

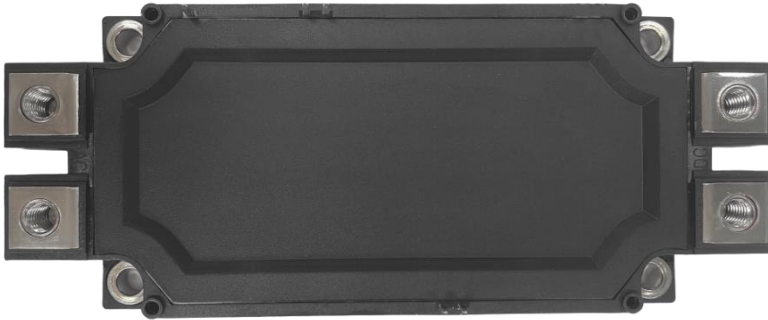


1200V SIC ED3 Power Module

ADPR35B12CSNT

**PRELIMINARY
DATASHEET**

V0.1, 2022/12



Applications

- Automotive Applications
- Electrical Vehicles (xEV)
- Commercial Agriculture Vehicles
- All-Terrain Vehicles
- Motor Drives
- Servo Drives
- UPS Drives

Electrical Features

- Low $R_{DS(on)}$
- $T_{j,op} = 150^{\circ}\text{C}$
- Blocking voltage 1200V
- Low Switching Losses
- Low Inductive Design
- SiC High Performance Chip

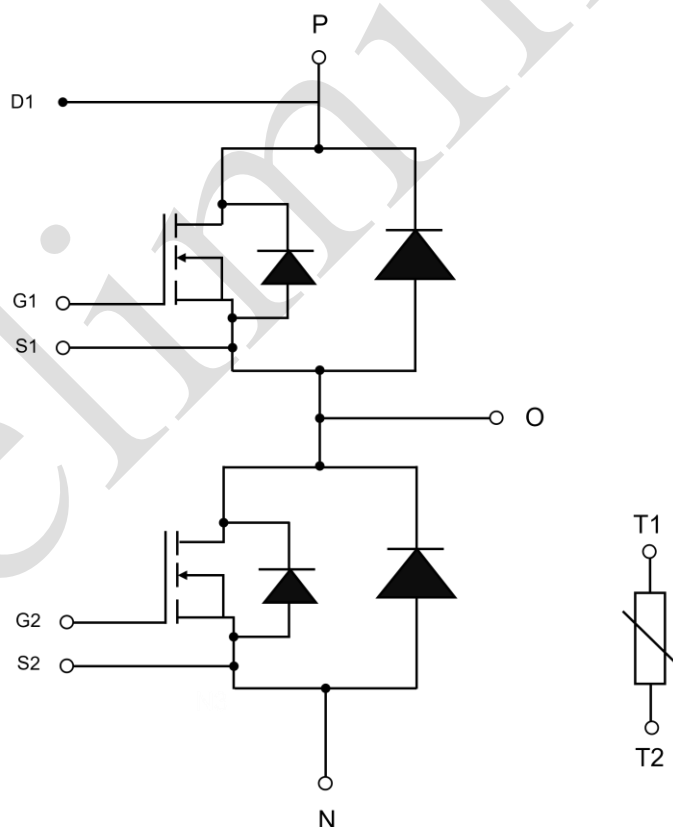
Mechanical Features

- Compact design
- UL 94 Module frame
- Temperature sensor included
- Pb-free device and RoHS compliant
- Guiding elements for PCB and cooler assembly
- Sintered Ag Die attachment

FEATURES

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

Inner Circuit Diagram





MOSEFT

Maximum Rated Values

Parameter	Conditions	Symbol	Values	Unit
Drain-source voltage	$T_j = 25^\circ\text{C}$	V_{DS}	1200	V
Gate-source voltage		V_{GS}	-5/+20	V
DC drain current	$V_{GS} = 15\text{ V}$, $T_C = 70^\circ\text{C}$, $T_j = 175^\circ\text{C}$	$I_{D\text{ nom}}$	450	A
Pulsed drain current	Verified by design, t_p limited by $T_{j, \text{max}}$	$I_{D\text{ pulse}}$	900	A

