

**flowNPC2 NPC Application 600V/200A**

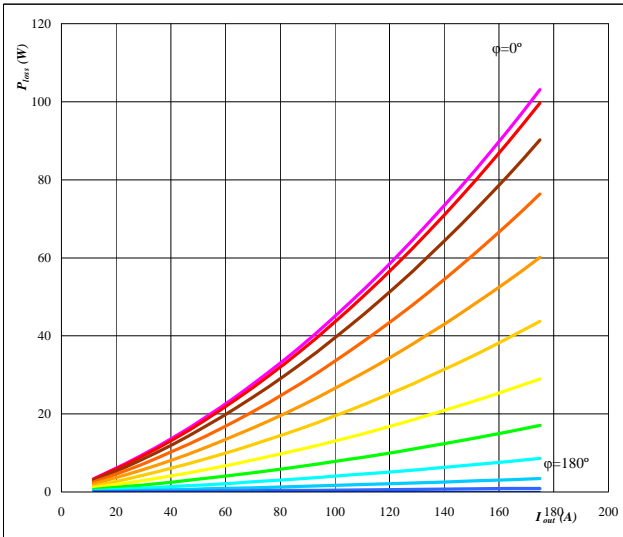
General conditions

V<sub>out</sub>= 230 VAC

BUCK	
V <sub>GEon</sub>	= 15 V
V <sub>GEoff</sub>	= -15 V
R <sub>gon</sub>	= 4 Ω
R <sub>goff</sub>	= 4 Ω

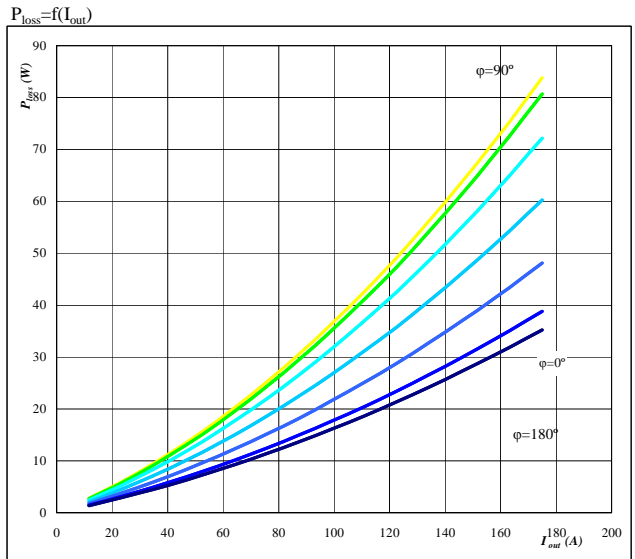
BOOST	
V <sub>GEon</sub>	= 15 V
V <sub>GEoff</sub>	= -15 V
R <sub>gon</sub>	= 4 Ω
R <sub>goff</sub>	= 4 Ω

**Figure 1. Buck IGBT**  
Typical average static loss as a function of



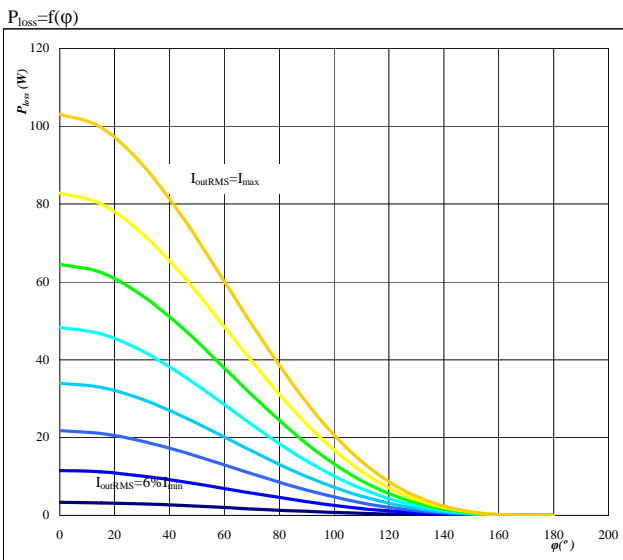
Conditions: T<sub>j</sub>= 150 °C  
parameter: φ from 0° to 180°  
in 12 steps

**Figure 2. Buck FRED**  
Typical average static loss as a function of output current I<sub>oRMS</sub>



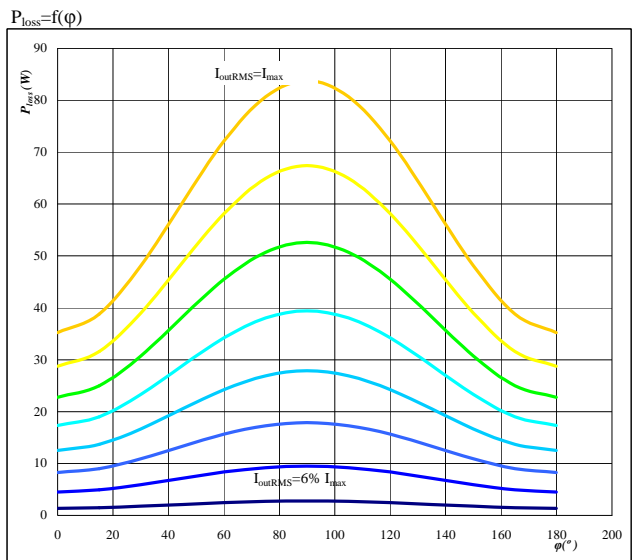
Conditions: T<sub>j</sub>= 150 °C  
parameter: φ from 0° to 180°  
in 12 steps

**Figure 3. Buck IGBT**  
Typical average static loss as a function of phase displacement φ



Conditions: T<sub>j</sub>= 150 °C  
parameter: I<sub>oRMS</sub> from 11,67 A to 175 A  
in steps of 23 A

