

VINcoMNPC X4 mixed voltage NPC Application 1200 V/400 A

General conditions

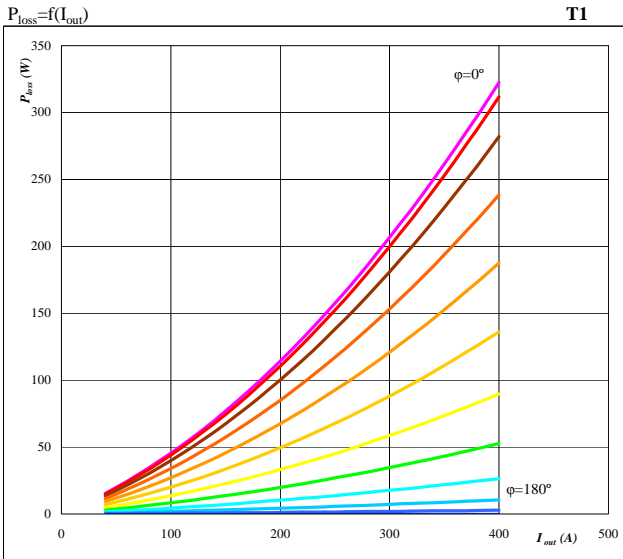
Vout= 230 VAC

Half Bridge IGBT	
V_{GEon}	= 15 V
V_{GEoff}	= -15 V
R_{gon}	= 1 Ω
R_{goff}	= 1 Ω

Neutral Point IGBT	
V_{GEon}	= 15 V
V_{GEoff}	= -15 V
R_{gon}	= 2 Ω
R_{goff}	= 2 Ω

Figure 1. Half Bridge IGBT

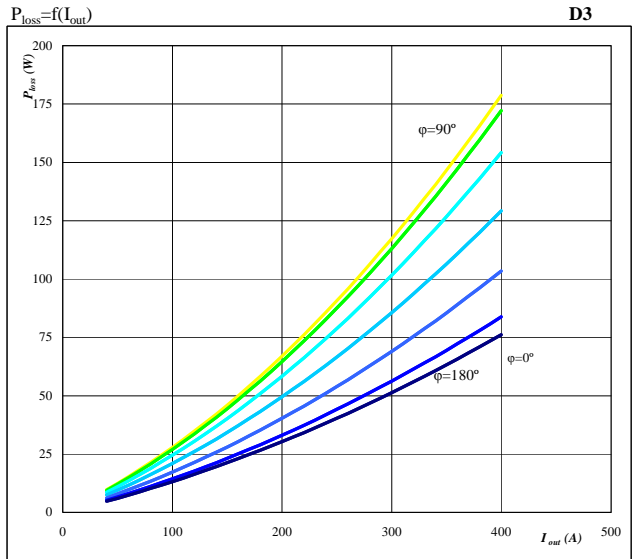
Typical average static loss as a function of output current I_{oRMS}



Conditions: $T_j = 125$ °C
 parameter: ϕ from 0° to 180°
 in 12 steps

Figure 2. Neutral Point FWD

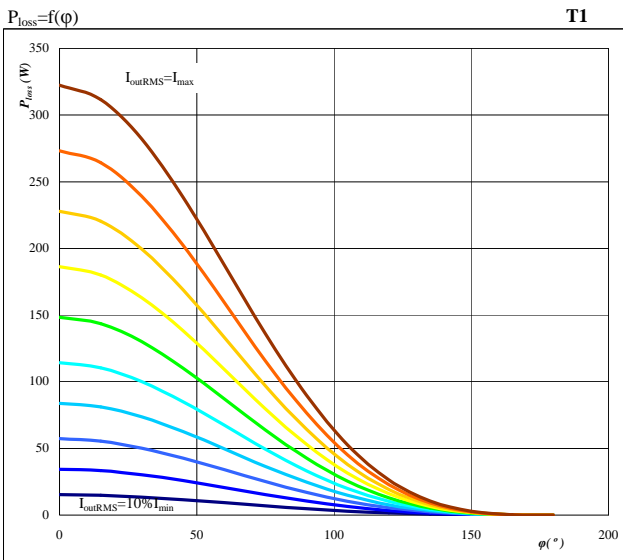
Typical average static loss as a function of output current I_{oRMS}



Conditions: $T_j = 125$ °C
 parameter: ϕ from 0° to 180°
 in 12 steps

Figure 3. Half Bridge IGBT

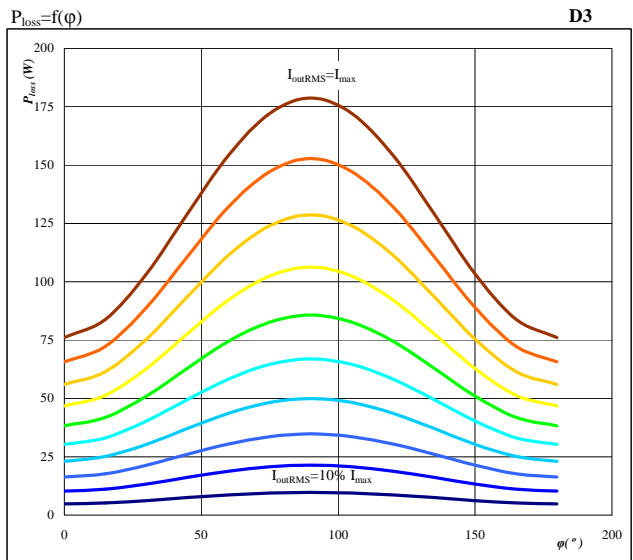
Typical average static loss as a function of phase displacement ϕ



Conditions: $T_j = 125$ °C
 parameter: I_{oRMS} from 40 A to 400 A
 in steps of 40 A

