

VINcoMNPC X4 mixed voltage NPC Application 1200 V/600 A

General conditions

half bridge IGBT	
V_{GEon}	= 15 V
V_{GEOff}	= -15 V
R_{gon}	= 2,25 Ω *
R_{goff}	= 2,25 Ω *

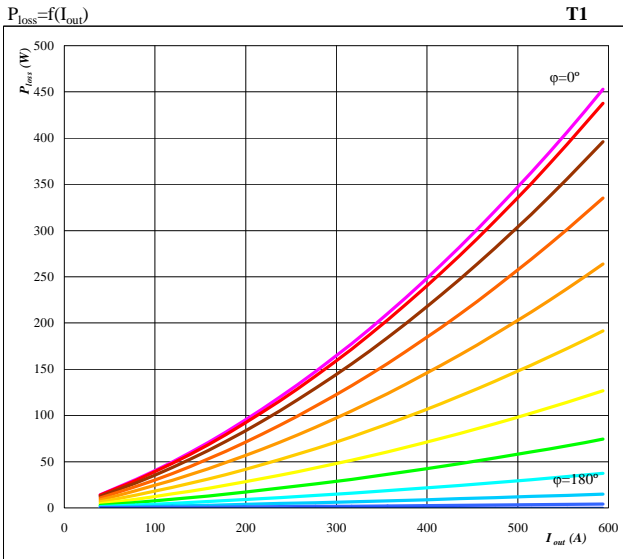
$V_{out} = 230$ VAC

* including chip gate resistor

neutral point IGBT	
V_{GEon}	= 15 V
V_{GEOff}	= -15 V
R_{gon}	= 2,5 Ω *
R_{goff}	= 2,5 Ω *

Figure 1. half bridge IGBT

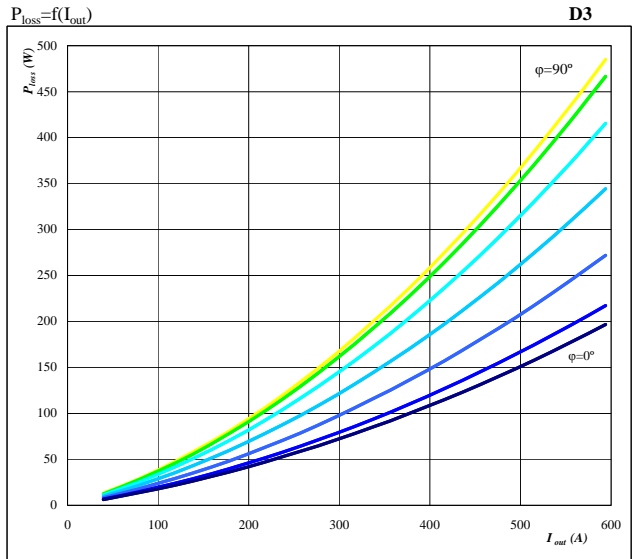
Typical average static loss as a function of output current I_{oRMS}



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

Figure 2. neutral point FWD

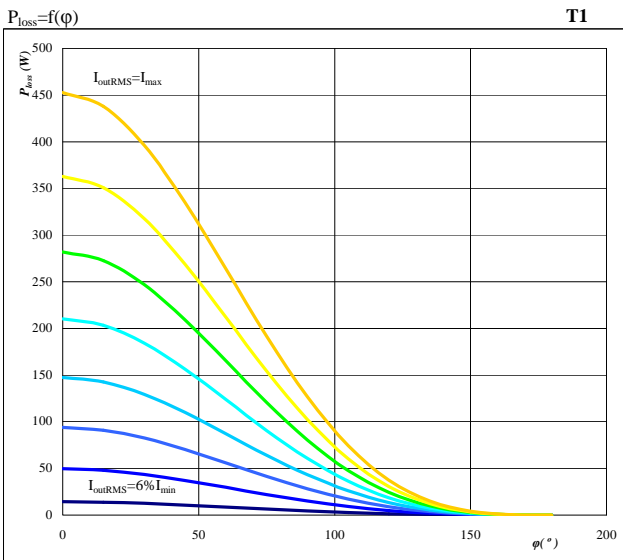
Typical average static loss as a function of output current I_{oRMS}



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

Figure 3. half bridge IGBT

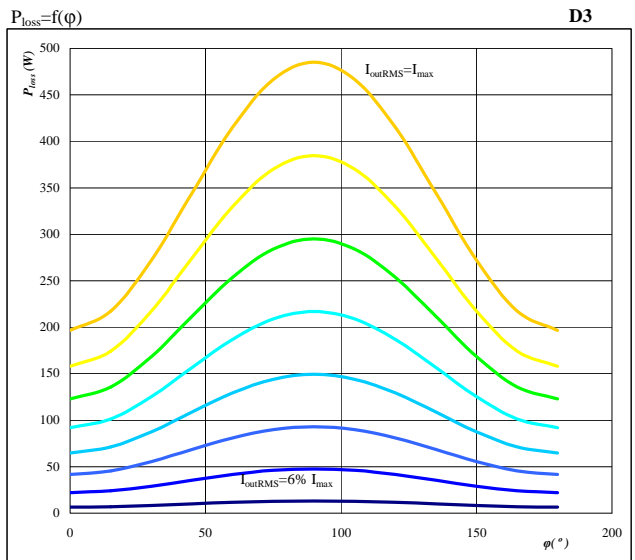
Typical average static loss as a function of phase displacement ϕ



Conditions: $T_j = 125$ °C
 parameter: I_{oRMS} from 39,6 A to 593 A
 in steps of 79 A

