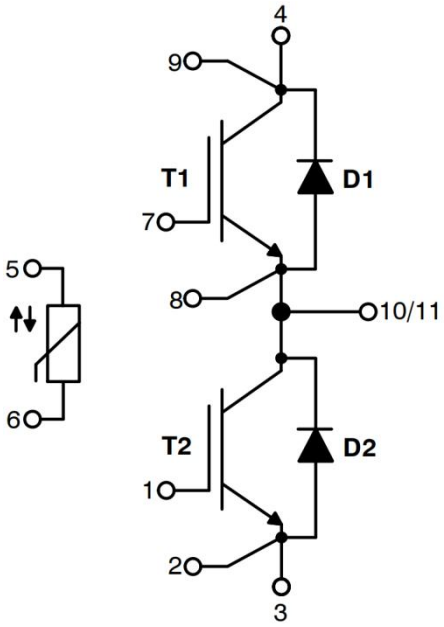


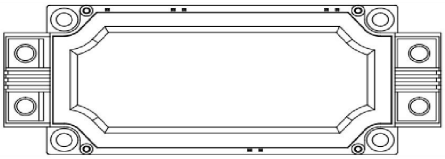
Figure 1. Schematic

MARKING DIAGRAM



ED450X12T4AHN = Device Code
WEXXXXXX = Year, Month and day
XXXX = Flow code

PIN ASSIGNMENTS



ORDERING INFORMATION

Device	Package
ED450X12T4AHN	Edual3

PIN DESCRIPTION

Pin	Name	Description
1	G2	T2 Gate
2	E2	T2 Emitter
3	DC-	DC Negative Bus Connection
4	DC+	DC Positive Bus Connection
5	TH2	Thermistor Connection 2
6	TH1	Thermistor Connection 1
7	G1	T1 Gate
8	E1	T1 Emitter
9	CS1	T1 Collector Sensing
10	OUT	Center Point of Half Bridge
11	OUT	Center Point of Half Bridge

MAXIMUM RATINGS

Rating	Symbol	Value	Unit

IGBT / Diode

Collector-Emitter Voltage	V_{CES}	1200	V
Gate−Emitter Voltage	V_{GES}	±20	V
Continuous Collector Current @ T_C = 100 ℃	I_C	450	A
Repetitive Pulsed Collector Current @ T_C = 25℃, t_P = 1ms	I_{pluse}	900	A
Operating Junction Temperature	T_{vjop}	-40 ~ 150	℃
Short Circuit Withstand Time, Non Repetitive @ $V_{GE} \leq 15$ V, $V_{DC+} \leq 800$ V	T_{SCWT}	10	us

MODULE

Isolation Voltage @ RMS, f = 50 Hz, t = 1 min	V_{ISO}	2500	V
Storage Temperature	T_{STG}	-40 ~ 125	V
Mounting torque to main terminals (Note1) @ M6 screw	M_T	6.0	N·m
Mounting torque to heat sink (Note1) @ M5 screw	M_H		

1. Recommendable value: 3.0 ~ 6.0 N·m

THERMAL RESISTANCE CHARACTERISTICS

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Junction-to-Case	per IGBT	R_{thJC}	-	-	0.051	K/W
Junction-to-Case	per Diode		-	-	0.097	
Case-to-Heatsink	per IGBT	R_{thCH}	-	0.067	-	
Case-to-Heatsink	per Diode		-	0.091	-	

THERMISTOR CHARACTERISTICS

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Rated Resistance		R_{25}	-	5	-	kΩ
Deviation of R_{100}	T_C = 100 ℃, R_{100} = 493.3 Ω	ΔR/R	-5	-	5	%
Power Dissipation		P_{25}	-	-	20.0	mW
B-value	$R_2 = R_{25}\exp[B_{25/50}(1/T_2-1/(298.15K))]$	$B_{25/50}$	-	3375	-	K
B-value	$R_2 = R_{25}\exp[B_{25/80}(1/T_2-1/(298.15K))]$	$B_{25/80}$	-	3411	-	K
B-value	$R_2 = R_{25}\exp[B_{25/100}(1/T_2-1/(298.15K))]$	$B_{25/100}$	-	3433	-	K