Characteristics Values

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Drain-source on resistance	$I_D = 450\text{ A}$, $V_{GS} = 15\text{ V}$	$R_{DS(on)}$		3.5	4.1	m Ω
	$I_D = 450\text{ A}$, $V_{GS} = 15\text{ V}$			6.0		
	$I_D = 450\text{ A}$, $V_{GS} = 15\text{ V}$			7.2		
Gate threshold voltage	$I_D = 140\text{ mA}$, $V_{GS} = V_{DS}$	V_{GSth}	2.5	3.5	4.5	V
	$I_D = 140\text{ mA}$, $V_{GS} = V_{DS}$			3.0		
	$I_D = 140\text{ mA}$, $V_{GS} = V_{DS}$			2.9		
Drain-source leakage current	$V_{DS} = 1200\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}			100	μA
	$V_{DS} = 1200\text{ V}$, $V_{GS} = 0\text{ V}$			1		mA
	$V_{DS} = 1200\text{ V}$, $V_{GS} = 0\text{ V}$			5		mA
Gate-source leakage current	$V_{DS} = 0\text{ V}$, $V_{GS} = 20\text{ V}$	I_{GSS}			400	nA
Input capacitance	$f = 100\text{ kHz}$, $V_{DS} = 100\text{ V}$ $V_{GS} = 0\text{ V}$	C_{iss}		30		nF
Output capacitance	$f = 100\text{ kHz}$, $V_{DS} = 100\text{ V}$ $V_{GS} = 0\text{ V}$	C_{oss}		6.4		nF
Reverse transfer capacitance	$f = 100\text{ kHz}$, $V_{DS} = 100\text{ V}$ $V_{GS} = 0\text{ V}$	C_{rss}		30		pF
Turn-on delay time, inductive load	$I_D = 450\text{ A}$, $V_{DS} = 600\text{ V}$	$t_{d(on)}$		38		ns
	$V_{GS} = -5\text{ V} / +15\text{ V}$			47		
	$R_G = 5.0\text{ }\Omega$					
Rise time, inductive load	$I_D = 450\text{ A}$, $V_{DS} = 600\text{ V}$	t_r		90		ns
	$V_{GS} = -5\text{ V} / +15\text{ V}$			64		
	$R_G = 5.0\text{ }\Omega$					



Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Turn-on energy loss per pulse	$I_D = 450\text{ A}$, $V_{DS} = 600\text{ V}$ $L_S = 30\text{ nH}$ $V_{GS} = -5\text{ V} / +15\text{ V}$ $R_G = 5.0\ \Omega$, $di/dt = 4000\text{ A}/\mu\text{s}$ (25°C) $di/dt = 6400\text{ A}/\mu\text{s}$ (175°C)	$T_J = 25^\circ\text{C}$ $T_J = 175^\circ\text{C}$ E_{on}		20.7 11.5		mJ
Turn-off delay time, inductive load	$I_D = 450\text{ A}$, $V_{DS} = 600\text{ V}$ $V_{GS} = -5\text{ V} / +15\text{ V}$ $R_G = 5.0\ \Omega$	$T_J = 25^\circ\text{C}$ $T_J = 175^\circ\text{C}$ $t_{d(off)}$		181 217		ns
Fall time, inductive load	$I_D = 450\text{ A}$, $V_{DS} = 600\text{ V}$ $V_{GS} = -5\text{ V} / +15\text{ V}$ $R_G = 5.0\ \Omega$	$T_J = 25^\circ\text{C}$ $T_J = 175^\circ\text{C}$ t_f		59 66		ns
Turn-off energy loss per pulse	$I_D = 450\text{ A}$, $V_{DS} = 600\text{ V}$ $L_S = 30\text{ nH}$ $V_{GS} = -5\text{ V} / +15\text{ V}$ $R_G = 5.0\ \Omega$, $dV/dt = 11.5\text{ kV}/\mu\text{s}$ (25°C) $dV/dt = 12.0\text{ kV}/\mu\text{s}$ (175°C)	$T_J = 25^\circ\text{C}$ $T_J = 175^\circ\text{C}$ E_{off}		7.2 8.4		mJ
Thermal resistance, junction to cooling fluid	Per MOSFET; $\Delta V/\Delta T = 10\text{ dm}^3/\text{min}$, $T_F = 60^\circ\text{C}$	R_{thJF}		TBD		K/W
Thermal resistance, junction to cooling fluid	Per Diode; $\Delta V/\Delta T = 10\text{ dm}^3/\text{min}$, $T_F = 60^\circ\text{C}$	R_{thJF}		0.13		K/W



