B0-SP10NAD600S704-PE19F18T
B0-SP10NAE600S704-PE29F18T
datasheet

***flow*ANPC S3 split** **950 V / 600 A**

Topology features

- Advanced Neutral Point Clamped topology
- Split topology
- Temperature sensor

Component features

- Low collector emitter saturation voltage
- High speed and smooth switching

Housing features

- Base isolation: AlN
- CTI600 housing material
- Compact, baseplate-less housing
- VINcoPress Technology
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

Extra features

- Heat-Pipe and Heat-Sink optimized layout

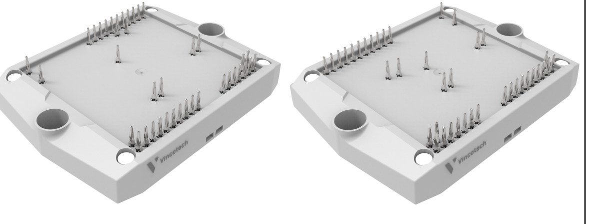
Target applications

- Energy Storage Systems
- Solar Inverters

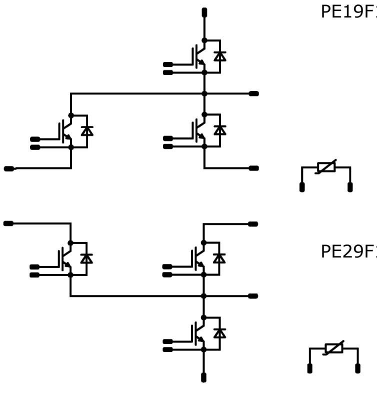
Types

- B0-SP10NAD600S704-PE19F18T
- B0-SP10NAE600S704-PE29F18T

flow S3 12 mm housing



Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
AC Switch					
Collector-emitter voltage	V_{CES}			950	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	461	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	599	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
AC Diode					
Peak repetitive reverse voltage	V_{RRM}			950	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	191	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	365	W
Maximum junction temperature	T_{jmax}			175	°C
DC-Link Switch					
Collector-emitter voltage	V_{CES}			950	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	382	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	704	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
DC-Link Diode					
Peak repetitive reverse voltage	V_{RRM}			950	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	191	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	365	W
Maximum junction temperature	T_{jmax}			175	°C
Neutral Point Switch					
Collector-emitter voltage	V_{CES}			950	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	282	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		800	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	539	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
Neutral Point Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	206	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		712	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 110 °C	1032	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	448	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions	Value	Unit
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		B0-SP10NAD600S704-PE19F18T B0-SP10NAE600S704-PE29F18T	11,99 11,39	mm
Comparative Tracking Index	CTI		≥ 600	

*100 % tested in production

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	
AC Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0065	25	4,15	4,85	5,65	V
Collector-emitter saturation voltage	V_{CEsat}		15		400	25 125 150		1,21 1,23 1,24	1,4(1)	V
Collector-emitter cut-off current	I_{CES}		0	950		25			8	µA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							0,75		Ω
Input capacitance	C_{ies}	f = 100 kHz	0	25		25		49200		pF
Output capacitance	C_{oes}							530		pF
Reverse transfer capacitance	C_{res}							220		pF
Gate charge	Q_g		±15		0	25		4100		nC
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,16		K/W
AC Diode										
Static										
Forward voltage	V_F				300	25 125 150	2,1	2,59 2,43 2,37	2,8(1)	V
Reverse leakage current	I_R	V_r = 950 V				25			12	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,26		K/W

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
DC-Link Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00975	25	4,35	5,1	5,85	V
Collector-emitter saturation voltage	V_{CEsat}		15		600	25 125 150		1,82 2,07 2,13	2,25(1)	V
Collector-emitter cut-off current	I_{CES}		0	950		25			12	µA
Gate-emitter leakage current	I_{GES}		20	0		25			300	nA
Internal gate resistance	r_g							0,5		Ω
Input capacitance	C_{ies}	f = 100 kHz	0	25		25		37800		pF
Output capacitance	C_{oes}							810		pF
Reverse transfer capacitance	C_{res}							120		pF
Gate charge	Q_g		±15		0	25		1350		nC
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,14		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 12,8 Ω R_{goff} = 12,8 Ω	±15	600	355	25 125 150		1066,77 1048,79 1042,63		ns
Rise time	t_r					25 125 150		102,92 113,55 117,86		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		684,23 730,61 742,65		ns
Fall time	t_f					25 125 150		23,01 36,62 40,18		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,911 µC Q_{rFWD}=0,876 µC Q_{rFWD}=0,941 µC				25 125 150		58,55 50,04 49,24		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		17,39 18,27 19,21		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	
DC-Link Diode										
Static										
Forward voltage	V_F				300	25 125 150	2,1	2,59 2,43 2,37	2,8(1)	V
Reverse leakage current	I_R	V_r = 950 V				25			12	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,26		K/W
Dynamic										
Peak recovery current	I_{RM}	di/dt=6618 A/µs di/dt=5990 A/µs di/dt=6156 A/µs	±15	600	355	25 125 150		69,54 69,01 68,97		A
Reverse recovery time	t_{rr}					25 125 150		25,67 26,2 26,4		ns
Recovered charge	Q_r					25 125 150		1,08 1,11 1,12		µC
Reverse recovered energy	E_{rec}					25 125 150		0,411 0,425 0,431		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		7251,59 7000,21 6801,22		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]	Min	Typ	Max	Unit
Neutral Point Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0065	25	4,35	5,1	5,85	V
Collector-emitter saturation voltage	V_{CEsat}		15		400	25 125 150		1,82 2,07 2,13	2,25(1)	V
Collector-emitter cut-off current	I_{CES}		0	950		25			8	µA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							0,75		Ω
Input capacitance	C_{ies}	f = 100 kHz	0	25		25		25200		pF
Output capacitance	C_{oes}							540		pF
Reverse transfer capacitance	C_{res}							80		pF
Gate charge	Q_g		±15		0	25		900		nC
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,18		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	600	355	25 125 150		207,36 211,69 213,64		ns
Rise time	t_r					25 125 150		36,11 38,61 39,6		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		176,43 210,44 220,65		ns
Fall time	t_f					25 125 150		26,39 46,75 56,01		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=1,08 µC Q_{rFWD}=1,11 µC Q_{rFWD}=1,12 µC				25 125 150		7,81 7,54 7,55		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		12,45 17,92 20,04		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	
Neutral Point Diode										
Static										
Forward voltage	V_F				160	25 125 150		1,5 1,73 1,83	2(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25		40	4000	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,21		K/W
Dynamic										
Peak recovery current	I_{RM}	di/dt=2658 A/µs di/dt=2303 A/µs di/dt=3676 A/µs	±15	600	355	25 125 150		47,75 44,86 45,83		A
Reverse recovery time	t_{rr}					25 125 150		32,48 33,49 34		ns
Recovered charge	Q_r					25 125 150		0,911 0,876 0,941		µC
Reverse recovered energy	E_{rec}					25 125 150		0,146 0,135 0,145		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		4306,56 4157,24 3039,4		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	
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	

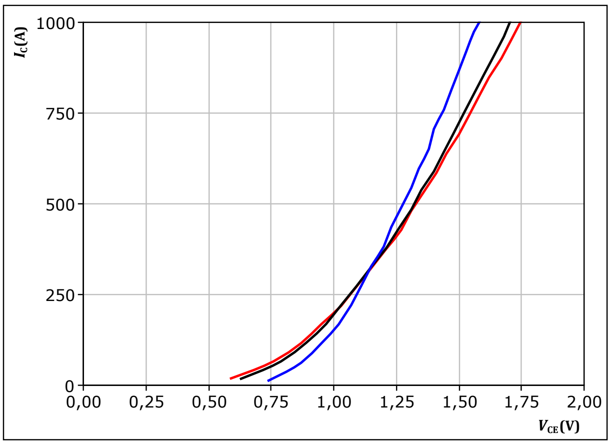
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

AC Switch Characteristics

figure 1. IGBT

Typical output characteristics

I_C = f(V_{CE})

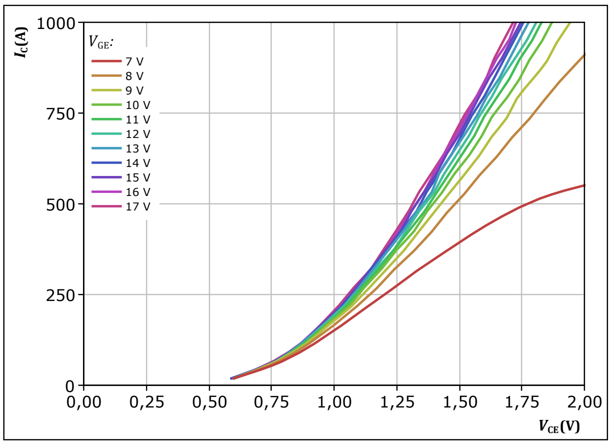


t_p = 250 µs
V_{GE} = 15 V
T_j: 25 °C, 125 °C, 150 °C

figure 2. IGBT

Typical output characteristics

I_C = f(V_{CE})