ELECTRICAL CHARACTERISTICS (T_J = 25 ℃ unless otherwise noted)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
IGBT						
Collector to Emitter Saturation Voltage	I_C = 450 A, V_{GE} = 15 V, T_J = 25 ℃	$V_{CE(sat)}$	-	1.75	2.10	V
	I_C = 450 A, V_{GE} = 15 V, T_J = 125 ℃		-	2.11	-	
	I_C = 450 A, V_{GE} = 15 V, T_J = 150 ℃			2.20	-	
Gate-Emitter Threshold Voltage	I_C = 17 mA, V_{CE} = V_{GE}, T_J = 25 ℃	$V_{GE(th)}$	5.20	5.89	6.40	V
Gate Charge	V_{GE} = -15…+15 V	Q_G	-	3.89	-	µC
Internal Gate Resistance	T_J = 25 ℃	R_{Gint}	-	0.38	-	Ω
Input Capacitance	V_{CE} = 25 V, f = 1 MHz, V_{GE} = 0 V, T_J = 25 ℃	C_{ies}	-	64.9	-	nF
Reverse Transfer Capacitance		C_{res}	-	1.04	-	
Output Capacitance		C_{oes}	-	2.79	-	
Collector Cut-Off Current	V_{CE} = V_{CES}, V_{GE} = 0 V, T_j = 25 ℃	I_{CES}	-	-	3	mA
Gate-Emitter Leakage Current	V_{GE} = V_{GES}, V_{CE} = 0 V, T_j = 25 ℃	I_{GES}	-	-	400	nA
Turn-on Delay Time	V_{CE} = 600 V, I_C = 450 A V_{GE} = ±15 V, R_G = 1.5 Ω L_S = 7 µH, T_J = 25 ℃	$T_{d(on)}$	-	159	-	ns
Rise Time		t_r	-	101	-	ns
Turn-off Delay Time		$T_{d(off)}$	-	315	-	ns
Fall Time		t_f	-	175	-	ns
Turn-on Switching Loss per Pulse		E_{on}	-	71.56	-	mJ
Turn-off Switching Loss per Pulse		E_{off}	-	32.32	-	mJ
Turn−on Delay Time	V_{CE} = 600 V, I_C = 450 A V_{GE} = ±15 V, R_G = 1.5 Ω L_S = 7 µH, T_J = 125 ℃	$T_{d(on)}$	-	175	-	ns
Rise Time		t_r	-	108	-	ns
Turn-off Delay Time		$T_{d(off)}$	-	358	-	ns
Fall Time		t_f	-	227	-	ns
Turn-on Switching Loss per Pulse		E_{on}	-	94.55	-	mJ
Turn-off Switching Loss per Pulse		E_{off}	-	38.31	-	mJ
Turn-on Delay Time	V_{CE} = 600 V, I_C = 450 A V_{GE} = ±15 V, R_G = 1.5 Ω L_S = 7 µH, T_J = 150 ℃	$T_{d(on)}$	-	183	-	ns
Rise Time		t_r	-	108	-	ns
Turn-off Delay Time		$T_{d(off)}$	-	367	-	ns
Fall Time		t_f	-	242	-	ns
Turn-on Switching Loss per Pulse		E_{on}	-	99.58	-	mJ
Turn-off Switching Loss per Pulse		E_{off}	-	39.31	-	mJ
SC data	t_P ≤ 10 µs, V_{GE} = 15 V, T_J = 150 ℃, V_{CC} = 800 V, V_{CEM} ≤ 1200 V	I_{SC}		1900		A

ELECTRICAL CHARACTERISTICS (T_J = 25℃ unless otherwise noted) (continued)