Figure 4. Neutral Point FWD

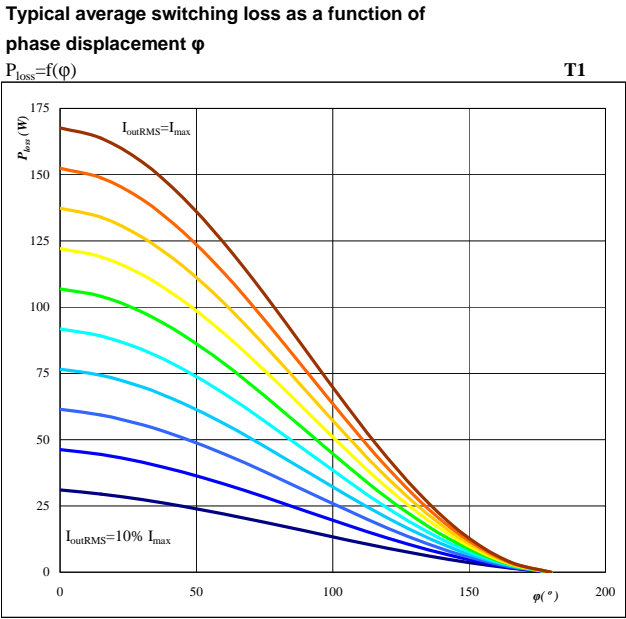
Typical average static loss as a function of phase displacement ϕ



Conditions: $T_j = 125$ °C
 parameter: I_{oRMS} from 40 A to 400 A
 in steps of 40 A

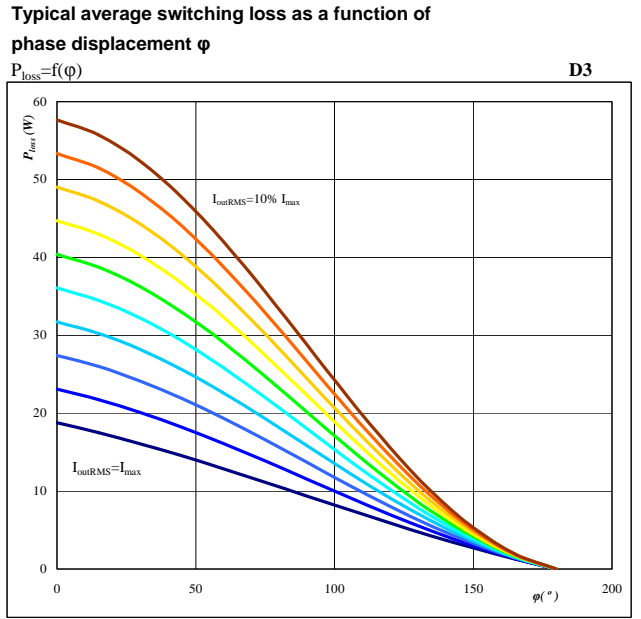
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Figure 5. Half Bridge IGBT



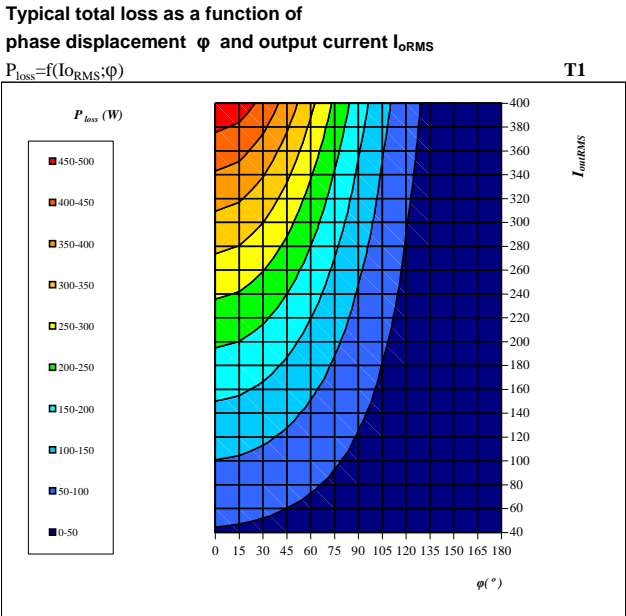
Conditions: $T_j = 125$ °C
 $f_{sw} = 16$ kHz
 DC link = 700 V
 parameter: I_{ORMS} from 40 A to 400 A
 in steps of 40 A

Figure 6. Neutral Point FWD



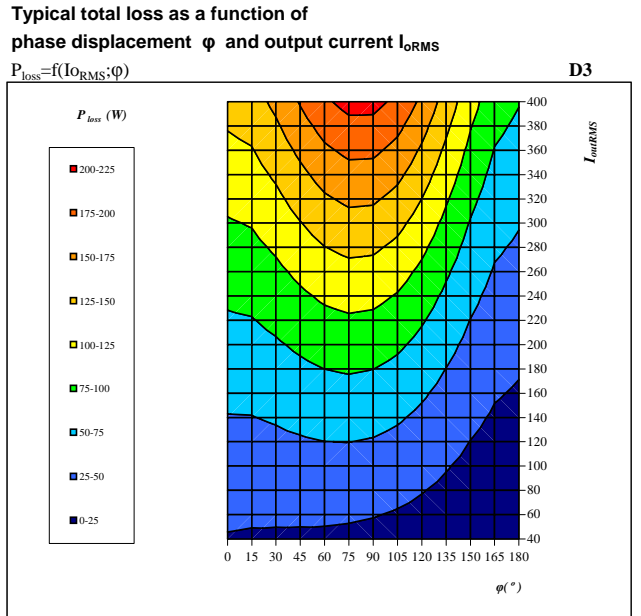
Conditions: $T_j = 125$ °C
 $f_{sw} = 16$ kHz
 DC link = 700 V
 parameter: I_{ORMS} from 40 A to 400 A
 in steps of 40 A

