Vincotech

B0-SP12NIB300SH-PG39F08T
B0-SP12NIC300SH-PG49F08T

datasheet

***flow*NPC S3 split** | **1200 V / 300 A**

Topology features

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

Component features

- Easy paralleling
- High speed switching
- Low switching losses

Housing features

- Base isolation: Al_2O_3
- CTI600 housing material
- Compact, baseplate-less housing
- VINcoPress Technology
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

Target applications

- Energy Storage Systems
- Special Application
- UPS

Types

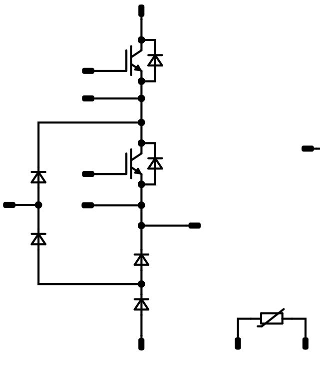
- B0-SP12NIB300SH-PG39F08T
- B0-SP12NIC300SH-PG49F08T

flow S3 12 mm housing

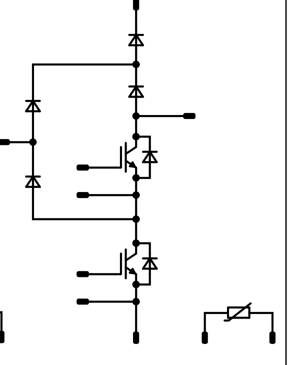
PG39F08T

PG49F08T

Schematic



PG39F08T



PG49F08T

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	262	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		900	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	621	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V, V_{CC} = 800 V	T_j = 150 °C	10	µs
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	177	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		600	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 45 °C	2100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	364	W
Maximum junction temperature	T_{jmax}			175	°C
Buck Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	52	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	200	A
Surge current capability	I^2t			200	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	135	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Boost Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	262	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		900	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	621	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V, V_{CC} = 800 V	T_j = 150 °C	10	µs
Maximum junction temperature	T_{jmax}			175	°C
Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	177	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		600	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 45 °C	2100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	364	W
Maximum junction temperature	T_{jmax}			175	°C
Boost Sw. Inv. Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	121	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	980	A
Surge current capability	I^2t			4800	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	135	W
Maximum junction temperature	T_{jmax}			150	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Boost Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	52	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	200	A
Surge current capability	I^2t			200	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	135	W
Maximum junction temperature	T_{jmax}			175	°C
Boost D. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	44	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	200	A
Surge current capability	I^2t			200	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	104	W
Maximum junction temperature	T_{jmax}			175	°C

Module Properties

Parameter	Symbol	Conditions		Value	Unit
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	6000	V
Creepage distance				9,34	mm
Clearance				7,47	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	
Buck Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0104	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		300	25 125 150	1,78	2,01 2,38 2,47	2,42(1)	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			4	µA
Gate-emitter leakage current	I_{GES}		20	0		25			480	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		17600		pF
Reverse transfer capacitance	C_{res}							940		pF
Gate charge	Q_g		15		0	25		2280		nC
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,15		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	600	300	25 125 150		99,93 100,47 100,12		ns
Rise time	t_r					25 125 150		30,88 32,85 34,26		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		180,07 231,09 244,51		ns
Fall time	t_f					25 125 150		40 76,9 88,36		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=4,88 µC Q_{rFWD}=20,23 µC Q_{rFWD}=25,54 µC				25 125 150		12,4 20,5 23,23		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		13,22 20,91 23,22		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				300	25 125 150		3,44 2,96 2,85	3,6(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25			250	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}	d*i*/d*t*=9454 A/µs d*i*/d*t*=9270 A/µs d*i*/d*t*=8760 A/µs	±15	600	300	25 125 150		207,81 308,79 335,42		A
Reverse recovery time	t_{rr}					25 125 150		41,85 192,67 224,88		ns
Recovered charge	Q_r					25 125 150		4,88 20,23 25,54		µC
Reverse recovered energy	E_{rec}					25 125 150		0,793 5,4 6,94		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		17999,55 11853,76 10797,11		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	
Buck Sw. Protection Diode										
Static										
Forward voltage	V_{F}				50	25 125 150		2,33 2,47	2,74(1) 2,79(1)	V
Reverse leakage current	I_{R}	V_{r} = 1200 V				25 150		 3200	120 6600	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,7		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
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0104	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		300	25 125 150	1,78	2,01 2,38 2,47	2,42(1)	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			4	µA
Gate-emitter leakage current	I_{GES}		20	0		25			480	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		17600		pF
Reverse transfer capacitance	C_{res}							940		pF
Gate charge	Q_g		15		0	25		2280		nC
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,15		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	600	300	25 125 150		100,67 100,13 100,58		ns
Rise time	t_r					25 125 150		32,57 36,09 36,28		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		181,6 232,02 246,05		ns
Fall time	t_f					25 125 150		40,36 73,88 85,99		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=5,99 µC Q_{rFWD}=21,42 µC Q_{rFWD}=26,73 µC				25 125 150		11,75 18,88 21,54		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		13,95 22,01 24,62		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				300	25 125 150		3,44 2,96 2,85	3,6(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25			250	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}	d*i*/d*t*=11846 A/µs d*i*/d*t*=8772 A/µs d*i*/d*t*=8220 A/µs	±15	600	300	25 125 150		203,27 325,03 351,17		A
Reverse recovery time	t_{rr}					25 125 150		61,94 185,65 214,19		ns
Recovered charge	Q_r					25 125 150		5,99 21,42 26,73		µC
Reverse recovered energy	E_{rec}					25 125 150		1,42 6,22 7,7		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		8953,88 10484,31 9916,56		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
Boost Sw. Inv. Diode										
Static										
Forward voltage	V_F				50	25 125		1 0,902	1,21(1) 1,1(1)	V
Reverse leakage current	I_R	V_r = 1600 V				25			100	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,52		K/W
Boost Sw. Protection Diode										
Static										
Forward voltage	V_F				50	25 125 150		2,33 2,47	2,74(1) 2,79(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25 150		 3200	120 6600	µA
Thermal										
Thermal resistance junction to sink(2)	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,7		K/W