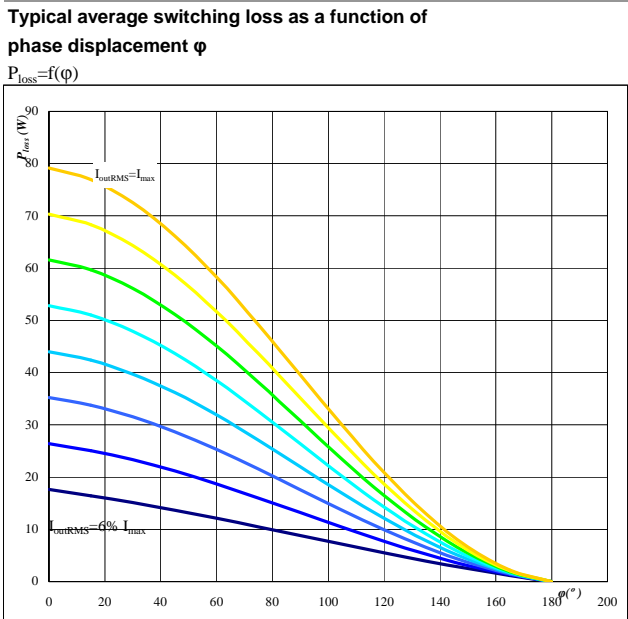
**Figure 4. Buck FRED**  
Typical average static loss as a function of phase displacement φ



Conditions: T<sub>j</sub>= 150 °C  
parameter: I<sub>oRMS</sub> from 11,67 A to 175 A  
in steps of 23 A

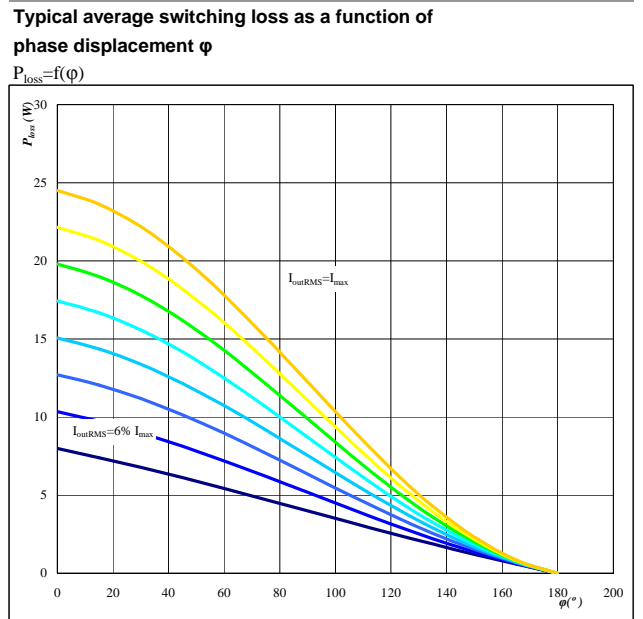
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**Figure 5. Buck IGBT**



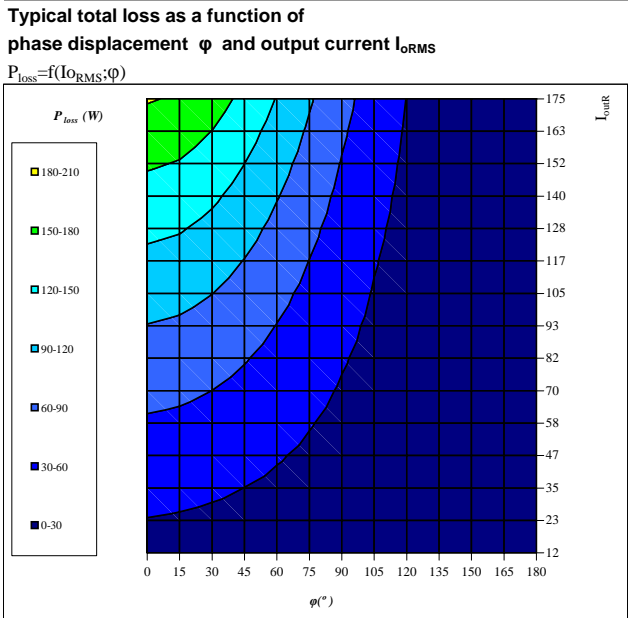
Conditions:  $T_j = 150$  °C  
 $f_{sw} = 16$  kHz  
 DC link = 700 V  
 parameter:  $I_{ORMS}$  from 11,67 A to 175 A  
 in steps of 23 A

**Figure 6. Buck FRED**



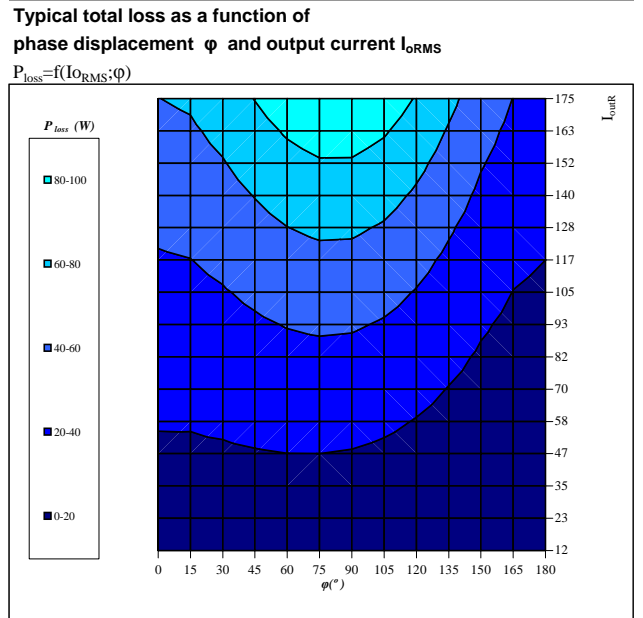
Conditions:  $T_j = 150$  °C  
 $f_{sw} = 16$  kHz  
 DC link = 700 V  
 parameter:  $I_{ORMS}$  from 11,67 A to 175 A  
 in steps of 23 A

