



flow NPC2 NPC Application 600 V / 300 A

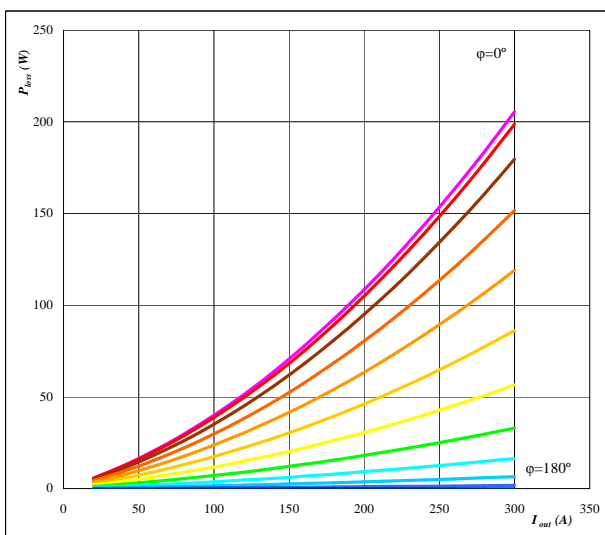
General conditions

BUCK	
V_{GEon}	= 15 V
V_{GEoff}	= -15 V
R_{gon}	= 4 Ω
R_{goff}	= 4 Ω

$V_{out} = 230 \text{ VAC}$

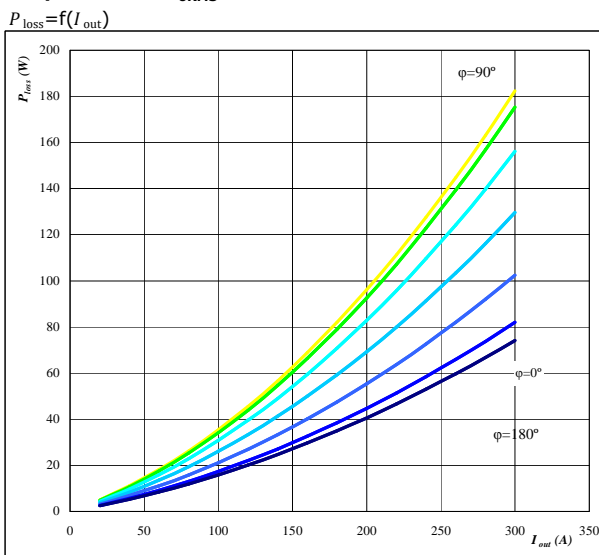
BOOST	
V_{GEon}	= 15 V
V_{GEoff}	= -15 V
R_{gon}	= 4 Ω
R_{goff}	= 4 Ω

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



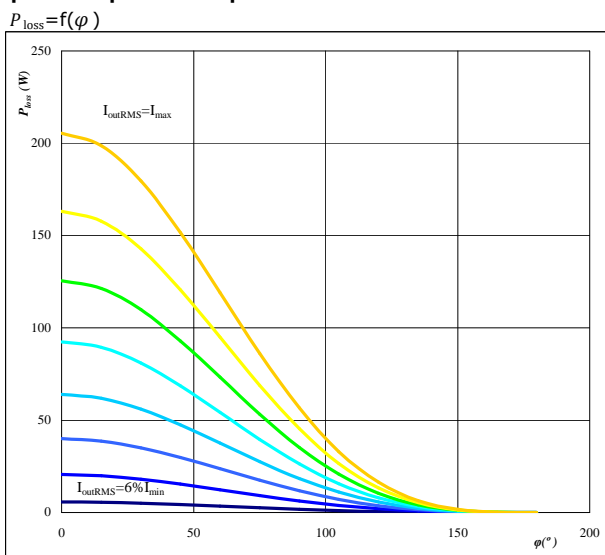
Conditions $T_j = 150 \text{ }^\circ\text{C}$
parameter φ from 0° to 180°
in 12 steps

Figure 2. Buck FWD
Typical average static loss as a function of output current I_{oRMS}



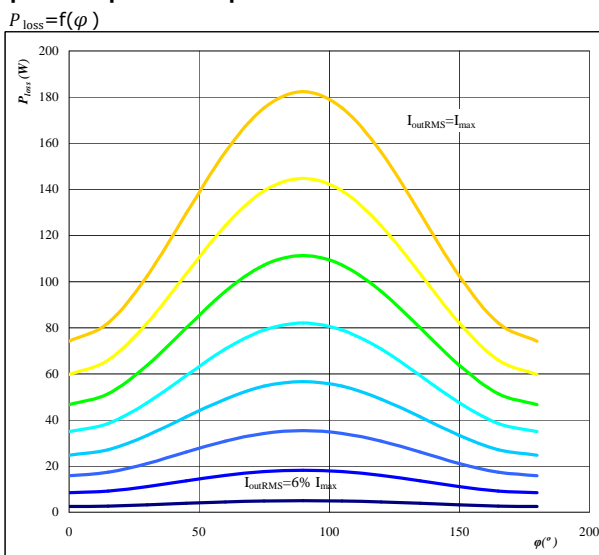
Conditions $T_j = 150 \text{ }^\circ\text{C}$
parameter φ from 0° to 180°
in 12 steps