Body diode

Maximum Rated Values

Parameter	Conditions	Symbol	Values	Unit
DC body diode forward current	$V_{GS} = -5\text{ V}$, $T_j = 175^\circ\text{C}$	I_{SD}	450	A
Pulsed body diode current	Verified by design, t_p limited by $T_{j, \max}$	$I_{SD, \text{pulse}}$	900	A

Characteristics Values

Parameter	Conditions	Symbol	Typ.	Max.	Unit
Forward voltage	$I_{SD} = 450\text{ A}$, $V_{GS} = -5\text{ V}$ $T_j = 25^\circ\text{C}$	V_{SD}	1.8	2.4	V
Peak reverse recovery current	$I_F = 450\text{ A}$, $V_R = 600\text{ V}$, $V_{GE} = -5\text{ V}$, $-di_F/dt = 4800\text{ A}/\mu\text{s}$ (25°C) $-di_F/dt = 7500\text{ A}/\mu\text{s}$ (150°C) $T_j = 25^\circ\text{C}$ $T_j = 175^\circ\text{C}$	I_{RM}	88 125		A
Recovered charge	$I_F = 450\text{ A}$, $V_R = 600\text{ V}$, $V_{GE} = -5\text{ V}$, $-di_F/dt = 4800\text{ A}/\mu\text{s}$ (25°C) $-di_F/dt = 7500\text{ A}/\mu\text{s}$ (150°C) $T_j = 25^\circ\text{C}$ $T_j = 175^\circ\text{C}$	Q_{rr}	2.7 3.6		μC
Reverse recovery energy	$I_F = 450\text{ A}$, $V_R = 600\text{ V}$, $V_{GE} = -5\text{ V}$, $-di_F/dt = 4800\text{ A}/\mu\text{s}$ (25°C) $-di_F/dt = 7500\text{ A}/\mu\text{s}$ (150°C) $T_j = 25^\circ\text{C}$ $T_j = 175^\circ\text{C}$	E_{rec}	0.55 0.70		mJ

NTC-Thermistor

Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Rated resistance	$T_c = 25^\circ\text{C}$	R_{25}		5.0		k Ω
Resistance tolerance	$T_c = 100^\circ\text{C}$	$\Delta R/R$	5		5	%
B-value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298.15\text{ K}))]$	$B_{25/50}$		3375		K
B-value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298.15\text{ K}))]$	$B_{25/80}$		3411		K
B-value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298.15\text{ K}))]$	$B_{25/100}$		3433		K



Module

Parameter	Conditions	Symbol	Value	Unit
Module baseplate material			Cu + Ni	
Module internal isolation material			Si ₃ N ₄	
Comparative tracking index ¹⁾		CTI	200	

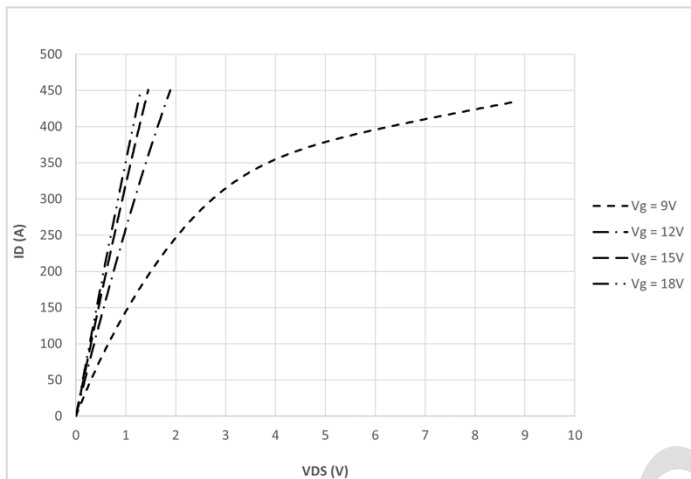
Parameter	Conditions	Symbol	Min.	Typ.	Max.	Unit
Module stray inductance		L _s		TBD		nH
Storage temperature		T _{stg}	-40		125	°C
Weight		G		355		g