**Figure 7. Buck IGBT**



Conditions:  $T_j = 150$  °C  
 DC link = 700 V  
 $f_{sw} = 16$  kHz

**Figure 8. Buck FRED**



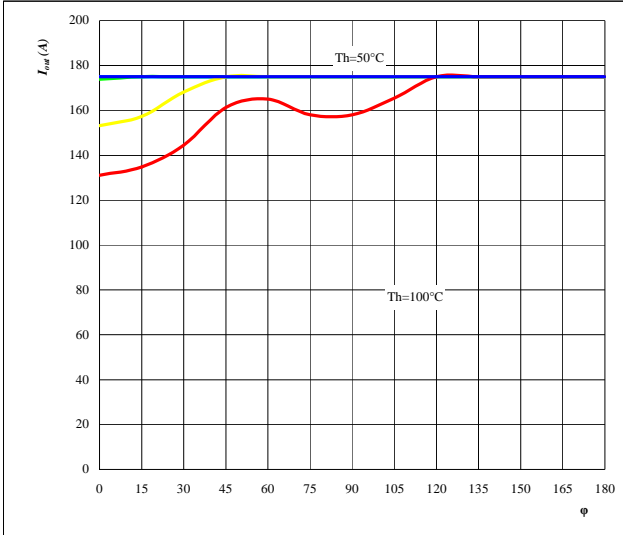
Conditions:  $T_j = 150$  °C  
 DC link = 700 V  
 $f_{sw} = 16$  kHz

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**Figure 9.** for Buck IGBT+FRED

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

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

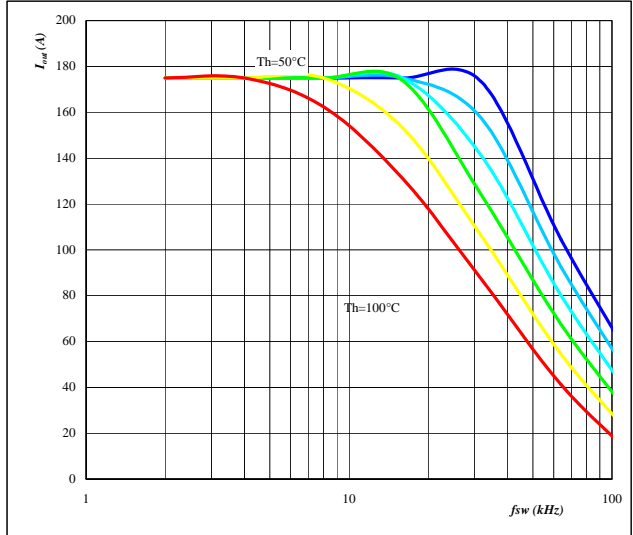


Conditions:  $T_j = T_{jmax}-25 \text{ }^\circ\text{C}$   $f_{sw} = 16 \text{ kHz}$   
 DC link = 700 V  
 parameter: Heatsink temp.  
 $T_h$  from 50  $^\circ\text{C}$  to 100  $^\circ\text{C}$   
 in 10  $^\circ\text{C}$  steps

**Figure 10.** for Buck IGBT+FRED

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

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

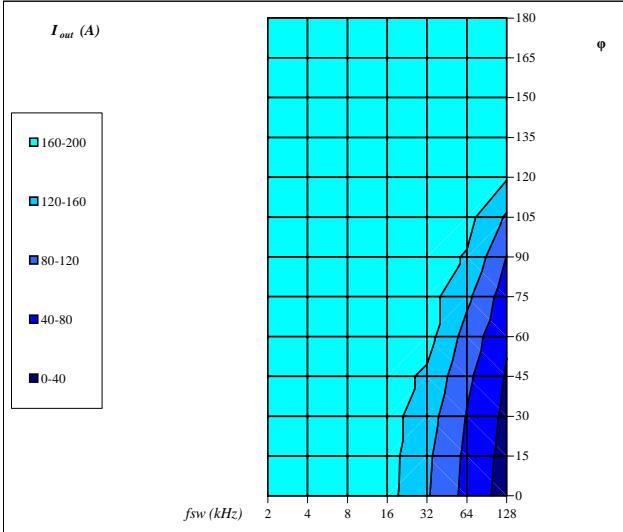


Conditions:  $T_j = T_{jmax}-25 \text{ }^\circ\text{C}$   $\phi = 0 \text{ }^\circ$   
 DC link = 700 V  
 parameter: Heatsink temp.  
 $T_h$  from 50  $^\circ\text{C}$  to 100  $^\circ\text{C}$   
 in 10  $^\circ\text{C}$  steps

