

flowNPC0 **NPC Application** 600V/30A

General conditions

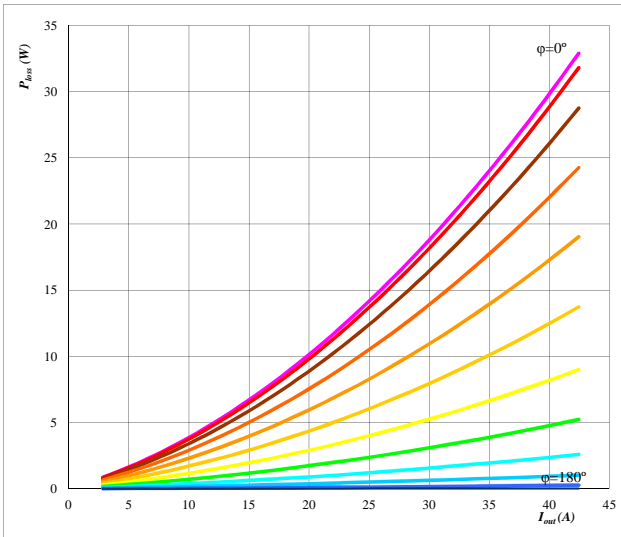
| BUCK        |               |
|-------------|---------------|
| $V_{GEon}$  | = 15 V        |
| $V_{GEoff}$ | = -15 V       |
| $R_{gon}$   | = 16 $\Omega$ |
| $R_{goff}$  | = 16 $\Omega$ |

$V_{out} = 230$  VAC

| BOOST       |               |
|-------------|---------------|
| $V_{GEon}$  | = 15 V        |
| $V_{GEoff}$ | = -15 V       |
| $R_{gon}$   | = 16 $\Omega$ |
| $R_{goff}$  | = 16 $\Omega$ |

Figure 1. Buck MOSFET

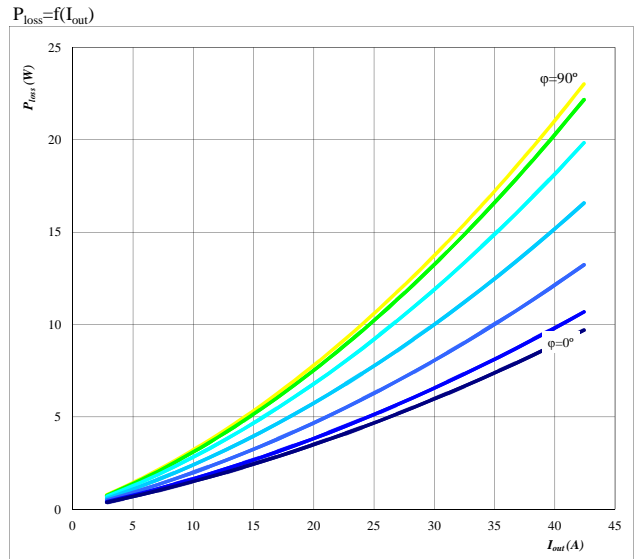
Typical average static loss as a function of



Conditions:  $T_j = 150$  °C  
parameter:  $\phi$  from 0° to 180°  
in 12 steps

Figure 2. Buck FWD

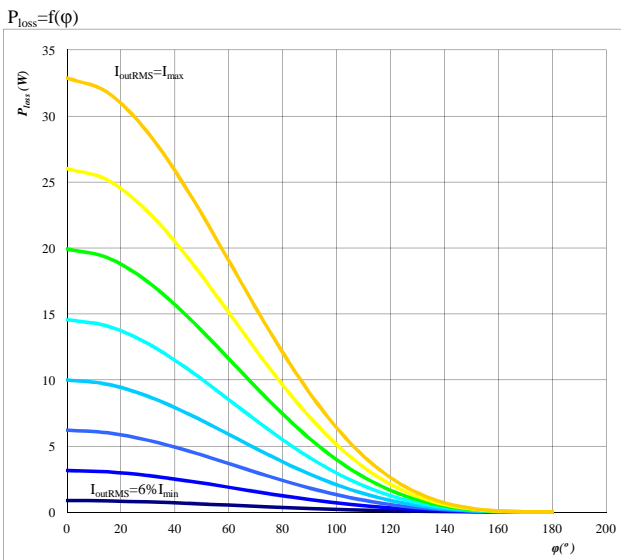
Typical average static loss as a function of output current  $I_{oRMS}$



Conditions:  $T_j = 150$  °C  
parameter:  $\phi$  from 0° to 180°  
in 12 steps

Figure 3. Buck MOSFET

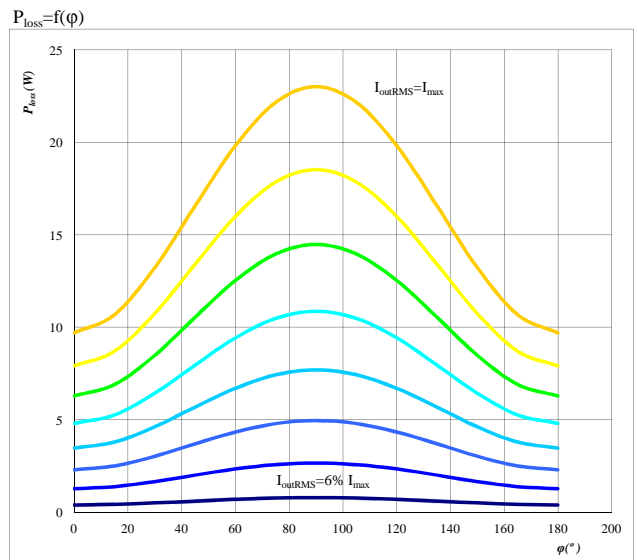
Typical average static loss as a function of phase displacement  $\phi$