Parameter	Test Conditions	Symbol	Min	Typ	Max	Unit
DIODE						
Diode Forward Voltage	I_F = 450 A, V_{GE} = 0 V, T_J = 25 ℃	V_F	-	1.70	2.10	V
	I_F = 450 A, V_{GE} = 0 V, T_J = 125 ℃		-	1.68	-	
	I_F = 450 A, V_{GE} = 0 V, T_J = 150 ℃		-	1.66	-	
Diode Reverse Recovery Charge	V_R = 600 V, I_F = 450 A, -di/dt = 3560 A/μs, L_S = 7 μH, V_{GE} = -15 V, T_J = 25 ℃	Q_r	-	58.68	-	uC
Peak Reverse Recovery Current		I_{rrm}	-	141.08	-	A
Reverse Recovery Energy		E_{rr}	-	21.59	-	mJ
Diode Reverse Recovery Charge	V_R = 600 V, I_F = 450 A, -di/dt = 3400 A/μs, L_S = 7 μH, V_{GE} = -15 V, T_J = 125 ℃	Q_r	-	114.52	-	uC
Peak Reverse Recovery Current		I_{rrm}	-	190.16	-	A
Reverse Recovery Energy		E_{rr}	-	44.18	-	mJ
Diode Reverse Recovery Charge	V_R = 600 V, I_F = 450 A, -di/dt = 3350 A/μs, L_S = 7 μH, V_{GE} = -15 V, T_J = 150 ℃	Q_r	-	130.86	-	uC
Peak Reverse Recovery Current		I_{rrm}	-	209.12	-	A
Reverse Recovery Energy		E_{rr}	-	50.76	-	mJ

MODULE AND MECHANICAL CHARACTERISTICS

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Comparative Tracking Index		CTI	＞200	-	-	K/W
Creepage Distance	Terminal to terminal	D_{CR}		13.0		mm
	Terminal to heatsink			14.5		mm
Clearance Distance	Terminal to terminal	D_{CL}		10.0		mm
	Terminal to heatsink			12.5		mm
Module Stray Inductance		M_{LS}		20		nH
Module Weight		M_W		350		g