1) Extracted by following UL 746A

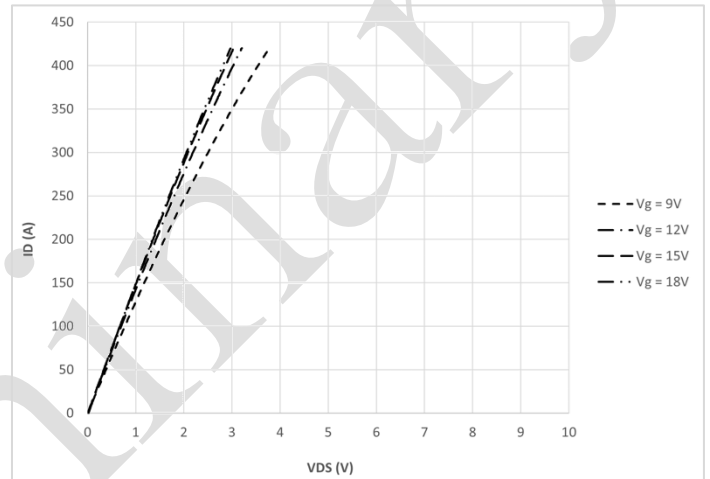


Characteristics Diagrams

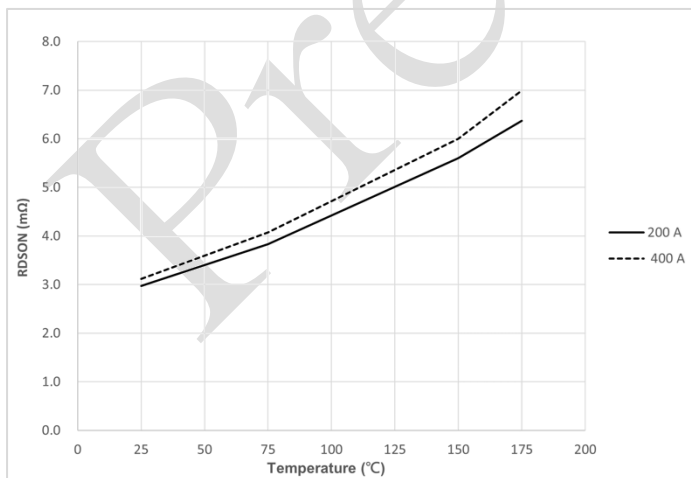
Typical Output Characteristics,
 $T_j = 25^\circ\text{C}$, $I_D = f(V_{DS})$



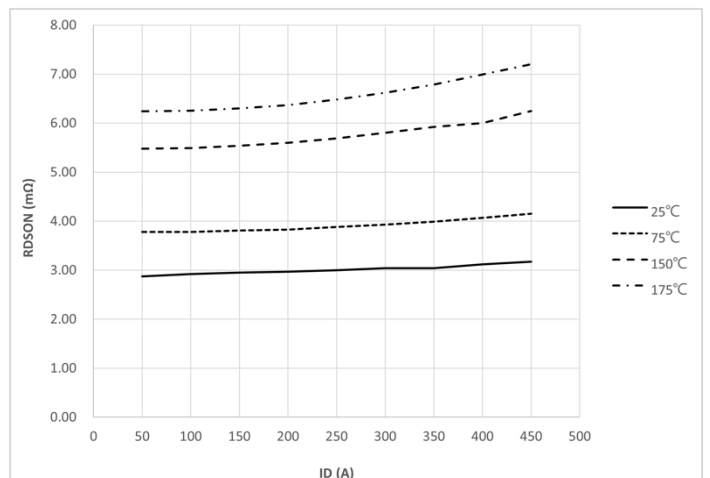
Typical Output Characteristics,
 $T_j = 175^\circ\text{C}$, $I_D = f(V_{DS})$



Typical temperature dependence of $R_{DS(on)}$,
 $V_{GS} = 15\text{V}$, $I_D = 450\text{A}$, $R_{DS(on)} = f(T_j)$



Typical I_D dependence of $R_{DS(on)}$,
 $V_{GS} = 15\text{V}$, $R_{DS(on)} = f(I_D)$