Figure 4. neutral point FWD

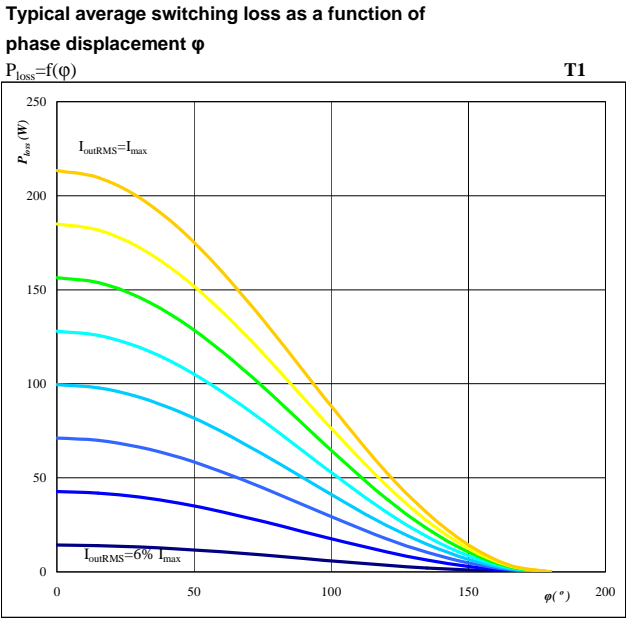
Typical average static loss as a function of phase displacement ϕ



Conditions: $T_j = 125$ °C
 parameter: I_{oRMS} from 39,6 A to 593 A
 in steps of 79 A

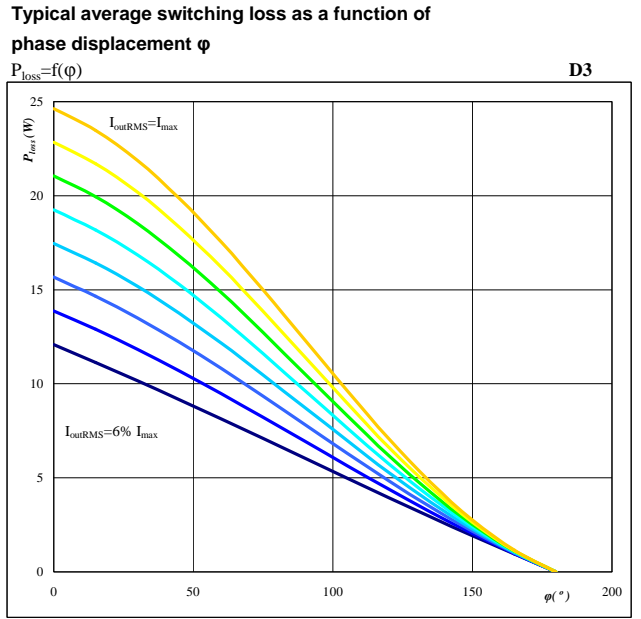
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Figure 5. half bridge IGBT



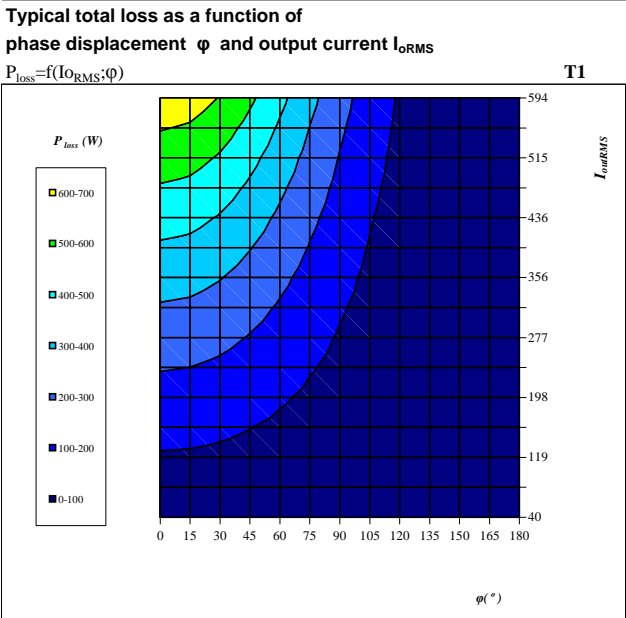
Conditions: $T_j = 125$ °C
 $f_{sw} = 8$ kHz
 DC link = 700 V
 parameter: I_{ORMS} from 39,6 A to 593 A
 in steps of 79 A

Figure 6. neutral point FWD



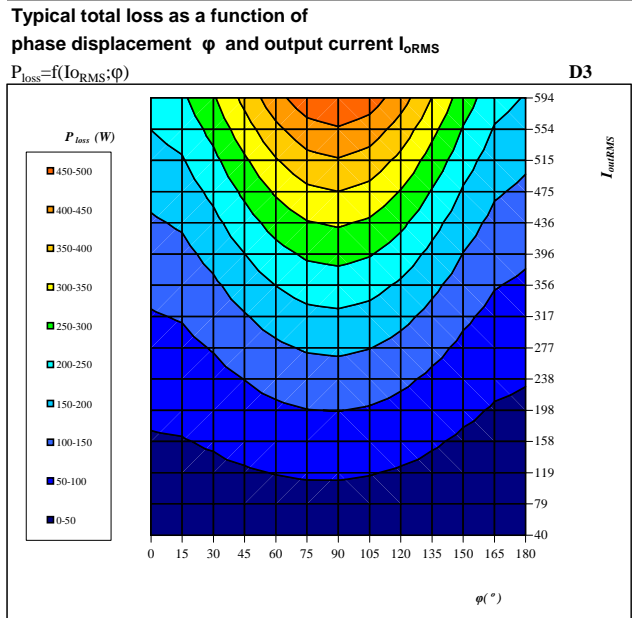
Conditions: $T_j = 125$ °C
 $f_{sw} = 8$ kHz
 DC link = 700 V
 parameter: I_{ORMS} from 39,6 A to 593 A
 in steps of 79 A