Figure 7. Half Bridge IGBT

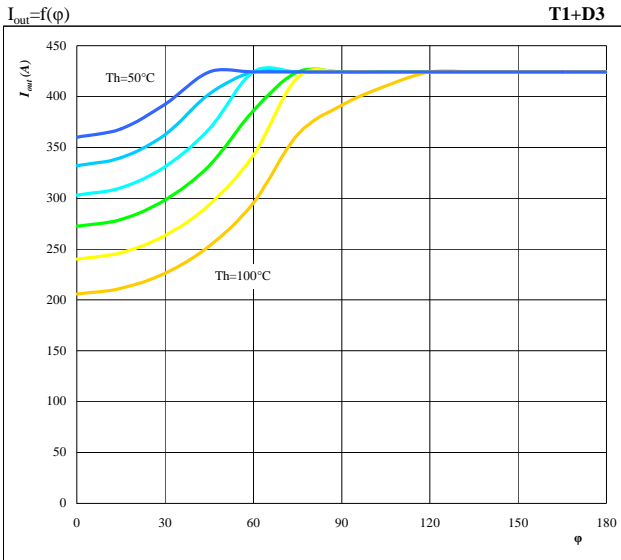


Conditions: $T_j = 125$ °C
 DC link = 700 V
 $f_{sw} = 16$ kHz

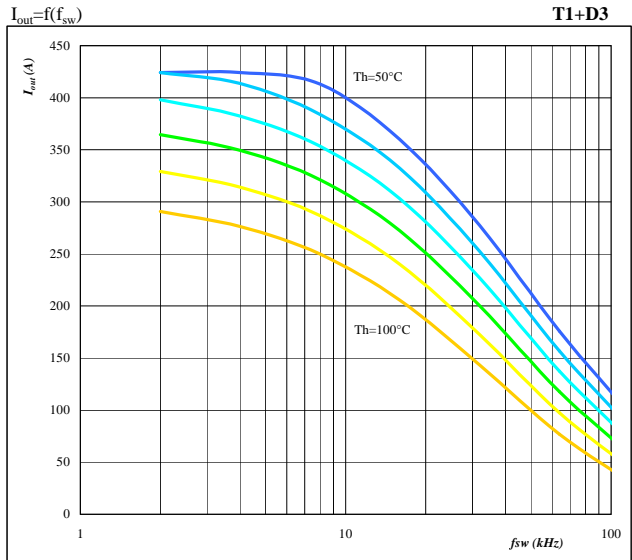
Figure 8. Neutral Point FWD



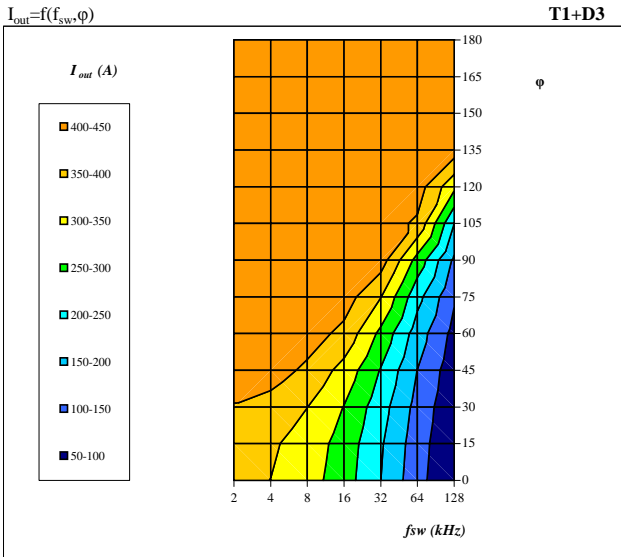
Conditions: $T_j = 125$ °C
 DC link = 700 V
 $f_{sw} = 16$ kHz

Figure 9. for Half Bridge IGBT+ Neutral Point FWD
Typical available output current as a function of phase displacement φ


Conditions: $T_j = T_{jmax}-25 \text{ }^\circ\text{C}$ $f_{sw} = 16 \text{ kHz}$
 DC link = 700 V
 parameter: Heatsink temp.
 T_h from 50 $^\circ\text{C}$ to 100 $^\circ\text{C}$
 in 10 $^\circ\text{C}$ steps

Figure 10. for Half Bridge IGBT+ Neutral Point FWD
Typical available output current as a function of switching frequency f_{sw}


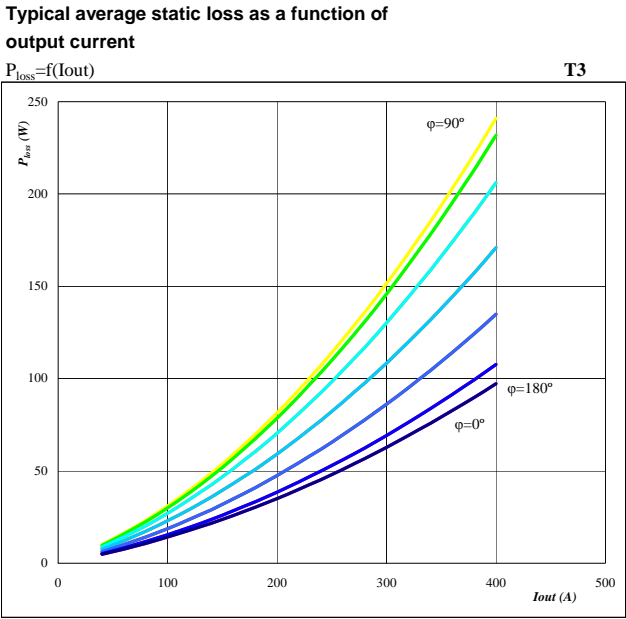
Conditions: $T_j = T_{jmax}-25 \text{ }^\circ\text{C}$ $\varphi = 0^\circ$
 DC link = 700 V
 parameter: Heatsink temp.
 T_h from 50 $^\circ\text{C}$ to 100 $^\circ\text{C}$
 in 10 $^\circ\text{C}$ steps

