30-EP12NIB400H710-PR49F07T

datasheet

***flow*NPC E3BP** **1200 V / 400 A**

Topology features

- Low side Kelvin Emitter for improved switching performance
- Neutral Point Clamped Topology (I-Type)
- Split topology
- Temperature sensor

Component features

- High speed switching
- Low collector emitter saturation voltage
- Low turn-off losses
- Optimized for hard switching topologies
- Positive temperature coefficient

Housing features

- Base isolation: Al_2O_3
- Cu baseplate
- Convex shaped baseplate for superior thermal contact
- CTI600 housing material
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

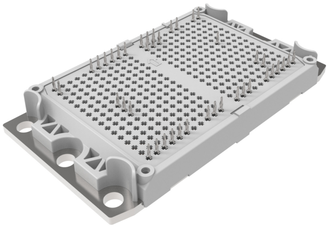
Target applications

- Energy Storage Systems

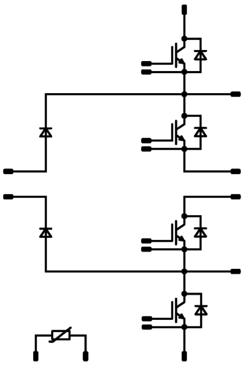
Types

- 30-EP12NIB400H710-PR49F07T

flow E3BP 12 mm housing



Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Buck Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	281	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		1200	A
Turn off safe operating area		T_j = 150°C, V_{CE} = 1200 V		1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	503	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
Buck Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	173	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		1260	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	310	W
Maximum junction temperature	T_{jmax}			175	°C
Boost Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	281	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		1200	A
Turn off safe operating area		T_j = 150°C, V_{CE} = 1200 V		1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	503	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	173	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		1260	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	310	W
Maximum junction temperature	T_{jmax}			175	°C
Boost Sw. Inv. Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	173	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		1260	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	310	W
Maximum junction temperature	T_{jmax}			175	°C
Module Properties					
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{jop}			-40…+(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC Test Voltage*	t_p = 2 s	6800	V
Creepage distance				>12,7	mm
Clearance				>12,7	mm
Comparative Tracking Index	CTI			≥ 600	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_{F} [V]	I_{C} [A] I_{D} [A] I_{F} [A]	T_{j} [°C]	Values Min	Values Typ	Values Max	Unit
Buck Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0064	25	4,7	5,5	6,2	V
Collector-emitter saturation voltage	V_{CEsat}		15		400	25 125 150		1,78 1,94 1,98	2,15(1)	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			16	µA
Gate-emitter leakage current	I_{GES}		20	0		25			400	nA
Internal gate resistance	r_{g}							None		Ω
Input capacitance	C_{ies}	f = 100 kHz	0	25		25		52000		pF
Output capacitance	C_{oes}	f = 100 kHz	0	25		25		960		pF
Reverse transfer capacitance	C_{res}	f = 100 kHz	0	25		25		288		pF
Gate charge	Q_{g}	V_{CC} = 960 V	0/15		400	25		2856		nC
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,19		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	600	400	25 125 150		301,22 301,22 302,05		ns
Rise time	t_{r}	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	600	400	25 125 150		28,41 30,52 31,48		ns
Turn-off delay time	$t_{d(off)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	600	400	25 125 150		258,73 294,31 304,56		ns
Fall time	t_{f}	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	600	400	25 125 150		32,08 57,91 66,34		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=10,83 µC Q_{rFWD}=26,49 µC Q_{rFWD}=31,81 µC	±15	600	400	25 125 150		11,17 13,53 14,17		mWs
Turn-off energy (per pulse)	E_{off}		±15	600	400	25 125 150		11,34 19,54 22,08		mWs

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Buck Diode										
Static										
Forward voltage	V_F				108	25 125 150		1,8 1,55 1,48	2[(1)]	V
Reverse leakage current	I_R	V_r = 1200 V				25			12	µA
Thermal										
Thermal resistance junction to sink[(2)]	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,31		K/W
Dynamic										
Peak recovery current	I_{RM}	di/dt=10828 A/µs di/dt=11980 A/µs di/dt=12194 A/µs	±15	600	400	25 125 150		335,35 490,42 529,68		A
Reverse recovery time	t_{rr}					25 125 150		64,15 134,69 151,99		ns
Recovered charge	Q_r					25 125 150		10,83 26,49 31,81		µC
Reverse recovered energy	E_{rec}					25 125 150		3,79 11,07 13,55		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		13589,49 12223,54 11782,06		A/µs

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Values Min	Typ	Max	Unit
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0064	25	4,7	5,5	6,2	V
Collector-emitter saturation voltage	V_{CEsat}		15		400	25 125 150		1,78 1,94 1,98	2,15(1)	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			16	μA
Gate-emitter leakage current	I_{GES}		20	0		25			400	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}							52000		pF
Output capacitance	C_{oes}	f = 100 kHz	0	25		25		960		pF
Reverse transfer capacitance	C_{res}							288		pF
Gate charge	Q_g	V_{CC} = 960 V	0/15		400	25		2856		nC
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,19		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$					25 125 150		304,8 304,82 305,45		ns
Rise time	t_r	R_{gon} = 2 Ω R_{goff} = 2 Ω				25 125 150		24,2 27,64 28,31		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		268,7 309,52 320,94		ns
Fall time	t_f		±15	600	300	25 125 150		24,79 59,36 68,41		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=10,04 μC Q_{rFWD}=23,31 μC Q_{rFWD}=27,75 μC				25 125 150		7,32 8,54 9,1		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		9,11 14,75 16,43		mWs

Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Boost Diode										
Static										
Forward voltage	V_F				108	25 125 150		1,8 1,55 1,48	2(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25			12	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,31		K/W
Dynamic										
Peak recovery current	I_{RM}	di/dt=9312 A/µs di/dt=9452 A/µs di/dt=9306 A/µs	±15	600	300	25 125 150		281,32 383,8 408,68		A
Reverse recovery time	t_{rr}					25 125 150		68,97 137,34 156,91		ns
Recovered charge	Q_r					25 125 150		10,04 23,31 27,75		µC
Reverse recovered energy	E_{rec}					25 125 150		3,36 8,75 10,5		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		9994,86 8032,34 7808,03		A/µs

Characteristic Values

Parameter	Symbol	Conditions					Values			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Boost Sw. Inv. Diode										
Static										
Forward voltage	V_F				108	25 125 150		1,8 1,55 1,48	2(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25			12	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,31		K/W
Thermistor										
Static										
Rated resistance	R					25		22		kΩ
Deviation of R100	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P					25		130		mW
Power dissipation constant	d					25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %						3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %						4000		K
Vincotech Thermistor Reference									I	

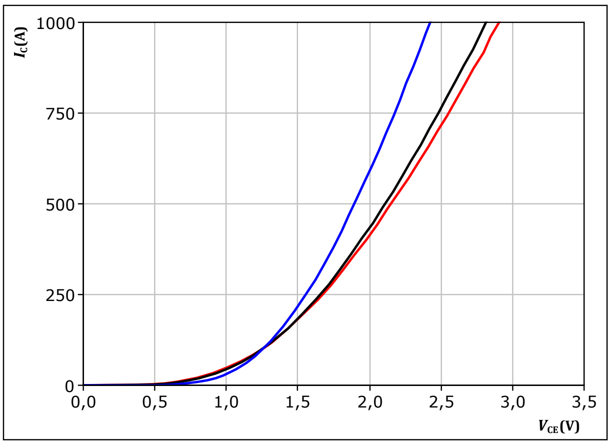
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Buck Switch Characteristics