**Figure 11.** for Buck IGBT+FRED

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

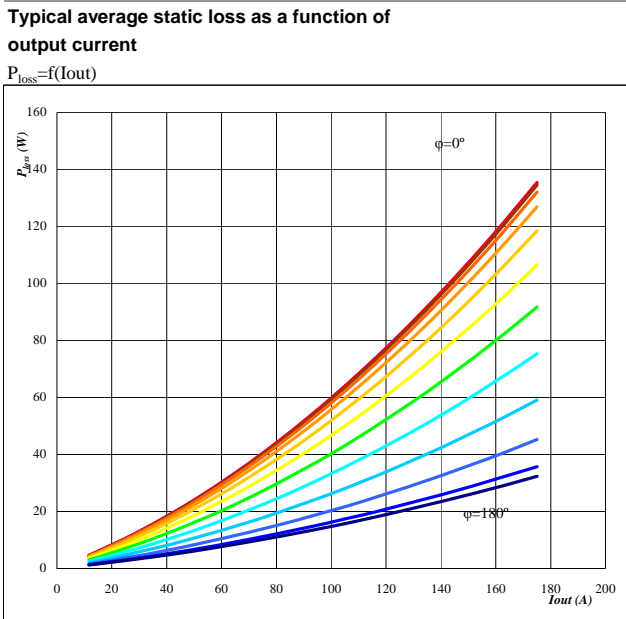
$I_{out}=f(f_{sw},\phi)$



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

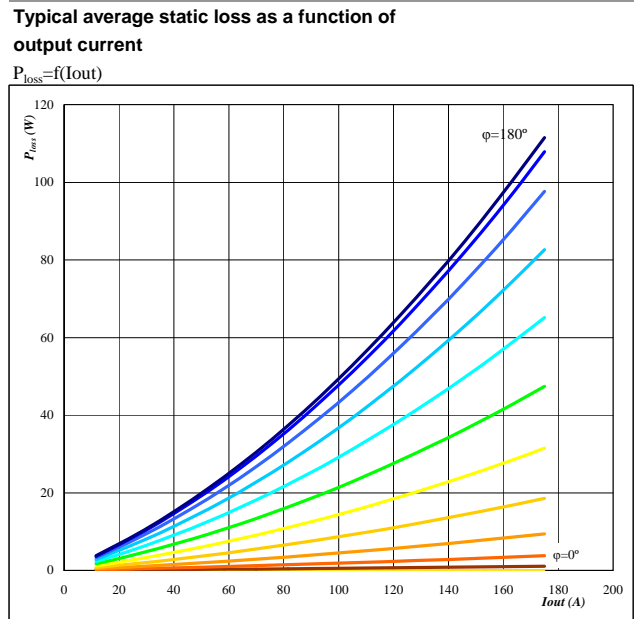
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**Figure 12.** Boost IGBT



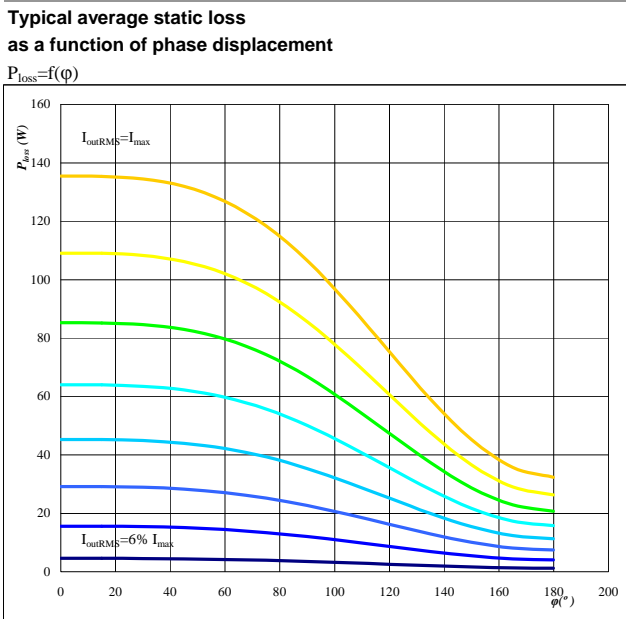
Conditions:  $T_j = 150$  °C  
 parameter:  $\phi$  from 0° to 180°  
 in 12 steps

**Figure 13.** Boost FRED



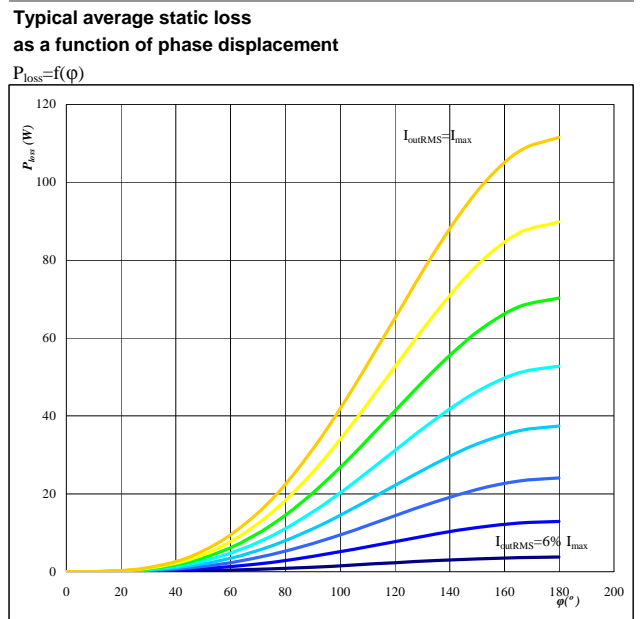
Conditions:  $T_j = 150$  °C  
 parameter:  $\phi$  from 0° to 180°  
 in 12 steps

**Figure 14.** Boost IGBT



Conditions:  $T_j = 150$  °C  
 parameter:  $I_{oRMS}$  from 12 A to 175 A  
 in steps of 23 A