Figure 11. for Half Bridge IGBT+ Neutral Point FWD
Typical available 50Hz output current as a function of f_{sw} and phase displacement φ


Conditions: $T_j = T_{jmax}-25 \text{ }^\circ\text{C}$
 DC link = 700 V
 $T_h = 80 \text{ }^\circ\text{C}$

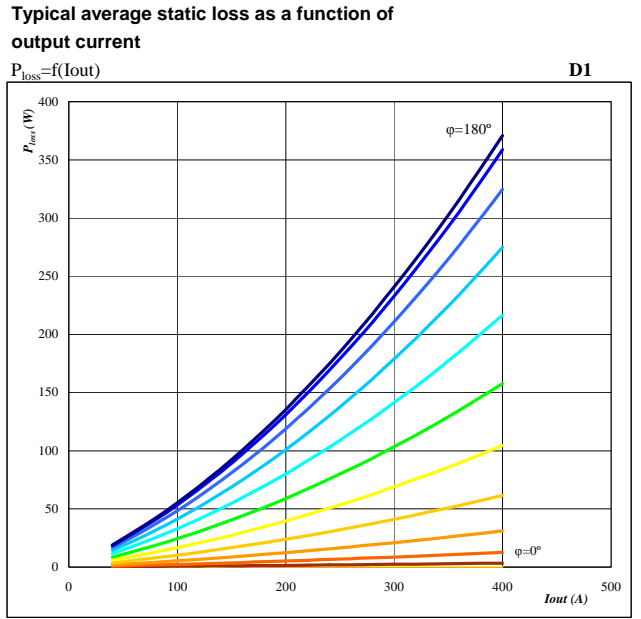
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Figure 12. Neutral Point IGBT



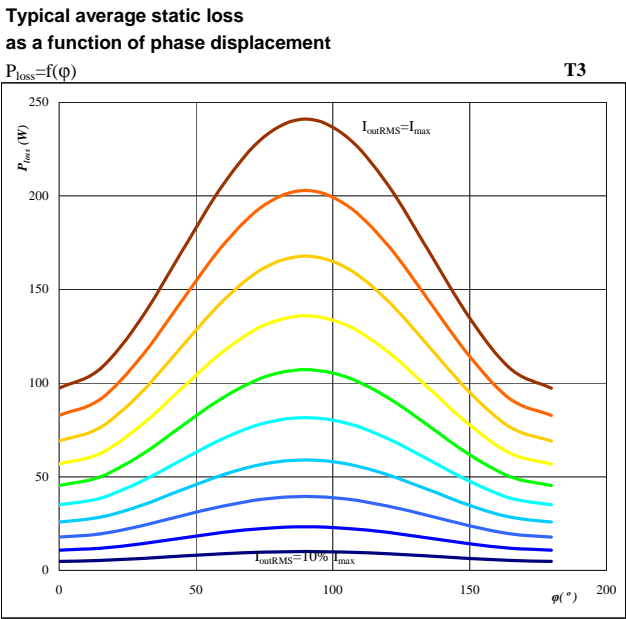
Conditions: $T_j = 125$ °C
 parameter: ϕ from 0° to 180°
 in 12 steps

Figure 13. Half Bridge FWD



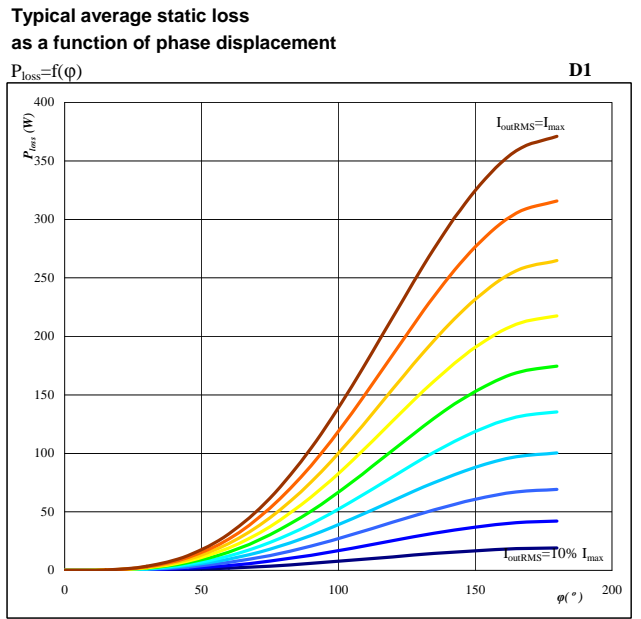
Conditions: $T_j = 125$ °C
 parameter: ϕ from 0° to 180°
 in 12 steps

Figure 14. Neutral Point IGBT



Conditions: $T_j = 125$ °C
 parameter: I_{oRMS} from 40 A to 400 A
 in steps of 40 A