Conditions:  $T_j = 150$  °C  
parameter:  $I_{oRMS}$  from 2,83 A to 42 A  
in steps of 6 A

Figure 4. Buck FWD

Typical average static loss as a function of phase displacement  $\phi$

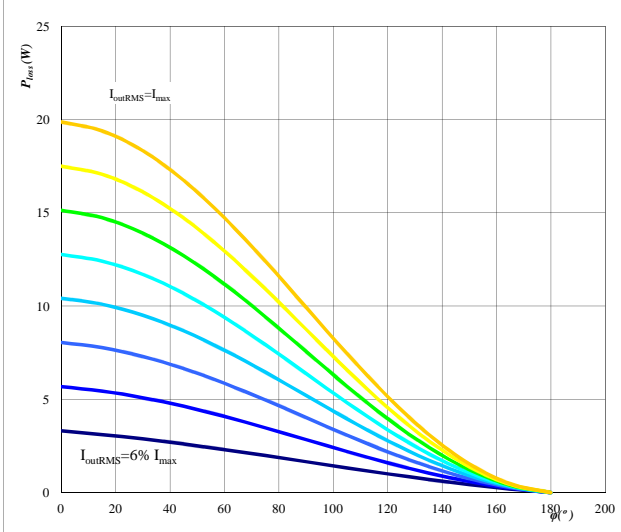


Conditions:  $T_j = 150$  °C  
parameter:  $I_{oRMS}$  from 2,83 A to 42 A  
in steps of 6 A

Figure 5. Buck MOSFET

Typical average switching loss as a function of phase displacement  $\phi$

$P_{loss} = f(\phi)$

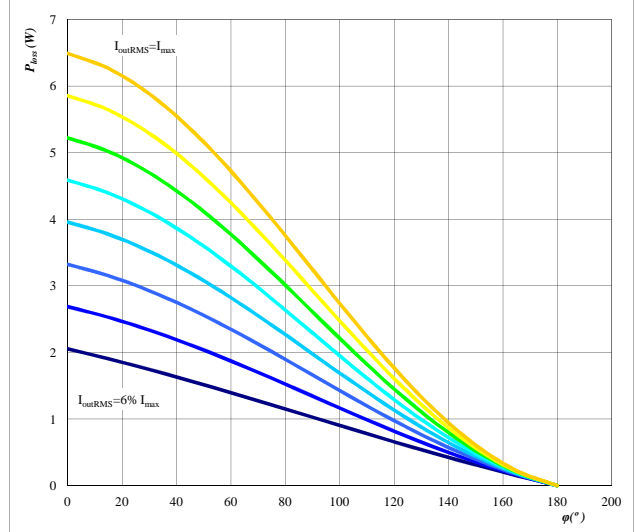


Conditions:  $T_j = 150$  °C  
 $f_{sw} = 20$  kHz  
 DC link = 700 V  
 parameter:  $I_{oRMS}$  from 2,83 A to 42 A  
 in steps of 6 A

Figure 6. Buck FWD

Typical average switching loss as a function of phase displacement  $\phi$

$P_{loss} = f(\phi)$

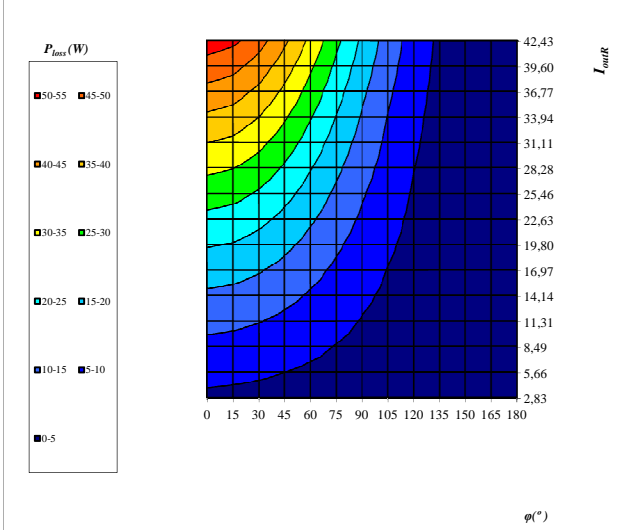


Conditions:  $T_j = 150$  °C  
 $f_{sw} = 20$  kHz  
 DC link = 700 V  
 parameter:  $I_{oRMS}$  from 2,83 A to 42 A  
 in steps of 6 A

Figure 7. Buck MOSFET

Typical total loss as a function of phase displacement  $\phi$  and output current  $I_{oRMS}$

$P_{loss} = f(I_{oRMS}; \phi)$

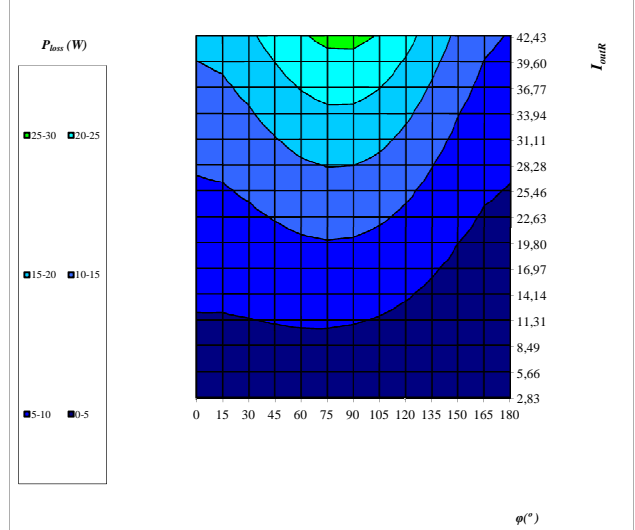


Conditions:  $T_j = 150$  °C  
 DC link = 700 V  
 $f_{sw} = 20$  kHz

Figure 8. Buck FWD

Typical total loss as a function of phase displacement  $\phi$  and output current  $I_{oRMS}$