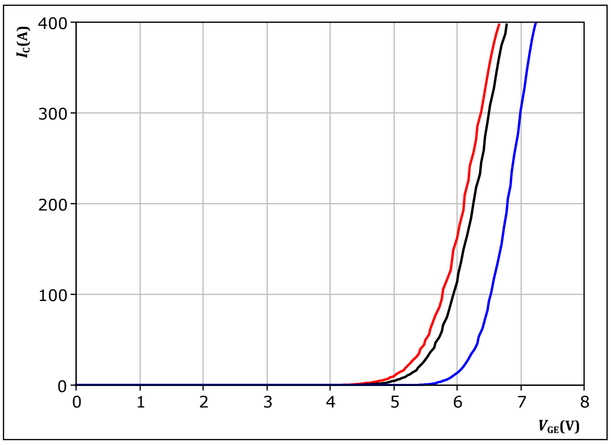


t_p = 250 µs
T_j = 150 °C
V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

I_C = f(V_{GE})

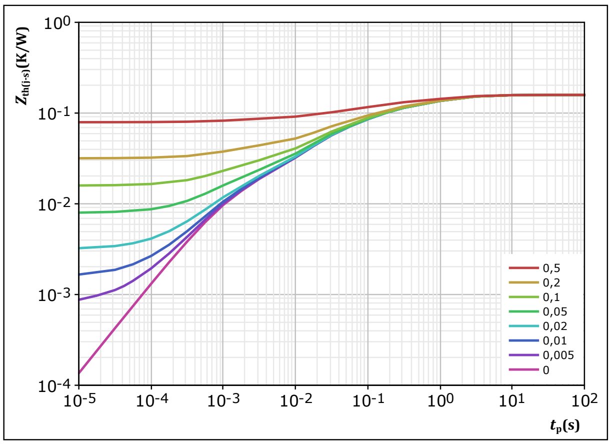


t_p = 250 µs
V_{CE} = 10 V
T_j: 25 °C, 125 °C, 150 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



D = t_p / T
$R_{th(j-s)}$ = 0,158 K/W

IGBT thermal model values

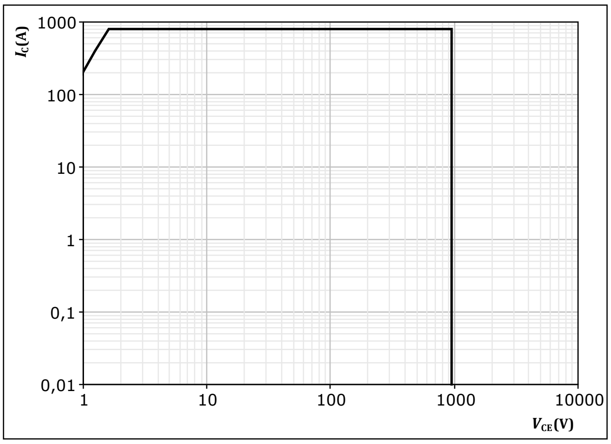
R (K/W)	τ (s)
9,88E-03	4,48E+00
4,29E-02	9,18E-01
5,31E-02	1,30E-01
4,03E-02	2,06E-02
1,24E-02	1,11E-03

AC Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



D = single pulse

T_s = 80 °C

V_{GE} = 15 V

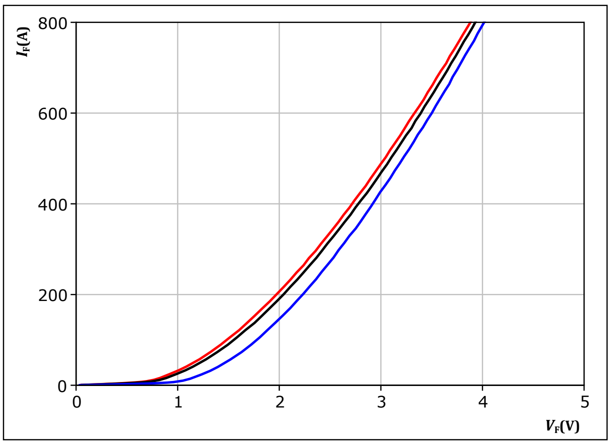
T_j = T_{jmax}

AC Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



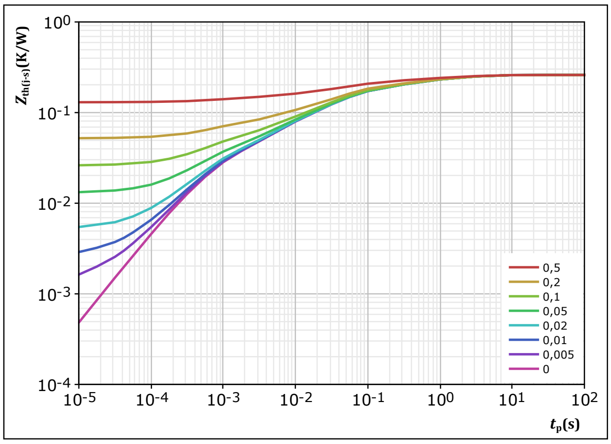
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 7. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,26 K/W

FWD thermal model values

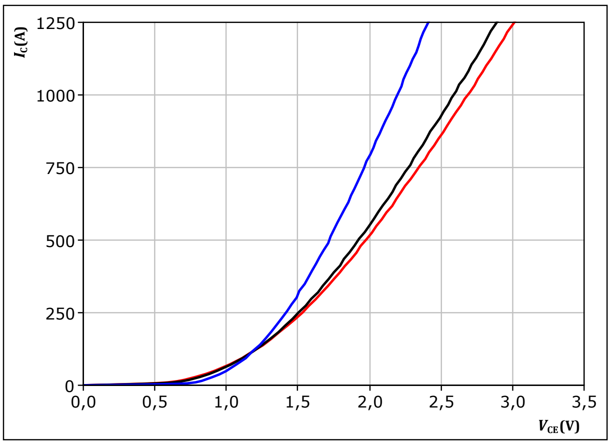
R (K/W)	τ (s)
2,71E-02	2,94E+00
5,54E-02	5,40E-01
1,05E-01	5,17E-02
4,70E-02	7,63E-03
2,60E-02	6,45E-04

DC-Link Switch Characteristics

figure 8. IGBT

Typical output characteristics

I_C = f(V_{CE})

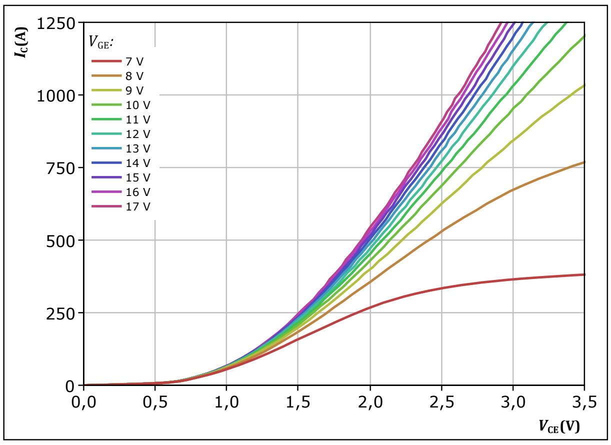


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 9. IGBT

Typical output characteristics

I_C = f(V_{CE})



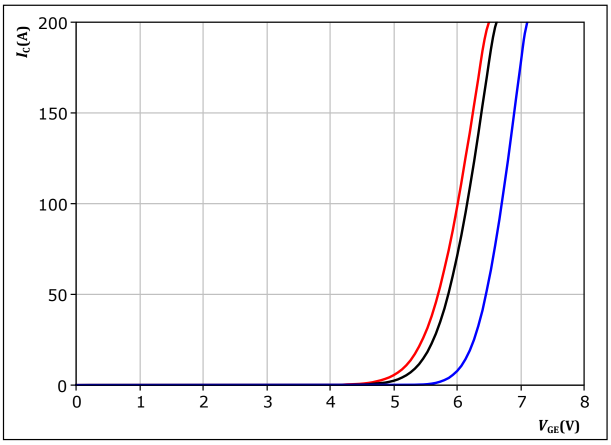
t_p =	250	µs
T_j =	150	°C

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

figure 10. IGBT

Typical transfer characteristics

I_C = f(V_{GE})

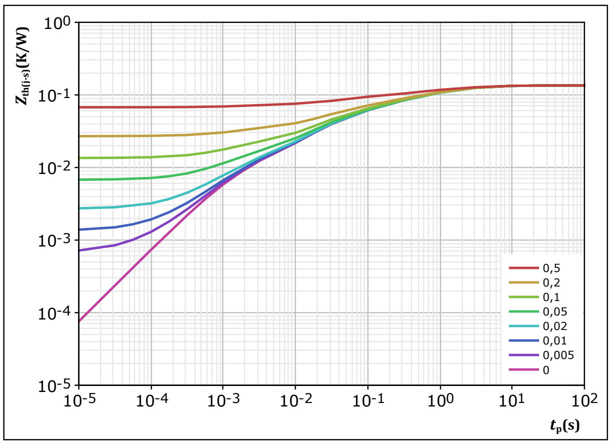


t_p =	250	µs		25 °C
V_{CE} =	24	V	T_j:	125 °C
				150 °C

figure 11. IGBT

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,135	K/W

IGBT thermal model values

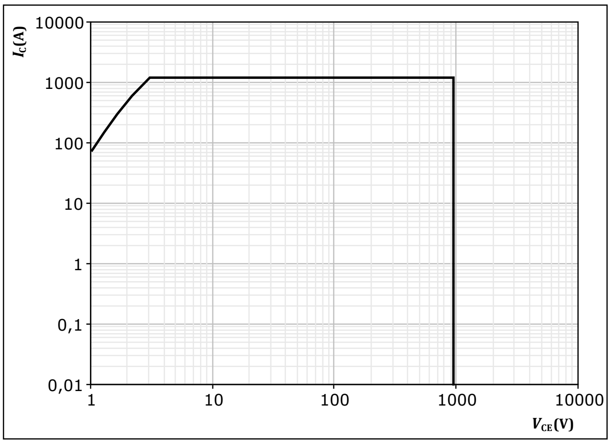
R (K/W)	τ (s)
9,28E-03	5,97E+00
3,75E-02	1,43E+00
4,26E-02	2,44E-01
3,69E-02	2,77E-02
8,68E-03	1,44E-03