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



Conditions $T_j = 150 \text{ }^\circ\text{C}$
parameter I_{oRMS} from 20 A to 300 A
in steps of 40 A

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



Conditions $T_j = 150 \text{ }^\circ\text{C}$
parameter I_{oRMS} from 20 A to 300 A
in steps of 40 A

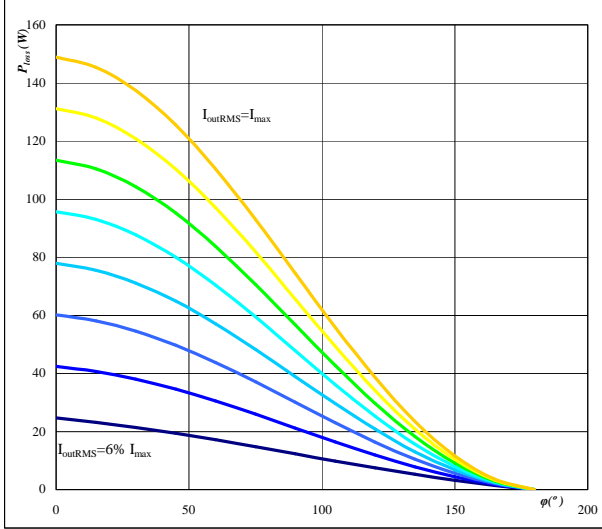


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Figure 5. Buck IGBT

Typical average switching loss as a function of phase displacement ϕ

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

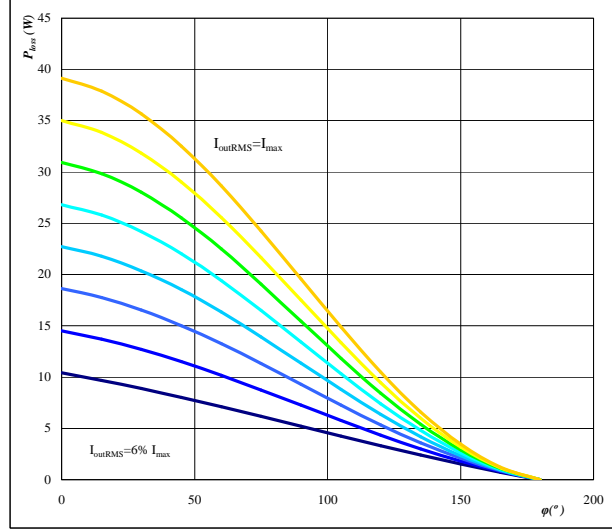


Conditions $T_j = 150$ °C
 $f_{sw} = 16$ kHz
DC link = 700 V
parameter I_{oRMS} from 20 A to 300 A
in steps of 40 A

Figure 6. Buck FWD

Typical average switching loss as a function of phase displacement ϕ

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

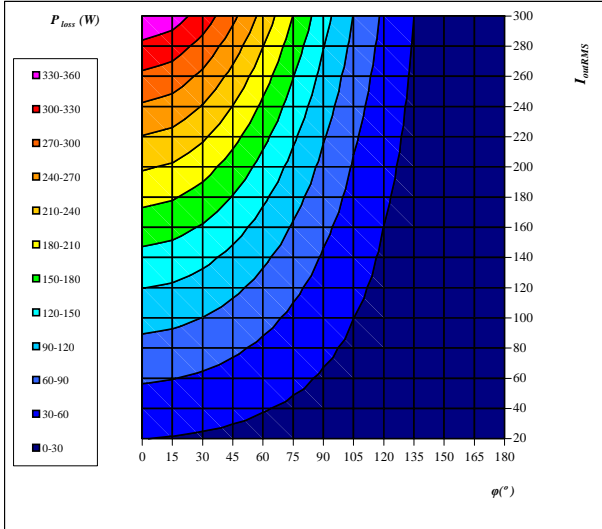


Conditions $T_j = 150$ °C
 $f_{sw} = 16$ kHz
DC link = 700 V
parameter I_{oRMS} from 20 A to 300 A
in steps of 40 A