Vincotech

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 D. Protection Diode										
Static										
Forward voltage	V_F				50	25 125 150		2,33 2,47	2,74[1] 2,79[1]	V
Reverse leakage current	I_R	V_r = 1200 V				25 150		 3200	120 6600	µA
Thermal										
Thermal resistance junction to sink[2]	$R_{th(j-s)}$	λ_{paste} = 5,2 W/mK (PTM)						0,91		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	

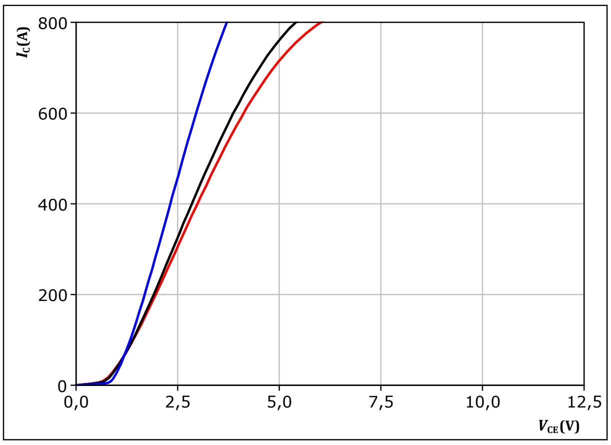
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Buck Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



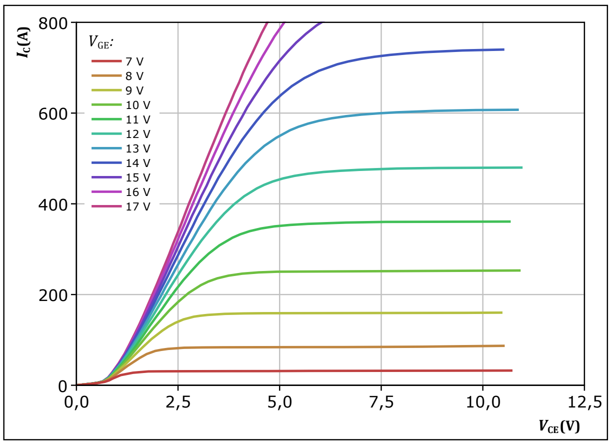
t_p =	250	µs
V_{GE} =	15	V

T_j: 25 °C, 125 °C, 150 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



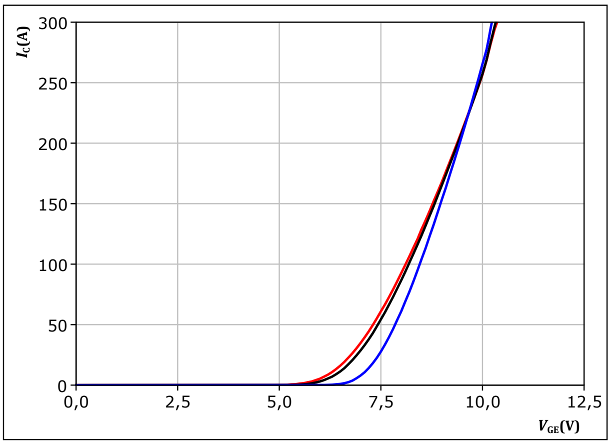
t_p =	250	µs
T_j =	150	°C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$



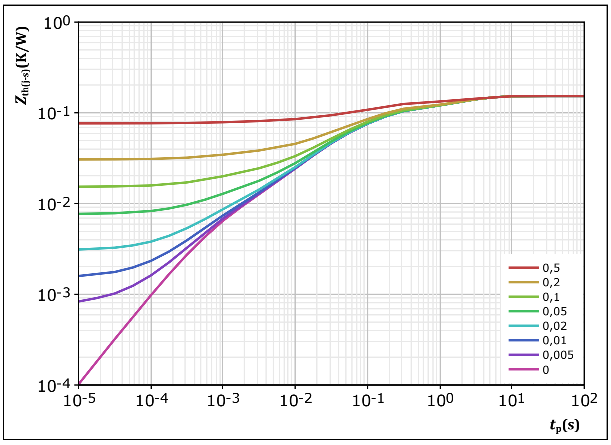
t_p =	250	µs
V_{CE} =	54	V

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	
$R_{th(j-s)}$ =	0,153	K/W

IGBT thermal model values

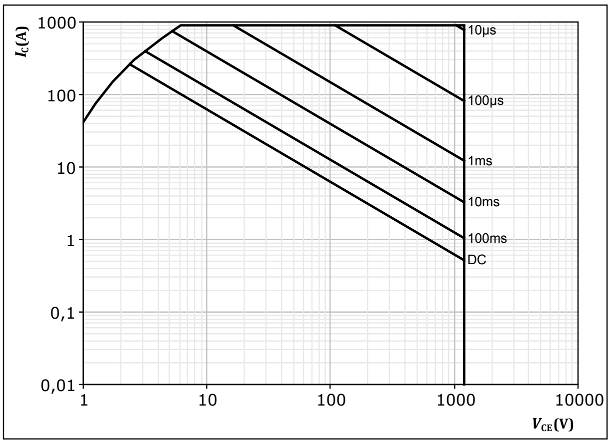
R (K/W)	τ (s)
5,05E-02	2,21E+00
6,62E-02	1,19E-01
2,84E-02	2,06E-02
4,28E-03	2,15E-03
3,55E-03	5,60E-04