Figure 15. Half Bridge FWD

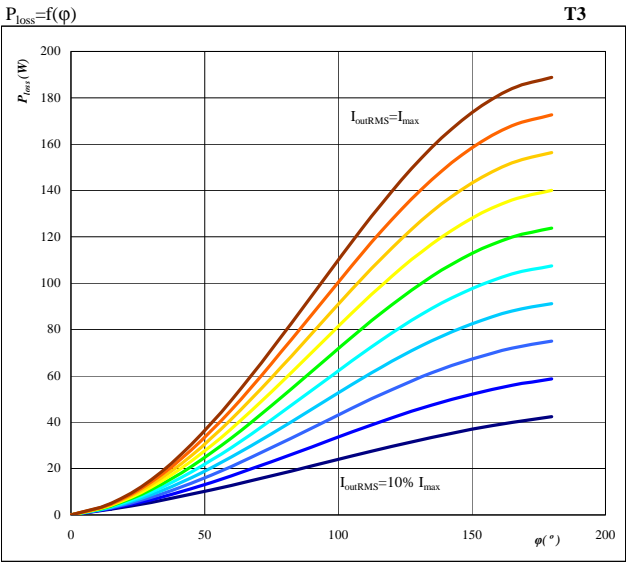


Conditions: $T_j = 125$ °C
 parameter: I_{oRMS} from 40 A to 400 A
 in steps of 40 A

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Figure 16. Neutral Point IGBT

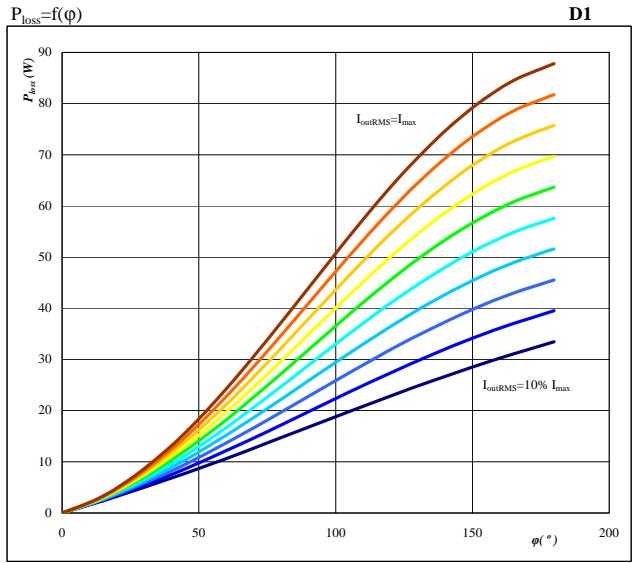
Typical average switching loss as a function of phase displacement



Conditions: $T_j = 125$ °C $f_{sw} = 16$ kHz
 DC link = 700 V
 parameter: I_{oRMS} from 40 A to 400 A
 in steps of 40 A A

Figure 17. Half Bridge FWD

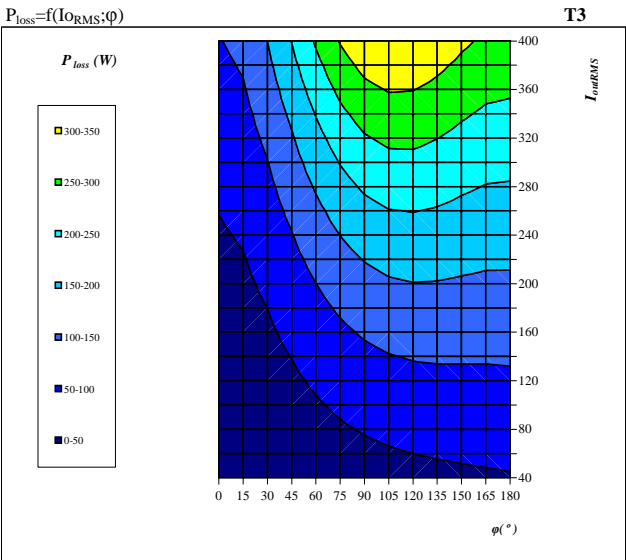
Typical average switching loss as a function of phase displacement



Conditions: $T_j = 125$ °C $f_{sw} = 16$ kHz
 DC link = 700 V
 parameter: I_{oRMS} from 40 A to 400 A
 in steps of 40 A A

Figure 18. Neutral Point IGBT

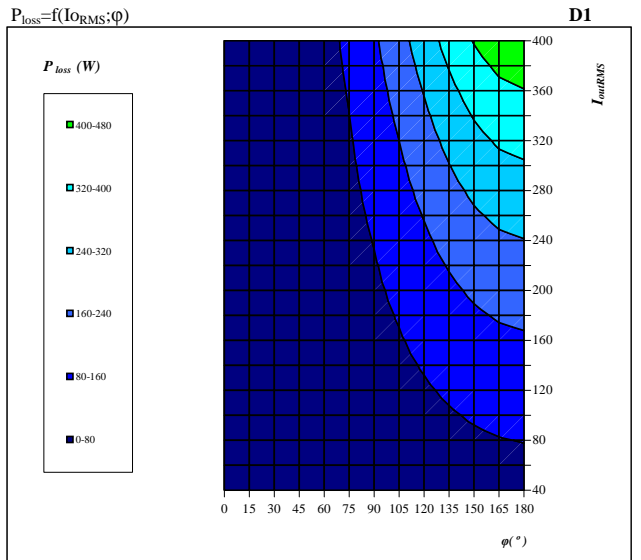
Typical total loss as a function of phase displacement and I_{outRMS}



