Heat Sink Design

Considering Sinusoidal logic results,

$V_{dc} = 900V$

$I_d = 50\,A_{max}$.

Now, considering 50% duty cycle,

$P_{d(cond)50} = (1-D)\, I_d^2\, R_{DS(ON)}$

$= 0.5 \times 50^2 \times 10m$

$= 12.5\,W$.

In the transient state while starting, $I_d = 90\,A_{max}$.

$\therefore P_{d(cond)90} = (1-D) \times 90^2\, R_{DS(ON)}$

$= 40.5\,W$.

To keep safety factor, we shall consider 41 W. in this calculation.

Switching loss calculation,

Page-10, E vs I_D graph, (Switching loss)

At 90A, $E_{off} = 0.5\,mJ$ (at 150°C)

$E_{ON} = 1.5\,mJ$ (at 150°C).

Total $E = 2\,mJ$

$\therefore P_{sw}\big|_{total} = E \times f_s$ (at 600 V_{DD})

$= 2m \times 100k$.

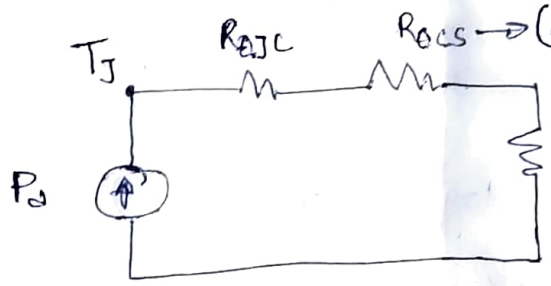
$= 200W$.

Now, only 1 device operates at a time.

$\therefore P_d = P_{d(cond)} + P_{sw} = 240W$.

From datasheet, $R_{\theta JC} = 0.252$ k/w per MOSFET

$R_{\theta CS} \rightarrow (0.05 \sim 0.1)$ k/w. (1 MOSFET operates per cycle).



Max. junc. temp $T_J|_{max} = 150^\circ C$.

We shall consider $T_J = 130^\circ C$ (safety zone).

$T_a = 25^\circ C$ (considered)

$$R_{\theta JC} + R_{\theta CS} + R_{\theta SA} = \frac{T_J - T_a}{P_d} = \frac{105}{240} = 0.4375 \text{ k/w}$$

$$\Rightarrow 0.252 + 0.1 + R_{\theta SA} = 0.4375$$

$$\Rightarrow R_{\theta SA} = 0.0855 \text{ k/W}$$

$$\therefore R_{\theta SA} \approx 0.1 \text{ k/W}$$

Dimensions of device $\rightarrow$ 51 mm $\times$ 63 mm (Total).

51 mm $\times$ 53 mm (till holes)

Recommended.

Sl.No	Part No.	Name	L W H	Rosa	Remarks.
(1)	ATS-NVP-3275-C3-RO (Mouser)	Jetson AGX Orin	100 X 87 X 16	0.21k/w.	Fan ~~not~~ recommended
(2)	ATS-NVP-3275-C1-RO (Mouser)	"	"	"	"
(3)	ATS-61500D-C2-RO (Mouser)	ATS	53 X 53 X 9.5	1.8~1.35k/w	Fan recommended
(4)					