Buck Switch Characteristics

figure 5.	IGBT

Safe operating area

I_C = f(V_{CE})



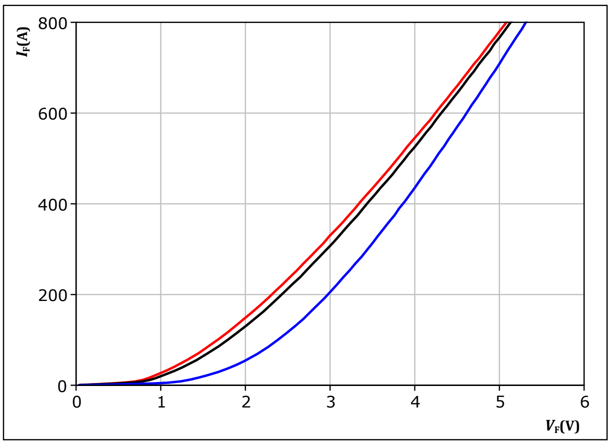
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Buck Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

I_F = f(V_F)



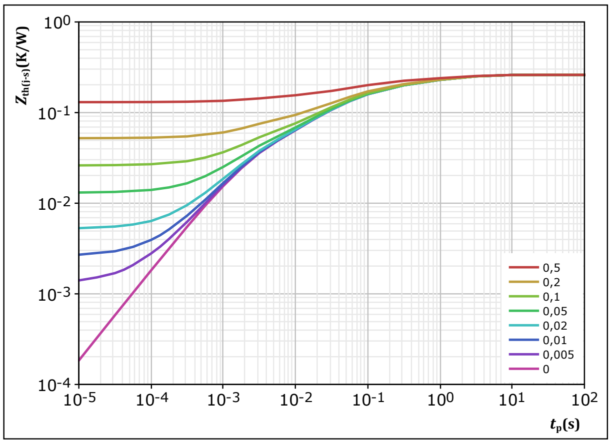
t_p = 250 µs

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

$R_{th(j-s)}$ = 0,261 K/W

FWD thermal model values

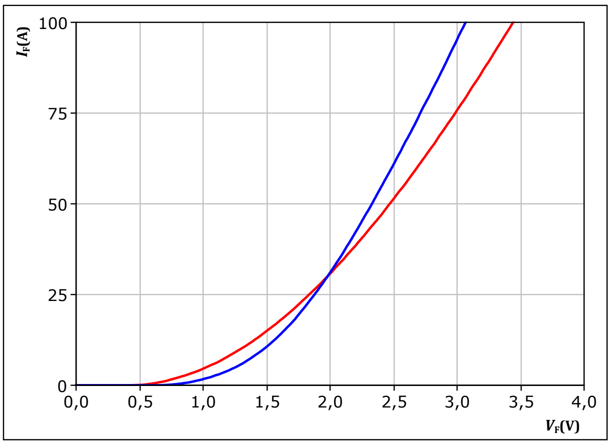
R (K/W)	τ (s)
3,14E-02	2,53E+00
5,06E-02	6,11E-01
8,12E-02	9,13E-02
6,57E-02	2,30E-02
3,18E-02	2,17E-03

Buck Sw. Protection Diode Characteristics

figure 8. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



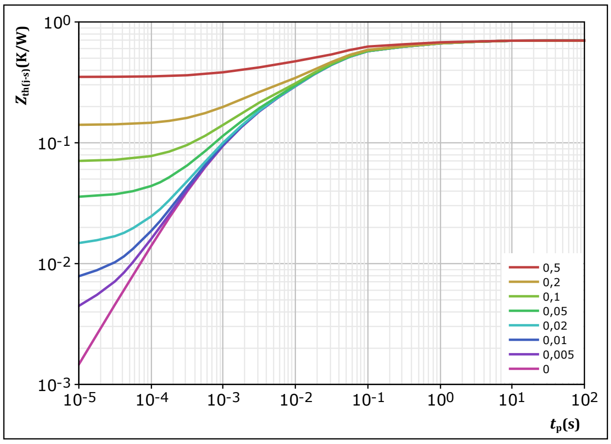
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 9. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,702 K/W

FWD thermal model values

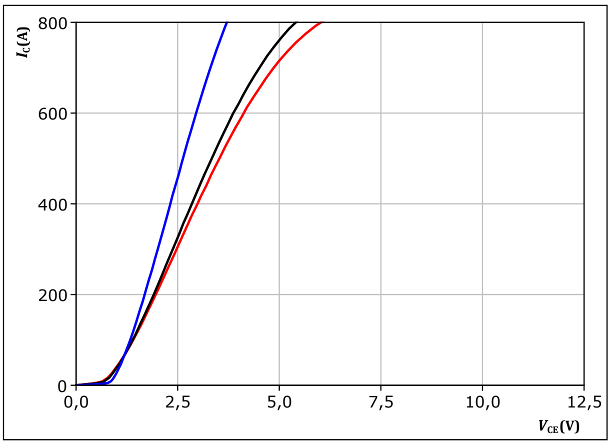
R (K/W)	τ (s)
4,85E-02	2,73E+00
9,90E-02	2,94E-01
3,68E-01	2,87E-02
1,37E-01	2,75E-03
4,91E-02	5,82E-04