Figure 7. half bridge IGBT

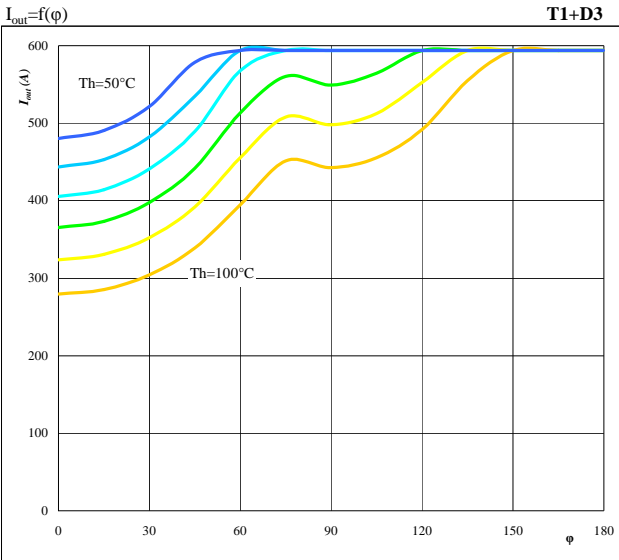


Conditions: $T_j = 125$ °C
 DC link = 700 V
 $f_{sw} = 8$ kHz

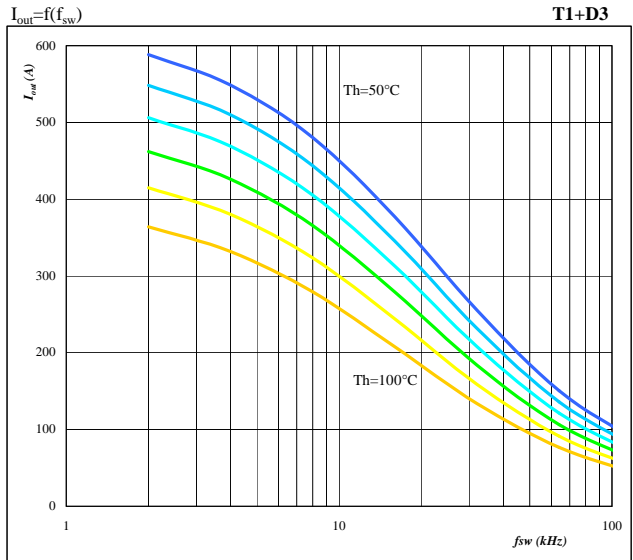
Figure 8. neutral point FWD



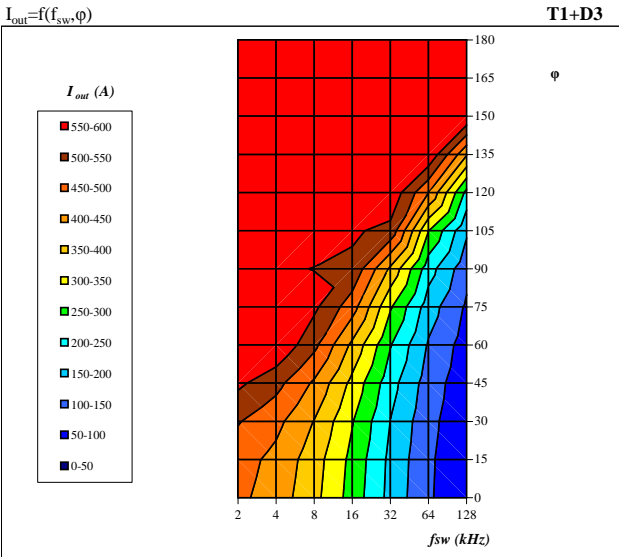
Conditions: $T_j = 125$ °C
 DC link = 700 V
 $f_{sw} = 8$ kHz

Figure 9. for half bridge IGBT+ neutral point FWD
Typical available output current as a function of phase displacement φ


Conditions: $T_j=$ 150 °C $f_{sw}=$ 8 kHz
 DC link= 700 V
 parameter: Heatsink temp.
 T_h from 50 °C to 100 °C
 in 10 °C steps

Figure 10. for half bridge IGBT+ neutral point FWD
Typical available output current as a function of switching frequency f_{sw}


Conditions: $T_j=$ 150 °C $\varphi=$ 0 °
 DC link= 700 V
 parameter: Heatsink temp.
 T_h from 50 °C to 100 °C
 in 10 °C steps