DC-Link Switch Characteristics

figure 12.	IGBT

Safe operating area

I_C = f(V_{CE})



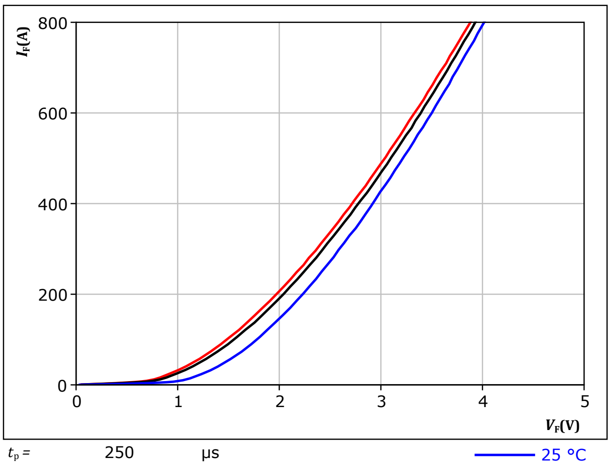
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

DC-Link Diode Characteristics

figure 13. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



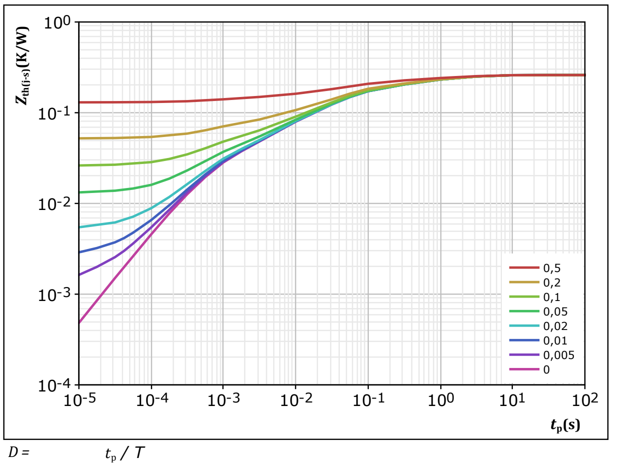
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 14. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,26 K/W

FWD thermal model values

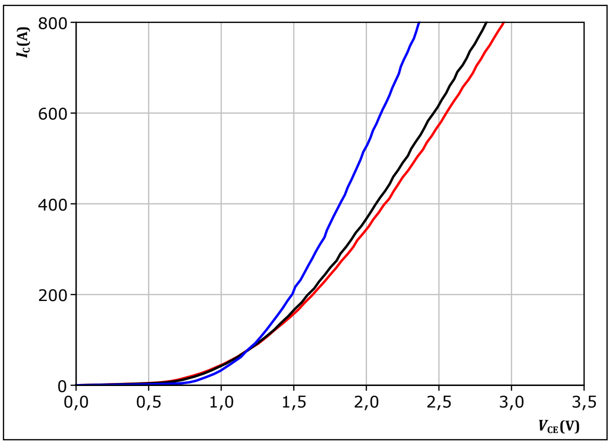
R (K/W)	τ (s)
2,71E-02	2,94E+00
5,54E-02	5,40E-01
1,05E-01	5,17E-02
4,70E-02	7,63E-03
2,60E-02	6,45E-04

Neutral Point Switch Characteristics

figure 15. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



t_p = 250 µs

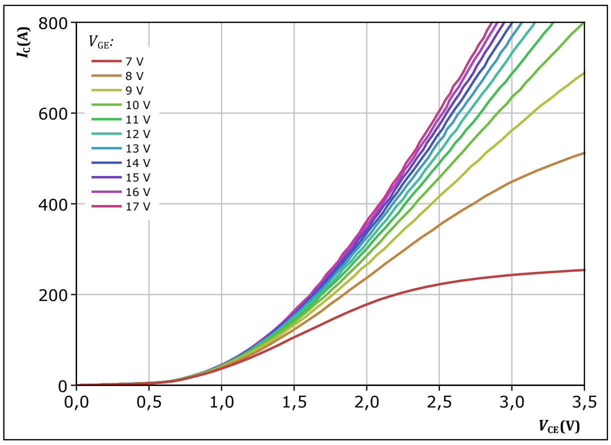
V_{GE} = 15 V

T_j: 25 °C, 125 °C, 150 °C

figure 16. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



t_p = 250 µs

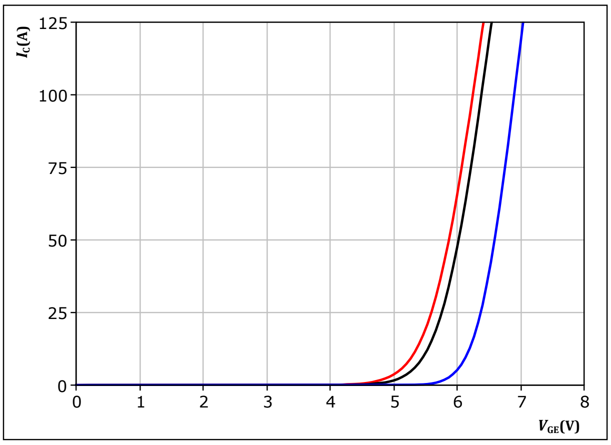
T_j = 150 °C

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

figure 17. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})



t_p = 250 µs

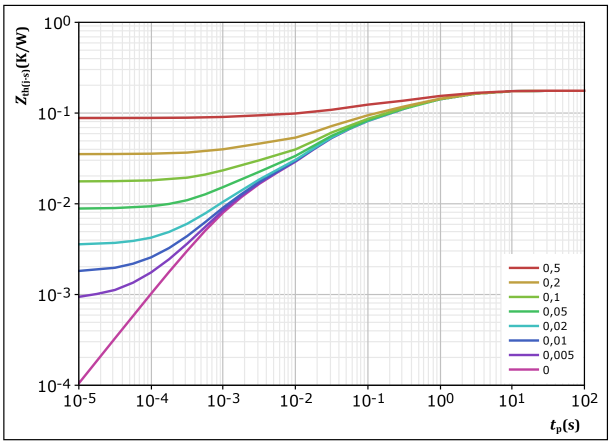
V_{CE} = 24 V

T_j: 25 °C, 125 °C, 150 °C

figure 18. **IGBT**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,176 K/W

IGBT thermal model values

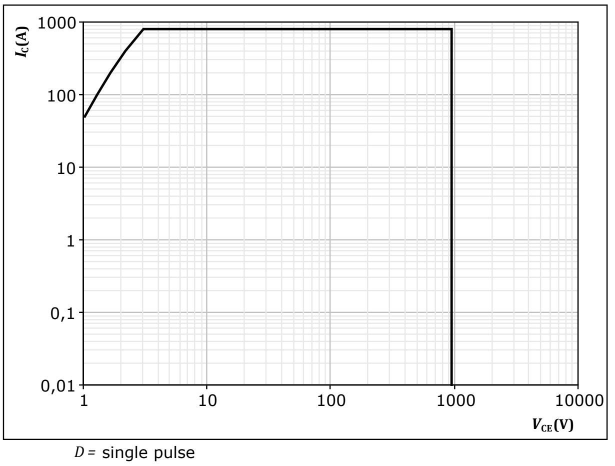
R (K/W)	τ (s)
1,35E-02	5,32E+00
4,39E-02	1,45E+00
5,74E-02	2,58E-01
4,99E-02	2,79E-02
1,17E-02	1,38E-03

Neutral Point Switch Characteristics

figure 19. **IGBT**

Safe operating area

I_C = f(V_{CE})



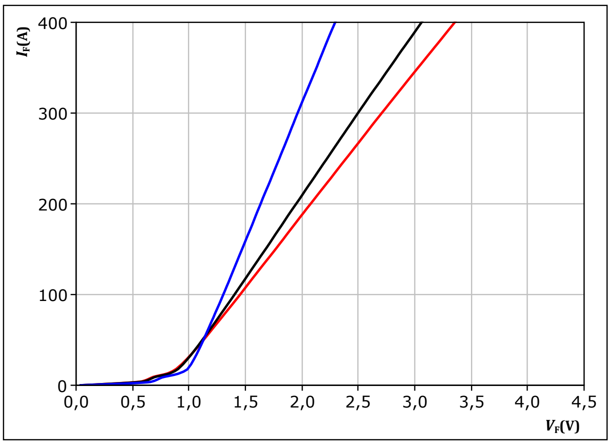
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Neutral Point Diode Characteristics

figure 20. **FWD**

Typical forward characteristics

I_F = f(V_F)



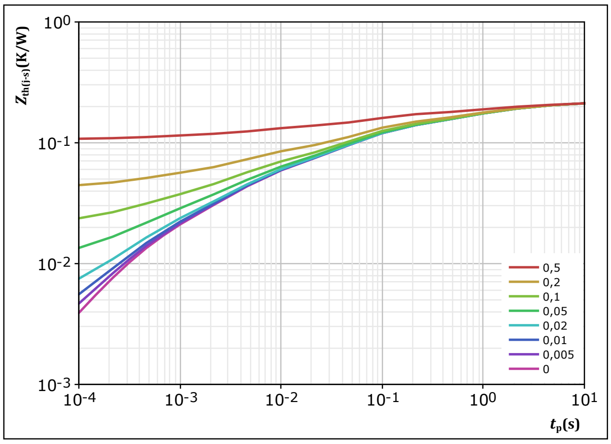
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 21. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,212 K/W