Figure 7. Buck IGBT

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

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

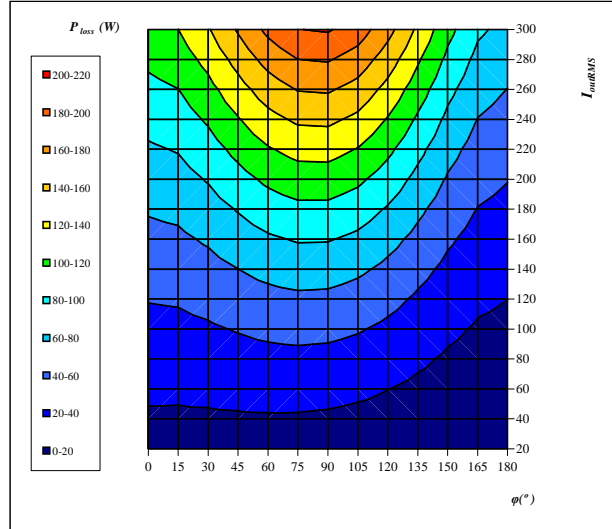


Conditions $T_j = 150$ °C
DC link = 700 V
 $f_{sw} = 16$ kHz

Figure 8. Buck FWD

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

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

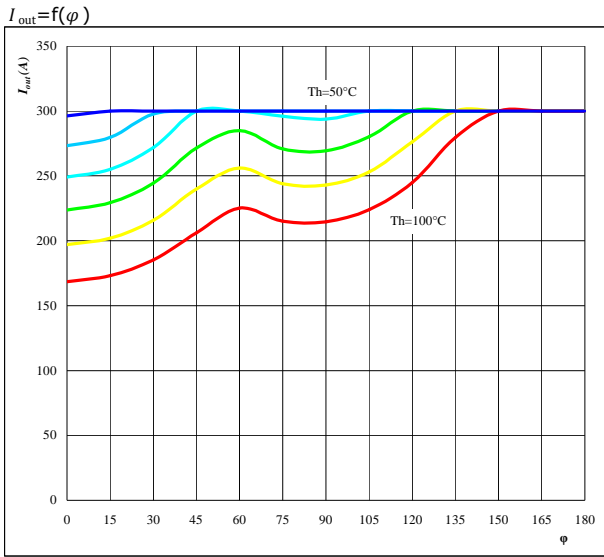


Conditions $T_j = 150$ °C
DC link = 700 V
 $f_{sw} = 16$ kHz



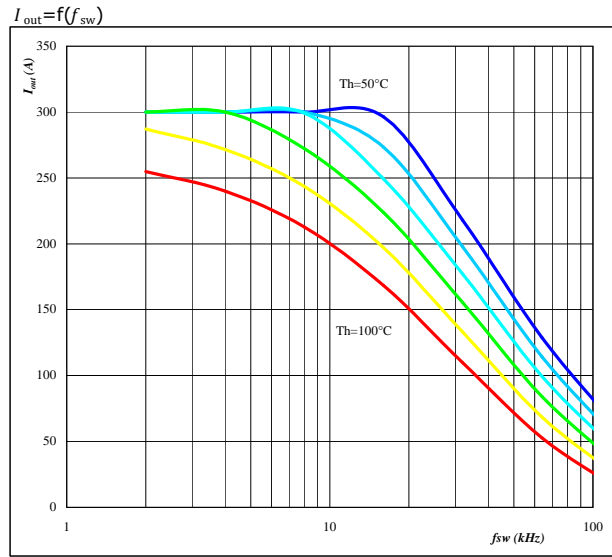
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Figure 9. for Buck IGBT+FWD
Typical available output current as a function of phase displacement φ



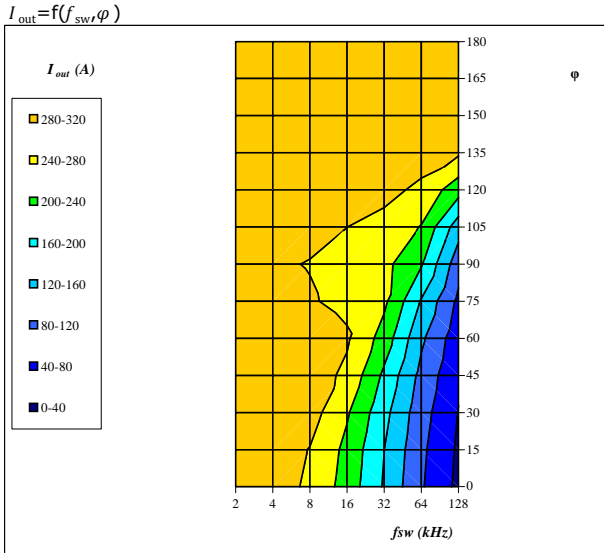
Conditions $T_j = T_{jmax} - 25 \text{ }^\circ\text{C}$ $f_{sw} = 16 \text{ kHz}$
DC link = 700 V
parameter: Heatsink temp.
 T_h from 50 $^\circ\text{C}$ to 100 $^\circ\text{C}$
in 10 $^\circ\text{C}$ steps

Figure 10. for Buck IGBT+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 Buck IGBT+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
 $T_h = 80 \text{ }^\circ\text{C}$