**Figure 15.** Boost FRED



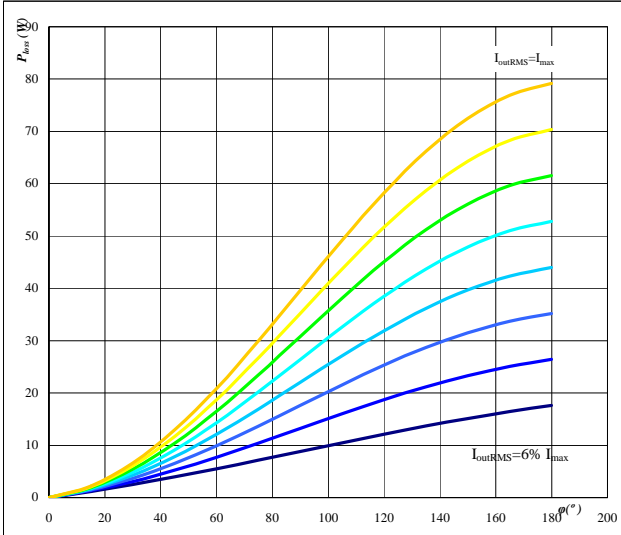
Conditions:  $T_j = 150$  °C  
 parameter:  $I_{oRMS}$  from 12 A to 175 A  
 in steps of 23 A

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**Figure 16. Boost IGBT**

**Typical average switching loss as a function of phase displacement**

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

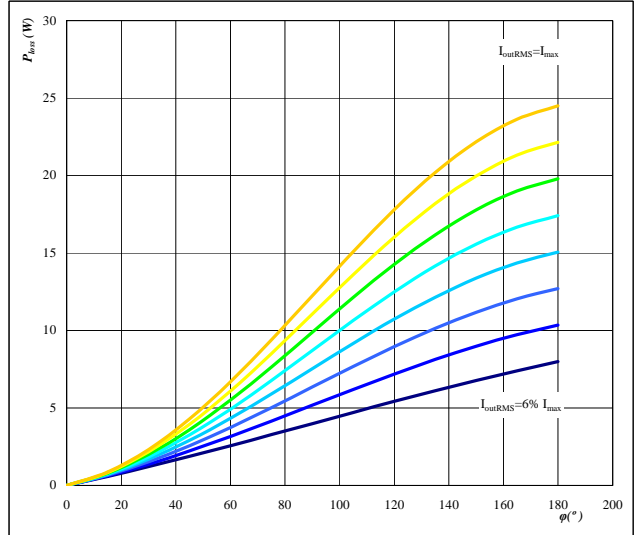


Conditions:  $T_j = 150$  °C  $f_{sw} = 16$  kHz  
 DC link = 700 V  
 parameter:  $I_{oRMS}$  from 12 A to 175 A  
 in steps of 23 A A

**Figure 17. Boost FRED**

**Typical average switching loss as a function of phase displacement**

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

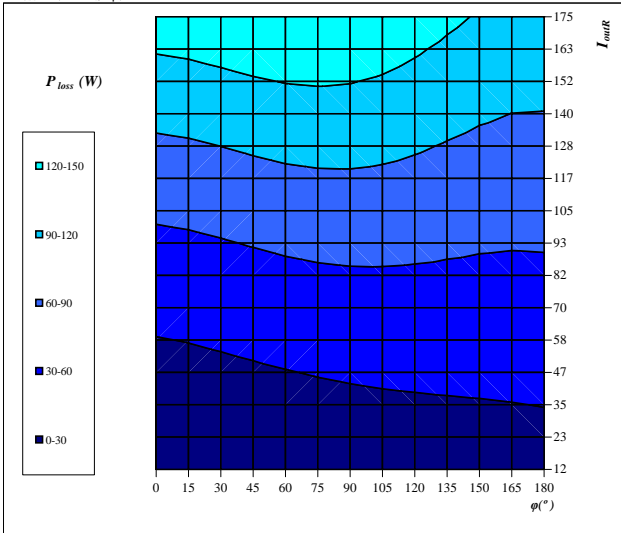


Conditions:  $T_j = 150$  °C  $f_{sw} = 16$  kHz  
 DC link = 700 V  
 parameter:  $I_{oRMS}$  from 12 A to 175 A  
 in steps of 23 A A

**Figure 18. Boost IGBT**

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

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

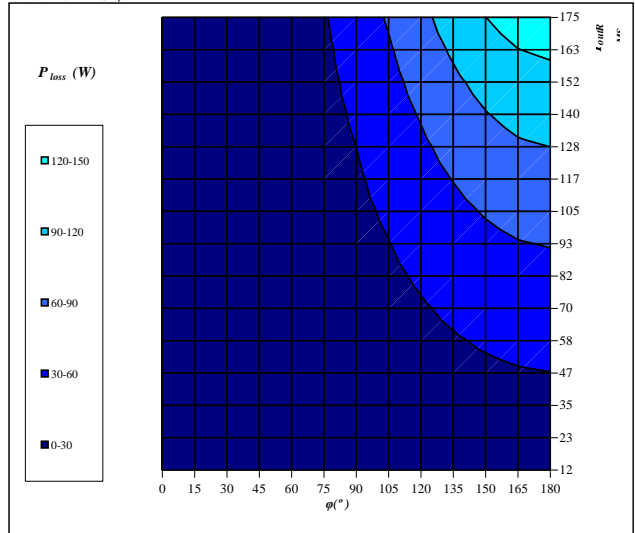


Conditions:  $T_j = 150$  °C  
 DC link = 700 V  
 $f_{sw} = 16$  kHz

**Figure 19. Boost FRED**

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

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

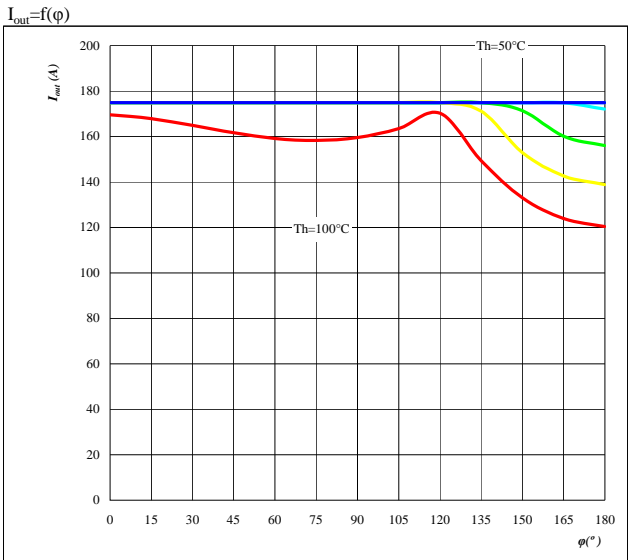


Conditions:  $T_j = 150$  °C  
 DC link = 700 V  
 $f_{sw} = 16$  kHz

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**Figure 20.** Boost IGBT+FRED