$P_{loss} = f(I_{oRMS}; \phi)$

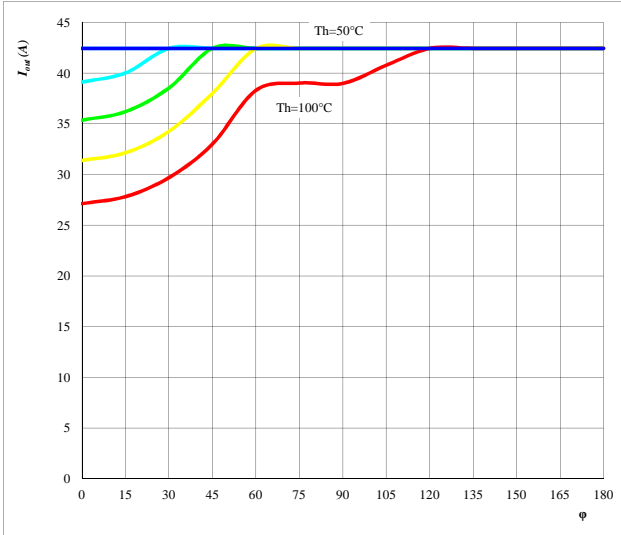


Conditions:  $T_j = 150$  °C  
 DC link = 700 V  
 $f_{sw} = 20$  kHz

Figure 9. for Buck MOSFET+FWD

Typical available output current as a function of phase displacement  $\varphi$

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

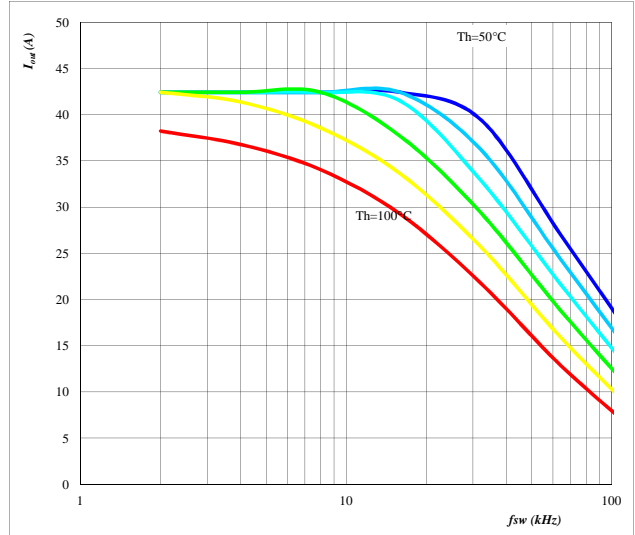


Conditions:  $T_j = T_{jmax} - 25 \text{ }^\circ\text{C}$   $f_{sw} = 20 \text{ kHz}$   
 DC link = 700 V  
 parameter: Heatsink temp.  
 $T_h$  from 50  $^\circ\text{C}$  to 100  $^\circ\text{C}$   
 in 10  $^\circ\text{C}$  steps

Figure 10. for Buck MOSFET+FWD

Typical available output current as a function of switching frequency  $f_{sw}$

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

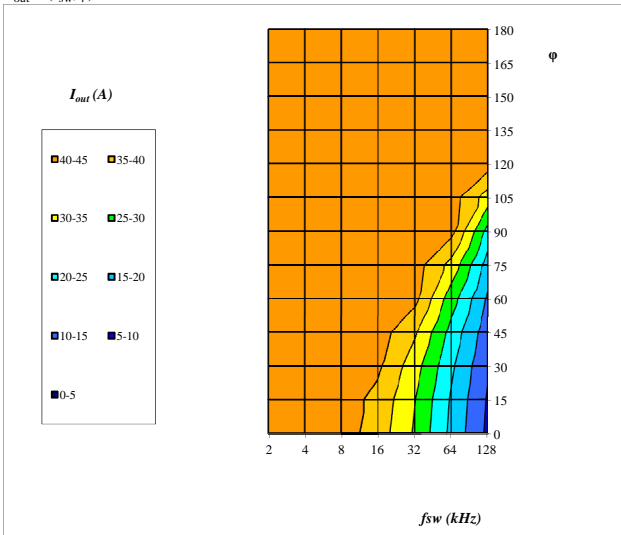


Conditions:  $T_j = T_{jmax} - 25 \text{ }^\circ\text{C}$   $\varphi = 0 \text{ }^\circ$   
 DC link = 700 V  
 parameter: Heatsink temp.  
 $T_h$  from 50  $^\circ\text{C}$  to 100  $^\circ\text{C}$   
 in 10  $^\circ\text{C}$  steps

Figure 11. for Buck IGBT+FWD

Typical available 50Hz output current as a function of  $f_{sw}$  and phase displacement  $\varphi$