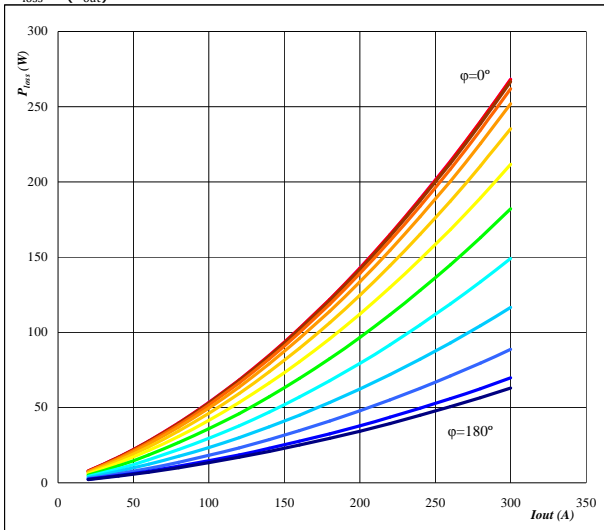


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Figure 12. Boost IGBT

Typical average static loss as a function of output current

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

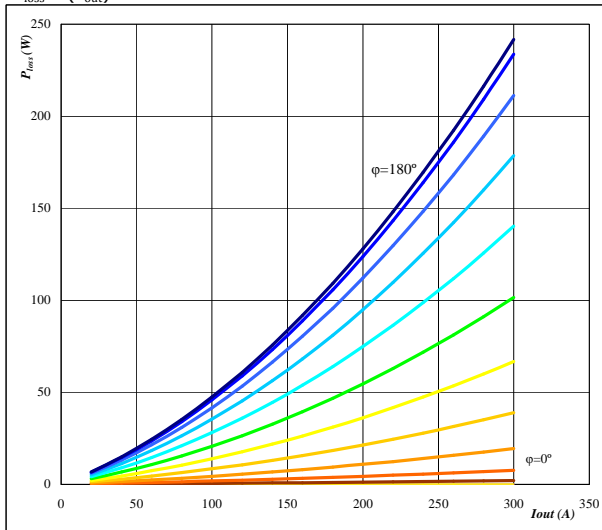


Conditions $T_j = 150$ °C
 parameter φ from 0° to 180°
 in 12 steps

Figure 13. Boost FWD

Typical average static loss as a function of output current

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

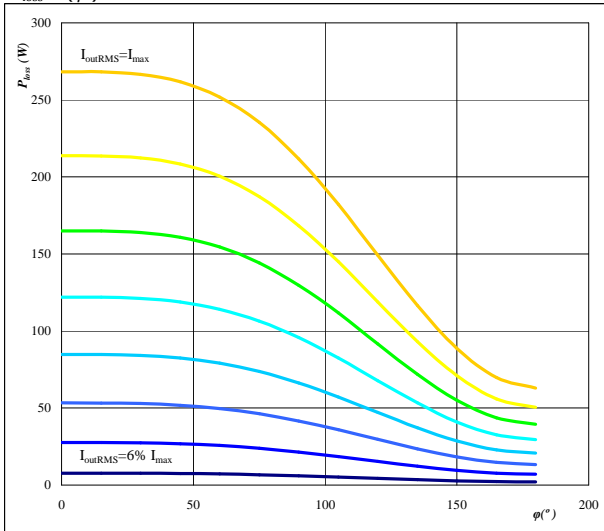


Conditions $T_j = 150$ °C
 parameter φ from 0° to 180°
 in 12 steps

Figure 14. Boost IGBT

Typical average static loss as a function of phase displacement

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

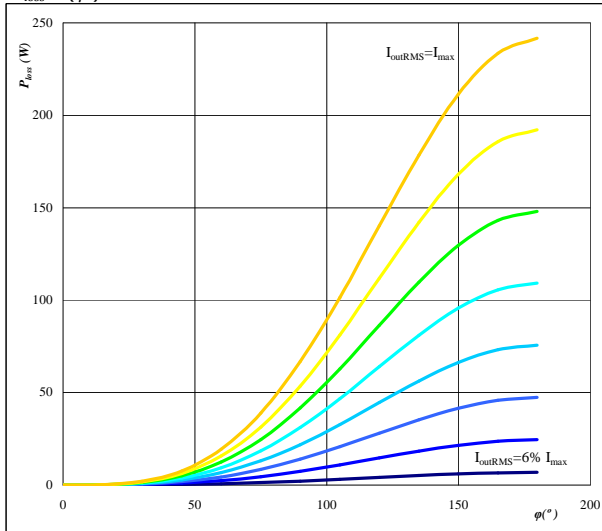


Conditions $T_j = 150$ °C
 parameter I_{oRMS} from 20 A to 300 A
 in steps of 40 A

Figure 15. Boost FWD

Typical average static loss as a function of phase displacement

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



Conditions $T_j = 150$ °C
 parameter I_{oRMS} from 20 A to 300 A
 in steps of 40 A