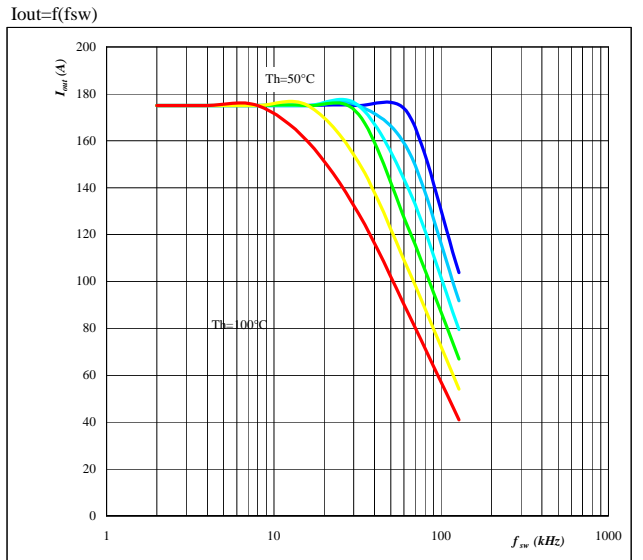
**Typical available output current as a function of phase displacement**



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

**Figure 21.** Boost IGBT+FRED

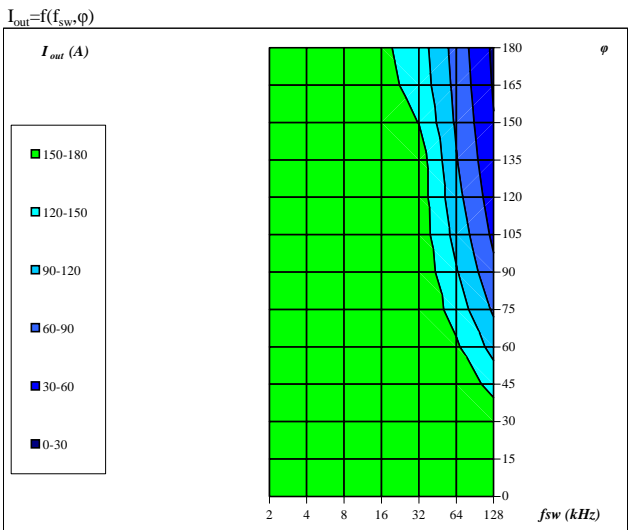
**Typical available output current as a function of switching frequency**



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

**Figure 22.** Boost IGBT+FRED

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



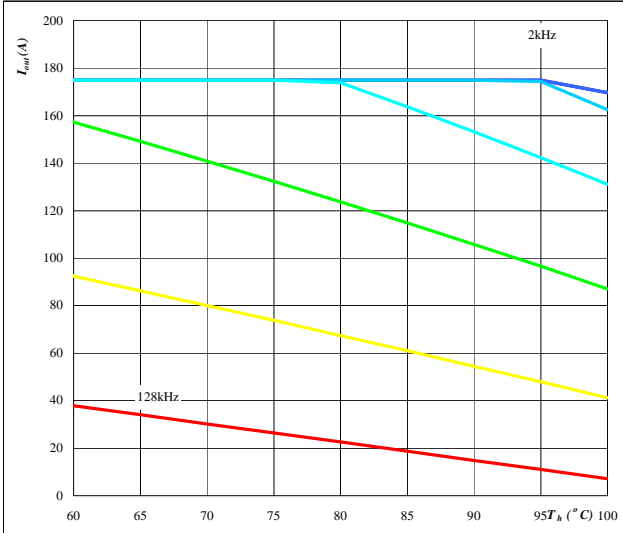
Conditions:  $T_j = T_{jmax}-25 \text{ }^\circ\text{C}$   
 DC link = 700 V  
 $T_h = 80 \text{ }^\circ\text{C}$

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**Figure 23.** per MODULE

**Typical available output current as a function of heat sink temperature**

$I_{out}=f(T_h)$

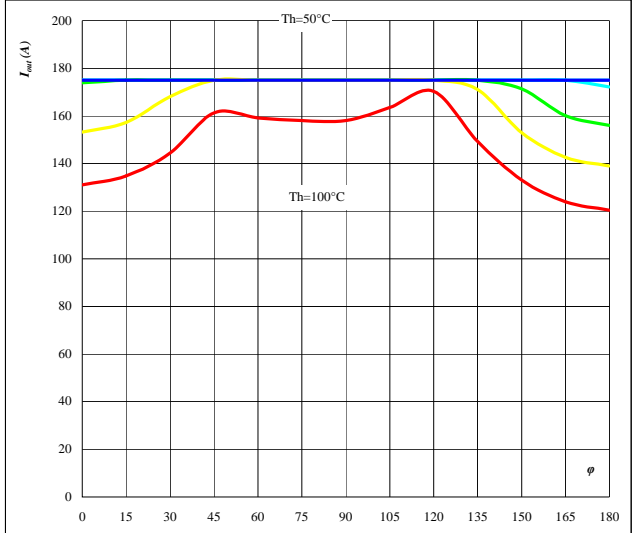


Conditions:  $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$   
 DC link = 700 V  
 $\varphi = 0^\circ$   
 parameter: Switching freq.  
 fsw from 2 kHz to 128 kHz  
 in steps of factor 2