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



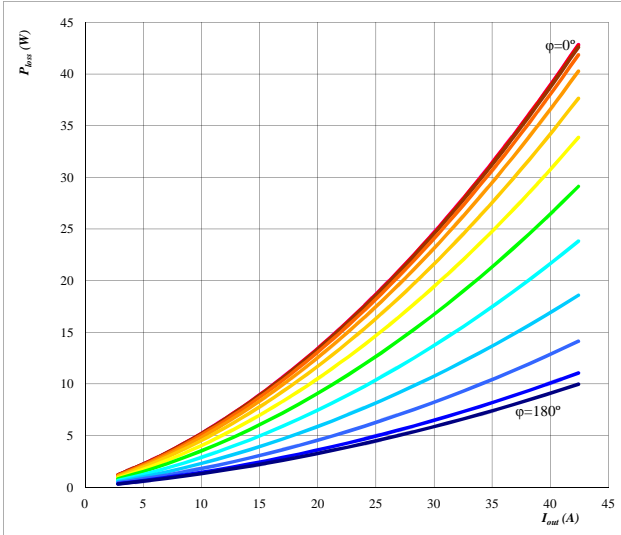
Conditions:  $T_j = T_{jmax} - 25 \text{ }^\circ\text{C}$   
 DC link = 700 V  
 $T_h = 80 \text{ }^\circ\text{C}$

flowNPC0 NPC Application 600V/30A

Figure 12. Boost IGBT

Typical average static loss as a function of output current

$$P_{loss} = f(I_{out})$$

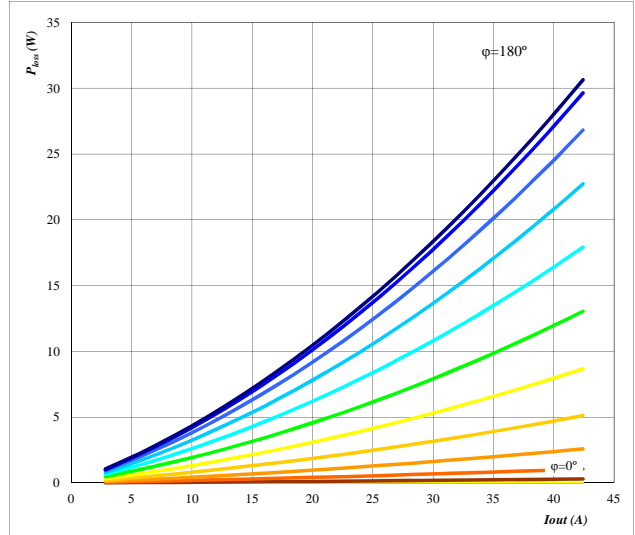


Conditions:  $T_j = 150^\circ\text{C}$   
parameter:  $\phi$  from  $0^\circ$  to  $180^\circ$   
in 12 steps

Figure 13. Boost FWD

Typical average static loss as a function of output current

$$P_{loss} = f(I_{out})$$

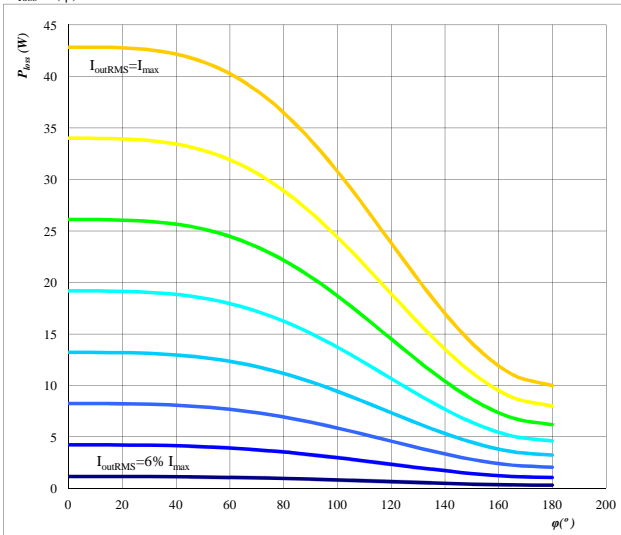


Conditions:  $T_j = 150^\circ\text{C}$   
parameter:  $\phi$  from  $0^\circ$  to  $180^\circ$   
in 12 steps

Figure 14. Boost IGBT

Typical average static loss as a function of phase displacement

$$P_{loss} = f(\phi)$$

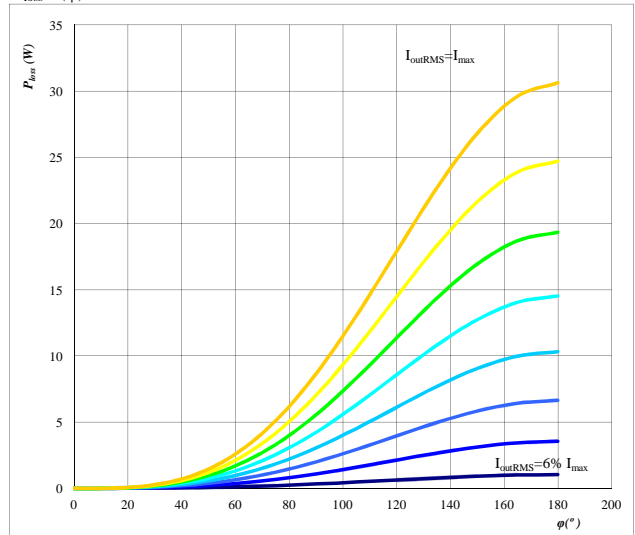


Conditions:  $T_j = 150^\circ\text{C}$   
parameter:  $I_{oRMS}$  from 3 A to 42 A  
in steps of 6 A

Figure 15. Boost FWD

Typical average static loss as a function of phase displacement

$$P_{loss} = f(\phi)$$

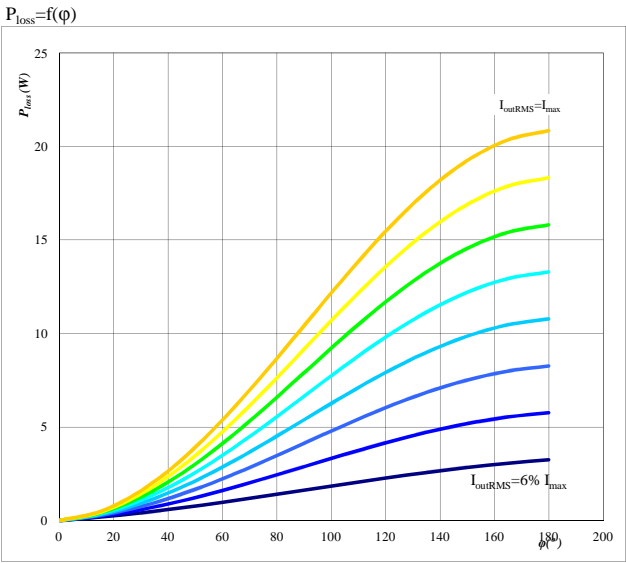


Conditions:  $T_j = 150^\circ\text{C}$   
parameter:  $I_{oRMS}$  from 3 A to 42 A  
in steps of 6 A