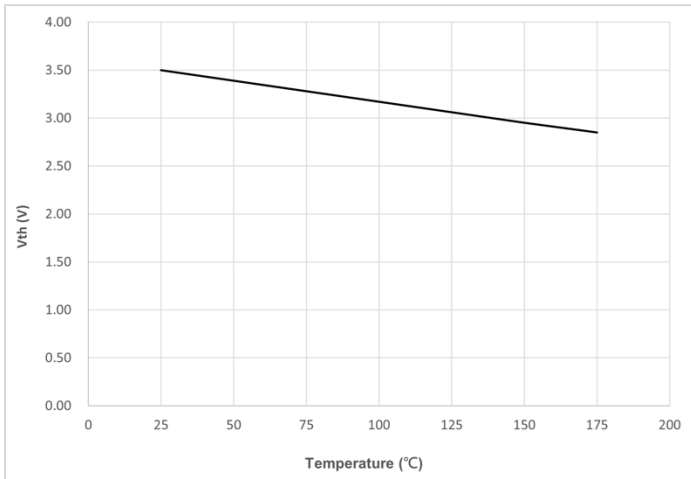




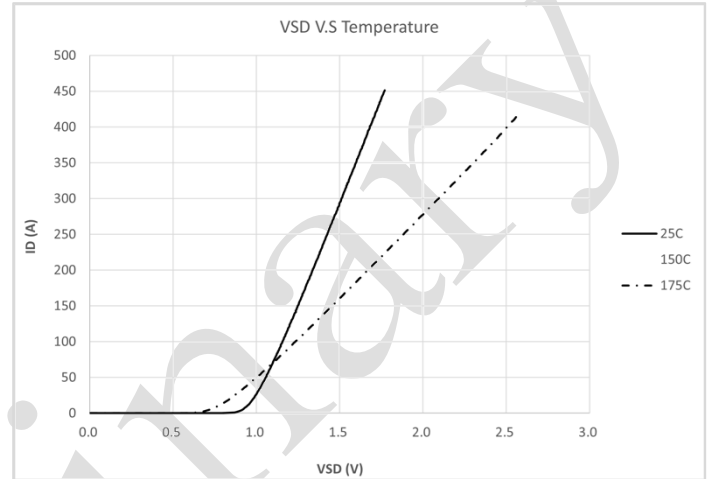
ACTRON TECHNOLOGY CORP.

ADPR35B12CSNT Power Module

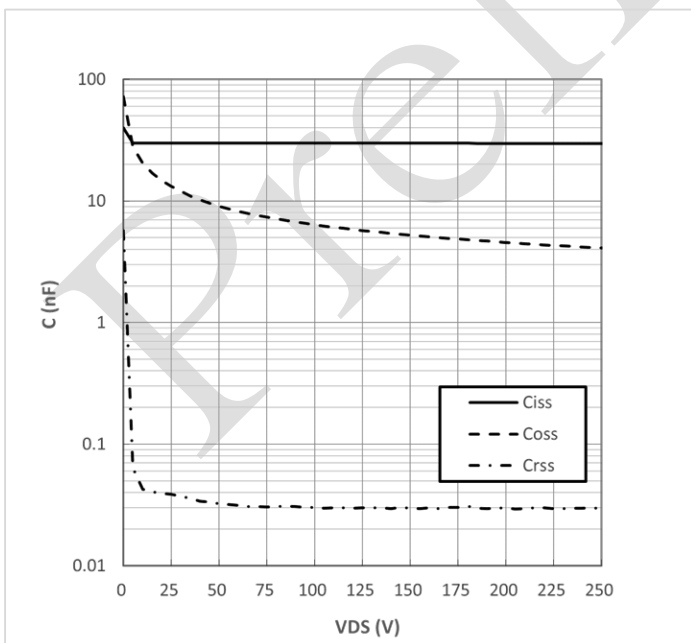
Typical temperature dependence of
threshold voltage, $T_j = 25^\circ\text{C}$, $V_{th} = f(T_j)$



Typical diode Characteristics,
 $V_{GS} = -5\text{V}$, $I_{SD} = f(V_{SD})$



Typical capacitance Characteristics,
 $f = 100\text{ kHz}$, $T_j = 25^\circ\text{C}$, $C = f(V_{DS})$