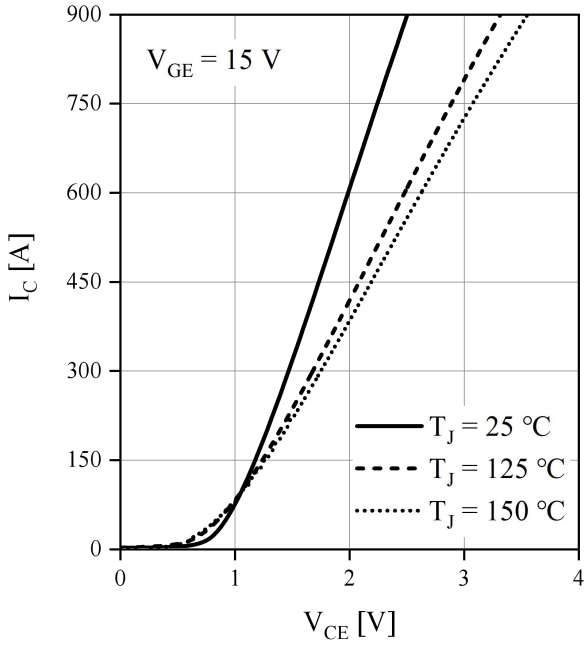


Figure 2. IGBT Output Characteristic

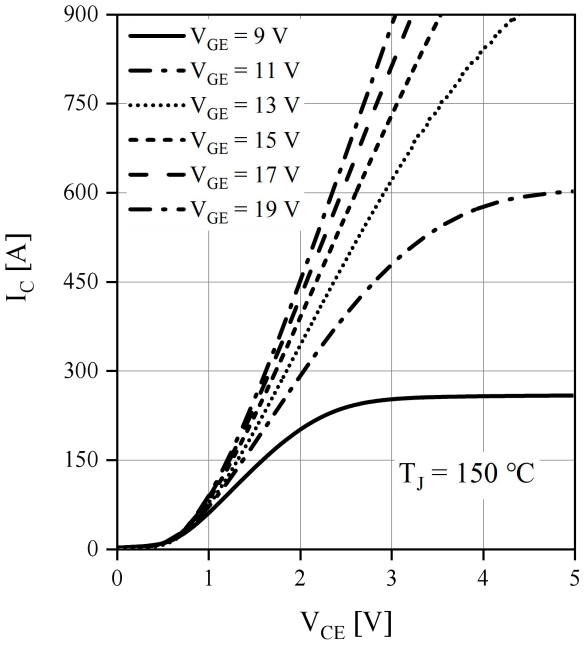


Figure 3. IGBT Output Characteristic

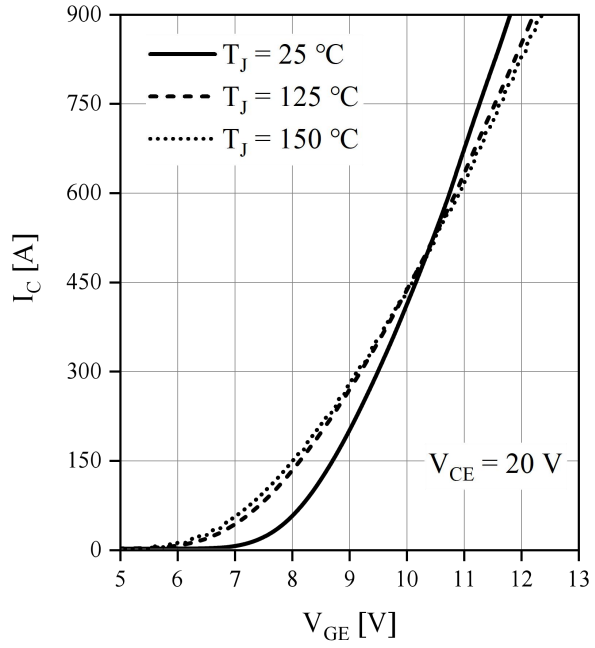


Figure 4. IGBT Transfer Characteristic

