Power Loss Equations for a 3-phase inverter

Parameter	Equation	Details
System Efficiency Factor (Sys_eff)	$Sys\_eff = PF \times ma \times \sqrt{2/3}$	PF = Motor power factor ma = modulation index
Motor phase peak current (I_{PK})	$I_{PK} = \frac{P}{VDC \times Sys\_eff}$	P = Inverter Output Power V_{DC} = DC Bus voltage
Motor phase RMS current (I_{RMS})	$I_{RMS} = \frac{I_{PK}}{\sqrt{2}}$	
3-phase conduction Loss	$P_{COND\_3PH} = 3 \times {I_{RMS}}^2 \times R_{DS\_ON}$	R_{DS_ON} = ON state resistance / FET
Switching loss due to VI overlap (P_{SW_VI})	$P_{SW\_VI\_3PH} = 3 \times 2 \times 0.5 \times V_{DC} \times 0.7 \times I_{PK} \times V_{DC} \times \frac{Q_{SW}}{I_G} \times F_{SW}$	F_{SW} = Switching Frequency
Switching loss due to FET input and output capacitances (P_{CAP})	$P_{CAP\_3PH} = (3 \times V_{DC} \times Q_{OSS} \times F_{SW}) + (3 \times 2 \times V_{GS} \times Q_{GS} \times F_{SW})$	Q_{OSS} = FET output charge V_{GS} = Gate-source voltage Q_{GS} = Total gate charge
Reverse recovery loss (P_{RR})	$P_{RR\_3PH} = 3 \times Q_{RR} \times V_{DC} \times F_{SW} \times \frac{I_{RMS}}{I_{QRR\_SPEC}}$	I_{QRR_SPEC} = Current at which QRR is specified in datasheet
Dead time loss (P_{DT})	$P_{DT\_3PH} = 6 \times V_{SD} \times I_{RMS} \times F_{SW} \times DT$	DT = Dead Time
Total power loss in 3-ph inverter with 3-ph modulation (P_{LOSS_3PH})	$P_{LOSS\_3PH} = P_{COND\_3PH} + P_{SW\_VI\_3PH} + P_{CAP\_3PH} + P_{RR\_3PH} + P_{DT\_3PH}$	