**Figure 24.** per MODULE

**Typical available output current as a function of phase displacement**

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

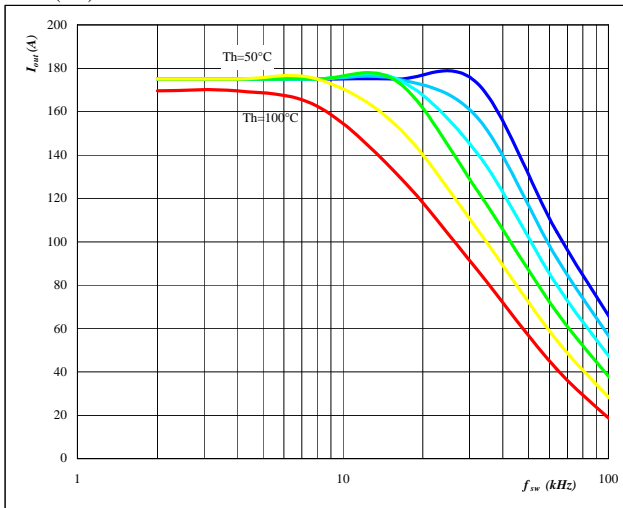


Conditions:  $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$   
 DC link = 700 V  
 $f_{sw} = 16 \text{ kHz}$   
 parameter: Heatsink temp.  
 Th from 50 °C to 100 °C  
 in 10 °C steps

**Figure 25.** per MODULE

**Typical available output current as a function of switching frequency**

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

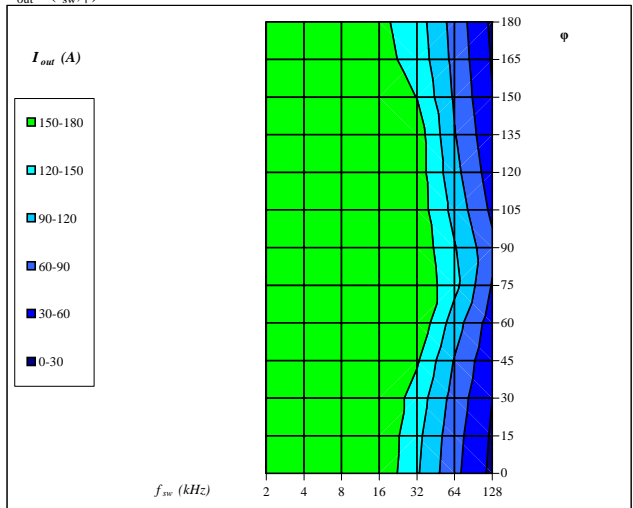


Conditions:  $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$   $\varphi = 0^\circ$   
 DC link = 700 V  
 parameter: Heatsink temp.  
 Th from 50 °C to 100 °C  
 in 10 °C steps

**Figure 26.** per MODULE

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

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



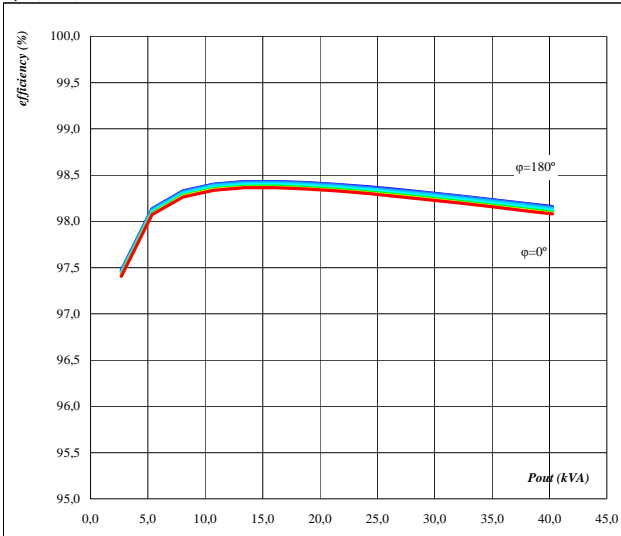
Conditions:  $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$   
 DC link = 700 V  
 $T_h = 80 \text{ } ^\circ\text{C}$

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**Figure 27.** per MODULE

**Typical efficiency as a function of output power**

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

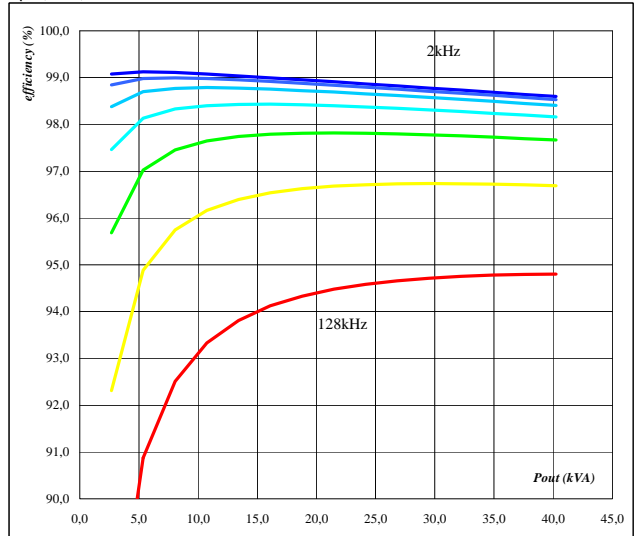


Conditions:  $T_j = T_{jmax}-25 \text{ }^\circ\text{C}$   
 $f_{sw} = 16 \text{ kHz}$   
 DC link = 700 V  
 parameter: phase displacement  $\varphi$  from  $0^\circ$  to  $180^\circ$  in steps of  $30^\circ$