flowNPC0 NPC Application 600V/30A

Figure 16. Boost IGBT

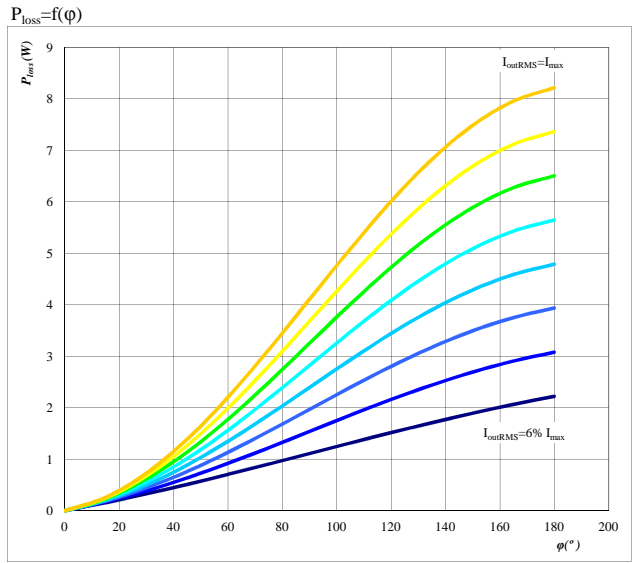
Typical average switching loss as a function of phase displacement



Conditions:  $T_j = 150$  °C  $f_{sw} = 20$  kHz  
DC link = 700 V  
parameter:  $I_{oRMS}$  from 3 A to 42 A  
in steps of 6 A A

Figure 17. Boost FWD

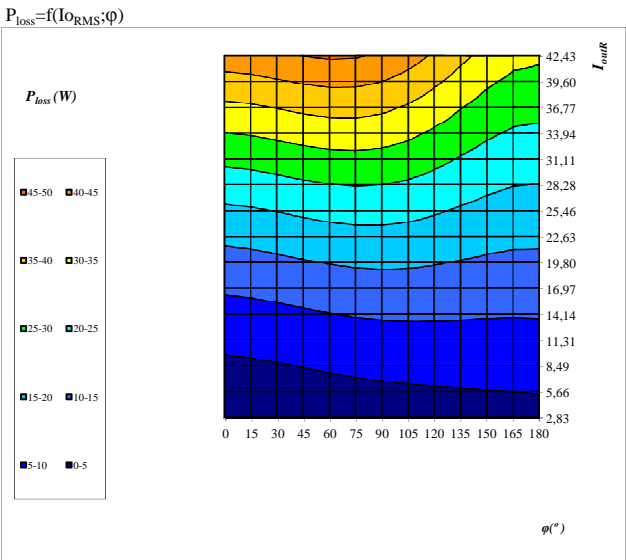
Typical average switching loss as a function of phase displacement



Conditions:  $T_j = 150$  °C  $f_{sw} = 20$  kHz  
DC link = 700 V  
parameter:  $I_{oRMS}$  from 3 A to 42 A  
in steps of 6 A A

Figure 18. Boost IGBT

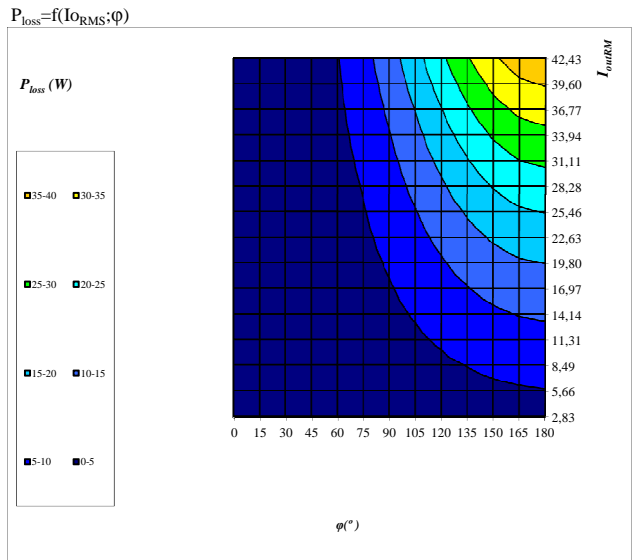
Typical total loss as a function of phase displacement and  $I_{outRMS}$



Conditions:  $T_j = 150$  °C  
DC link = 700 V  
 $f_{sw} = 20$  kHz

Figure 19. Boost FWD

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



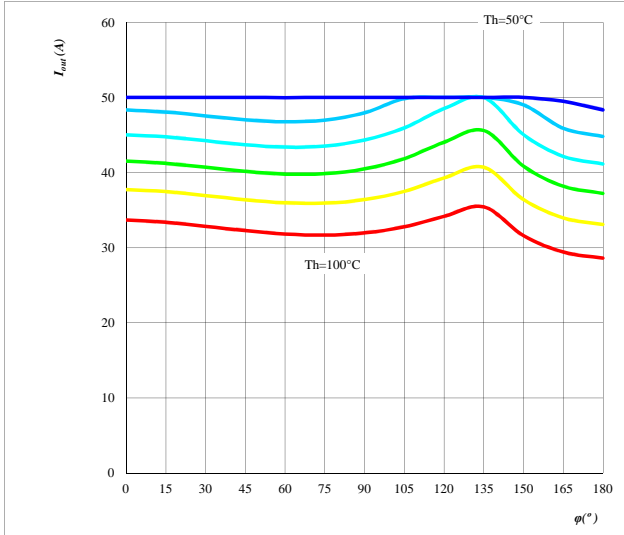
Conditions:  $T_j = 150$  °C  
DC link = 700 V  
 $f_{sw} = 20$  kHz