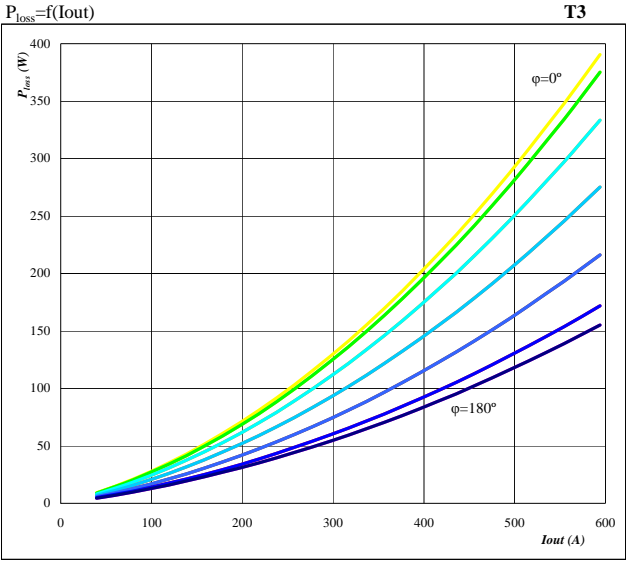
Figure 11. for half bridge IGBT+ neutral point FWD
Typical available 50Hz output current as a function of f_{sw} and phase displacement φ


Conditions: $T_j=$ 150 °C
 DC link= 700 V
 $T_h=$ 80 °C

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Figure 12. neutral point IGBT

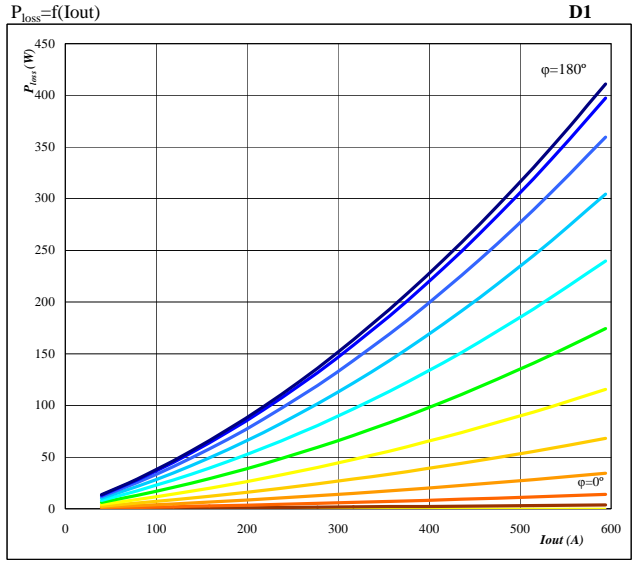
Typical average static loss as a function of output current



Conditions: $T_j = 125 \text{ }^\circ\text{C}$
 parameter: ϕ from 0° to 180°
 in 12 steps

Figure 13. half bridge FWD

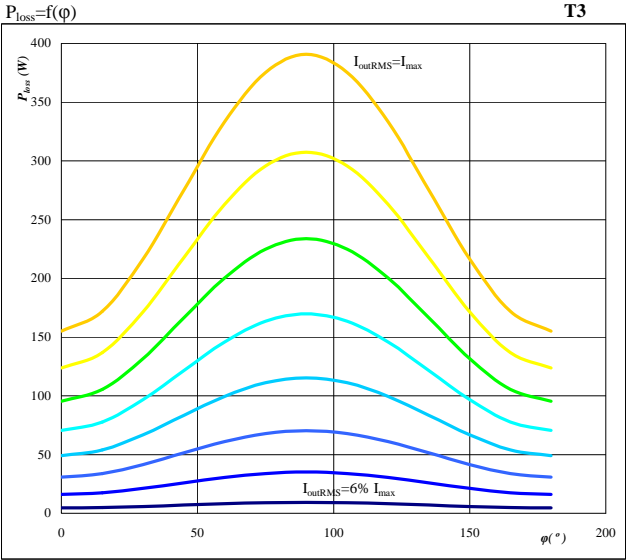
Typical average static loss as a function of output current



Conditions: $T_j = 125 \text{ }^\circ\text{C}$
 parameter: ϕ from 0° to 180°
 in 12 steps

Figure 14. neutral point IGBT

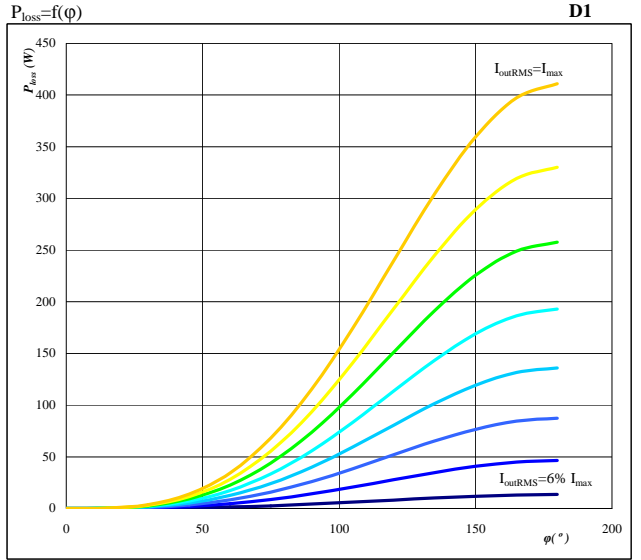
Typical average static loss as a function of phase displacement



Conditions: $T_j = 125 \text{ }^\circ\text{C}$
 parameter: I_{oRMS} from 40 A to 593 A
 in steps of 79 A