figure 1. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

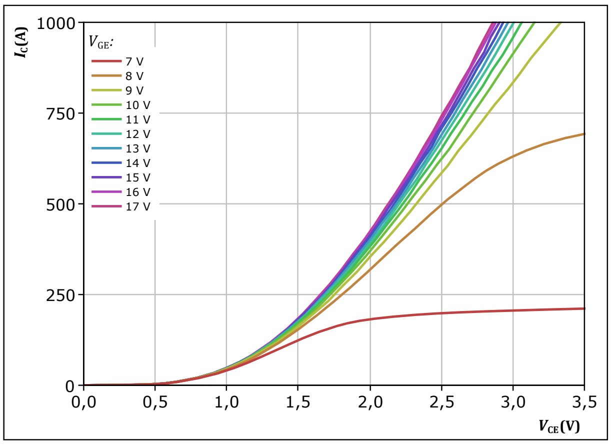


t_p = 250 µs
V_{GE} = 15 V
T_j: 25 °C, 125 °C, 150 °C

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

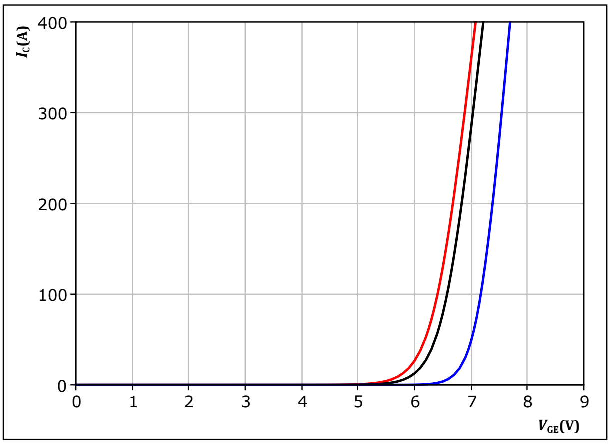


t_p = 250 µs
T_j = 150 °C
V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

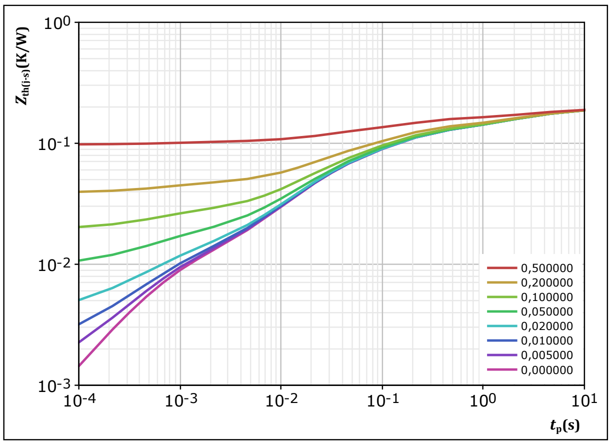


t_p = 250 µs
V_{CE} = 48 V
T_j: 25 °C, 125 °C, 150 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

$Z_{th(j-s)} = f(t_p)$



$D = t_p / T$
$R_{th(j-s)}$ = 0,189 K/W

IGBT thermal model values

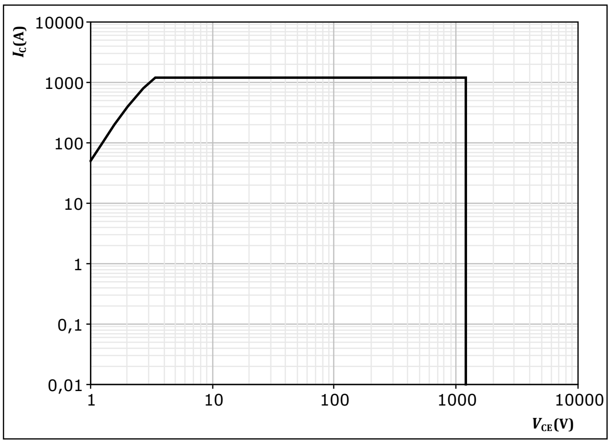
R (K/W)	τ (s)
3,45E-02	6,76E+00
4,33E-02	1,55E+00
6,75E-02	1,27E-01
4,21E-02	2,01E-02
7,94E-03	6,24E-04

Buck Switch Characteristics

figure 5. **IGBT**

Safe operating area

I_C = f(V_{CE})

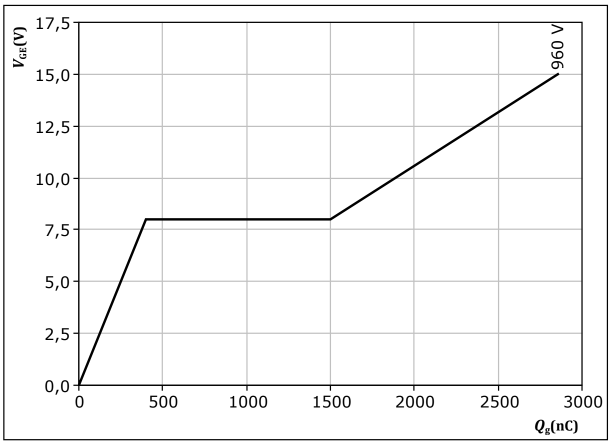


D = single pulse
T_s = 80 °C
V_{GE} = 15 V
T_j = T_{jmax}

figure 6. **IGBT**

Gate voltage vs gate charge

V_{GE} = f(Q_g)



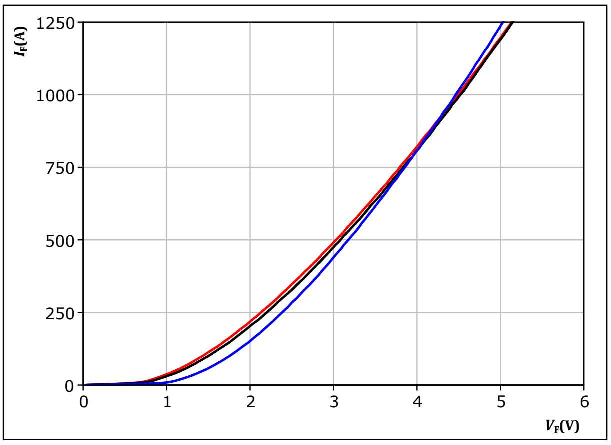
I_C = 400 A
T_j = 25 °C

Buck Diode Characteristics

figure 7. **FWD**

Typical forward characteristics

I_F = f(V_F)



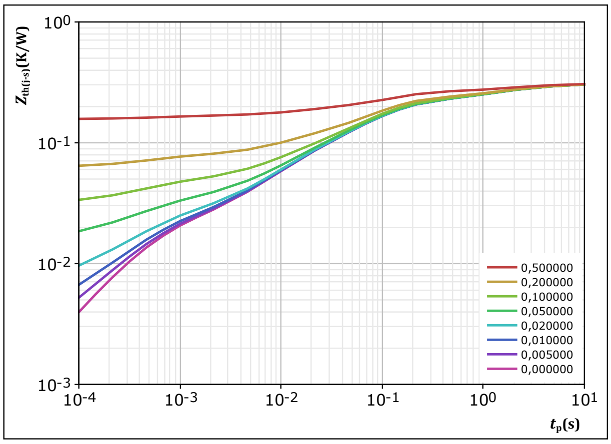
t_p = 250 μs

T_j: 25 °C, 125 °C, 150 °C

figure 8. **FWD**

Transient thermal impedance as a function of pulse width

$Z_{th(j-s)}$ = f(t_p)



D = t_p / T

$R_{th(j-s)}$ = 0,306 K/W

FWD thermal model values

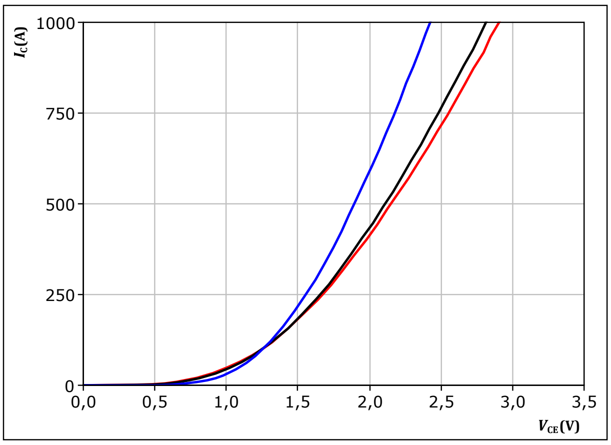
R (K/W)	τ (s)
3,44E-02	7,61E+00
7,17E-02	1,21E+00
1,50E-01	8,64E-02
4,00E-02	1,09E-02
1,72E-02	4,51E-04

Boost Switch Characteristics

figure 9. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



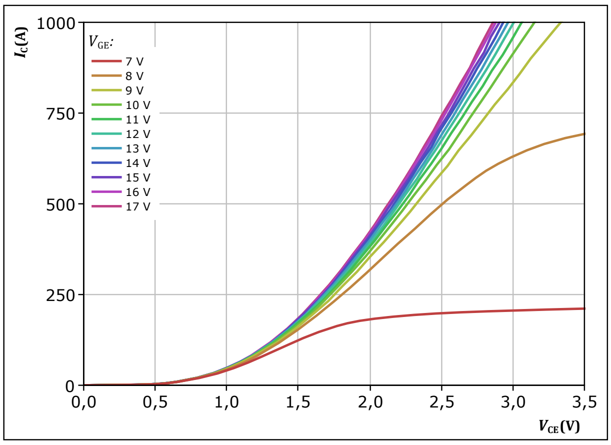
t_p =	250	µs
V_{GE} =	15	V

T_j: 25 °C, 125 °C, 150 °C

figure 10. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



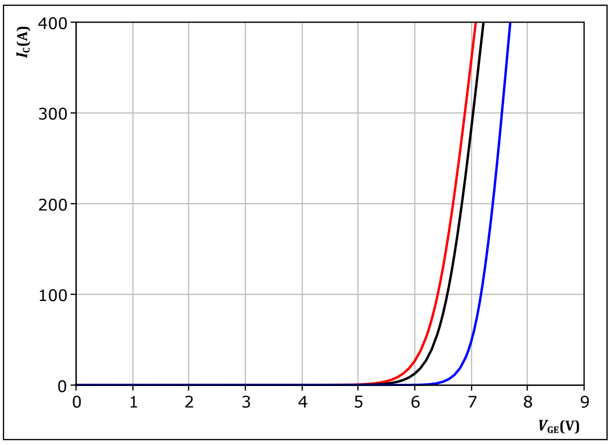
t_p =	250	µs
T_j =	150	°C

V_{GE} from 7 V to 17 V in steps of 1 V

figure 11. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})