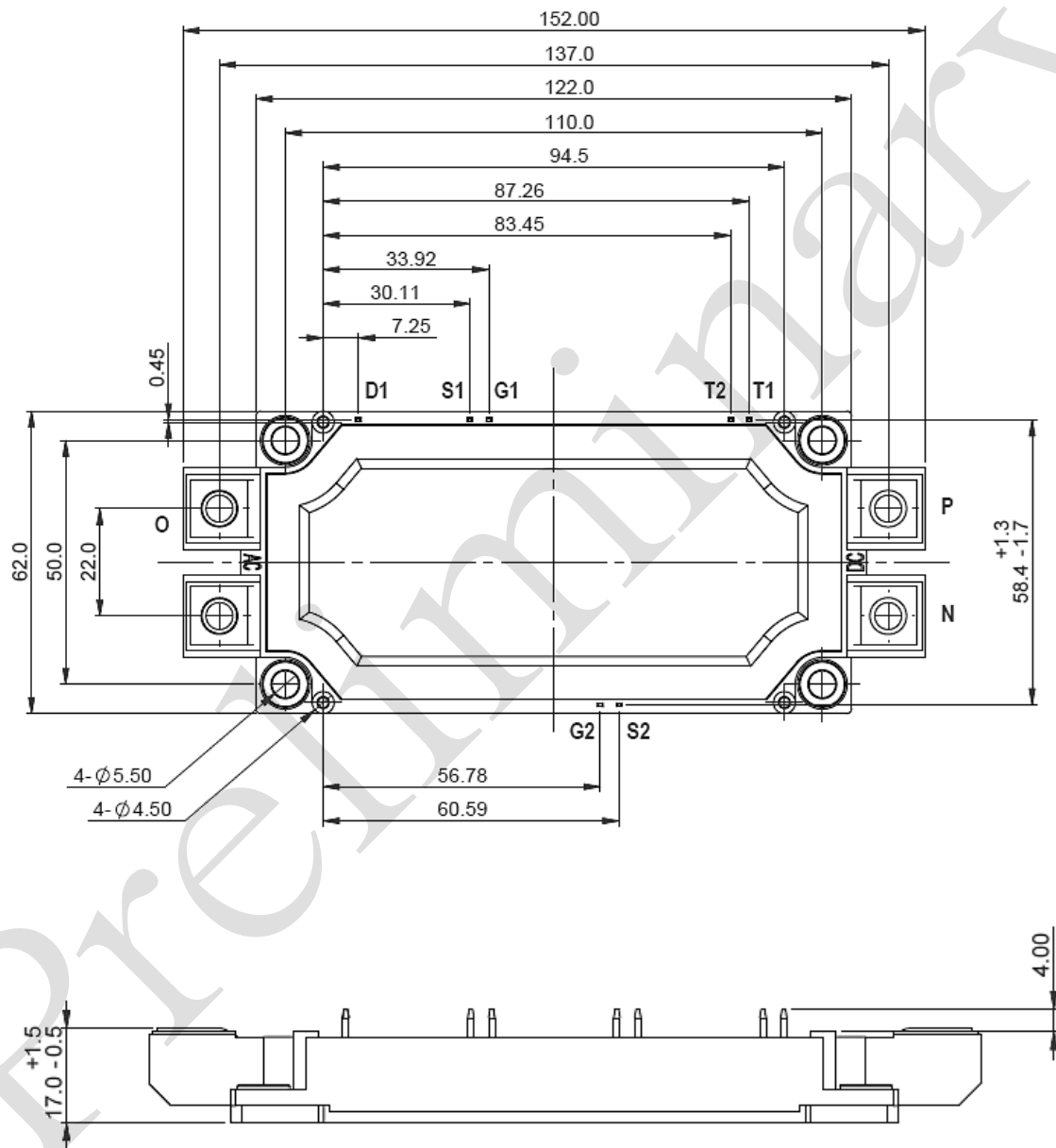




ACTRON TECHNOLOGY CORP.

ADPR35B12CSNT Power Module

Package Outlines



IMPORTANT NOTICE AND DISCLAIMER

Edition 2022-12

**Published by
Actron Technology**

The information given in this document shall declare not to be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and / or any information regarding the application of the device. Actron technology provides such information, and other resources “as is”, and disclaims all warranties, express and implied, including without limitation any implied warranties of merchantability, fitness for a particular purpose or non-infringement of third party intellectual property rights.

These resources are intended for skilled developers designing with Actron products. You are solely responsible for (1) selecting the appropriate Actron products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

For further information on technology, delivery terms and conditions and prices, please contact the Actron Technology. (<http://www.actron.com.tw/>)

Warnings Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the Actron Technology. Actron Technology components may be used in special applications only with the express written approval of Actron Technology.



Trademarks of Actron Technology

Copyright © 2022 Actron Technology — All Rights Reserved.