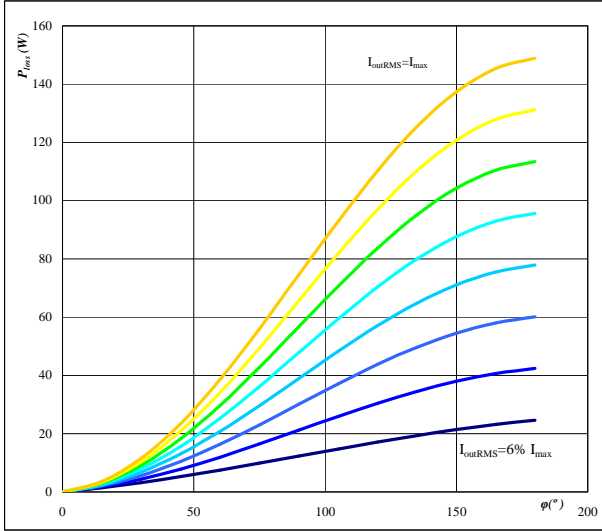


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Figure 16. Boost IGBT

Typical average switching loss as a function of phase displacement

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

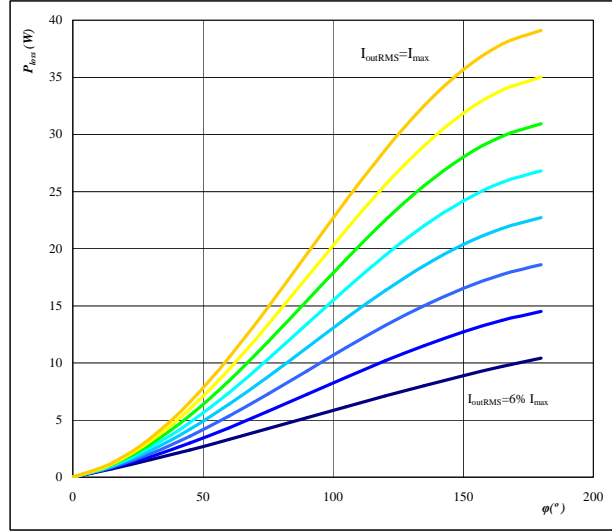


Conditions $T_j = 150$ °C $f_{sw} = 16$ kHz
 DC link = 700 V
 parameter I_{oRMS} from 20 A to 300 A
 in steps of 40 A A

Figure 17. Boost FWD

Typical average switching loss as a function of phase displacement

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

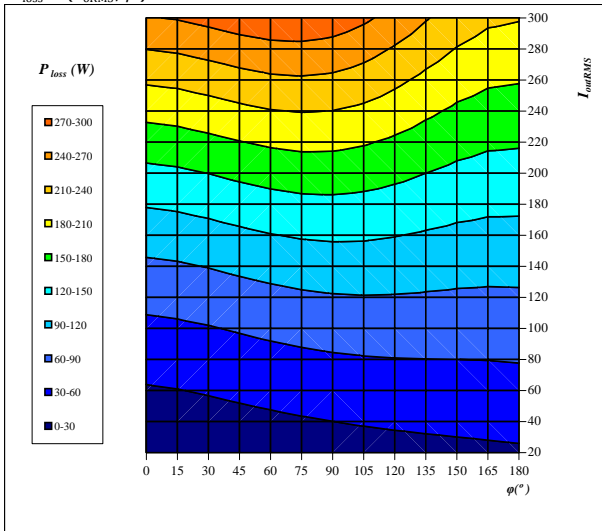


Conditions $T_j = 150$ °C $f_{sw} = 16$ kHz
 DC link = 700 V
 parameter I_{oRMS} from 20 A to 300 A
 in steps of 40 A A