flowNPC0 NPC Application 600V/30A

Figure 20. Boost IGBT+FWD

Typical available output current as a function of phase displacement

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

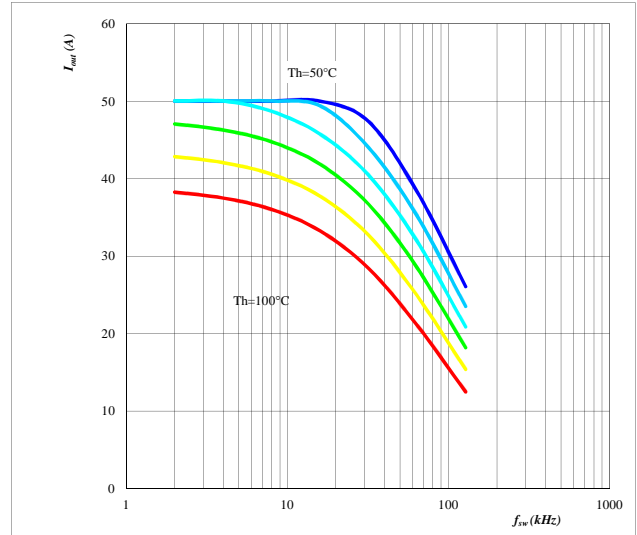


Conditions:  $T_j = T_{jmax}-25 \text{ }^\circ\text{C}$   $f_{sw} = 20 \text{ kHz}$   
 DC link = 700 V  
 parameter: Heatsink temp.  
 Th from 50  $^\circ\text{C}$  to 100  $^\circ\text{C}$   
 in 10  $^\circ\text{C}$  steps

Figure 21. Boost IGBT+FWD

Typical available output current as a function of switching frequency

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

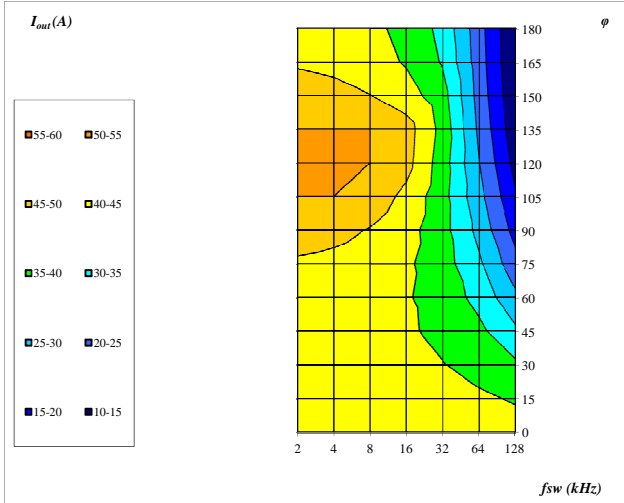


Conditions:  $T_j = T_{jmax}-25 \text{ }^\circ\text{C}$   $\varphi = 90^\circ$   
 DC link = 700 V  
 parameter: Heatsink temp.  
 Th from 50  $^\circ\text{C}$  to 100  $^\circ\text{C}$   
 in 10  $^\circ\text{C}$  steps

Figure 22. Boost IGBT+FWD

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

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



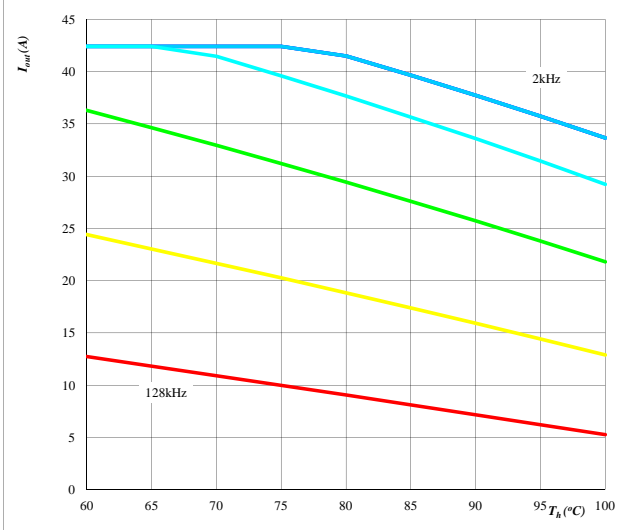
Conditions:  $T_j = T_{jmax}-25 \text{ }^\circ\text{C}$   
 DC link = 700 V  
 $T_h = 80 \text{ }^\circ\text{C}$

flowNPC0 NPC Application 600V/30A

Figure 23. per MODULE

Typical available output current as a function of heat sink temperature

$I_{out}=f(T_h)$

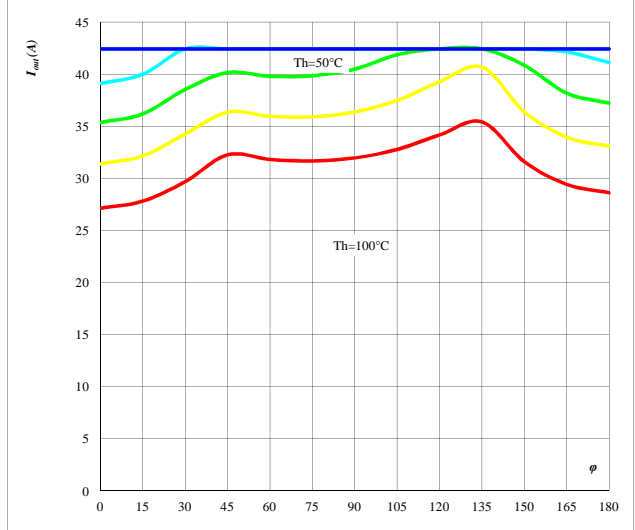


Conditions:  $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$   
DC link= 700 V  
 $\varphi = 0^\circ$   
parameter: Switching freq.  
fsw from 2 kHz to 128 kHz  
in steps of factor 2