Boost Switch Characteristics

figure 10. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



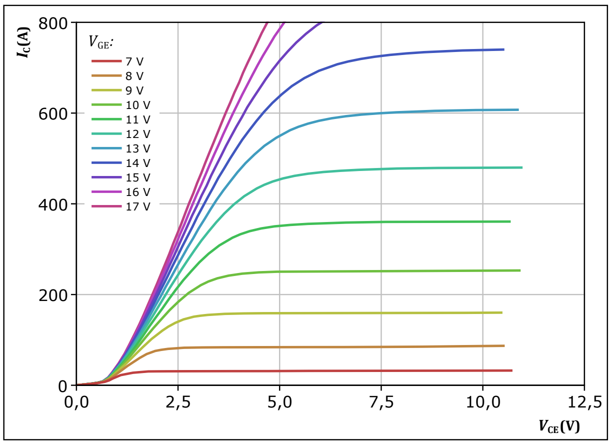
t_p = 250 µs
V_{GE} = 15 V

T_j: 25 °C, 125 °C, 150 °C

figure 11. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

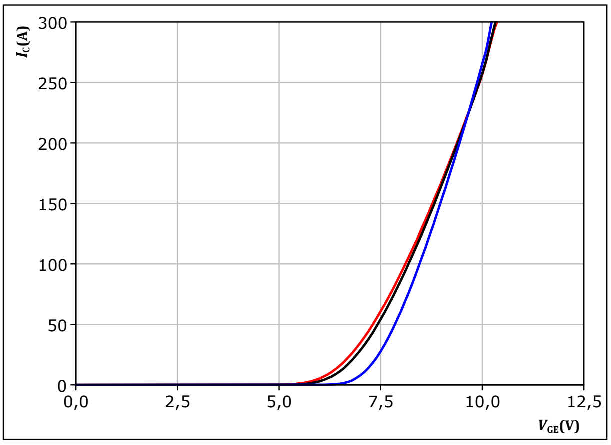


t_p = 250 µs
T_j = 150 °C
V_{GE} from 7 V to 17 V in steps of 1 V

figure 12. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})



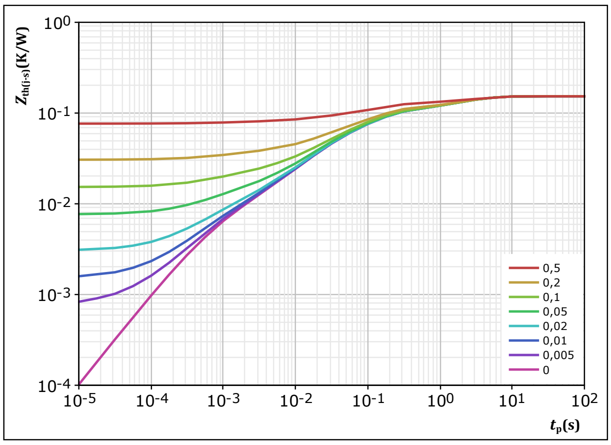
t_p = 250 µs
V_{CE} = 54 V

T_j: 25 °C, 125 °C, 150 °C

figure 13. **IGBT**

Transient thermal impedance as a function of pulse width

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



D = t_p / T
$R_{th(j-s)}$ = 0,153 K/W

IGBT thermal model values

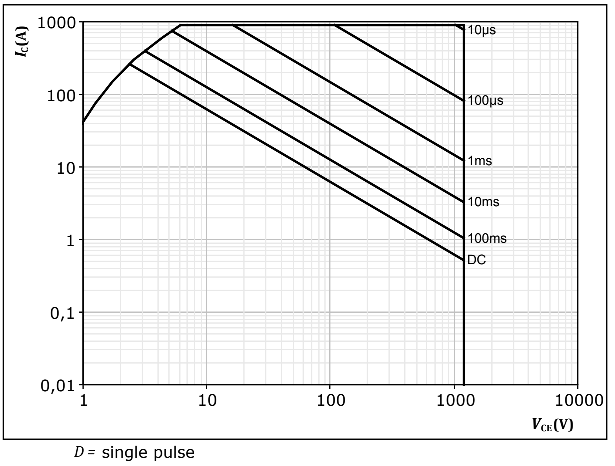
R (K/W)	τ (s)
5,05E-02	2,21E+00
6,62E-02	1,19E-01
2,84E-02	2,06E-02
4,28E-03	2,15E-03
3,55E-03	5,60E-04

Boost Switch Characteristics

figure 14.	IGBT

Safe operating area

I_C = f(V_{CE})



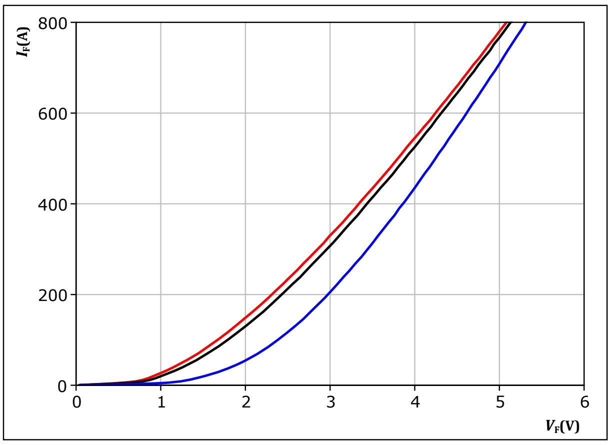
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 15. **FWD**

Typical forward characteristics

I_F = f(V_F)