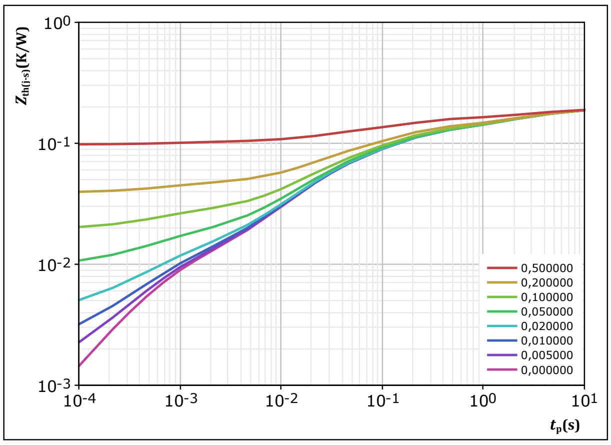
t_p =	250	µs
V_{CE} =	48	V

T_j: 25 °C, 125 °C, 150 °C

figure 12. **IGBT**

Transient thermal impedance as a function of pulse width

$Z_{th(j-s)}$ = f(t_p)



D =	t_p / T	
$R_{th(j-s)}$ =	0,189	K/W

IGBT thermal model values

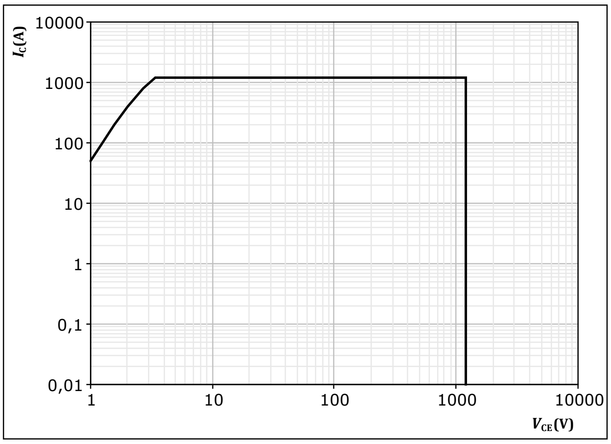
R (K/W)	τ (s)
3,45E-02	6,76E+00
4,33E-02	1,55E+00
6,75E-02	1,27E-01
4,21E-02	2,01E-02
7,94E-03	6,24E-04

Boost Switch Characteristics

figure 13. **IGBT**

Safe operating area

I_C = f(V_{CE})

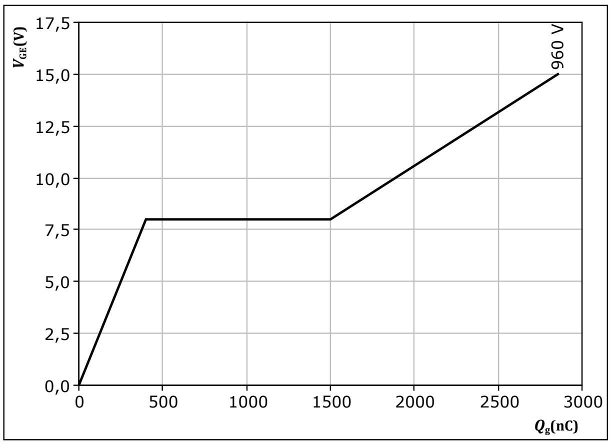


D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

figure 14. **IGBT**

Gate voltage vs gate charge

V_{GE} = f(Q_g)



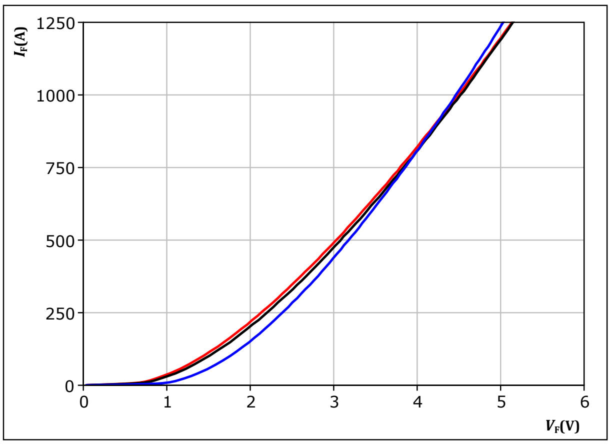
I_C =	400	A
T_j =	25	°C

Boost Diode Characteristics

figure 15. **FWD**

Typical forward characteristics

I_F = f(V_F)



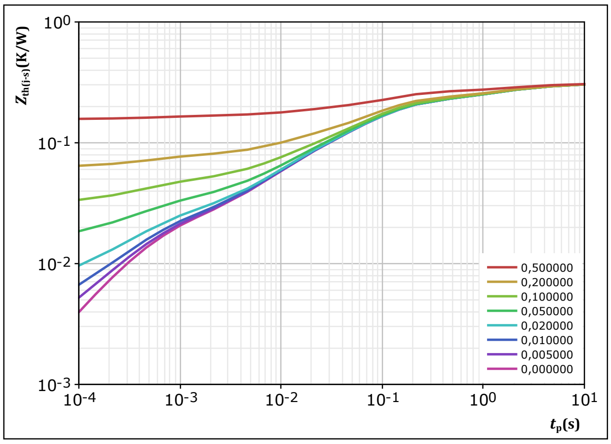
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 16. **FWD**

Transient thermal impedance as a function of pulse width

$Z_{th(j\text{-}s)}$ = f(t_p)



D = t_p / T

$R_{th(j\text{-}s)}$ = 0,306 K/W

FWD thermal model values

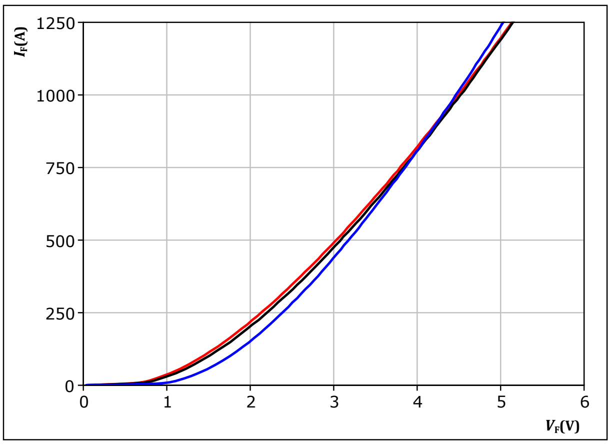
R (K/W)	τ (s)
3,44E-02	7,61E+00
7,17E-02	1,21E+00
1,50E-01	8,64E-02
4,00E-02	1,09E-02
1,72E-02	4,51E-04

Boost Sw. Inv. Diode Characteristics

figure 17. **FWD**

Typical forward characteristics

I_F = f(V_F)



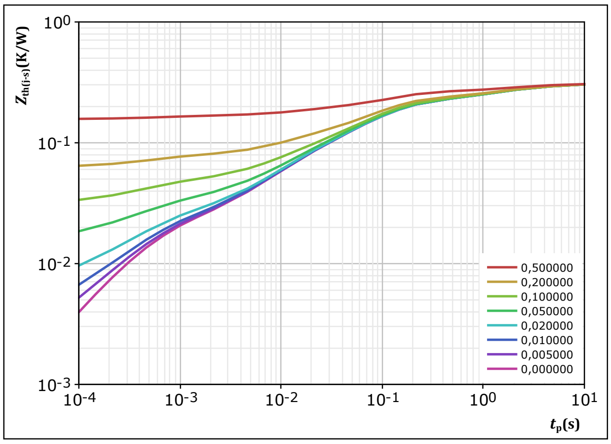
t_p = 250 µs

T_j: 25 °C / 125 °C / 150 °C

figure 18. **FWD**

Transient thermal impedance as a function of pulse width

$Z_{th(j-s)}$ = f(t_p)