FWD thermal model values

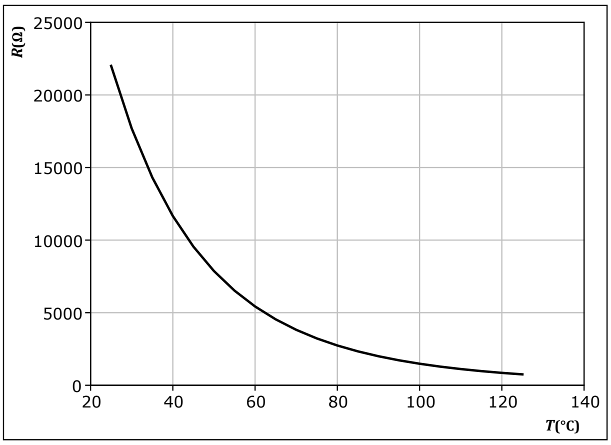
R (K/W)	τ (s)
4,08E-02	3,18E+00
4,88E-02	5,85E-01
7,47E-02	5,71E-02
3,67E-02	4,18E-03
1,29E-02	3,91E-04

Thermistor Characteristics

figure 22.	Thermistor

Typical NTC characteristic as function of temperature

R_T = f(T)

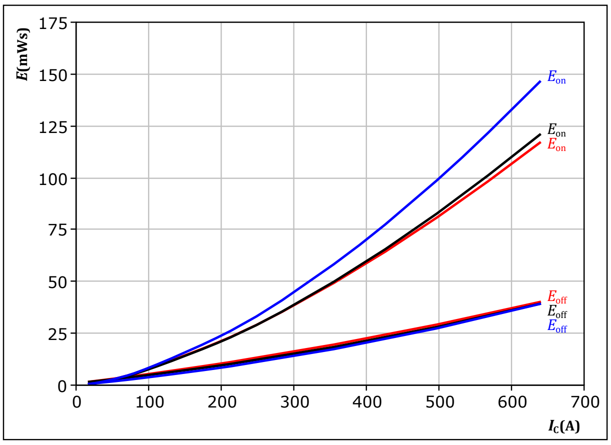


DC-Link Switching Characteristics

figure 23. **IGBT**

Typical switching energy losses as a function of collector current

E = f(I_C)



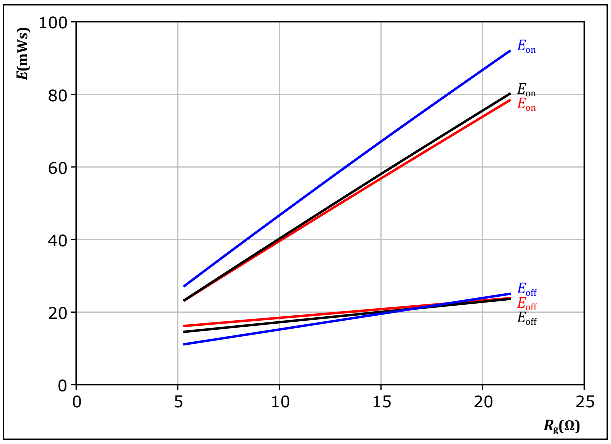
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	12,8	Ω		150 °C
R_{goff} =	12,8	Ω		

figure 24. **IGBT**

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

E = f(R_g)



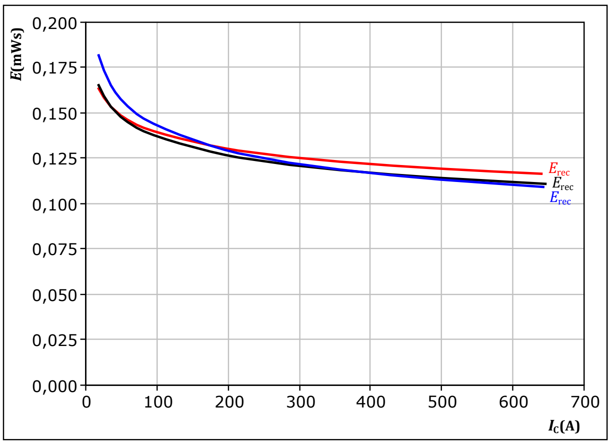
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	355	A		150 °C

figure 25. **FWD**

Typical reverse recovered energy loss as a function of collector current

E_{rec} = f(I_C)



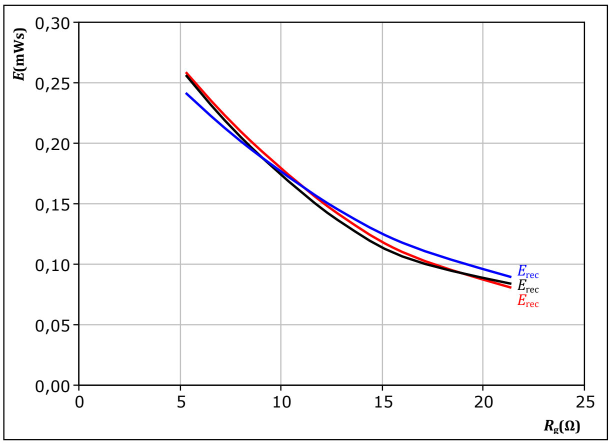
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	12,8	Ω		150 °C

figure 26. **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

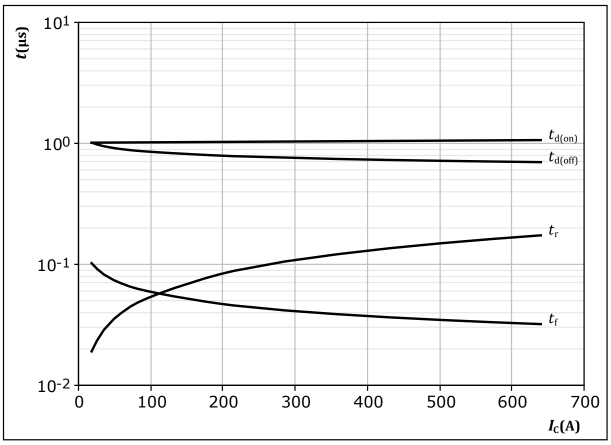
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	355	A		150 °C

DC-Link Switching Characteristics

figure 27. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



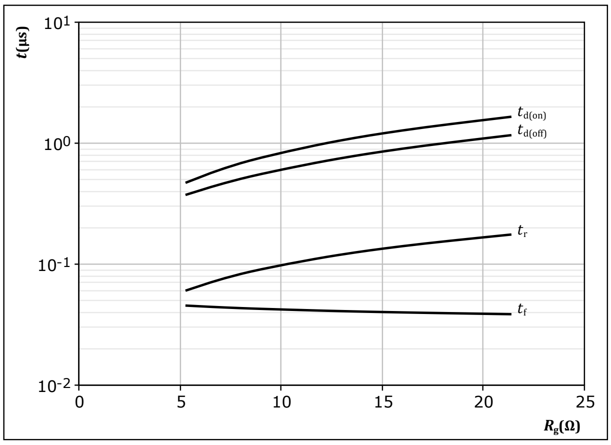
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	12,8	Ω
R_{goff} =	12,8	Ω

figure 28. **IGBT**

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

t = f(R_g)



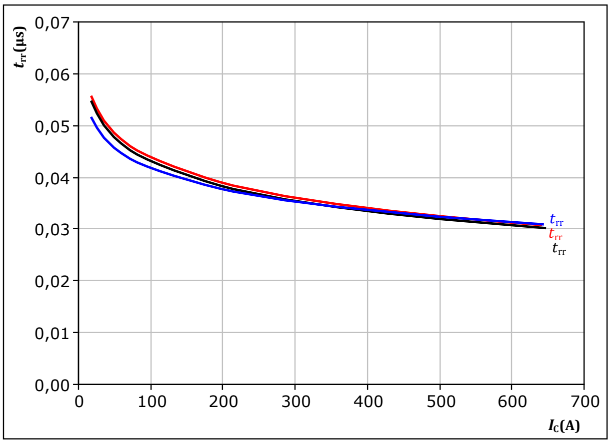
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	355	A

figure 29. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

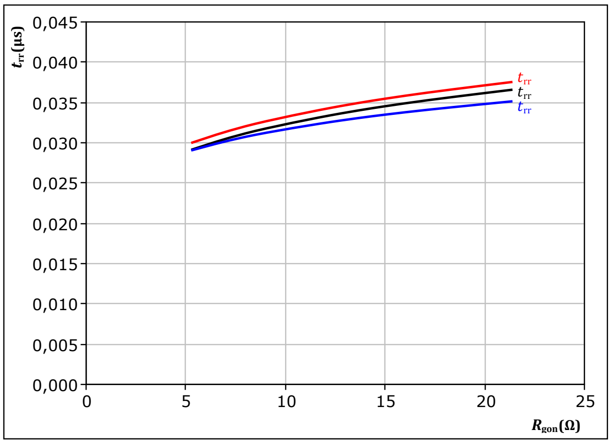
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	12,8	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 30. **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 =	355	A