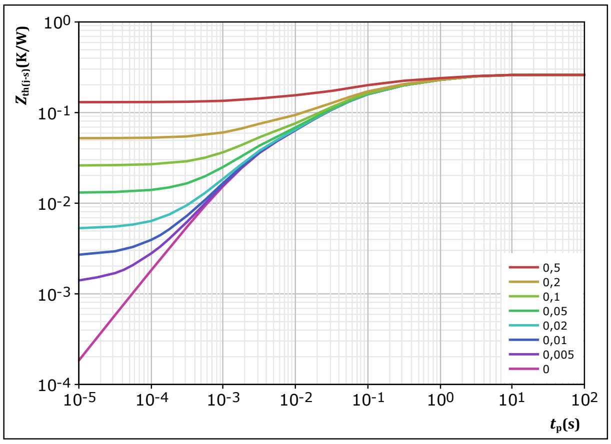
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 16. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,261 K/W

FWD thermal model values

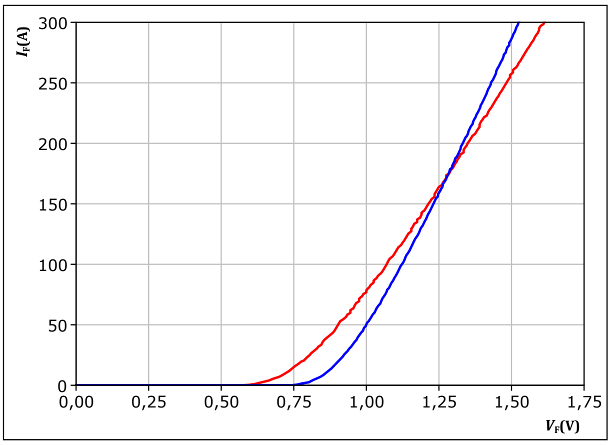
R (K/W)	τ (s)
3,14E-02	2,53E+00
5,06E-02	6,11E-01
8,12E-02	9,13E-02
6,57E-02	2,30E-02
3,18E-02	2,17E-03

Boost Sw. Inv. Diode Characteristics

figure 17. Rectifier

Typical forward characteristics

$I_F = f(V_F)$



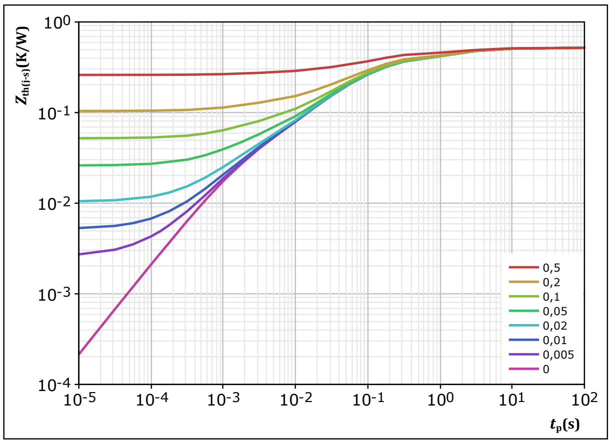
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 18. Rectifier

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,519 K/W

Rectifier thermal model values

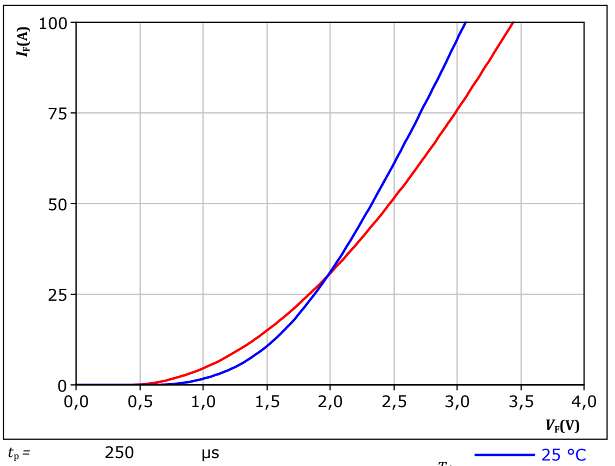
R (K/W)	τ (s)
1,79E-02	3,90E+01
1,46E-01	1,79E+00
2,55E-01	1,07E-01
7,77E-02	1,88E-02
2,39E-02	1,59E-03

Boost Sw. Protection Diode Characteristics

figure 19. FWD

Typical forward characteristics

I_F = f(V_F)



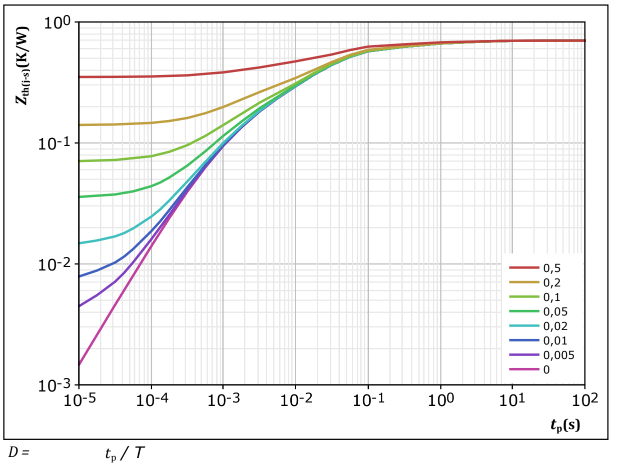
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 20. FWD

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,702 K/W

FWD thermal model values

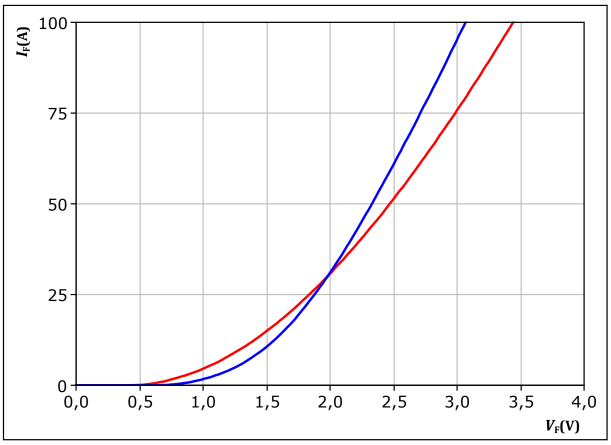
R (K/W)	τ (s)
4,85E-02	2,73E+00
9,90E-02	2,94E-01
3,68E-01	2,87E-02
1,37E-01	2,75E-03
4,91E-02	5,82E-04