Conditions: $T_j = 125$ °C
 DC link = 700 V
 $f_{sw} = 16$ kHz

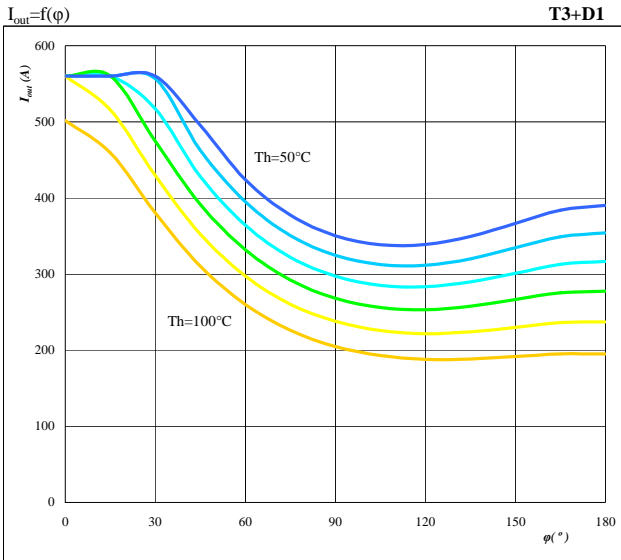
Figure 19. Half Bridge FWD

Typical total loss as a function of phase displacement and I_{outRMS}



Conditions: $T_j = 125$ °C
 DC link = 700 V
 $f_{sw} = 16$ kHz

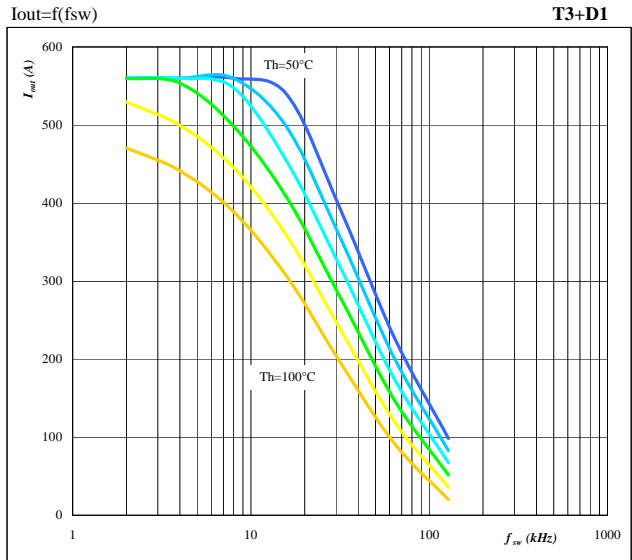
Figure 20. for Neutral Point IGBT+ Half Bridge FWD

Typical available output current as a function of phase displacement


Conditions: $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$ $f_{sw} = 16 \text{ kHz}$
 DC link = 700 V

parameter: Heatsink temp.
 T_h from 50 $^\circ\text{C}$ to 100 $^\circ\text{C}$
 in 10 $^\circ\text{C}$ steps

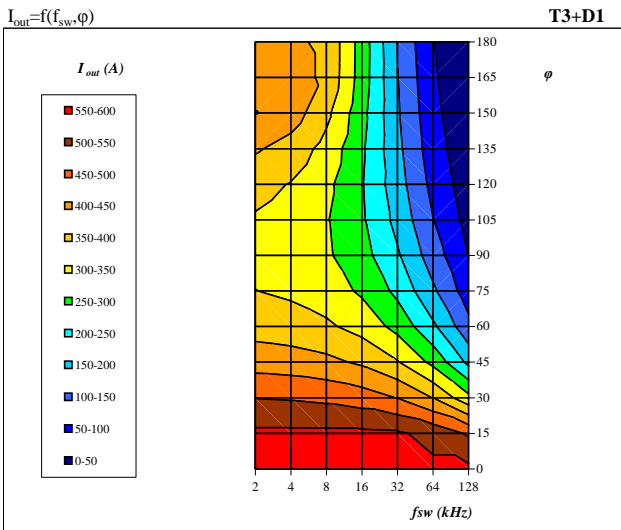
Figure 21. for Neutral Point IGBT+ Half Bridge FWD

Typical available output current as a function of switching frequency


Conditions: $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$ $\varphi = 90^\circ$
 DC link = 700 V

parameter: Heatsink temp.
 T_h from 50 $^\circ\text{C}$ to 100 $^\circ\text{C}$
 in 10 $^\circ\text{C}$ steps

Figure 22. for Neutral Point IGBT+ Half Bridge FWD

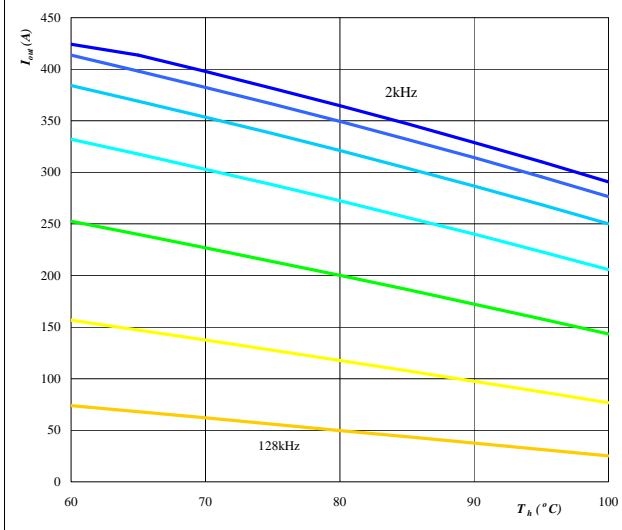
Typical available 50Hz output current as a function of fsw and phase displacement


Conditions: $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$
 DC link = 700 V
 $T_h = 80 \text{ } ^\circ\text{C}$