D = t_p / T

$R_{th(j-s)}$ = 0,306 K/W

FWD thermal model values

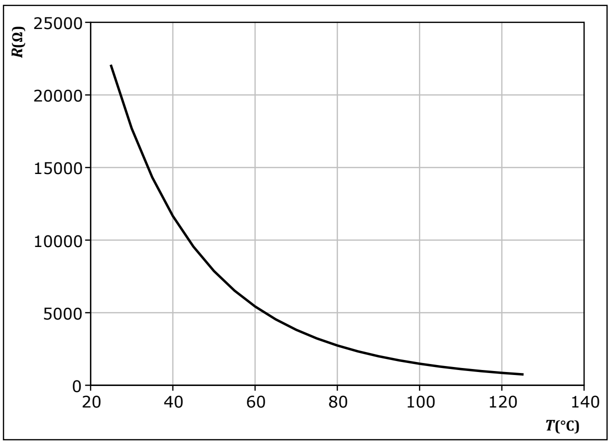
R (K/W)	τ (s)
3,44E-02	7,61E+00
7,17E-02	1,21E+00
1,50E-01	8,64E-02
4,00E-02	1,09E-02
1,72E-02	4,51E-04

Thermistor Characteristics

figure 19. **Thermistor**

Typical NTC characteristic as function of temperature

$R_T = f(T)$

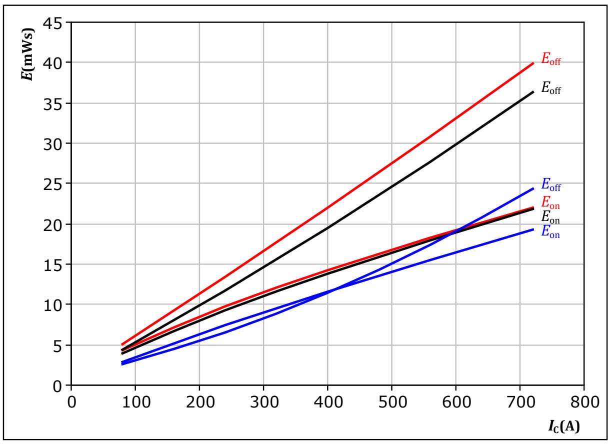


Buck Switching Characteristics

figure 20. **IGBT**

Typical switching energy losses as a function of collector current

E = f(I_C)



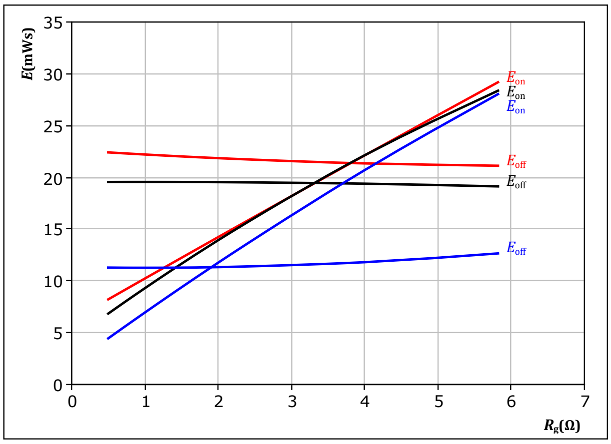
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C
R_{goff} =	2	Ω		

figure 21. **IGBT**

Typical switching energy losses as a function of IGBT turn on gate resistor

E = f(R_g)



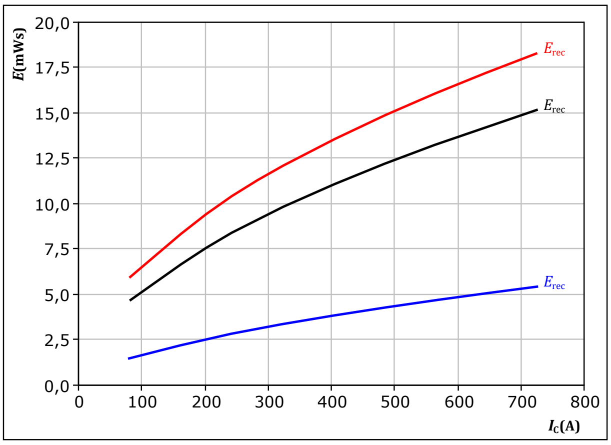
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	400	A		150 °C

figure 22. **FWD**

Typical reverse recovered energy loss as a function of collector current

E_{rec} = f(I_C)



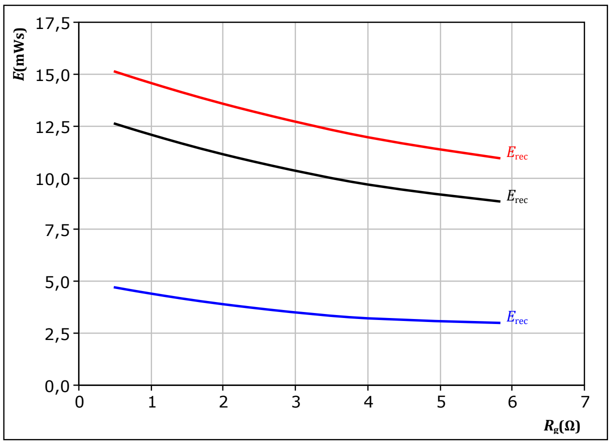
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 23. **FWD**

Typical reverse recovered energy loss as a function of IGBT turn on gate resistor

E_{rec} = f(R_g)



With an inductive load at

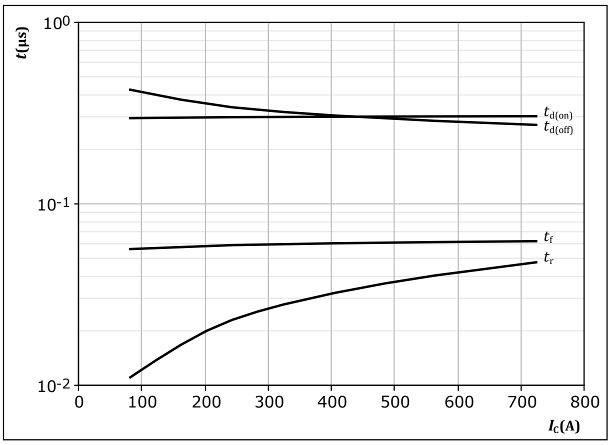
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	400	A		150 °C

Buck Switching Characteristics

figure 24. IGBT

Typical switching times as a function of collector current

t = f(I_C)



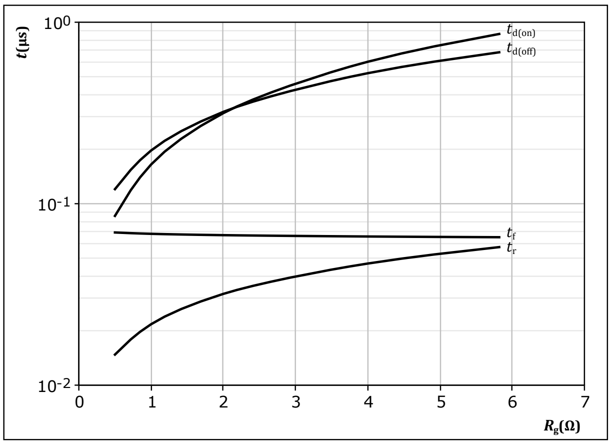
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 25. IGBT

Typical switching times as a function of IGBT turn on gate resistor

t = f(R_g)



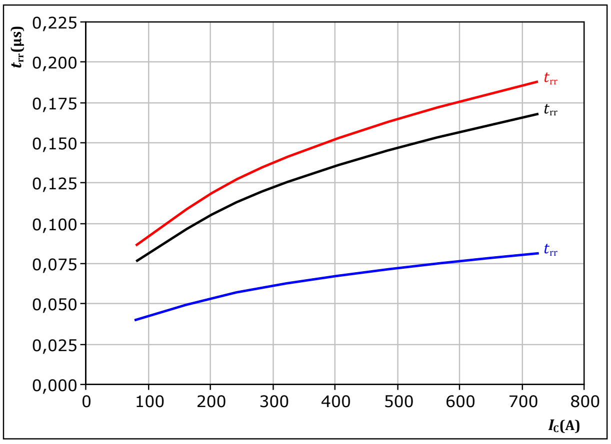
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	400	A

figure 26. FWD

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

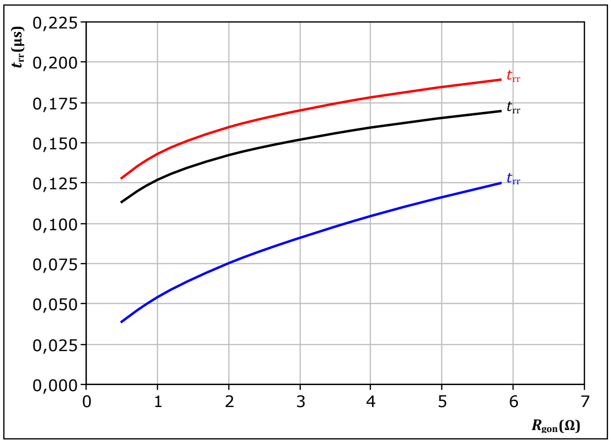
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 27. FWD