Boost D. Protection Diode Characteristics

figure 21. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



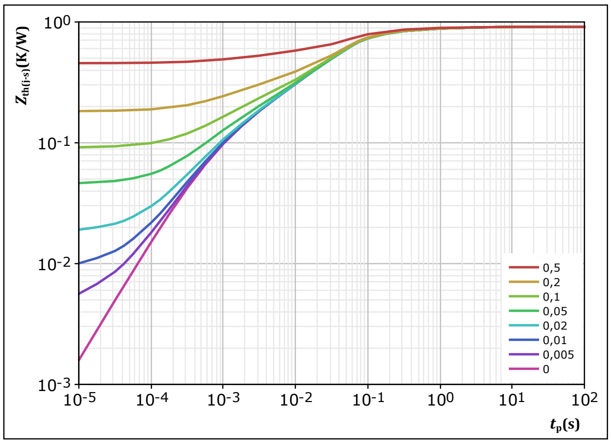
t_p = 250 μs

T_j: 25 °C, 125 °C

figure 22. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,912 K/W

FWD thermal model values

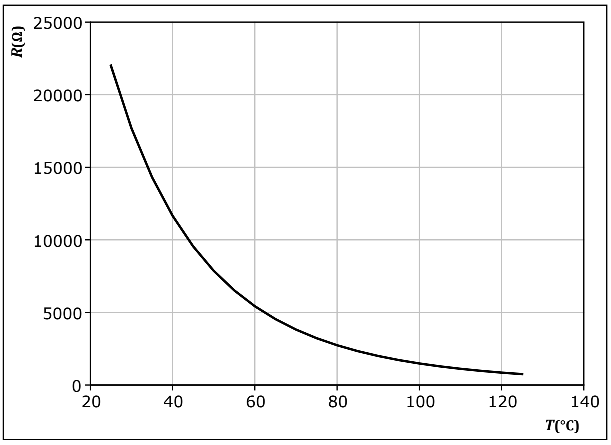
R (K/W)	τ (s)
4,28E-02	2,39E+00
1,52E-01	2,09E-01
5,27E-01	4,07E-02
1,31E-01	3,19E-03
5,93E-02	5,64E-04

Thermistor Characteristics

figure 23. **Thermistor**

Typical NTC characteristic as function of temperature

R_T = f(T)

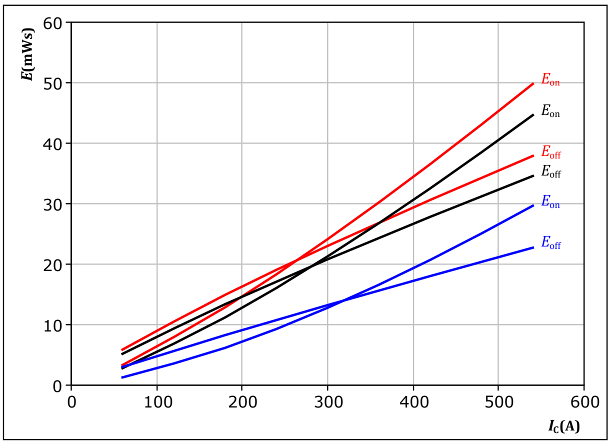


Buck Switching Characteristics

figure 24. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



With an inductive load at

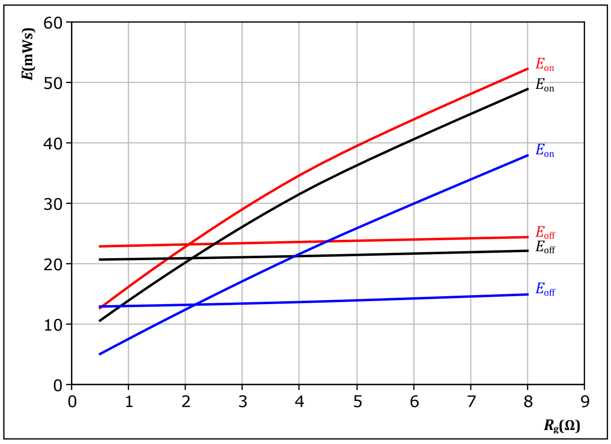
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 25. **IGBT**

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

$E = f(R_g)$



With an inductive load at

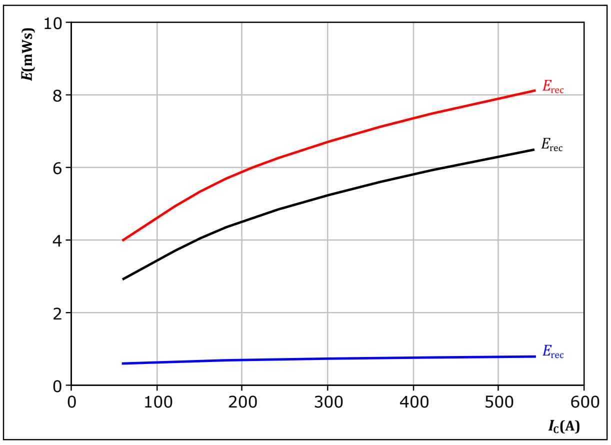
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	300	A