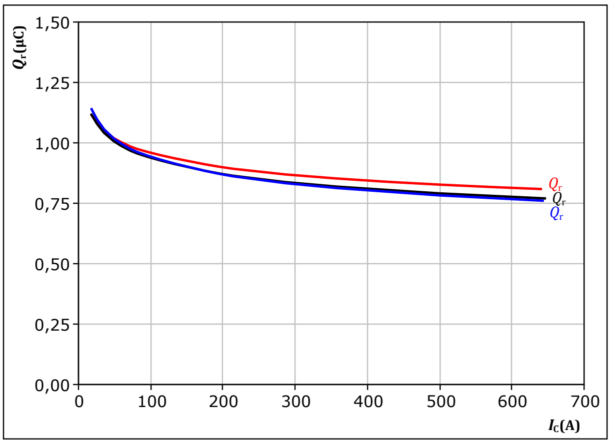
T_j: 25 °C, 125 °C, 150 °C

DC-Link Switching Characteristics

figure 31. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



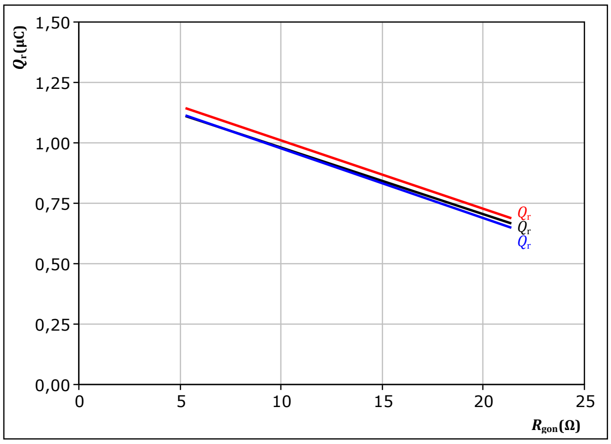
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	12,8	Ω		150 °C

figure 32. **FWD**

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

Q_r = f(R_{gon})



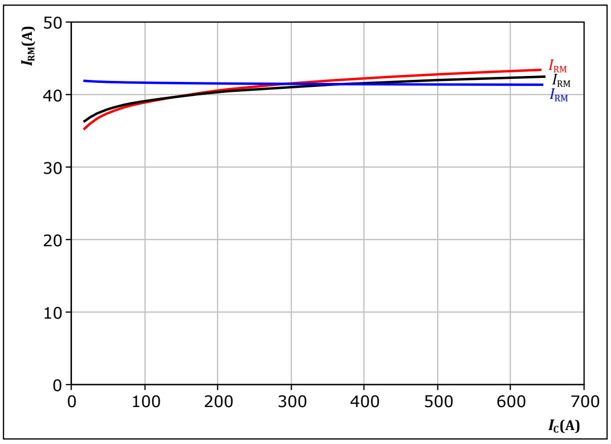
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	355	A		150 °C

figure 33. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



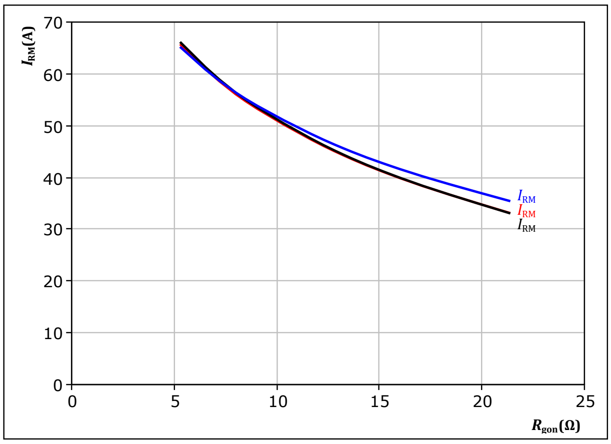
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	12,8	Ω		150 °C

figure 34. **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

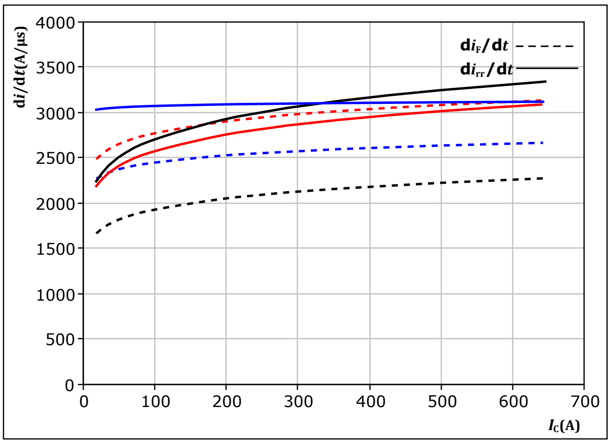
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	355	A		150 °C

DC-Link Switching Characteristics

figure 35. **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)



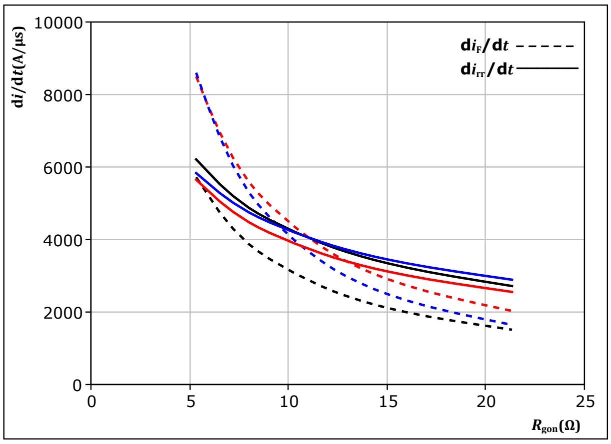
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	12,8	Ω		150 °C

figure 36. **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})



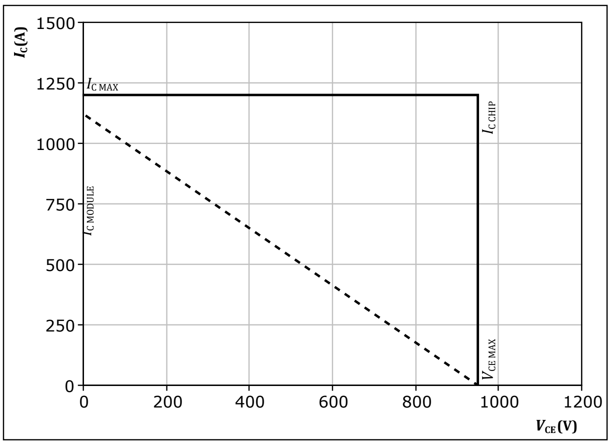
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	355	A		150 °C

figure 37. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



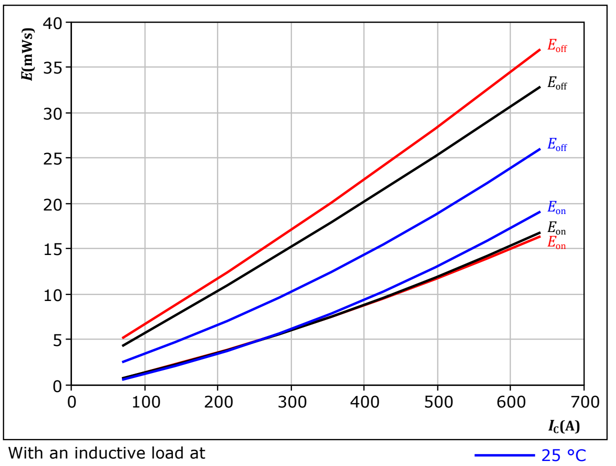
At	T_j =	150	°C
	R_{gon} =	12,8	Ω
	R_{goff} =	12,8	Ω

Neutral Point Switching Characteristics

figure 38. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



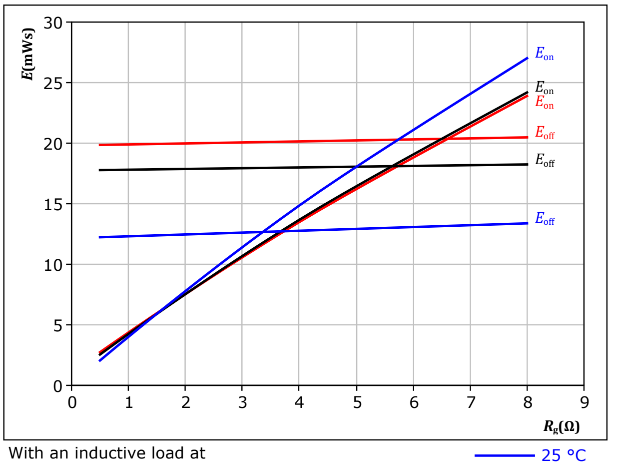
With an inductive load at

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 39. **IGBT**

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

$E = f(R_g)$



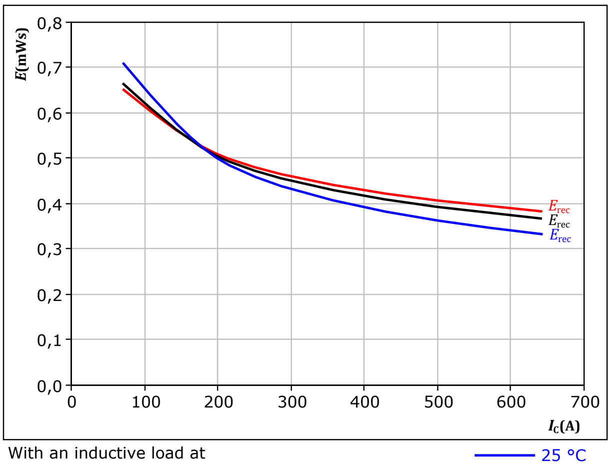
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	355	A		150 °C