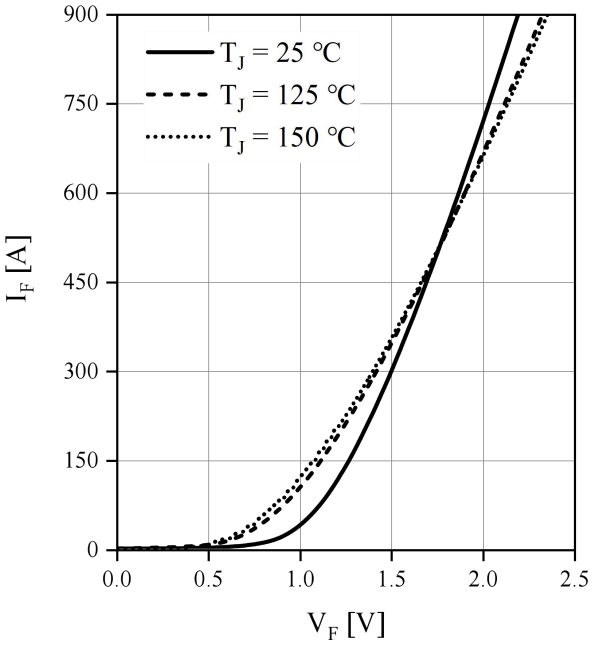


Figure 5. Diode Forward Characteristic

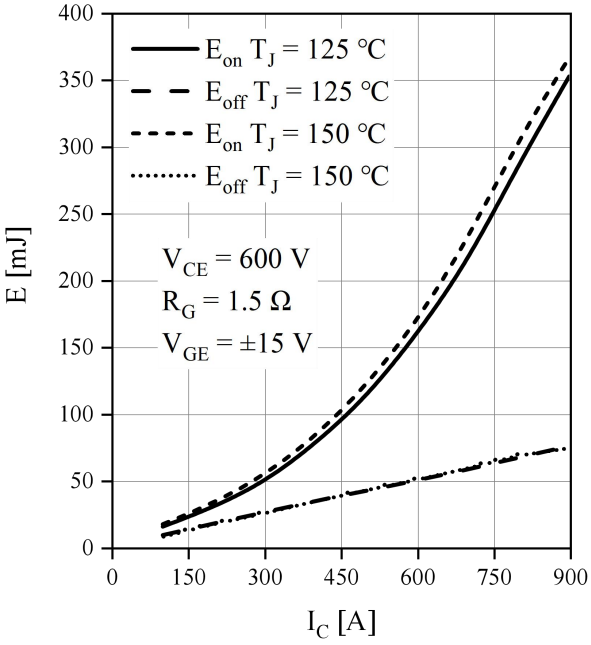


Figure 6. IGBT Switching Loss vs. I_C

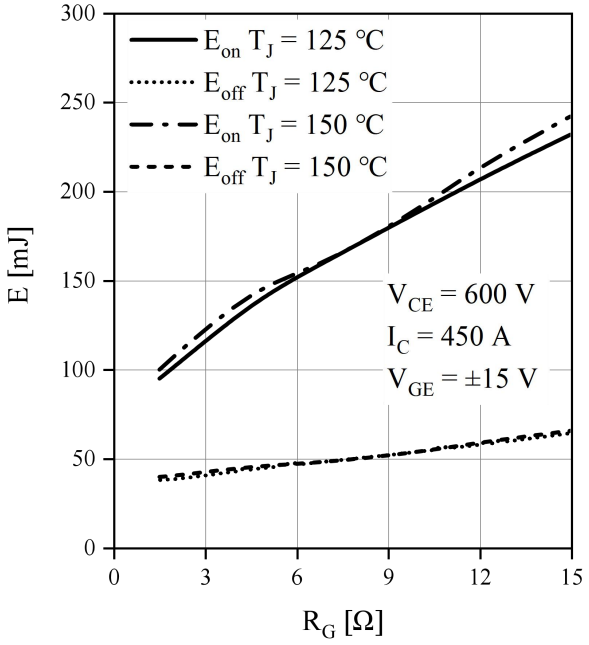