Figure 15. half bridge FWD

Typical average static loss as a function of phase displacement

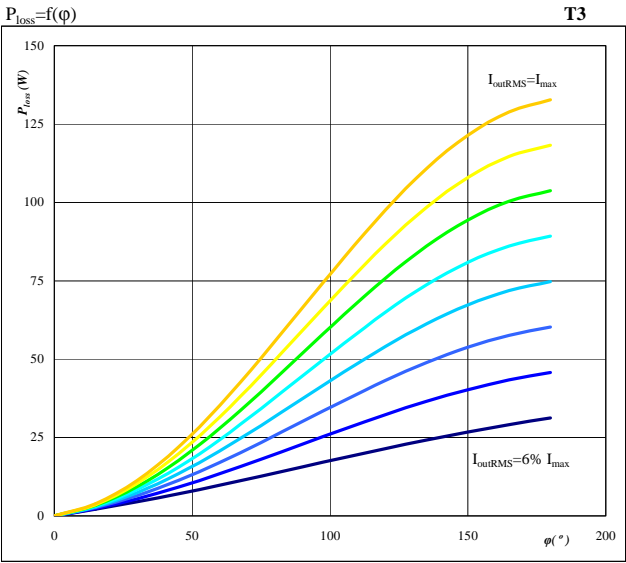


Conditions: $T_j = 125 \text{ }^\circ\text{C}$
 parameter: I_{oRMS} from 40 A to 593 A
 in steps of 79 A

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Figure 16. neutral point IGBT

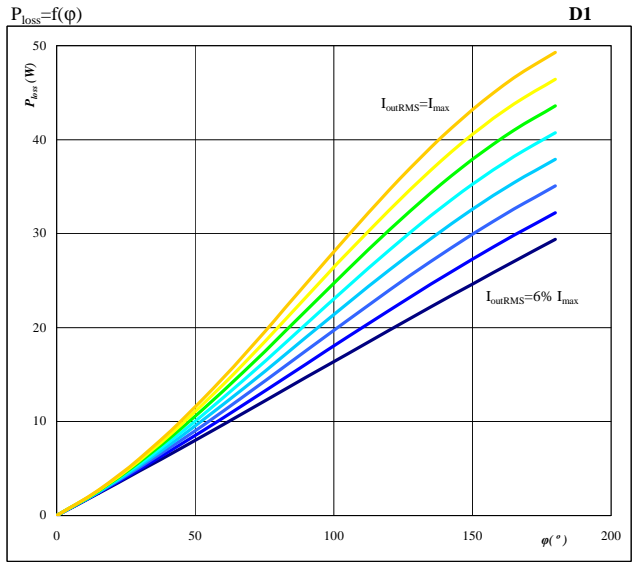
Typical average switching loss as a function of phase displacement



Conditions: $T_j = 125$ °C $f_{sw} = 8$ kHz
 DC link = 700 V
 parameter: I_{oRMS} from 40 A to 593 A
 in steps of 79 A A

Figure 17. half bridge FWD

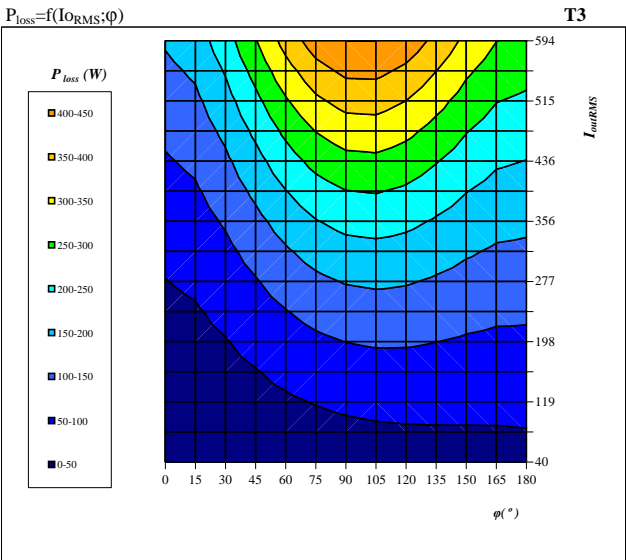
Typical average switching loss as a function of phase displacement



Conditions: $T_j = 125$ °C $f_{sw} = 8$ kHz
 DC link = 700 V
 parameter: I_{oRMS} from 40 A to 593 A
 in steps of 79 A A

Figure 18. neutral point IGBT

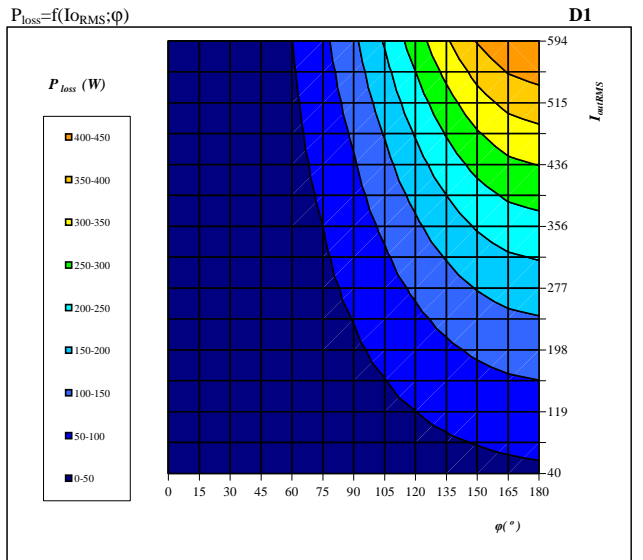
Typical total loss as a function of phase displacement and I_{outRMS}