Figure 18. Boost IGBT

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

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

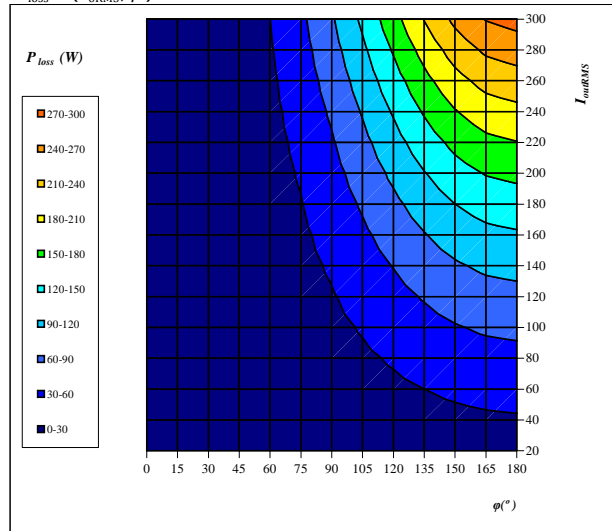


Conditions $T_j = 150$ °C
 DC link = 700 V
 $f_{sw} = 16$ kHz

Figure 19. Boost FWD

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

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

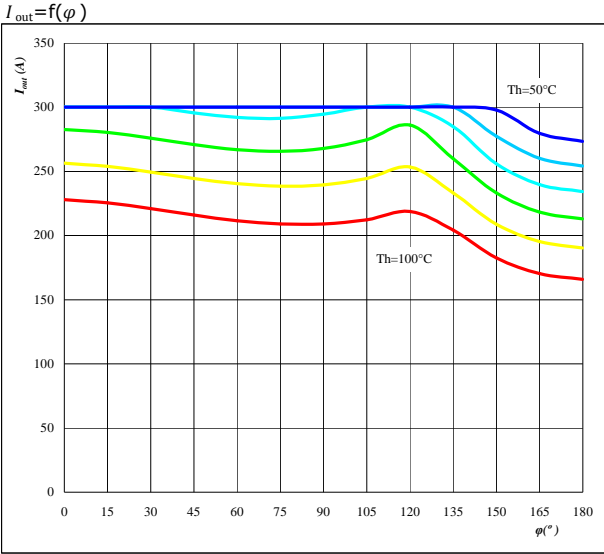


Conditions $T_j = 150$ °C
 DC link = 700 V
 $f_{sw} = 16$ kHz



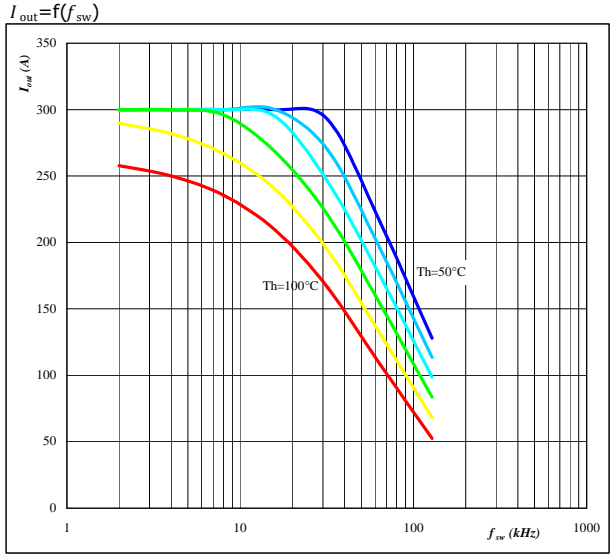
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Figure 20. Boost IGBT+FWD
Typical available output current as a function of phase displacement



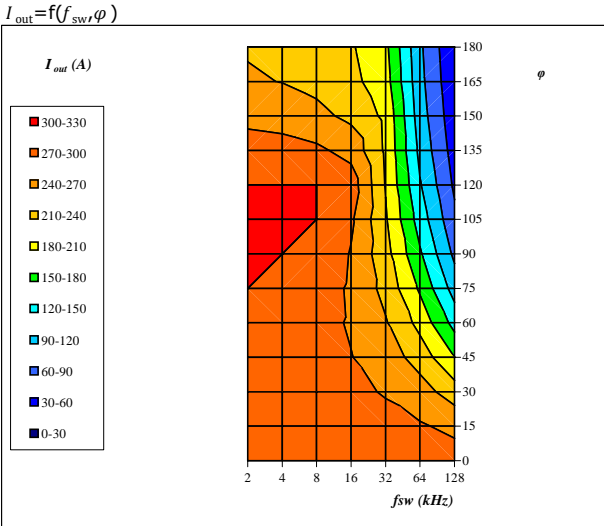
Conditions $T_j = T_{jmax} - 25 \text{ }^\circ\text{C}$ $f_{sw} = 16 \text{ kHz}$
 DC link = 700 V
 parameter: Heatsink temp.
 T_h from 50 $^\circ\text{C}$ to 100 $^\circ\text{C}$
 in 10 $^\circ\text{C}$ steps

Figure 21. Boost IGBT+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. Boost IGBT+FWD
Typical available 50Hz output current as a function of f_{sw} and phase displacement



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

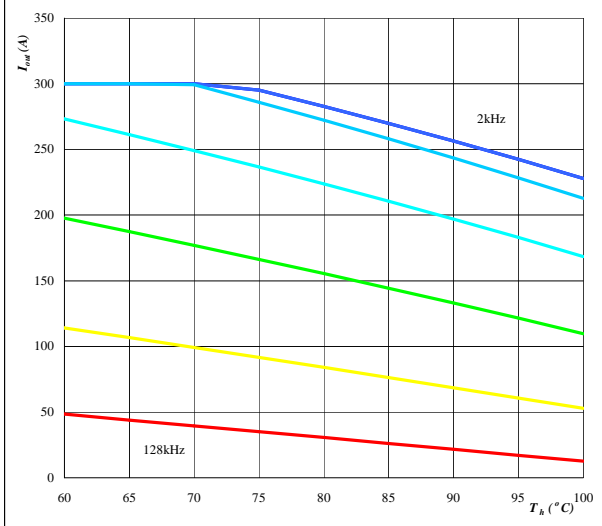


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Figure 23. per MODULE

Typical available output current as a function of heat sink temperature

$I_{out}=f(T_h)$

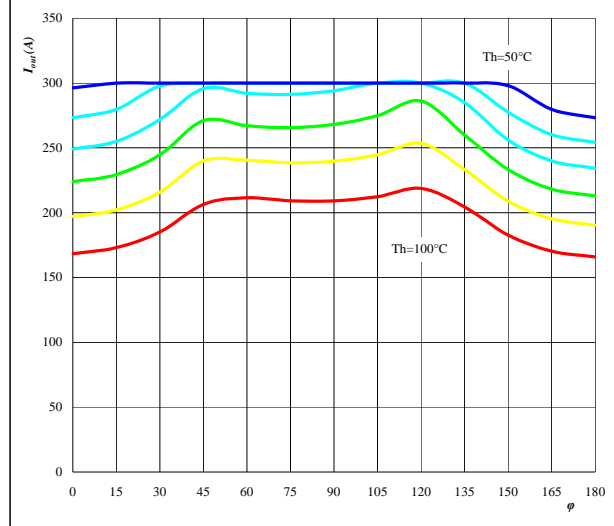


Conditions $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$
DC link = 700 V
 $\varphi = 0^\circ$
parameter: Switching freq.
 f_{sw} from 2 kHz to 128 kHz
in steps of factor 2