Figure 23. per MODULE

Typical available output current as a function of heat sink temperature

$$I_{out}=f(T_h)$$



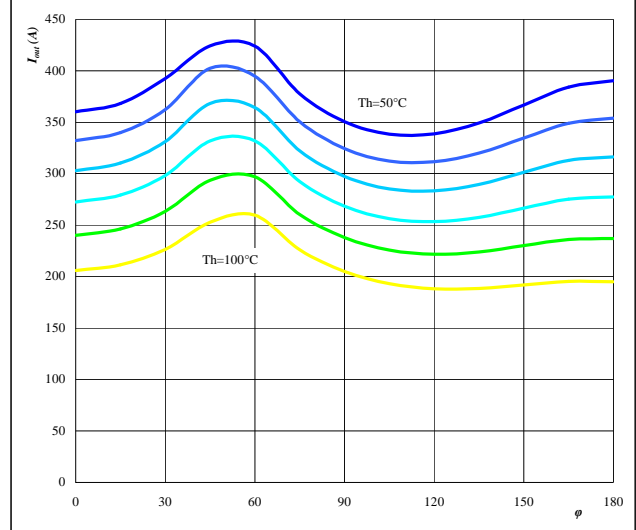
Conditions: $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$
 DC link = 700 V
 $\varphi = 0^\circ$

parameter: Switching freq.
 fsw from 2 kHz to 128 kHz
 in steps of factor 2

Figure 24. per MODULE

Typical available output current as a function of phase displacement

$$I_{out}=f(\varphi)$$



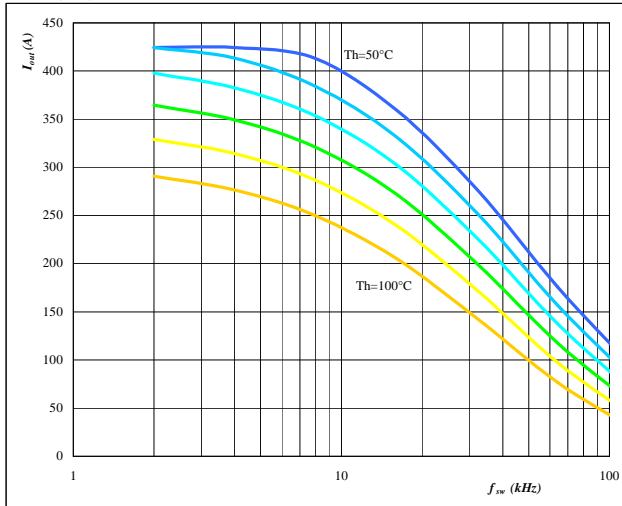
Conditions: $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$
 DC link = 700 V
 $f_{sw} = 16 \text{ kHz}$

parameter: Heatsink temp.
 Th from 50 °C to 100 °C
 in 10 °C steps

Figure 25. per MODULE

Typical available output current as a function of switching frequency

$$I_{out}=f(f_{sw})$$



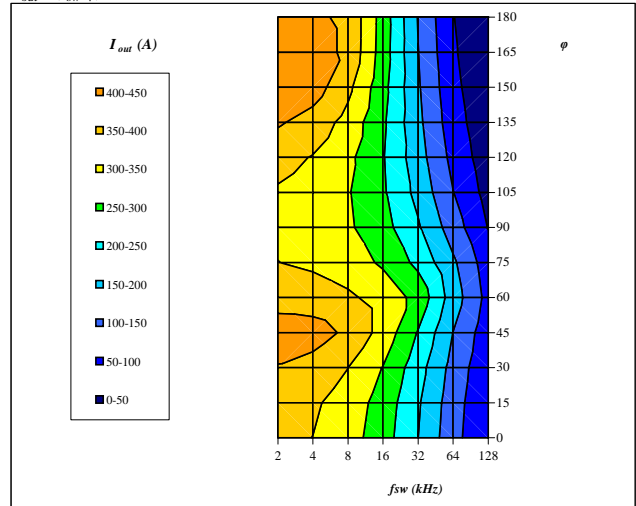
Conditions: $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$ $\varphi = 0^\circ$
 DC link = 700 V

parameter: Heatsink temp.
 Th from 50 °C to 100 °C
 in 10 °C steps

Figure 26. per MODULE

Typical available 50Hz output current as a function of fsw and phase displacement

$$I_{out}=f(f_{sw},\varphi)$$

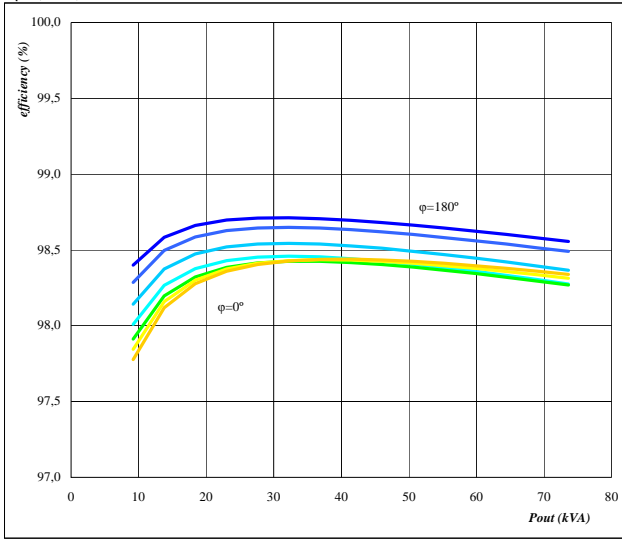


Conditions: $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$
 DC link = 700 V
 $T_h = 80 \text{ } ^\circ\text{C}$