Figure 24. per MODULE

Typical available output current as a function of phase displacement

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

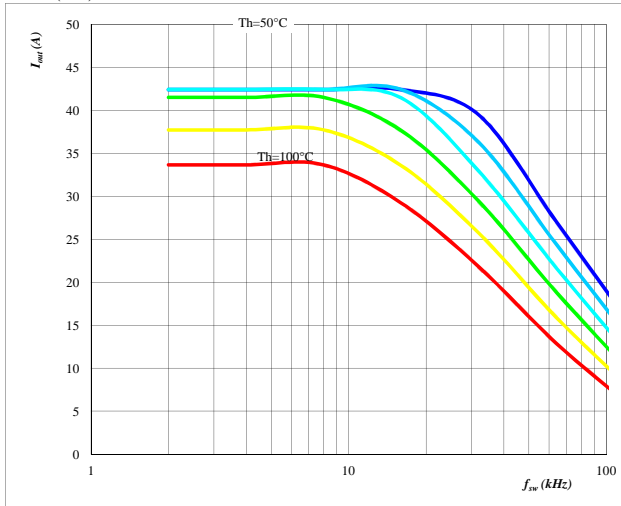


Conditions:  $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$   
DC link= 700 V  
fsw= 20 kHz  
parameter: Heatsink temp.  
Th from 50 °C to 100 °C  
in 10 °C steps

Figure 25. per MODULE

Typical available output current as a function of switching frequency

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

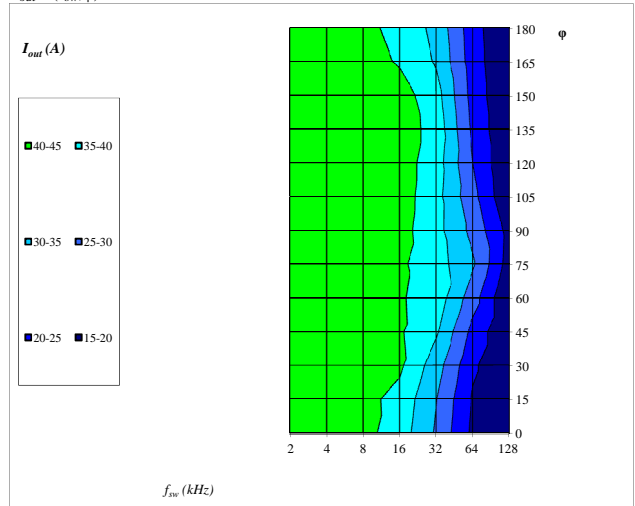


Conditions:  $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$   $\varphi = 0^\circ$   
DC link= 700 V  
parameter: Heatsink temp.  
Th from 50 °C to 100 °C  
in 10 °C steps

Figure 26. per MODULE

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

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

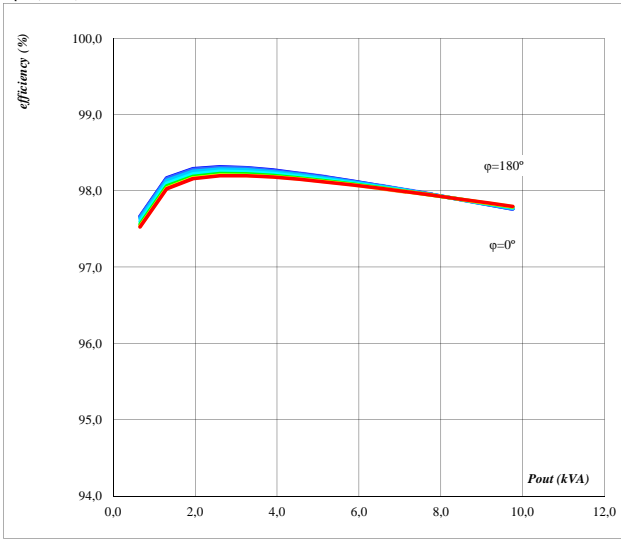


Conditions:  $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$   
DC link= 700 V  
 $T_h = 80 \text{ } ^\circ\text{C}$

**Figure 27.** per MODULE

Typical efficiency as a function of output power

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

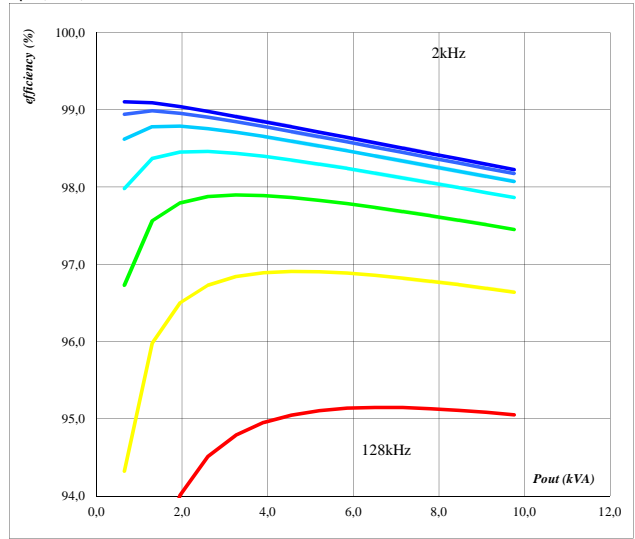


Conditions:  $T_j = 150$  °C  
 $f_{sw} = 20$  kHz  
 DC link = 700 V  
 parameter: phase displacement  $\varphi$  from 0° to 180° in steps of 30°