Figure 24. per MODULE

Typical available output current as a function of phase displacement

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

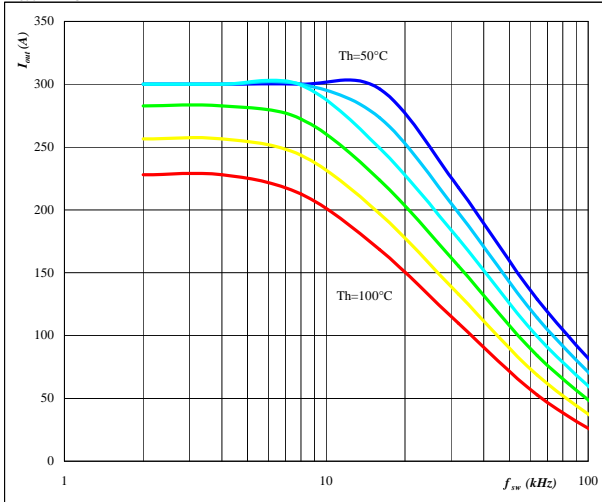


Conditions $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$
DC link = 700 V
 $f_{sw} = 16 \text{ kHz}$
parameter: Heatsink temp.
 T_h from 50 °C to 100 °C
in 10 °C steps

Figure 25. per MODULE

Typical available output current as a function of switching frequency

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

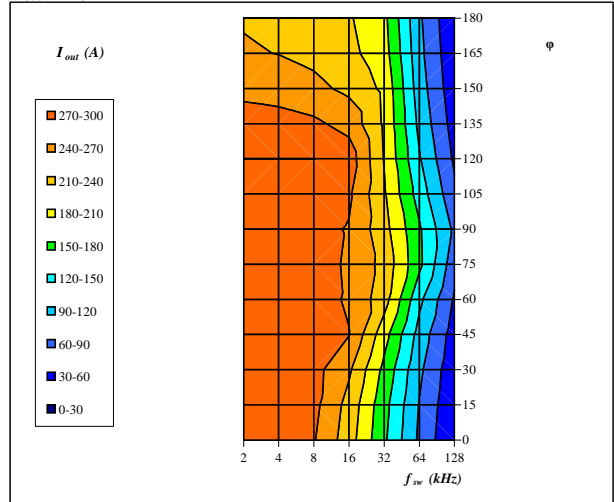


Conditions $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$ $\varphi = 0^\circ$
DC link = 700 V
parameter: Heatsink temp.
 T_h from 50 °C to 100 °C
in 10 °C steps

Figure 26. per MODULE

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

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



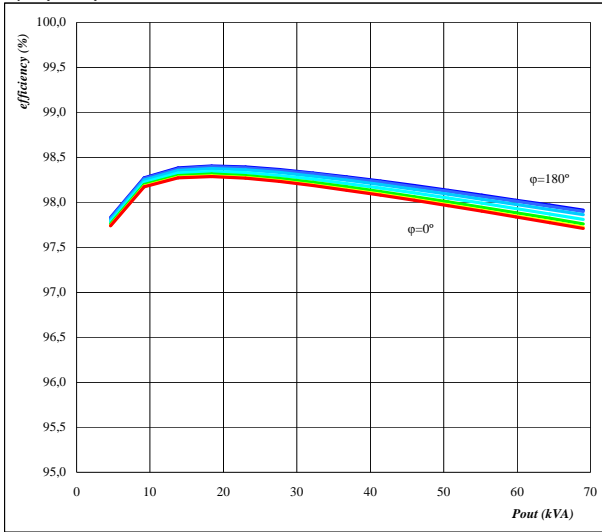
Conditions $T_j = T_{jmax} - 25 \text{ } ^\circ\text{C}$
DC link = 700 V
 $T_h = 80 \text{ } ^\circ\text{C}$



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Figure 27. per MODULE

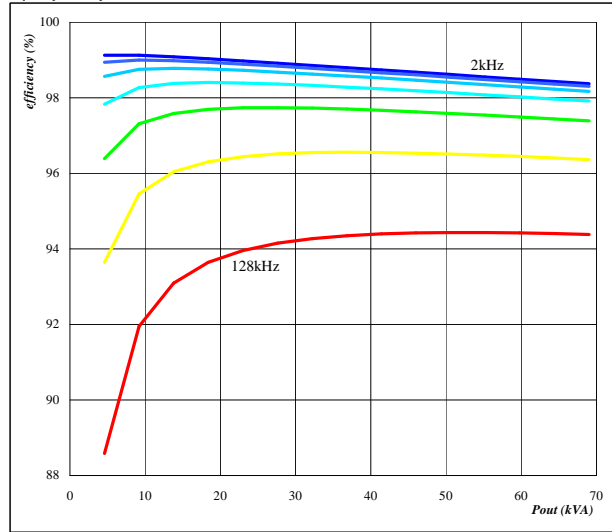
Typical efficiency as a function of output power
 $\eta=f(P_{out})$