T_j: 25 °C, 125 °C, 150 °C

figure 26. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



With an inductive load at

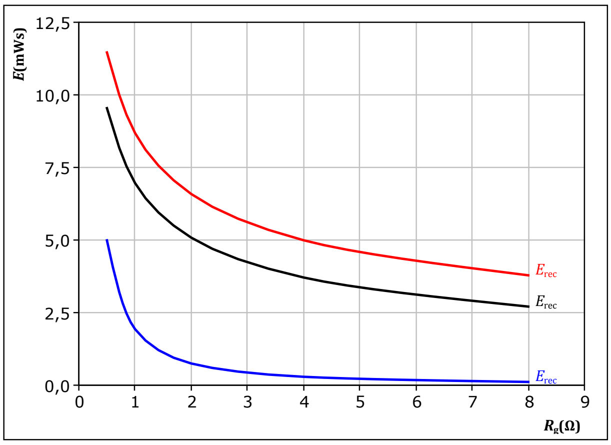
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 27. **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
V_{GE} =	±15	V
I_C =	300	A

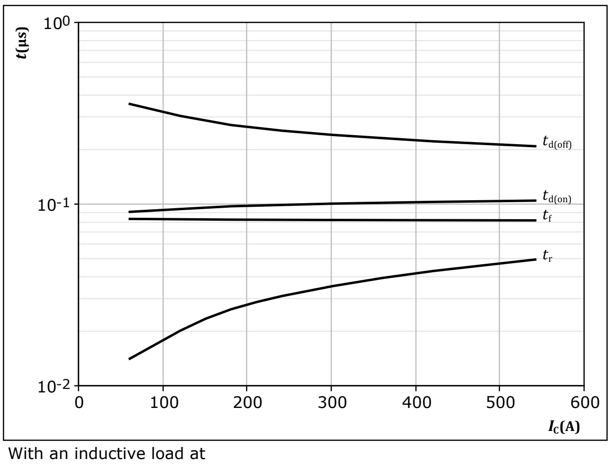
T_j: 25 °C, 125 °C, 150 °C

Buck Switching Characteristics

figure 28. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



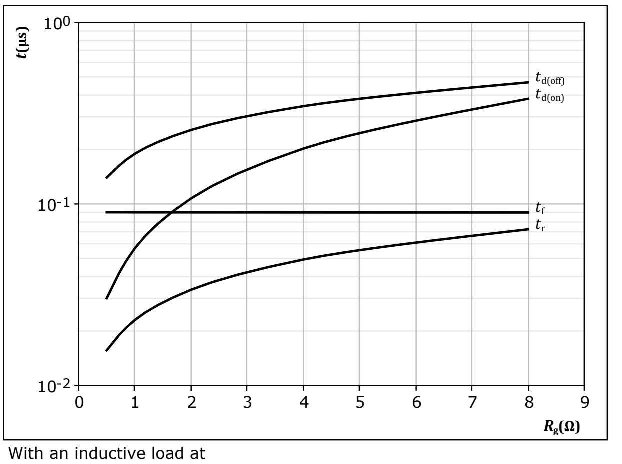
With an inductive load at

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

figure 29. **IGBT**

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

t = f(R_g)



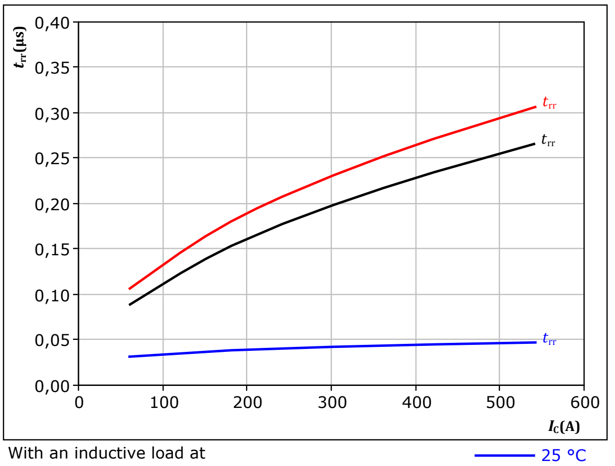
With an inductive load at

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

figure 30. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

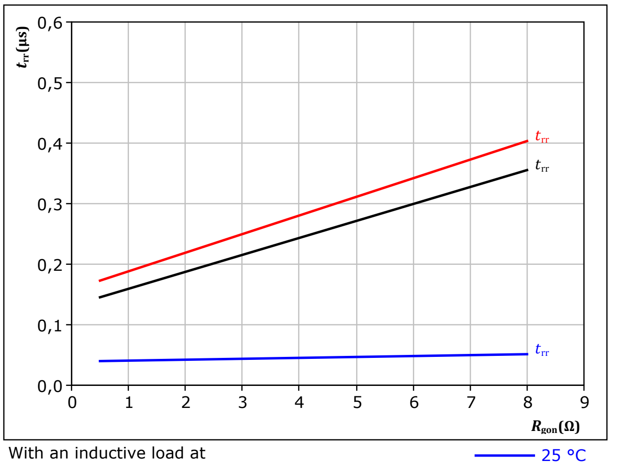
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 31. **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