Typical reverse recovery time as a function of IGBT turn on gate resistor

t_{rr} = f(R_{gon})



With an inductive load at

V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	400	A

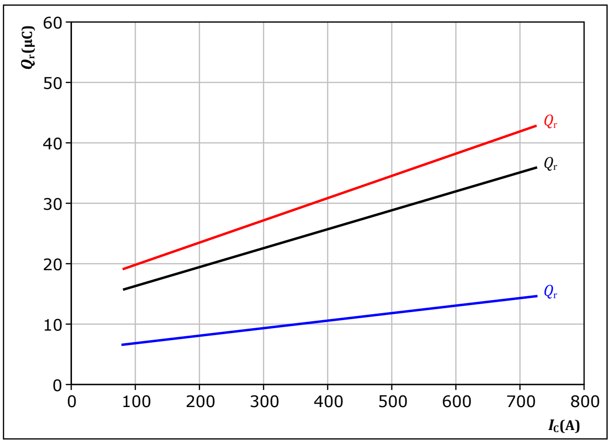
T_j: 25 °C, 125 °C, 150 °C

Buck Switching Characteristics

figure 28. FWD

Typical recovered charge as a function of collector current

Q_r = f(I_C)



With an inductive load at

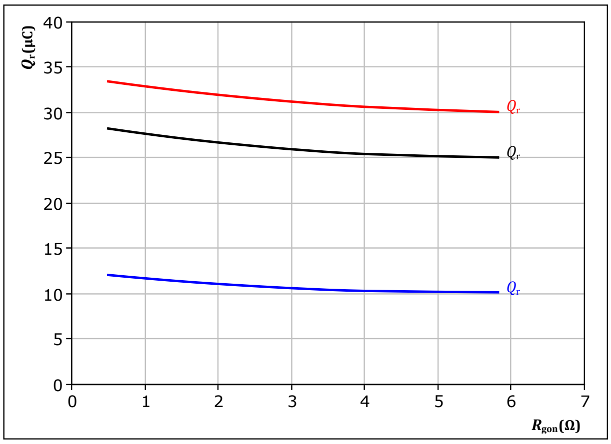
T_j: 25 °C / 125 °C / 150 °C

V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

figure 29. FWD

Typical recovered charge as a function of IGBT turn on gate resistor

Q_r = f(R_{gon})



With an inductive load at

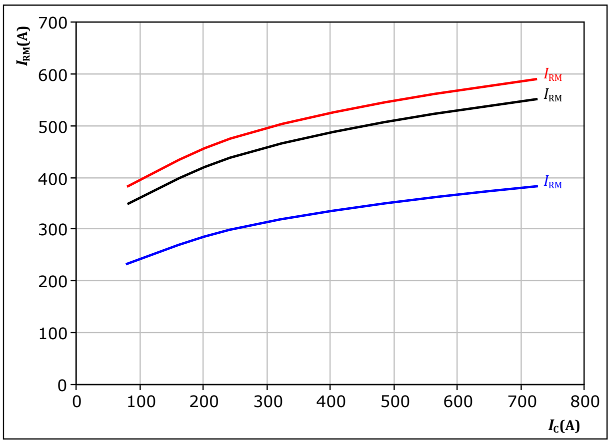
T_j: 25 °C / 125 °C / 150 °C

V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	400	A

figure 30. FWD

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



With an inductive load at

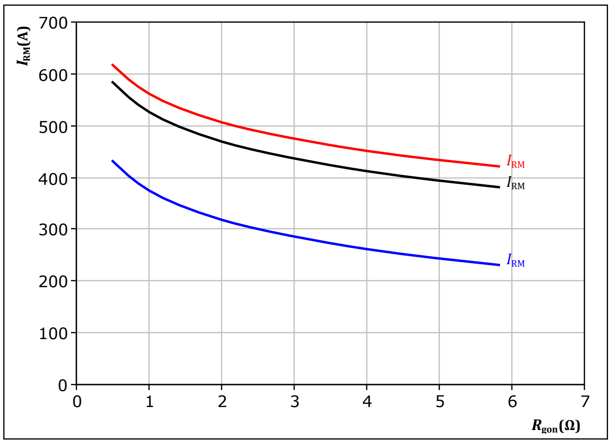
T_j: 25 °C / 125 °C / 150 °C

V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

figure 31. FWD

Typical peak reverse recovery current as a function of IGBT turn on gate resistor

I_{RM} = f(R_{gon})



With an inductive load at

T_j: 25 °C / 125 °C / 150 °C

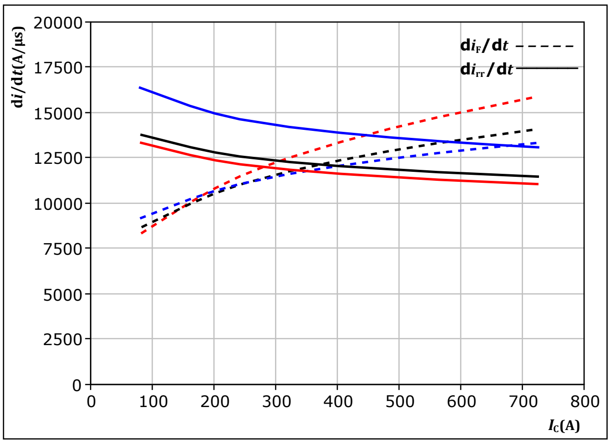
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	400	A

Buck Switching Characteristics

figure 32. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of collector current

di_F/dt, di_{rr}/dt = f(I_C)



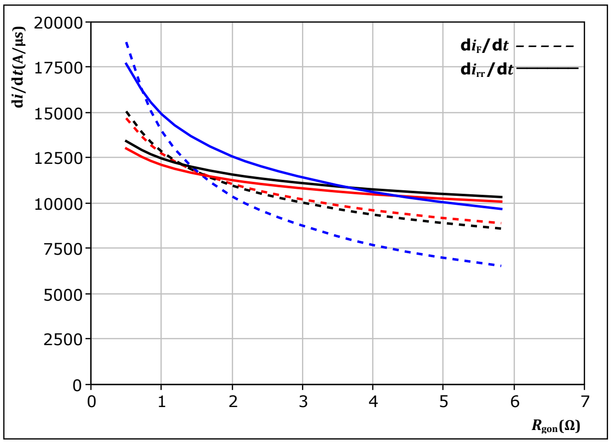
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 33. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor

di_F/dt, di_{rr}/dt = f(R_{gon})



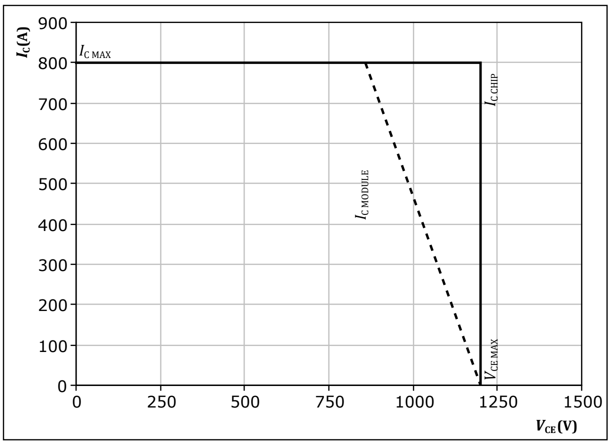
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	400	A		150 °C

figure 34. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



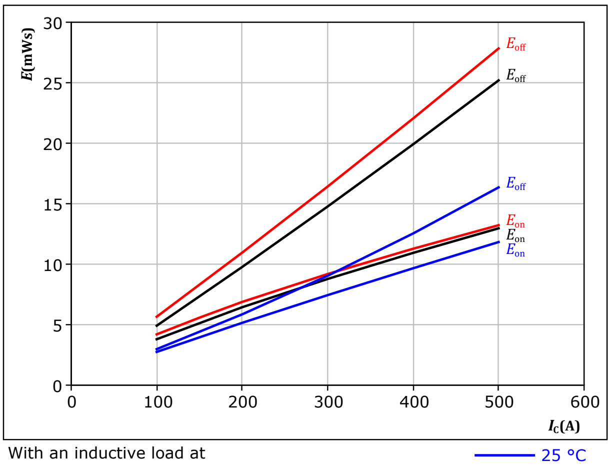
At	T_j =	150	°C
	R_{gon} =	2	Ω
	R_{goff} =	2	Ω