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

Figure 28. per MODULE

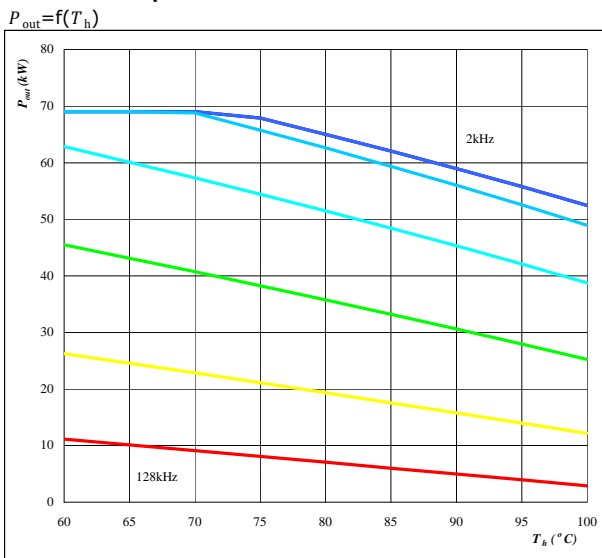
Typical efficiency as a function of output power
 $\eta=f(P_{out})$



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

Figure 29. per MODULE

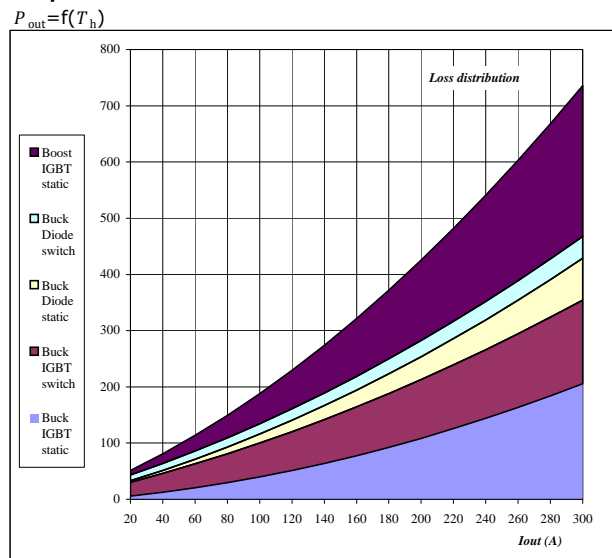
Typical available output power as a function of heat sink temperature
 $P_{out}=f(T_h)$



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

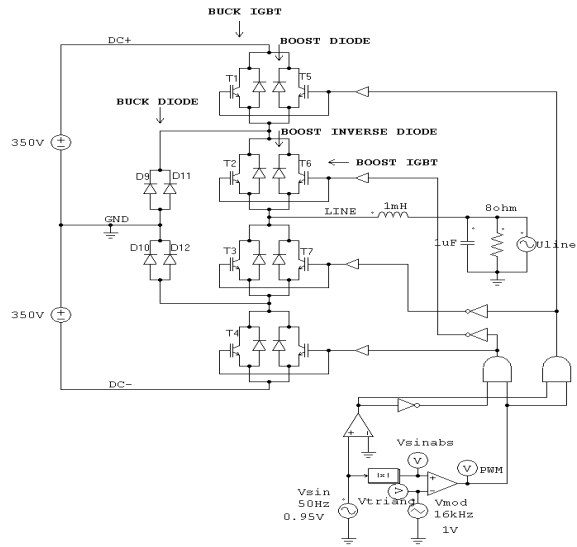
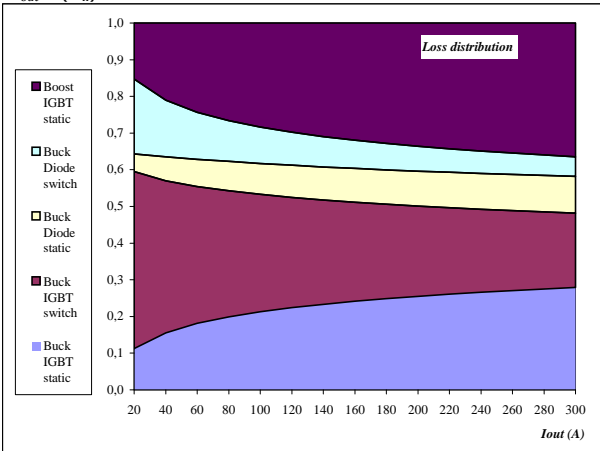


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Figure 31. per MODULE

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
 $\varphi = 0^\circ$