figure 40. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



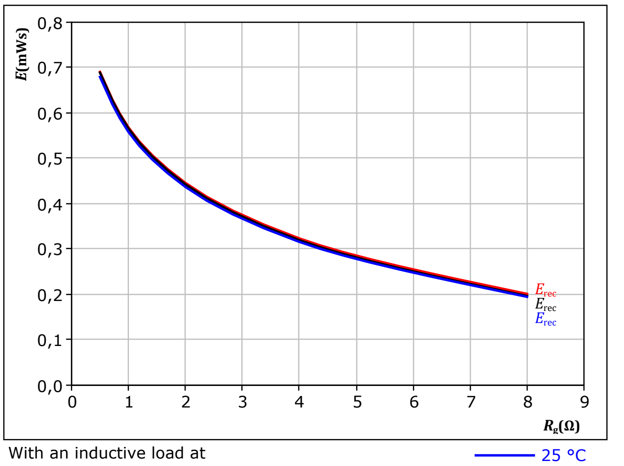
With an inductive load at

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

figure 41. **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

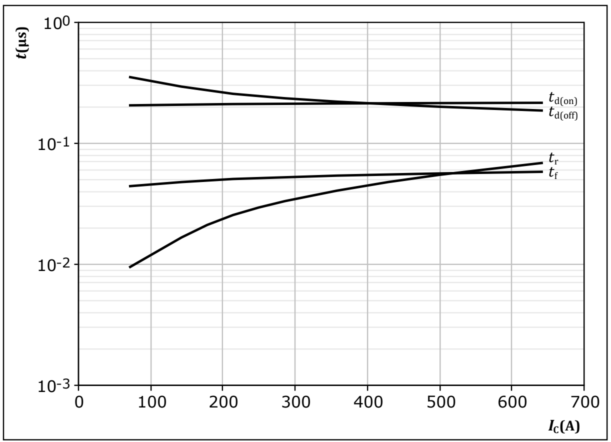
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	355	A		150 °C

Neutral Point Switching Characteristics

figure 42. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



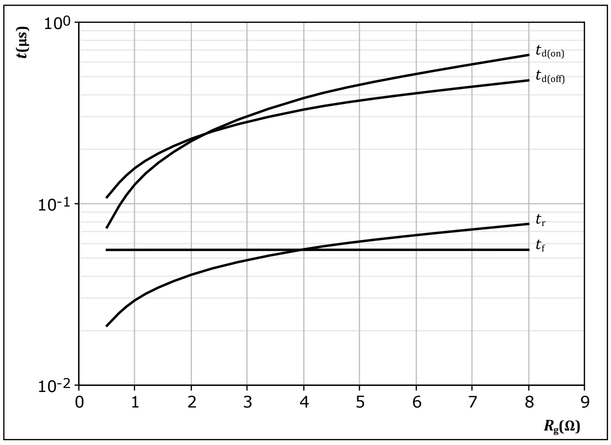
With an inductive load at

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

figure 43. **IGBT**

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

t = f(R_g)



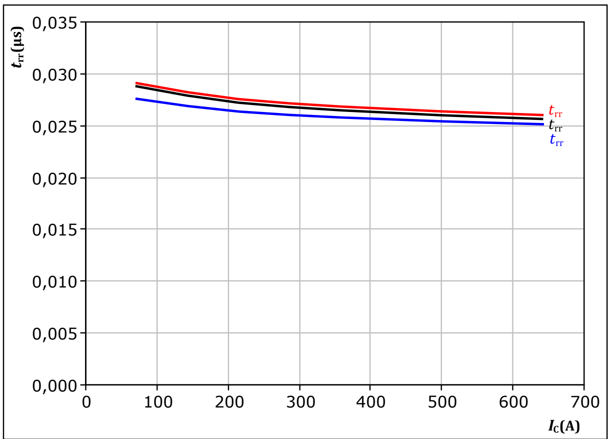
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	355	A

figure 44. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

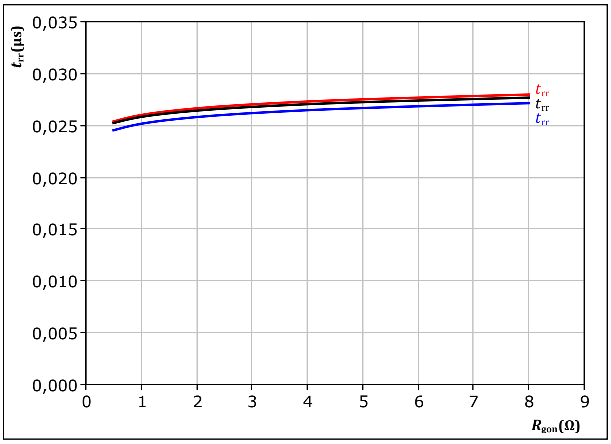
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 45. **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 =	355	A

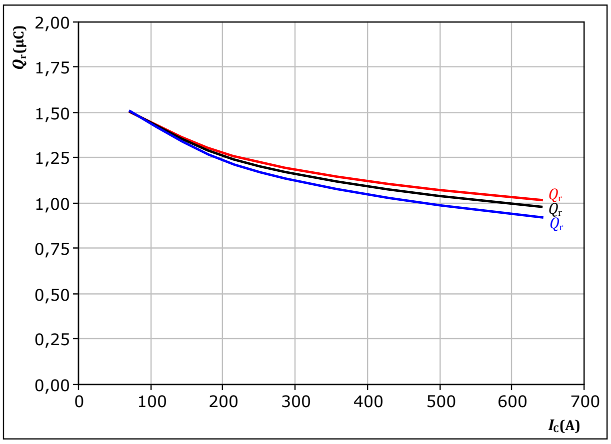
T_j: 25 °C, 125 °C, 150 °C

Neutral Point Switching Characteristics

figure 46. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



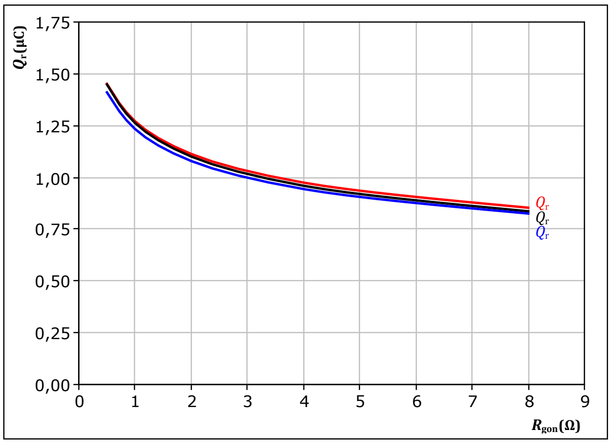
With an inductive load at

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

figure 47. **FWD**

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

Q_r = f(R_{gon})



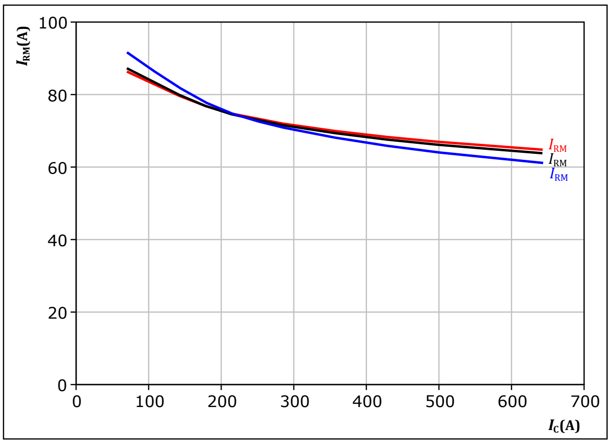
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	355	A		150 °C

figure 48. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



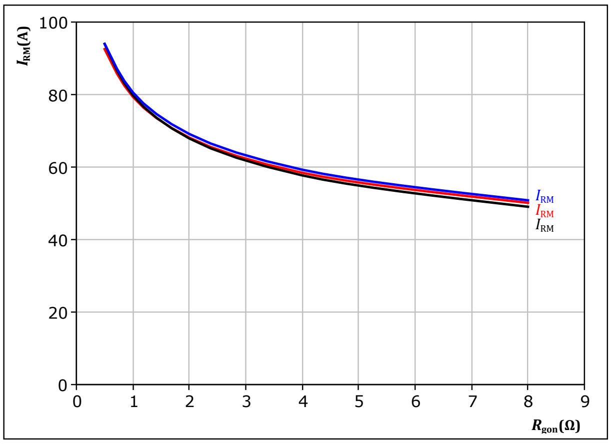
With an inductive load at

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

figure 49. **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

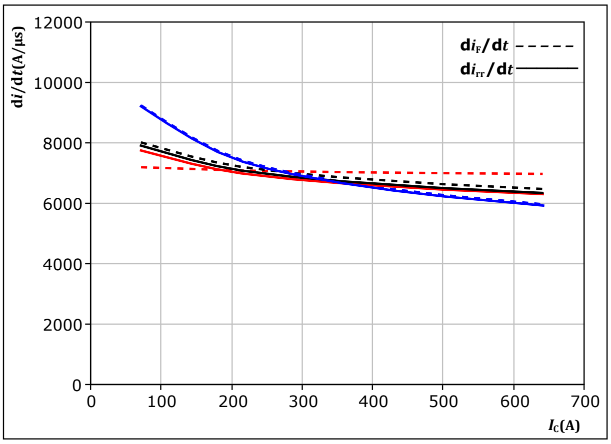
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	355	A		150 °C

Neutral Point Switching Characteristics

figure 50. **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)