Figure 7. IGBT Switching Loss vs. R_G

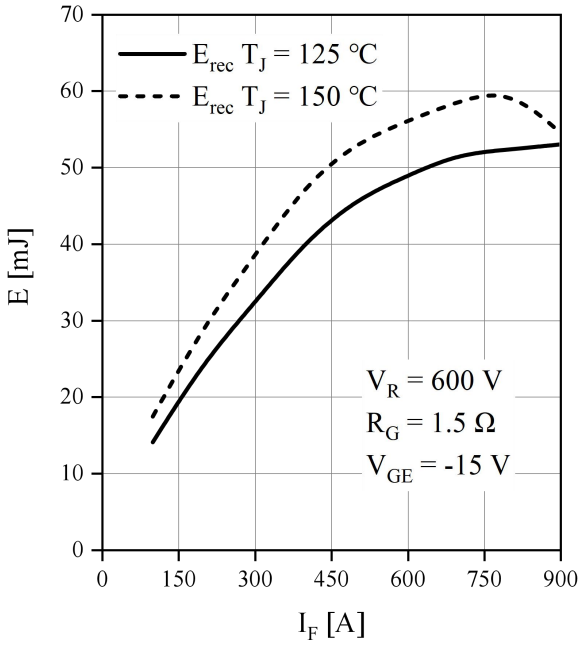


Figure 8. Diode Switching Loss vs. I_F

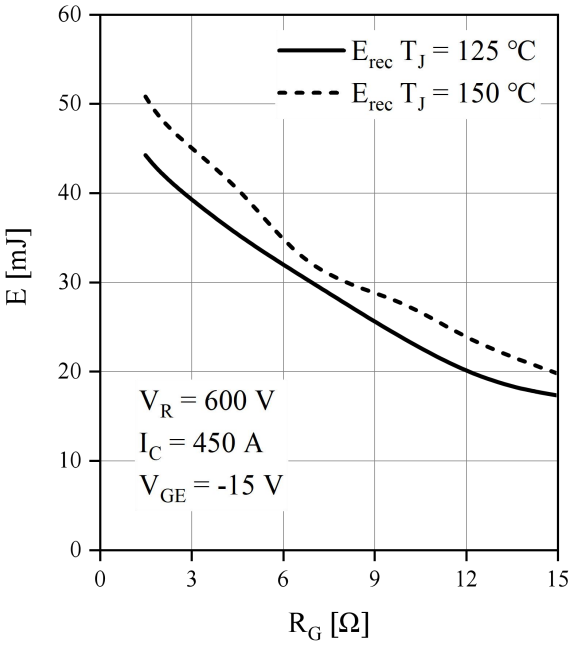


Figure 9. Diode Switching Loss vs. R_G