Conditions: $T_j = 125$ °C
 DC link = 700 V
 $f_{sw} = 8$ kHz

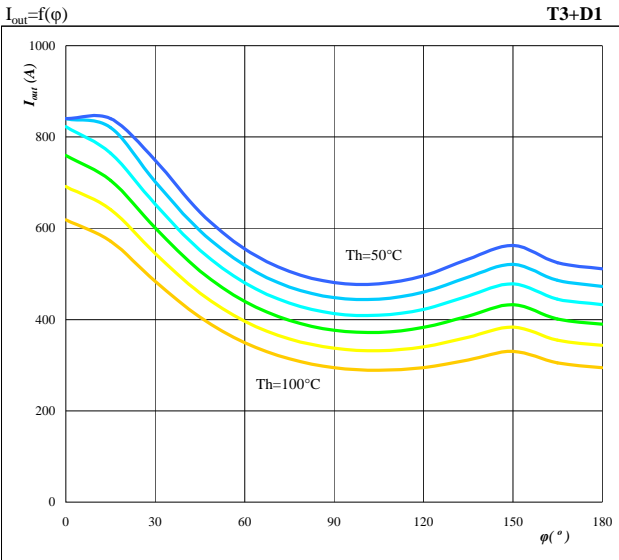
Figure 19. half bridge FWD

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



Conditions: $T_j = 125$ °C
 DC link = 700 V
 $f_{sw} = 8$ kHz

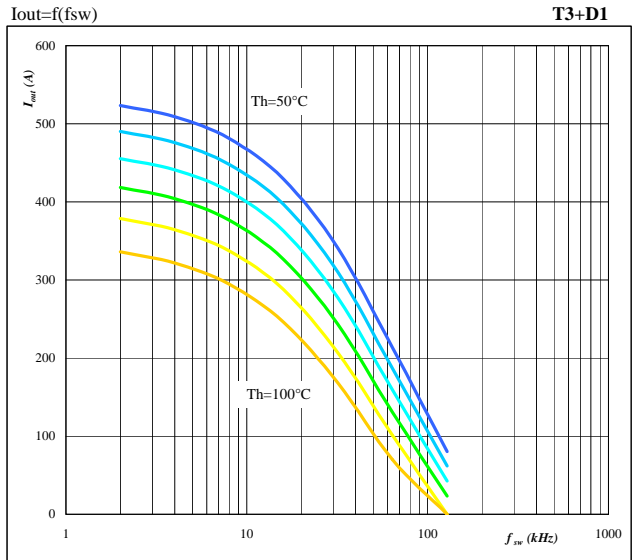
Figure 20. for neutral point IGBT+ half bridge FWD

Typical available output current as a function of phase displacement


Conditions: $T_j = 150$ °C $f_{sw} = 8$ kHz
 DC link = 700 V

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

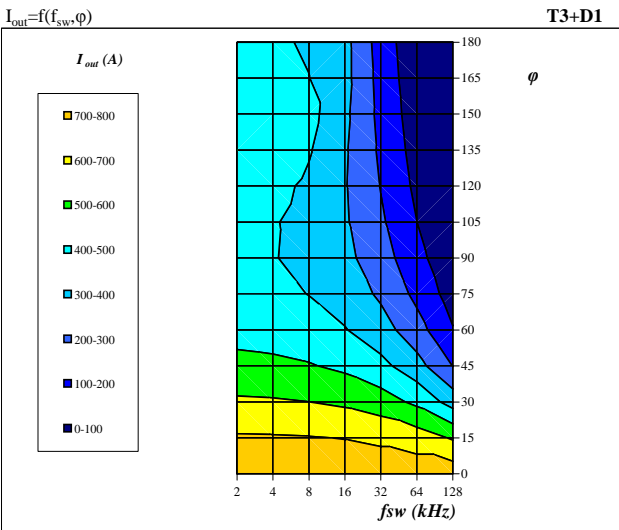
Figure 21. for neutral point IGBT+ half bridge FWD

Typical available output current as a function of switching frequency


Conditions: $T_j = 150$ °C $\varphi = 90^\circ$
 DC link = 700 V

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

Figure 22. for neutral point IGBT+ half bridge FWD

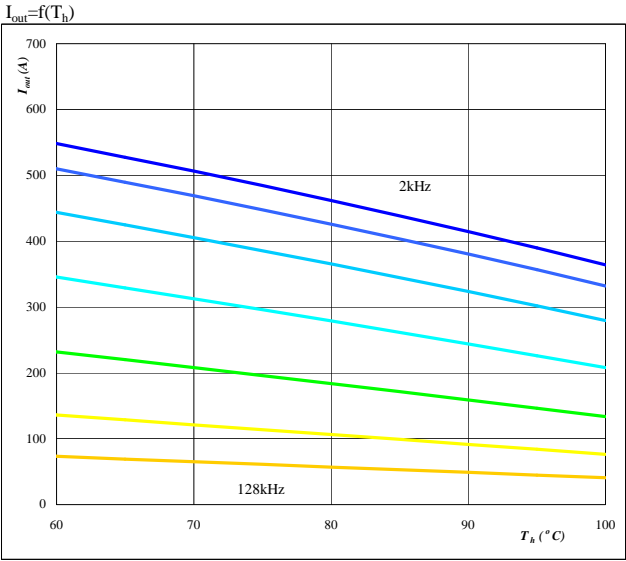
Typical available 50Hz output current as a function of fsw and phase displacement