Figure 27. per MODULE

Typical efficiency as a function of output power

$$\eta = f(P_{out})$$

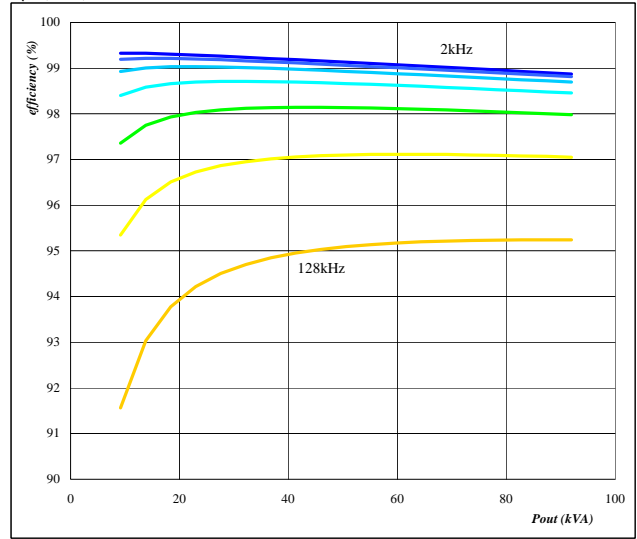


Conditions: $T_j = 125 \text{ }^\circ\text{C}$
 $f_{sw} = 16 \text{ kHz}$
 DC link = 700 V
 parameter: phase displacement φ from 0° to 180° in steps of 30°

Figure 28. per MODULE

Typical efficiency as a function of output power

$$\eta = f(P_{out})$$

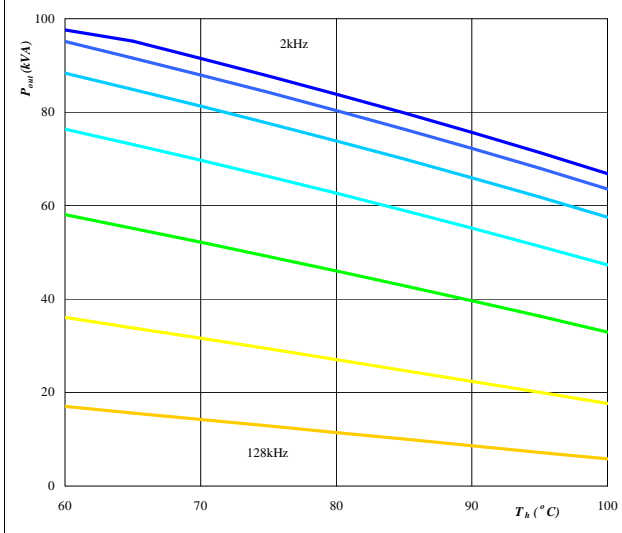


Conditions: $T_j = 125 \text{ }^\circ\text{C}$ $\varphi = 0^\circ$
 DC link = 700 V
 parameter: Switching freq. f_{sw} from 2 kHz to 128 kHz in steps of factor 2

Figure 29. per MODULE

Typical available output power as a function of heat sink temperature

$$P_{out} = f(T_h)$$

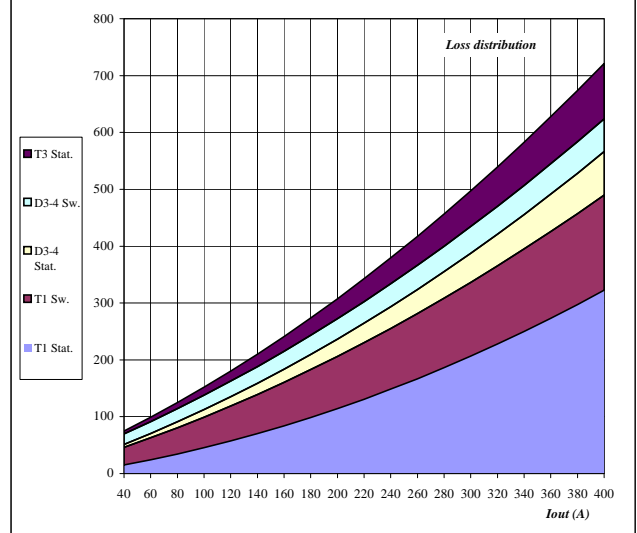


Conditions: $T_j = T_{jmax} - 25 \text{ }^\circ\text{C}$
 DC link = 700 V
 $\varphi = 0^\circ$
 parameter: Switching freq. f_{sw} from 2 kHz to 128 kHz in steps of factor 2

Figure 30. per MODULE

Typical loss distribution as a function of output current

$$P_{out} = f(T_h)$$

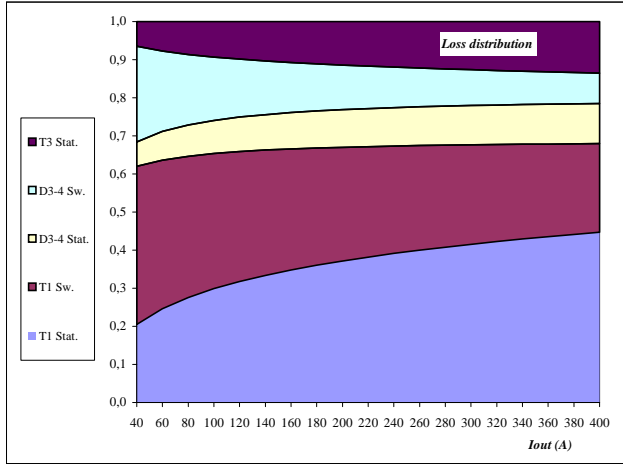


Conditions: $T_j = 125 \text{ }^\circ\text{C}$
 $f_{sw} = 16 \text{ kHz}$
 DC link = 700 V
 $\varphi = 0^\circ$

Figure 31. per MODULE

Typical relativ loss distribution as a function of output current

$$P_{out}=f(T_h)$$



Conditions:

$T_j =$	125	°C
$f_{sw} =$	16	kHz
DC link =	700	V
$\phi =$	0°	