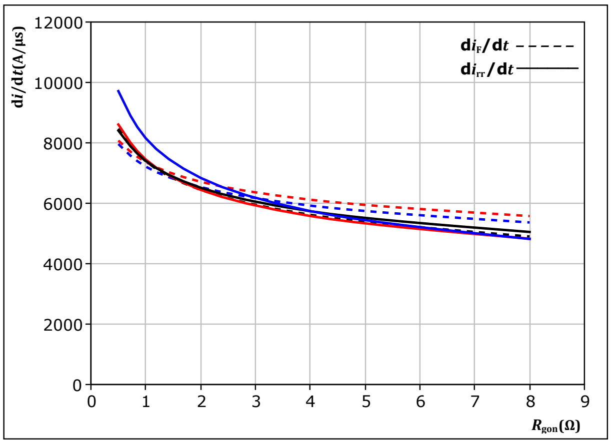
With an inductive load at

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

figure 51. **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})



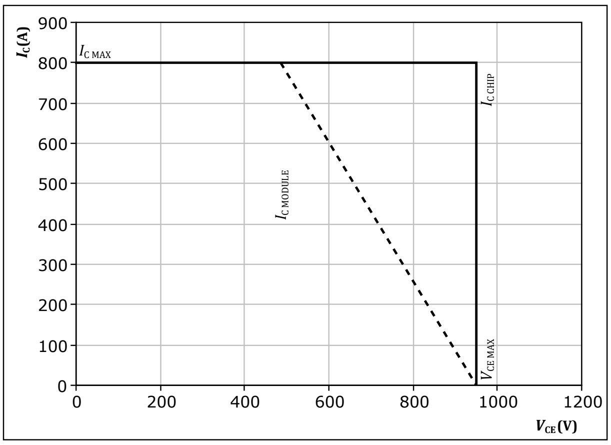
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	355	A		150 °C

figure 52. **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 53. **IGBT**

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

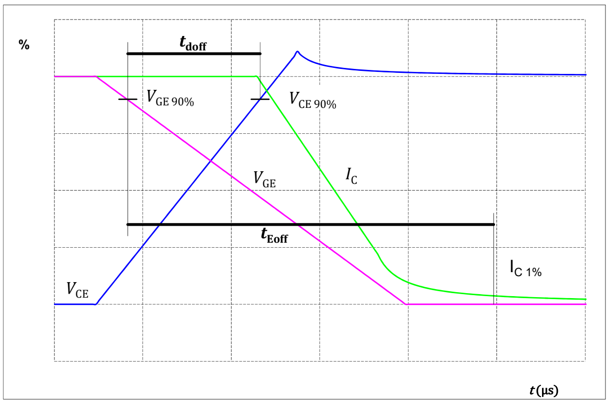


figure 54. **IGBT**

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

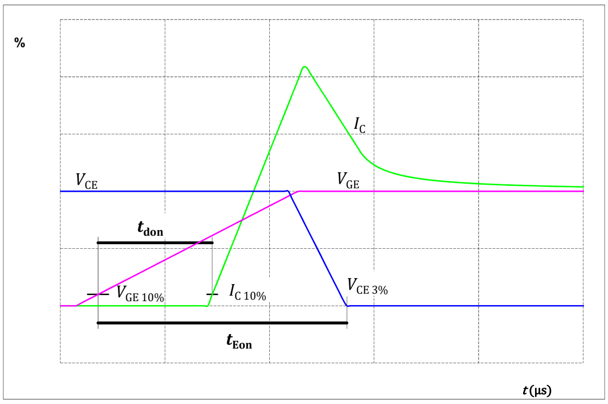


figure 55. **IGBT**

Turn-off Switching Waveforms & definition of t_f

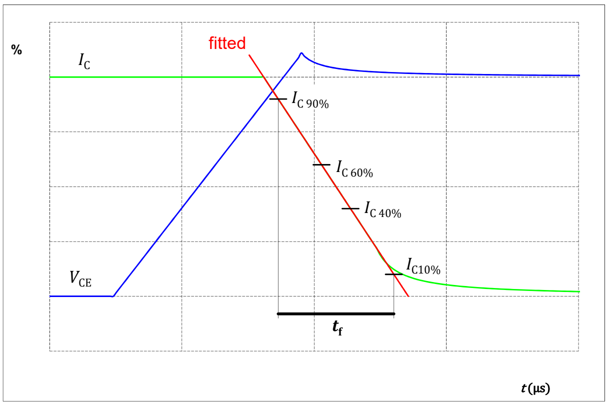
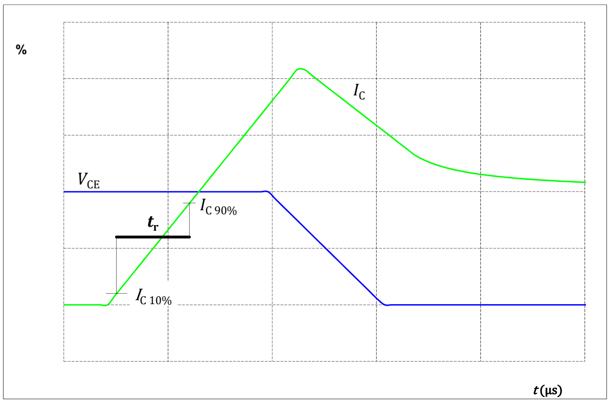


figure 56. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 57. **FWD**

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

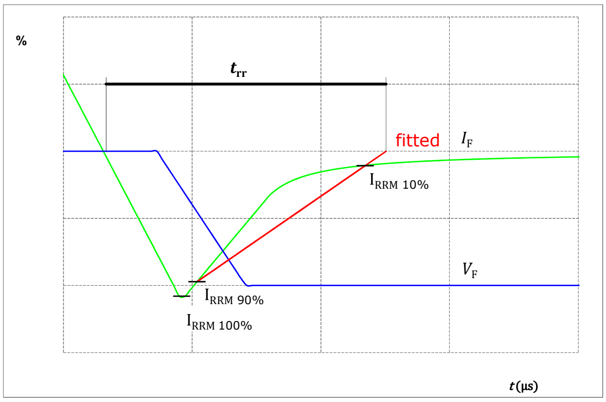
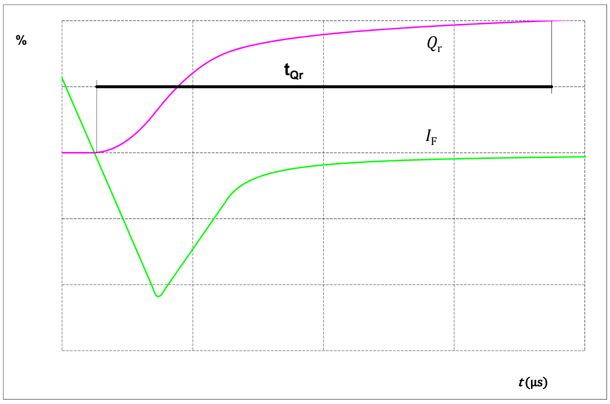


figure 58. **FWD**

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



Ordering Code

Version	Ordering Code
Without thermal paste	B0-SP10NAD600S704-PE19F18T
With thermal paste (5,2 W/mK, PTM6000HV)	B0-SP10NAD600S704-PE19F18T-/7/

Marking

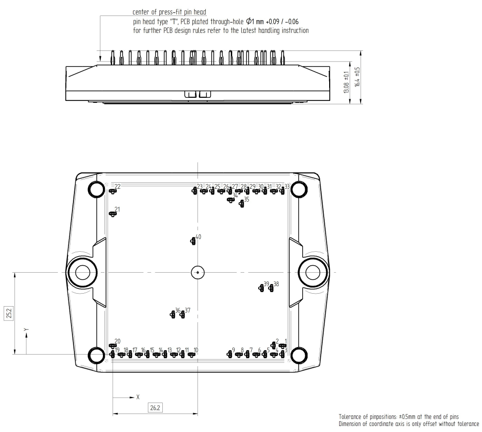
Text	**Name**		**Date code**	**UL & VIN**	**Lot**	**Serial**
	NN-NNNNNNNNNNNNNN-TTTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin	X	Y	Function
1	52,4	2,7	GND1
2	49,7	2,7	GND1
3	52,4	0	GND1
4	49,7	0	GND1
5	47	0	GND1
6	44,3	0	GND1
7	41,6	0	GND1
8	38,9	0	GND1
9	36,2	0	GND1
10	24,3	0	DC+
11	21,6	0	DC+
12	18,9	0	DC+
13	16,2	0	DC+
14	13,5	0	DC+
15	10,8	0	DC+
16	8,1	0	DC+
17	5,4	0	DC+
18	2,7	0	DC+
19	0	0	DC+
20	0	2,7	DC+
21	0	43,4	Therm1
22	0	50,4	Therm2
23	25,4	50,4	Ph1
24	28,1	50,4	Ph1
25	30,8	50,4	Ph1
26	33,5	50,4	Ph1
27	36,2	50,4	Ph1
28	38,9	50,4	Ph1
29	41,6	50,4	Ph1
30	44,3	50,4	Ph1
31	47	50,4	Ph1
32	49,7	50,4	Ph1
33	52,4	50,4	Ph1
34	36,4	47,7	S13
35	39,9	46,45	G13
36	18,65	12,25	G11
37	21,65	12,25	S11
38	49	20,4	S16
39	46	20,4	G16
40	24,95	34,9	C13