Conditions: $T_j = 150$ °C
 DC link = 700 V
 $T_h = 80$ °C

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Figure 23. per PHASE

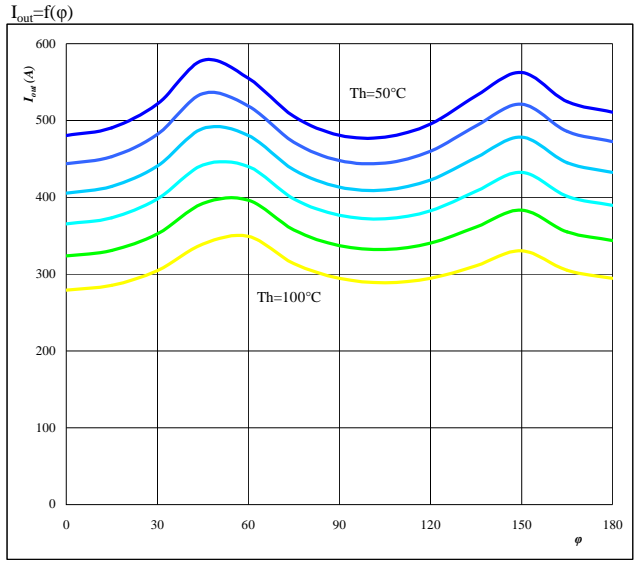
Typical available output current as a function of heat sink temperature



Conditions: $T_j= 150 \text{ }^\circ\text{C}$
 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 PHASE

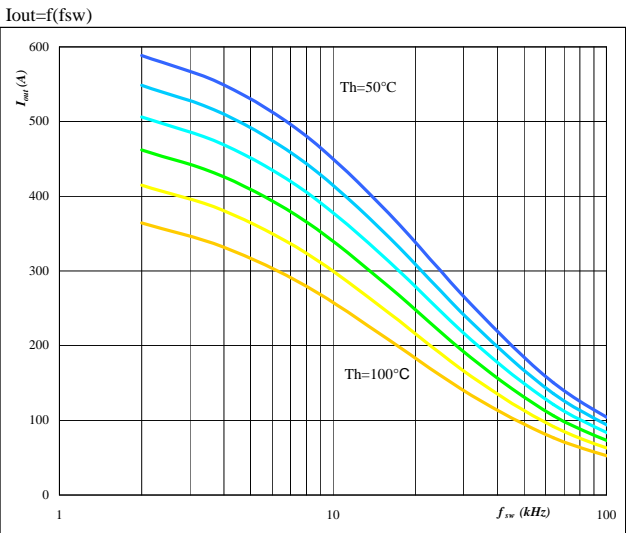
Typical available output current as a function of phase displacement



Conditions: $T_j= 150 \text{ }^\circ\text{C}$
 DC link= 700 V
 $f_{sw}= 8 \text{ kHz}$
 parameter: Heatsink temp.
 Th from 50 °C to 100
 in 10 °C steps

Figure 25. per PHASE

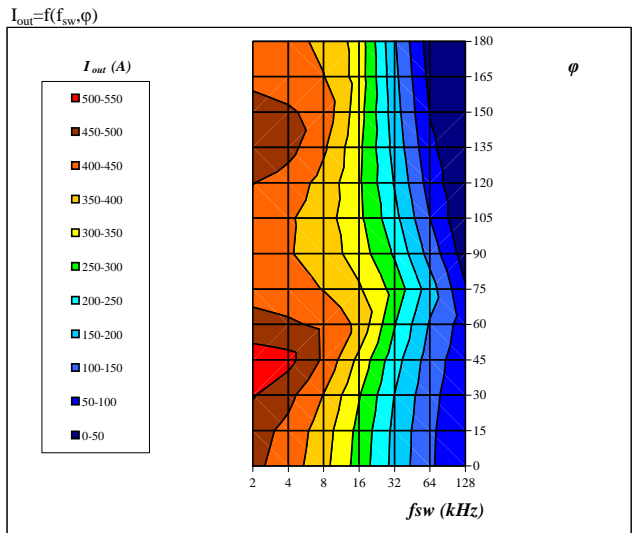
Typical available output current as a function of switching frequency



Conditions: $T_j= 150 \text{ }^\circ\text{C}$ $\varphi= 0^\circ$
 DC link= 700 V
 parameter: Heatsink temp.
 Th from 50 °C to 100
 in 10 °C steps

Figure 26. per PHASE

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



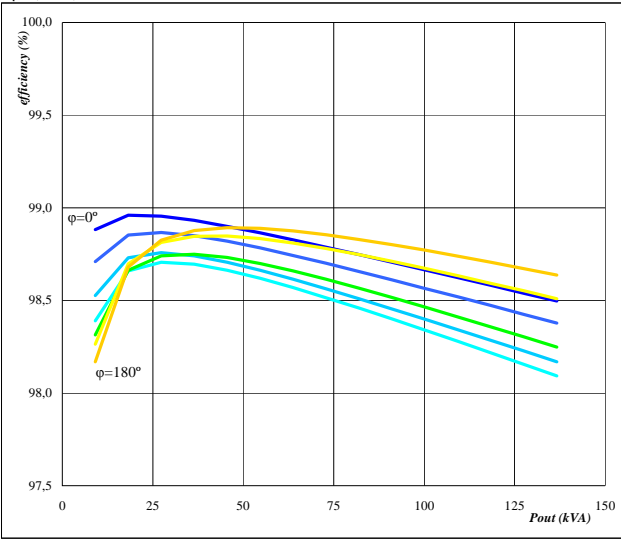
Conditions: $T_j= 150 \text{ }^\circ\text{C}$
 DC link= 700 V
 $T_h= 80 \text{ }^\circ\text{C}$