**Figure 28.** per MODULE

Typical efficiency as a function of output power

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

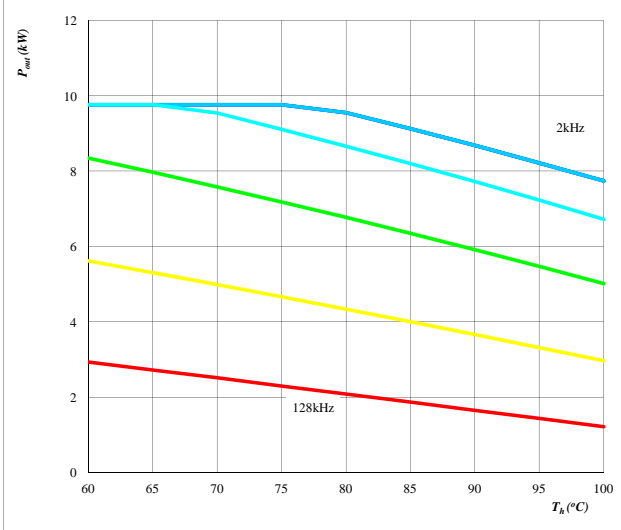


Conditions:  $T_j = 150$  °C  $\varphi = 0$  °  
 DC link = 700 V  
 parameter: Switching freq.  $f_{sw}$  from 2 kHz to 128 kHz in steps of factor 2

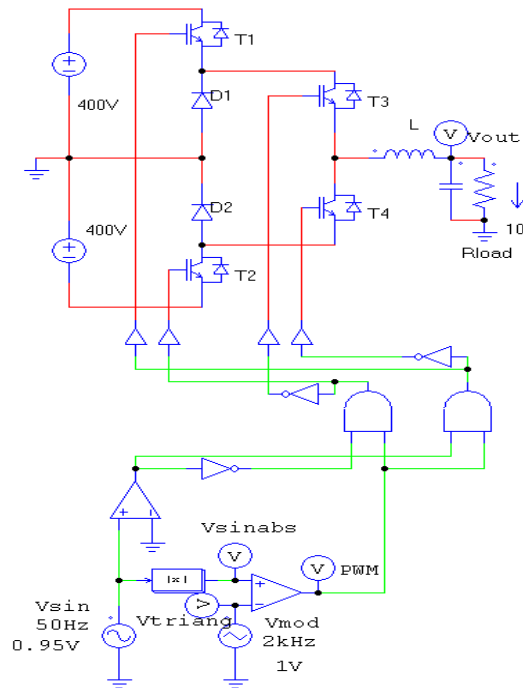
**Figure 29.** per MODULE

Typical available output power as a function of heat sink temperature

$P_{out}=f(T_h)$



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

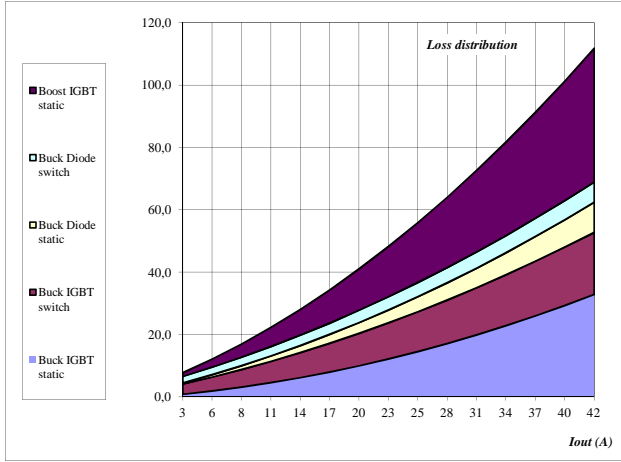




**Figure 30.** per MODULE

**Typical loss distribution as a function of output current**

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



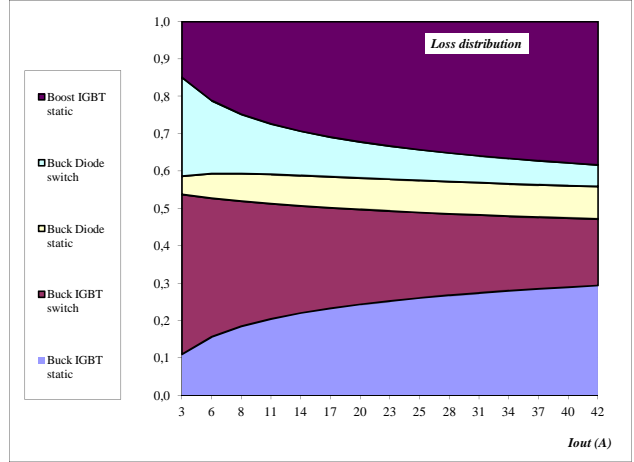
Conditions:

|             |     |     |
|-------------|-----|-----|
| $T_j$ =     | 150 | °C  |
| $f_{sw}$ =  | 20  | kHz |
| DC link=    | 700 | V   |
| $\varphi$ = | 0°  |     |

**Figure 31.** per MODULE

**Typical relativ loss distribution as a function of output current**

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



Conditions:

|             |     |     |
|-------------|-----|-----|
| $T_j$ =     | 150 | °C  |
| $f_{sw}$ =  | 20  | kHz |
| DC link=    | 700 | V   |
| $\varphi$ = | 0°  |     |