**Figure 28.** per MODULE

**Typical efficiency as a function of output power**

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

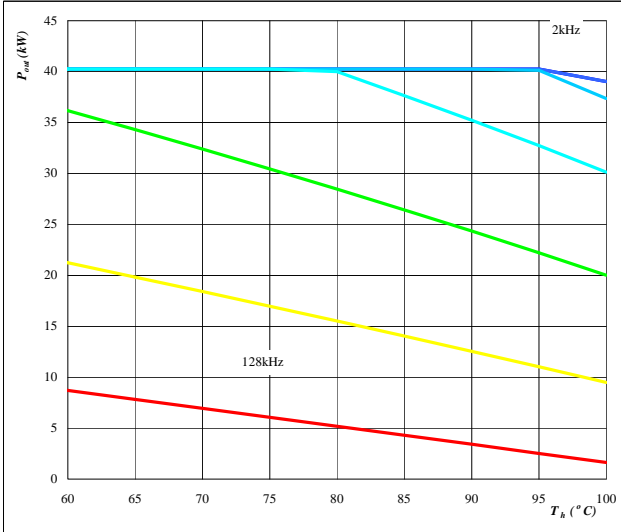


Conditions:  $T_j = T_{jmax}-25 \text{ }^\circ\text{C}$   $\varphi = 0^\circ$   
 DC link = 700 V  
 parameter: Switching freq.  $f_{sw}$  from 2 kHz to 128 kHz in steps of factor 2

**Figure 29.** per MODULE

**Typical available output power as a function of heat sink temperature**

$P_{out}=f(T_h)$

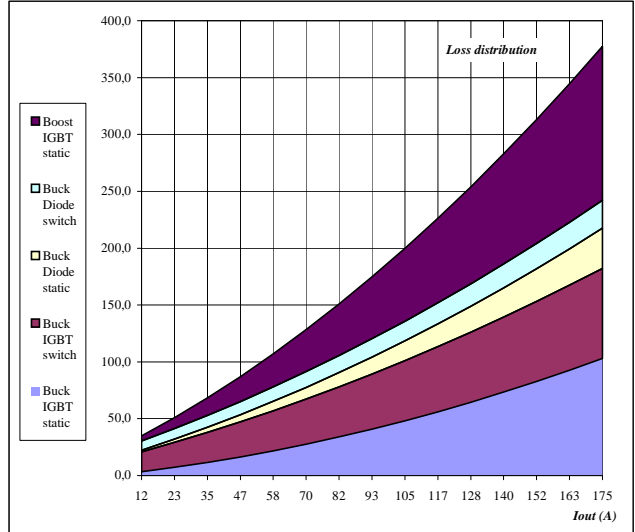


Conditions:  $T_j = T_{jmax}-25 \text{ }^\circ\text{C}$   
 DC link = 700 V  
 $\varphi = 0^\circ$   
 parameter: Switching freq.  $f_{sw}$  from 2 kHz to 128 kHz in steps of factor 2

**Figure 30.** per MODULE

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

$P_{out}=f(T_h)$



Conditions:  $T_j = T_{jmax}-25 \text{ }^\circ\text{C}$   
 $f_{sw} = 16 \text{ kHz}$   
 DC link = 700 V  
 $\varphi = 0^\circ$

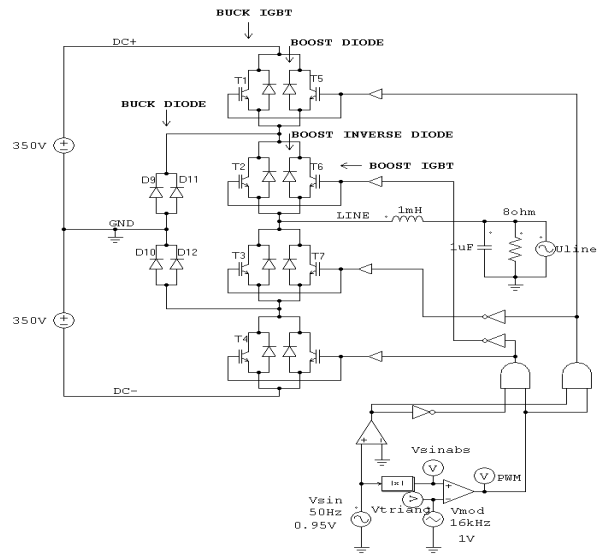
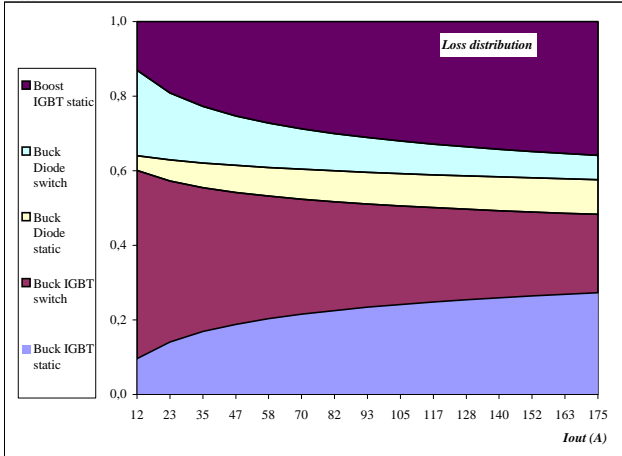


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Figure 31. **per MODULE**

Typical relativ loss distribution as a function of output current

$P_{out}=f(T_h)$



Conditions:  $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$   
 $f_{sw} = 16 \text{ kHz}$   
 DC link = 700 V  
 $\phi = 0^\circ$

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Datasheet Status	Product Status	Definition
Target	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. The data contained is exclusively intended for technically trained staff.
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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.