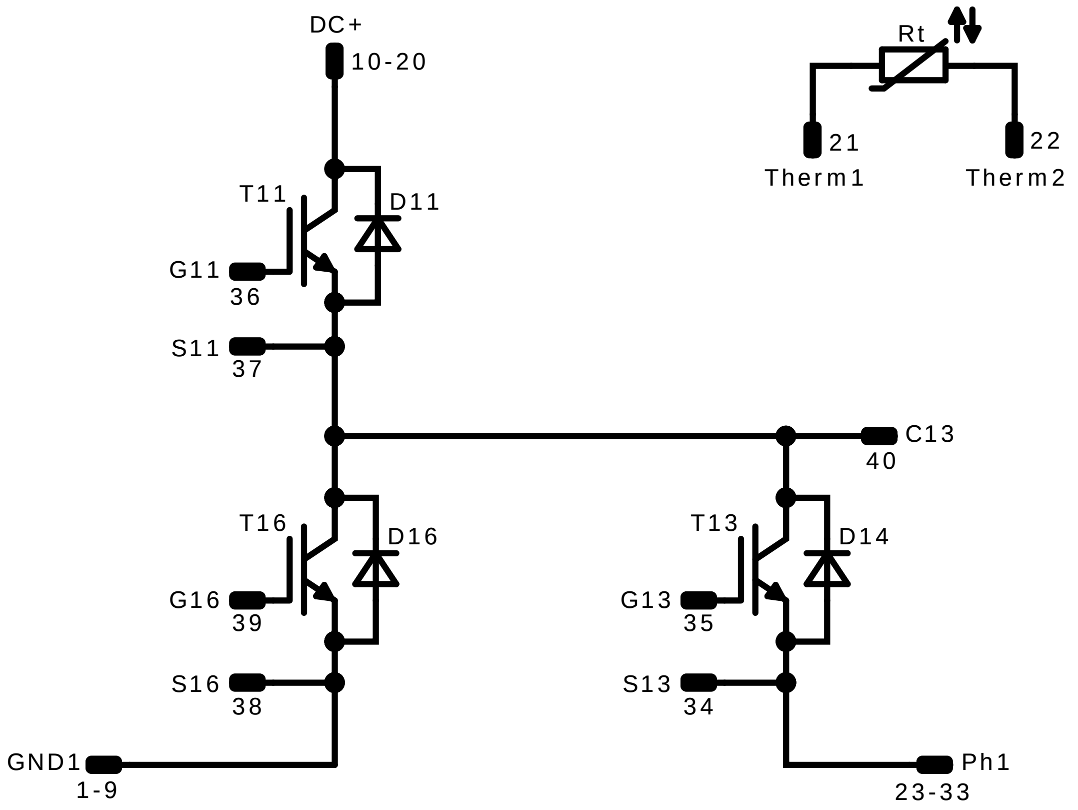
Pin table [mm]

B0-SP10NAD600S704-PE19F18T



Pinout

B0-SP10NAD600S704-PE19F18T



Identification

ID	Component	Voltage	Current	Function	Comment
T13	IGBT	950 V	400 A	AC Switch	
D14	FWD	950 V	300 A	AC Diode	
T16	IGBT	950 V	400 A	Neutral Point Switch	
D11	FWD	950 V	300 A	DC-Link Diode	
T11	IGBT	950 V	600 A	DC-Link Switch	
D16	FWD	1200 V	160 A	Neutral Point Diode	
Rt	Thermistor			Thermistor	

B0-SP10NAD600S704-PE19F18T
B0-SP10NAE600S704-PE29F18T
datasheet

Ordering Code

Version	Ordering Code
Without thermal paste	B0-SP10NAE600S704-PE29F18T
With thermal paste (5,2 W/mK, PTM6000HV)	B0-SP10NAE600S704-PE29F18T-/7/

Marking

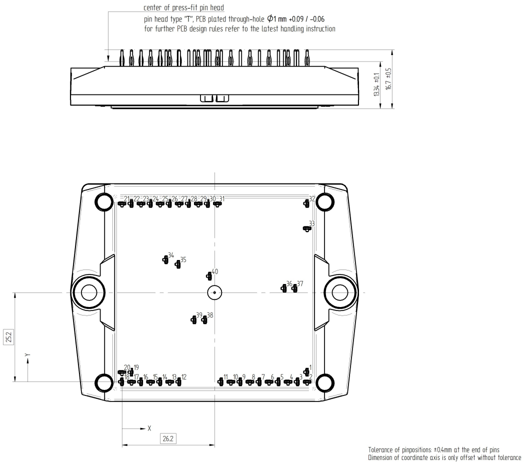
	Name		Date code	UL & VIN	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-TTTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
	Type&Ver	Lot number	Serial	Date code		
Datamatrix	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

B0-SP10NAE600S704-PE29F18T

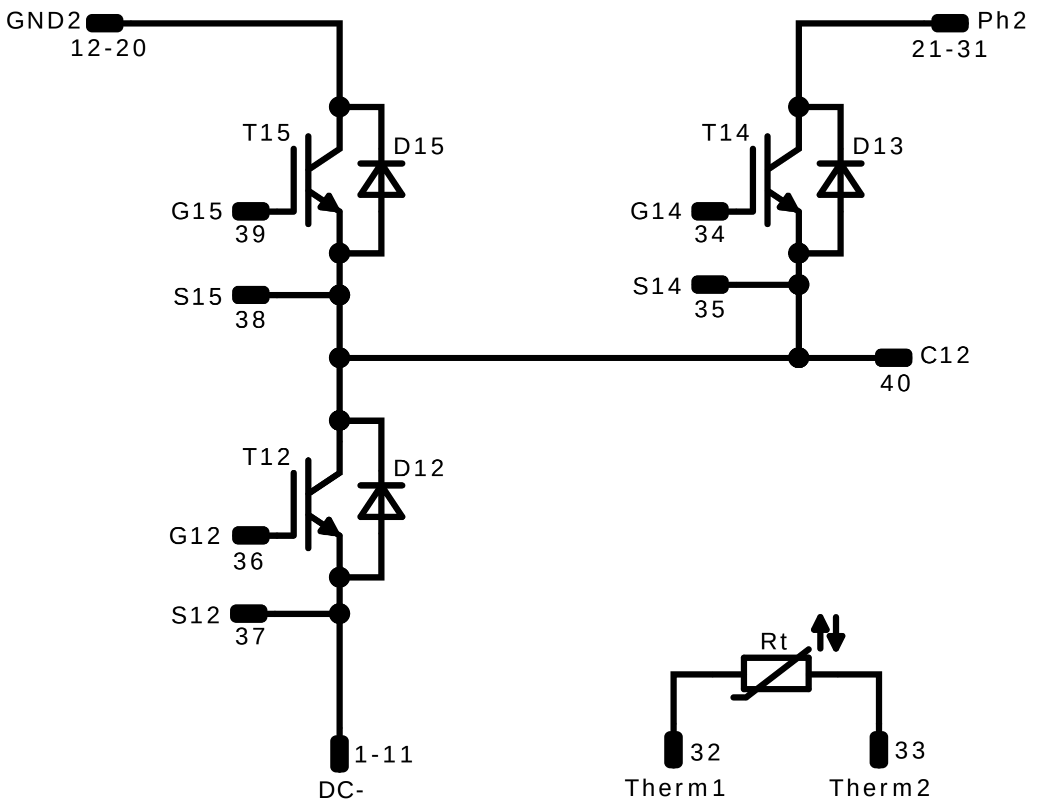
Pin table [mm]

Pin	X	Y	Function
1	52,4	2,7	DC-
2	52,4	0	DC-
3	49,7	0	DC-
4	47	0	DC-
5	44,3	0	DC-
6	41,6	0	DC-
7	38,9	0	DC-
8	36,2	0	DC-
9	33,5	0	DC-
10	30,8	0	DC-
11	28,1	0	DC-
12	16,2	0	GND2
13	13,5	0	GND2
14	10,8	0	GND2
15	8,1	0	GND2
16	5,4	0	GND2
17	2,7	0	GND2
18	0	0	GND2
19	2,7	2,7	GND2
20	0	2,7	GND2
21	0	50,4	Ph2
22	2,7	50,4	Ph2
23	5,4	50,4	Ph2
24	8,1	50,4	Ph2
25	10,8	50,4	Ph2
26	13,5	50,4	Ph2
27	16,2	50,4	Ph2
28	18,9	50,4	Ph2
29	21,6	50,4	Ph2
30	24,3	50,4	Ph2
31	27	50,4	Ph2
32	52,4	50,4	Therm1
33	52,4	43,4	Therm2
34	12,5	34,5	G14
35	16	33,2	S14
36	46	26,4	G12
37	49	26,4	S12
38	23,5	17,5	S15
39	20,5	17,5	G15
40	24,85	29,85	C12



Pinout

B0-SP10NAE600S704-PE29F18T



Identification

ID	Component	Voltage	Current	Function	Comment
T14	IGBT	950 V	400 A	AC Switch	
D13	FWD	950 V	300 A	AC Diode	
T15	IGBT	950 V	400 A	Neutral Point Switch	
D12	FWD	950 V	300 A	DC-Link Diode	
T12	IGBT	950 V	600 A	DC-Link Switch	
D15	FWD	1200 V	160 A	Neutral Point Diode	
Rt	Thermistor			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 45	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* S3 packages see vincotech.com website.

Package data
Package data for *flow* S3 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 $T_{j,op}$=150°C and up to 4000VAC/1min isolation voltage. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
B0-SP10NAx600S704-PEx9F18T-D5-14	5 Oct. 2025	Change Neutral Point Diode according to PCN-2025-004	