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Figure 27. per PHASE

Typical efficiency as a function of output power

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

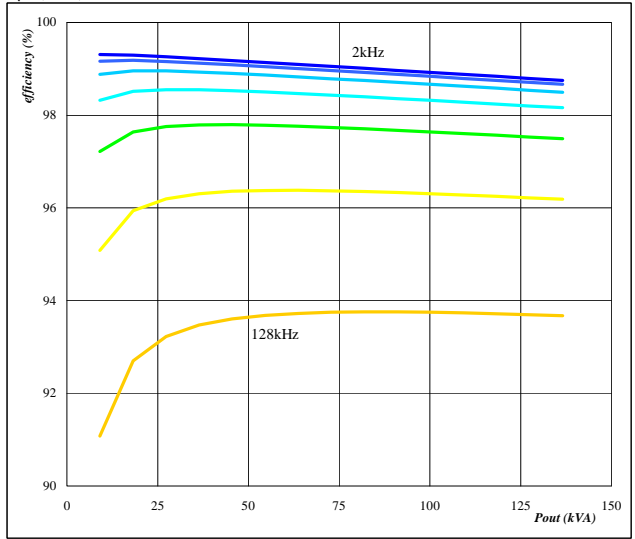


Conditions: $T_j= 125 \text{ }^\circ\text{C}$
 $f_{sw}= 8 \text{ kHz}$
 DC link= 700 V
 parameter: phase displacement
 φ from 0° to 180°
 in steps of 30°

Figure 28. per PHASE

Typical efficiency as a function of output power

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

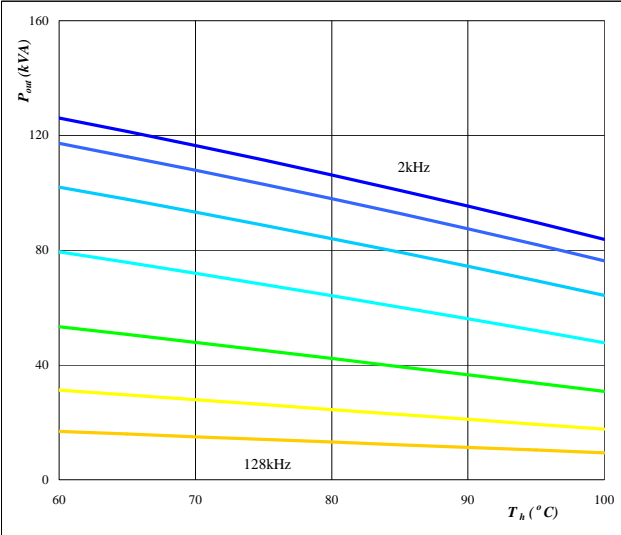


Conditions: $T_j= 125 \text{ }^\circ\text{C}$ $\varphi= 0^\circ$
 DC link= 700 V
 parameter: Switching freq.
 fsw from 2 kHz to 128 kHz
 in steps of factor 2

Figure 29. per PHASE

Typical available output power as a function of heat sink temperature

$P_{out}=f(T_h)$

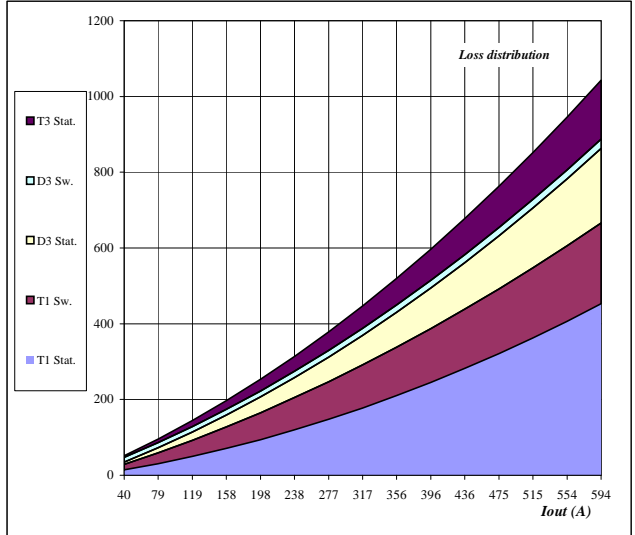


Conditions: $T_j= 125 \text{ }^\circ\text{C}$
 DC link= 700 V
 $\varphi= 0^\circ$
 parameter: Switching freq.
 fsw from 2 kHz to 128 kHz
 in steps of factor 2

Figure 30. per PHASE

Typical loss distribution as a function of output current

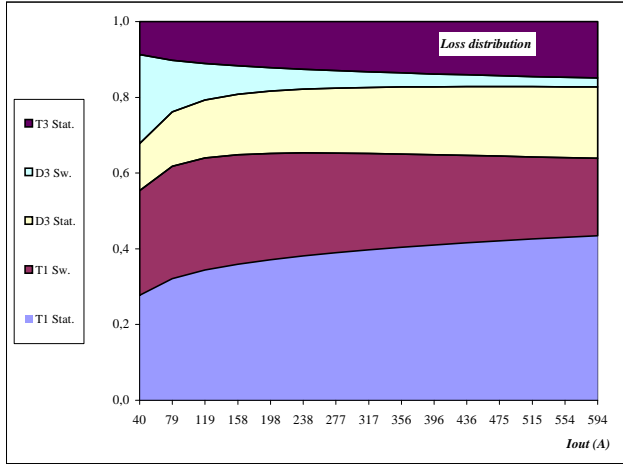
$P_{out}=f(T_h)$



Conditions: $T_j= 125 \text{ }^\circ\text{C}$
 $f_{sw}= 8 \text{ kHz}$
 DC link= 700 V
 $\varphi= 0^\circ$

Figure 31. per PHASE
Typical relativ loss distribution as a function of output current

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



Conditions:

T_j =	125	°C
f_{sw} =	8	kHz
DC link=	700	V
φ =	0°	