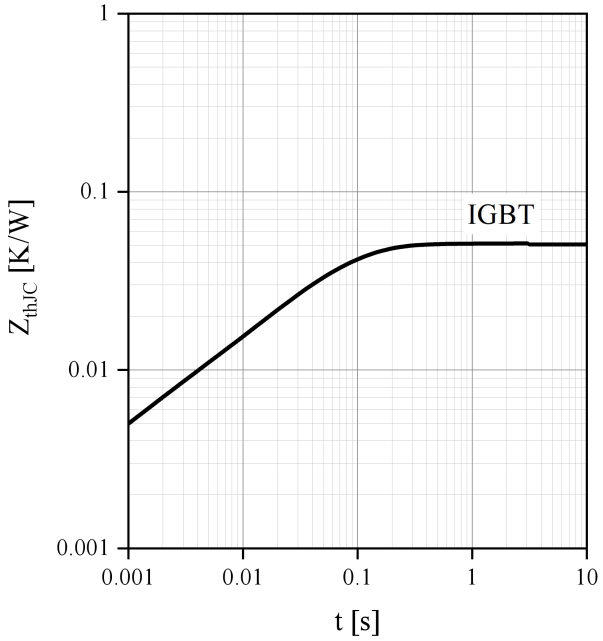


Figure 10. IGBT Transient Thermal Impedance

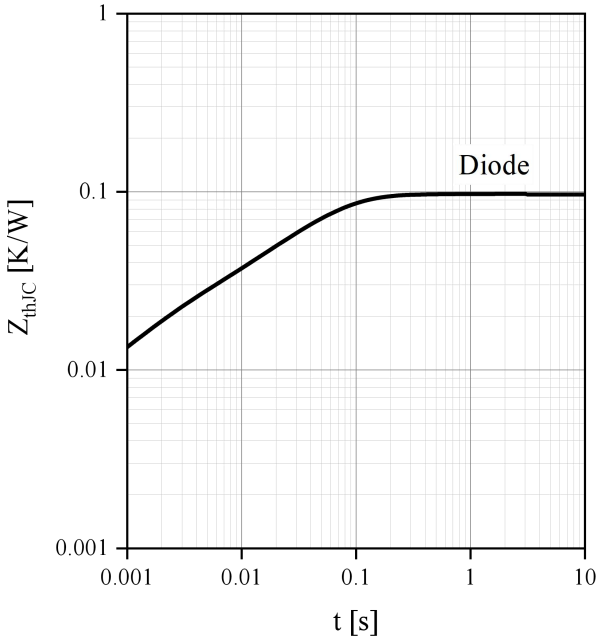
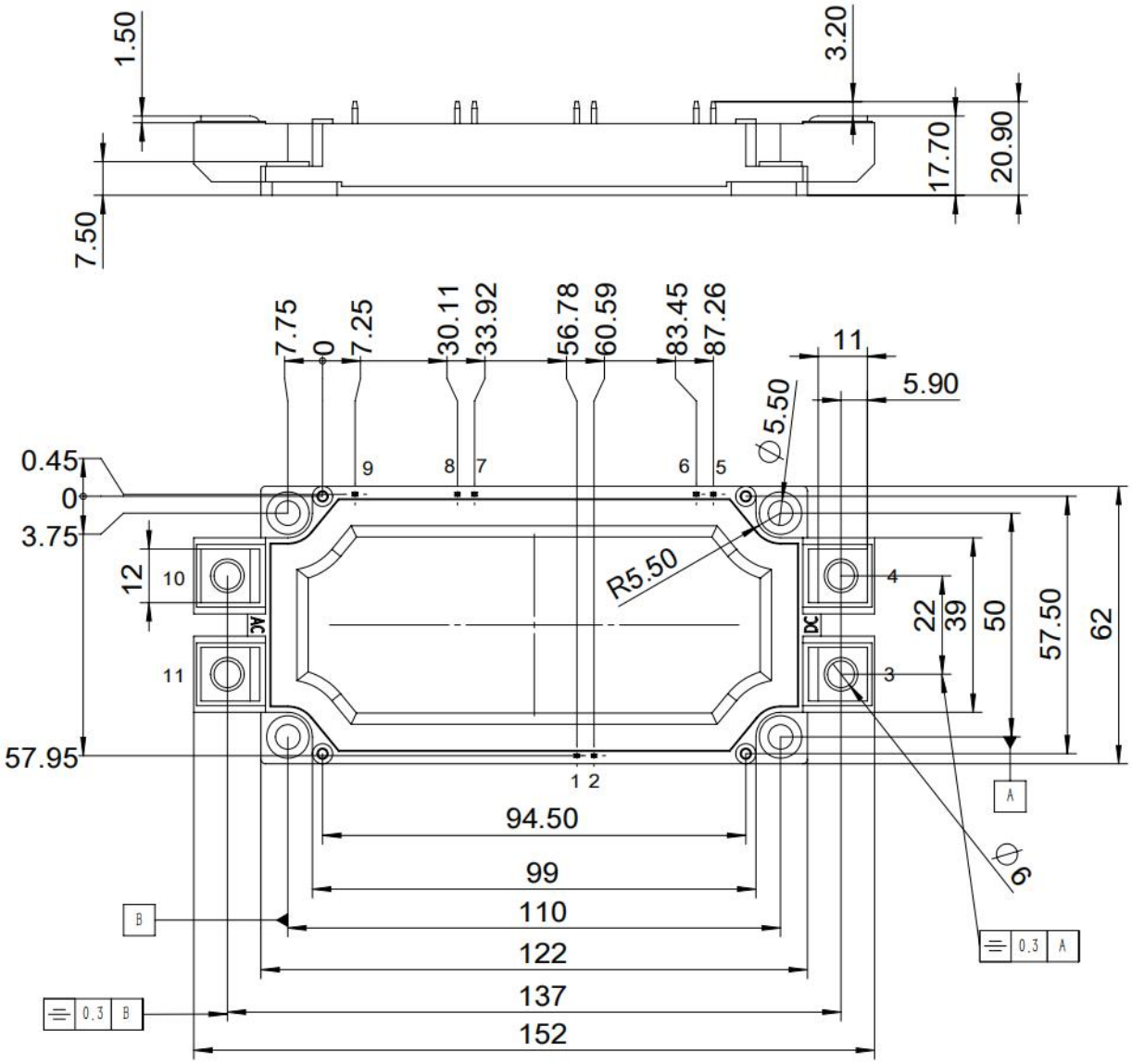


Figure 11. Diode Transient Thermal Impedance

Package Drawing



UNIT:mm