Boost Switching Characteristics

figure 35. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



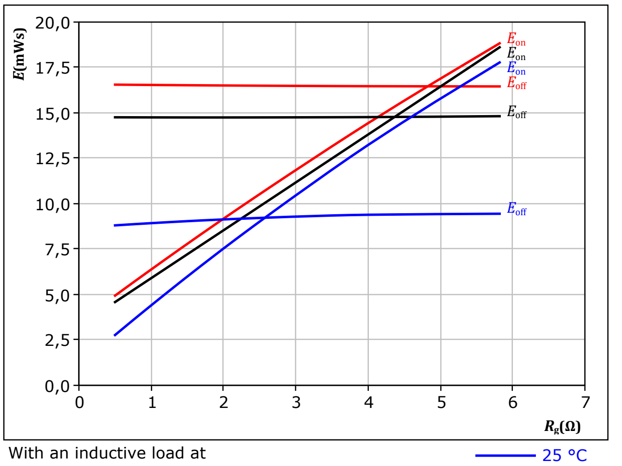
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C
R_{goff} =	2	Ω		

figure 36. **IGBT**

Typical switching energy losses as a function of IGBT turn on gate resistor

$E = f(R_g)$



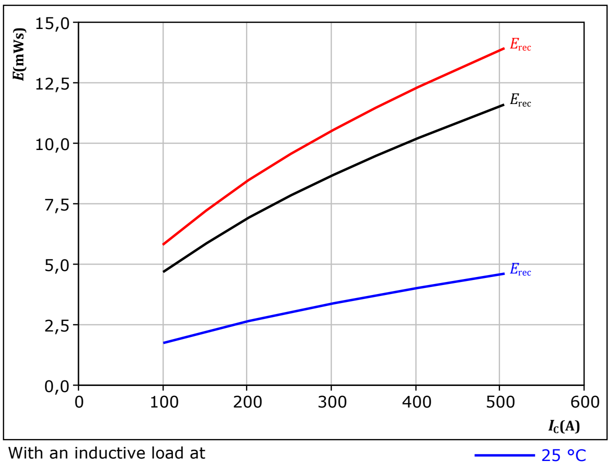
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	300	A		150 °C

figure 37. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



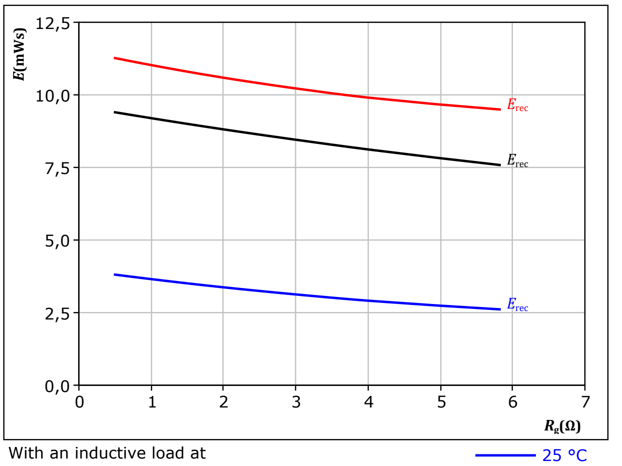
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 38. **FWD**

Typical reverse recovered energy loss as a function of IGBT turn on gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

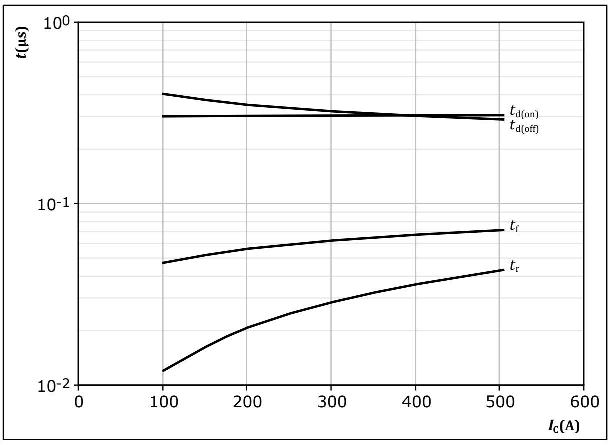
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	300	A		150 °C

Boost Switching Characteristics

figure 39. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



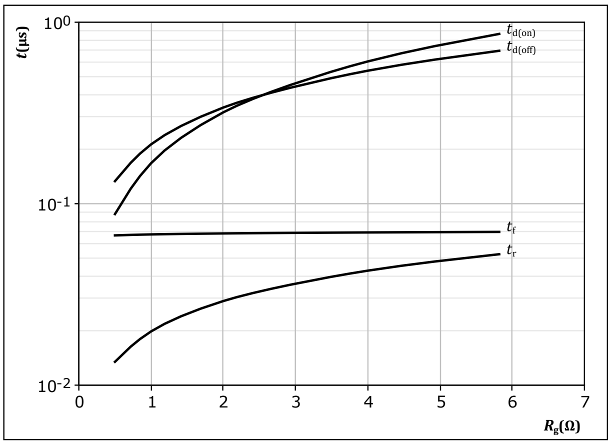
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 40. **IGBT**

Typical switching times as a function of IGBT turn on gate resistor

t = f(R_g)



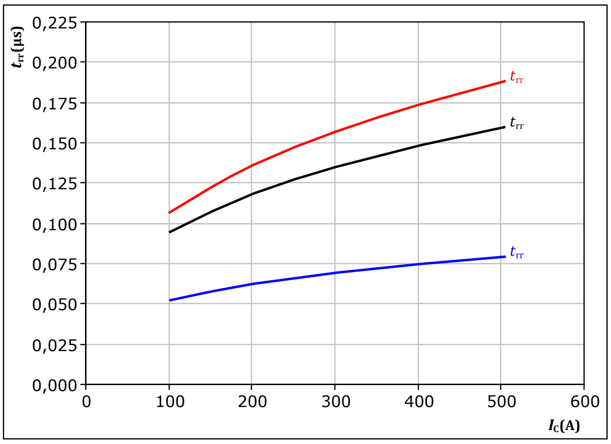
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	300	A

figure 41. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

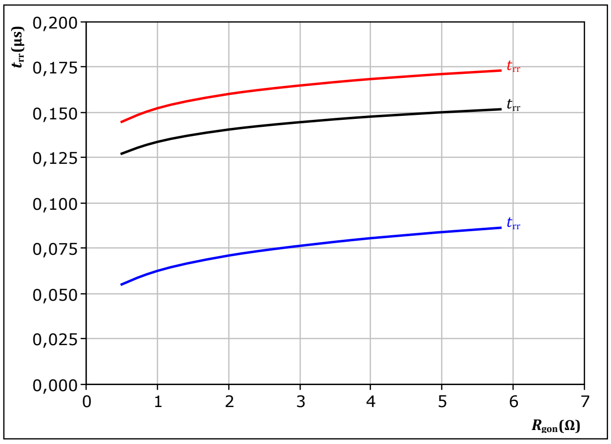
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 42. **FWD**

Typical reverse recovery time as a function of IGBT turn on gate resistor

t_{rr} = f(R_{gon})



With an inductive load at

V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	300	A

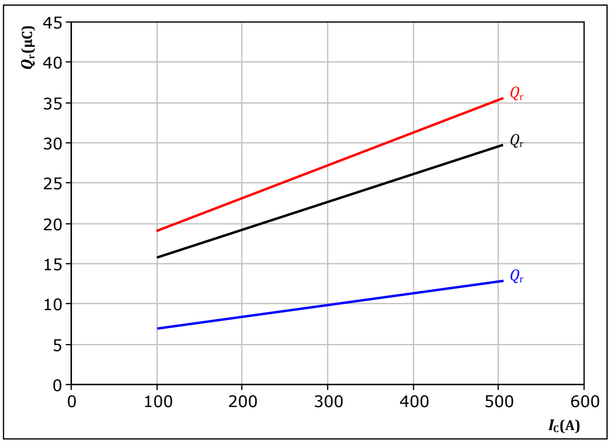
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 43. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$



With an inductive load at

V_{CE} = 600 V

V_{GE} = ±15 V

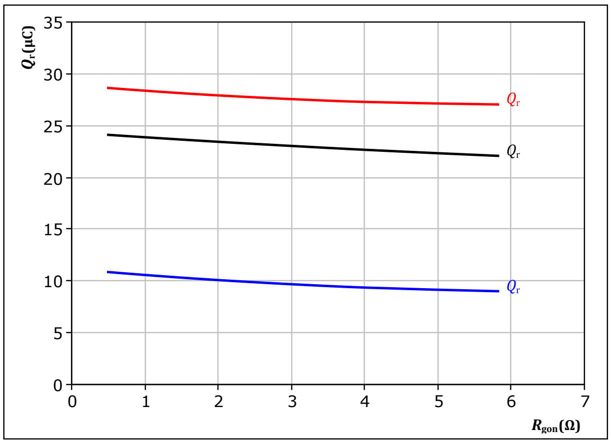
R_{gon} = 2 Ω

T_j: 25 °C, 125 °C, 150 °C

figure 44. **FWD**

Typical recovered charge as a function of IGBT turn on gate resistor

$Q_r = f(R_{gon})$



With an inductive load at

V_{CE} = 600 V

V_{GE} = ±15 V

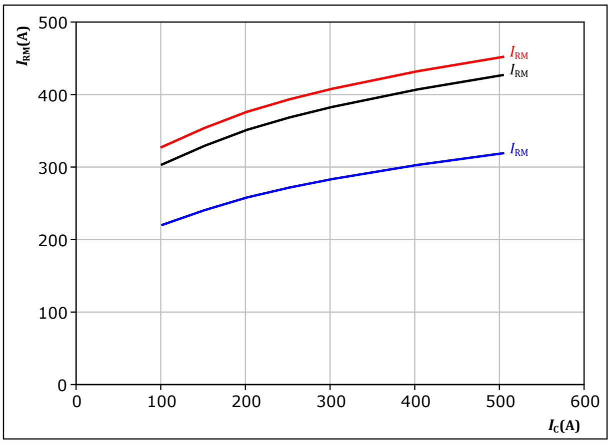
I_C = 300 A

T_j: 25 °C, 125 °C, 150 °C

figure 45. **FWD**

Typical peak reverse recovery current as a function of collector current

$I_{RM} = f(I_C)$



With an inductive load at

V_{CE} = 600 V

V_{GE} = ±15 V

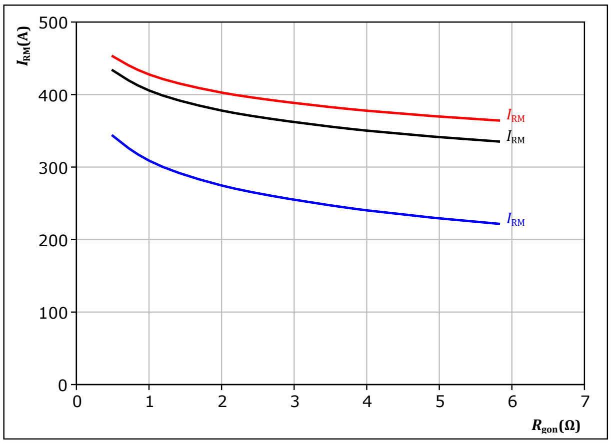
R_{gon} = 2 Ω

T_j: 25 °C, 125 °C, 150 °C

figure 46. **FWD**

Typical peak reverse recovery current as a function of IGBT turn on gate resistor

$I_{RM} = f(R_{gon})$



With an inductive load at

V_{CE} = 600 V

V_{GE} = ±15 V

I_C = 300 A

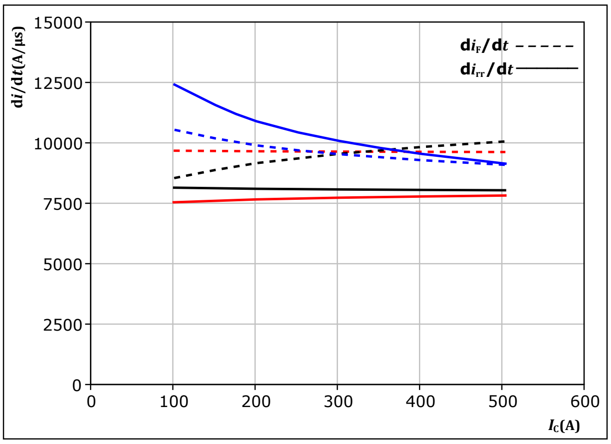
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 47. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of collector current

di_F/dt, di_{rr}/dt = f(I_C)



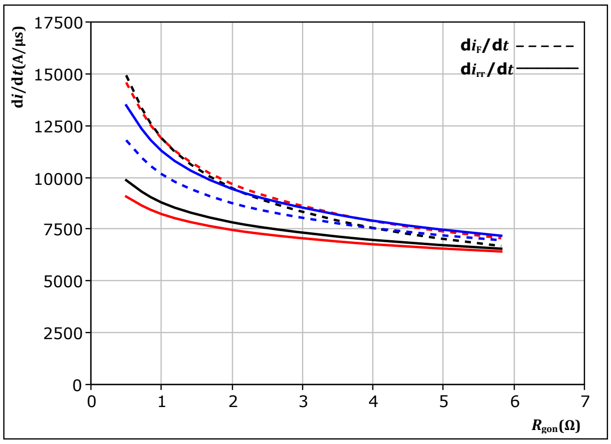
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 48. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of turn on gate resistor

di_F/dt, di_{rr}/dt = f(R_{gon})



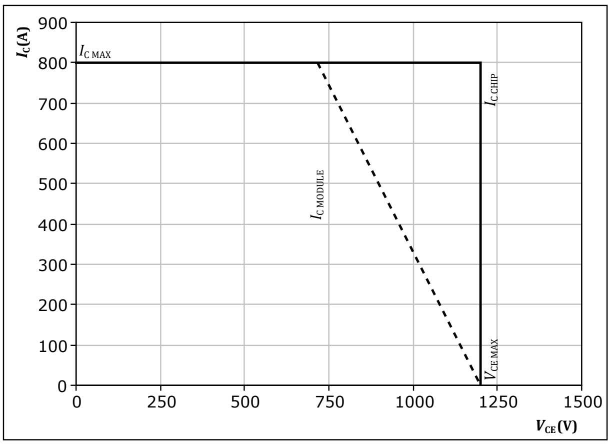
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	300	A		150 °C

figure 49. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At	T_j =	150	°C
	R_{gon} =	2	Ω
	R_{goff} =	2	Ω

Switching Definitions

figure 50. **IGBT**

Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{tEoff} **= integrating time for** E_{off})

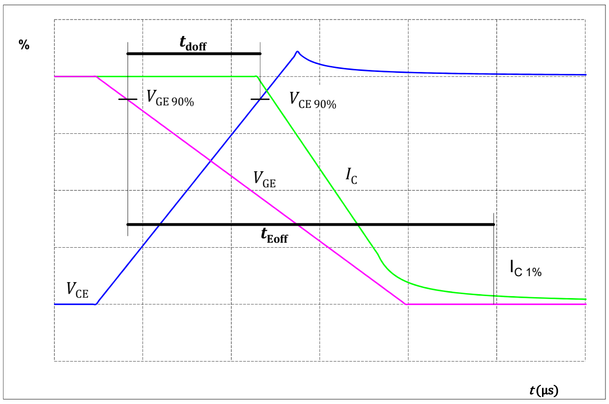


figure 51. **IGBT**

Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} **= integrating time for** E_{on})

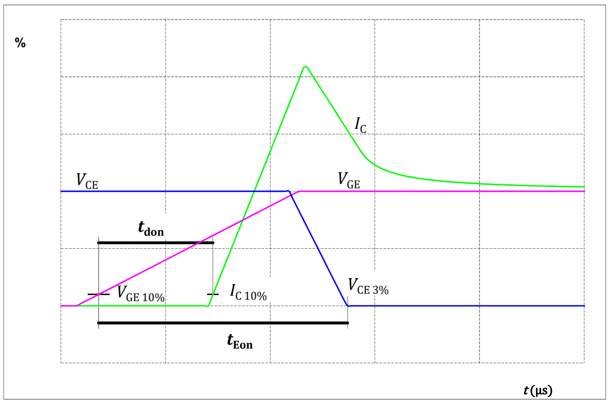


figure 52. **IGBT**

Turn-off Switching Waveforms & definition of t_f

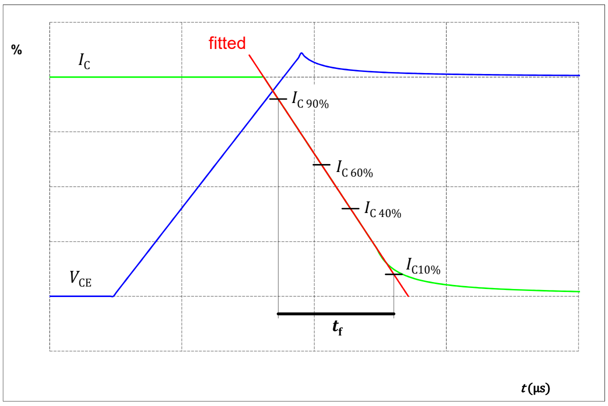
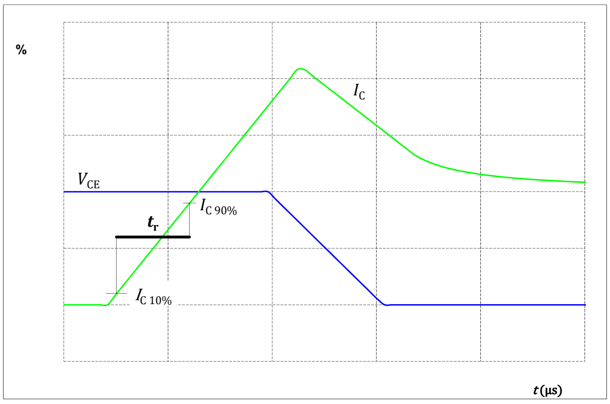


figure 53. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 54. **FWD**

Turn-off Switching Waveforms & definition of t_{rr}

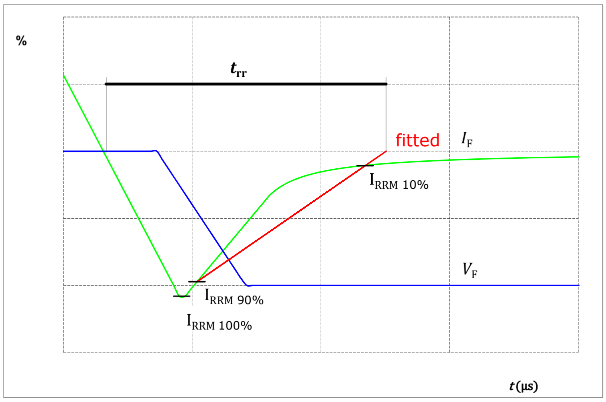
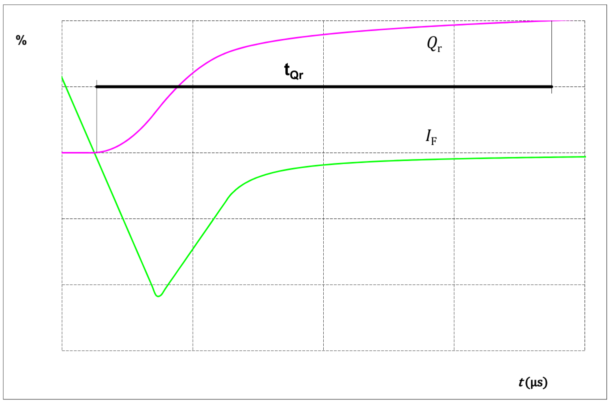


figure 55. **FWD**

Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



30-EP12NIB400H710-PR49F07T
datasheet

Vincotech

Ordering Code

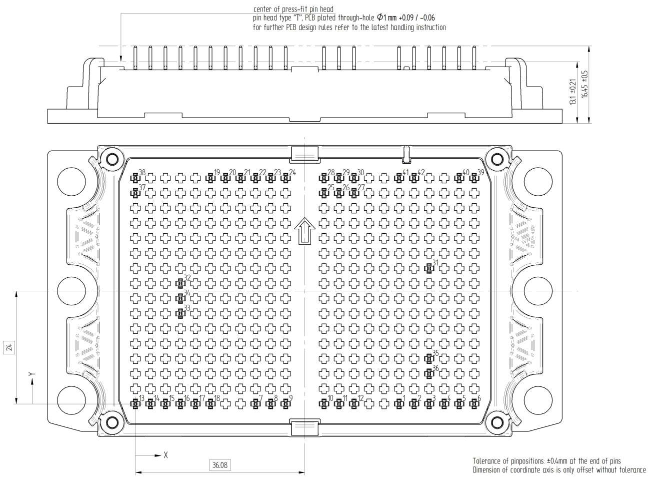
Version	Ordering Code
Without thermal paste	30-EP12NIB400H710-PR49F07T
With thermal paste (5,2 W/mK, PTM6000HV)	30-EP12NIB400H710-PR49F07T-/7/

Marking

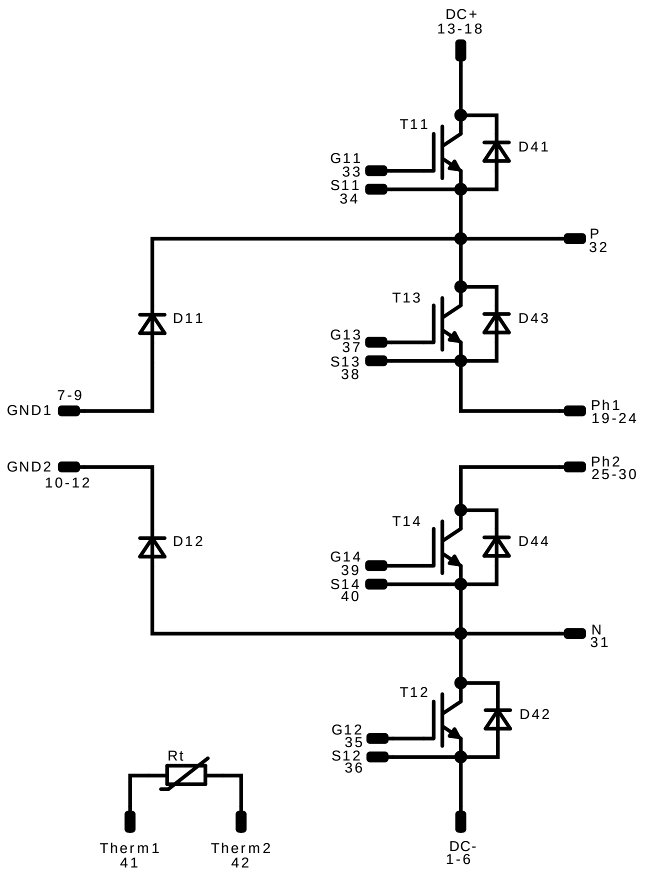
	Name		Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-TTTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]			
Pin	X	Y	Function
1	56,16	0	DC-
2	59,36	0	DC-
3	62,56	0	DC-
4	65,76	0	DC-
5	68,96	0	DC-
6	72,16	0	DC-
7	25,6	0	GND1
8	28,8	0	GND1
9	32	0	GND1
10	40,16	0	GND2
11	43,36	0	GND2
12	46,56	0	GND2
13	0	0	DC+
14	3,2	0	DC+
15	6,4	0	DC+
16	9,6	0	DC+
17	12,8	0	DC+
18	16	0	DC+
19	16	48	Ph1
20	19,2	48	Ph1
21	22,4	48	Ph1
22	25,6	48	Ph1
23	28,8	48	Ph1
24	32	48	Ph1
25	40,16	44,8	Ph2
26	43,36	44,8	Ph2
27	46,56	44,8	Ph2
28	40,16	48	Ph2
29	43,36	48	Ph2
30	46,56	48	Ph2
31	62,56	28,8	N
32	9,6	25,6	P
33	9,6	19,2	G11
34	9,6	22,4	S11
35	62,56	9,6	G12
36	62,56	6,4	S12
37	0	44,8	G13
38	0	48	S13
39	72,16	48	G14
40	68,96	48	S14
41	56,16	48	Therm1
42	59,36	48	Therm2



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	1200 V	400 A	Buck Switch	
D11, D12	FWD	1200 V	420 A	Buck Diode	
T13, T14	IGBT	1200 V	400 A	Boost Switch	
D42, D41	FWD	1200 V	420 A	Boost Diode	
D43, D44	FWD	1200 V	420 A	Boost Sw. Inv. Diode	
Rt	Thermistor			Thermistor	

Packaging instruction					
Standard packaging quantity (SPQ) 24	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* E3BP packages see vincotech.com website.

Package data
Package data for *flow* E3BP packages see vincotech.com website.

Vincotech thermistor reference
See Vincotech thermistor reference table at vincotech.com website.

UL recognition and file number
This device is UL 1557 recognized under E192116 up to a junction temperature under switching condition $T_{j,op}$=175°C and up to 4000VAC/1min isolation voltage. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
30-EP12NIB400H710-PR49F07T-D1-14	29 Apr. 2025	Initial Release	