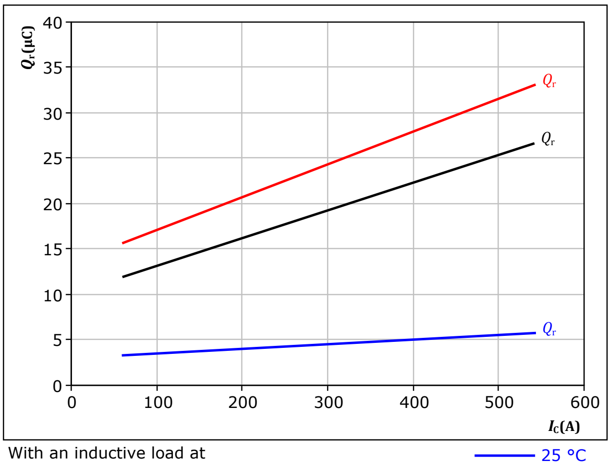
T_j: 25 °C, 125 °C, 150 °C

Buck Switching Characteristics

figure 32. FWD

Typical recovered charge as a function of collector current

Q_r = f(I_C)



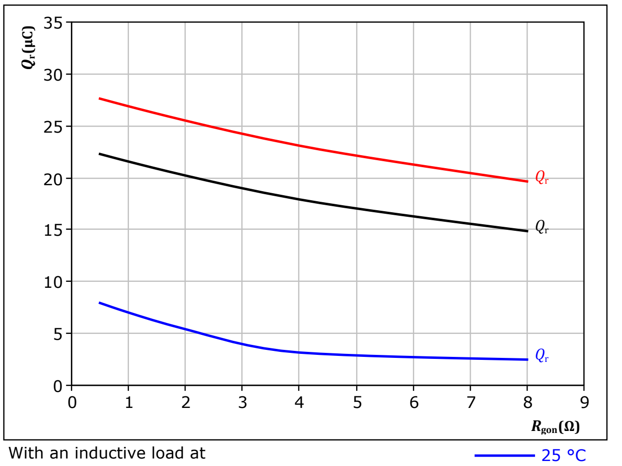
With an inductive load at

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

figure 33. FWD

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

Q_r = f(R_{gon})



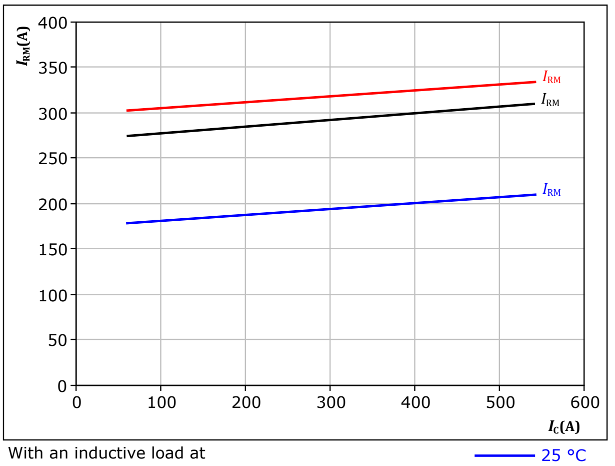
With an inductive load at

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

figure 34. FWD

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



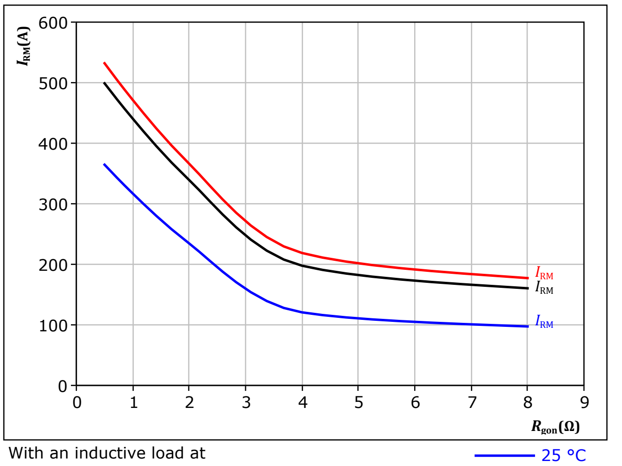
With an inductive load at

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

figure 35. 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

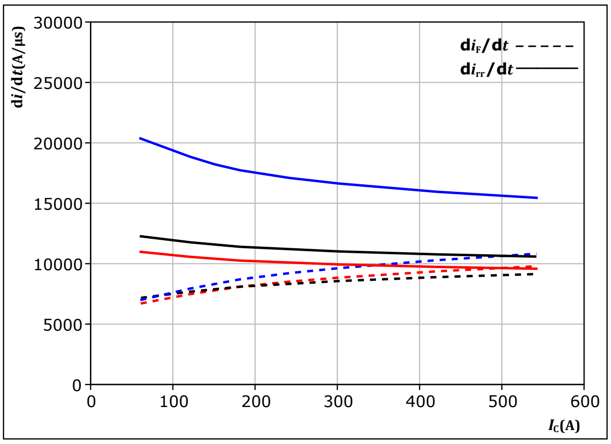
V_{CE} =	600	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
I_C =	300	A	

Buck Switching Characteristics

figure 36. **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)



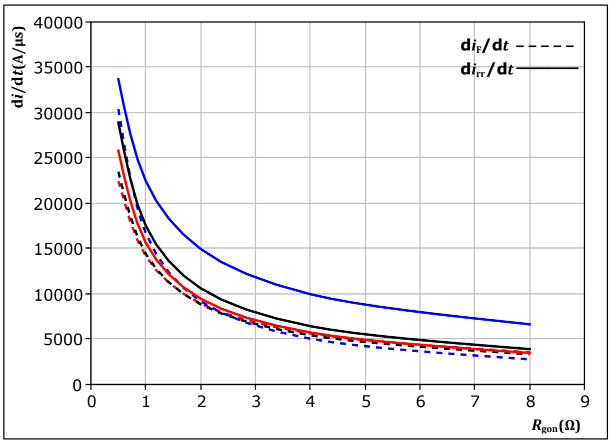
With an inductive load at

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

figure 37. **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})



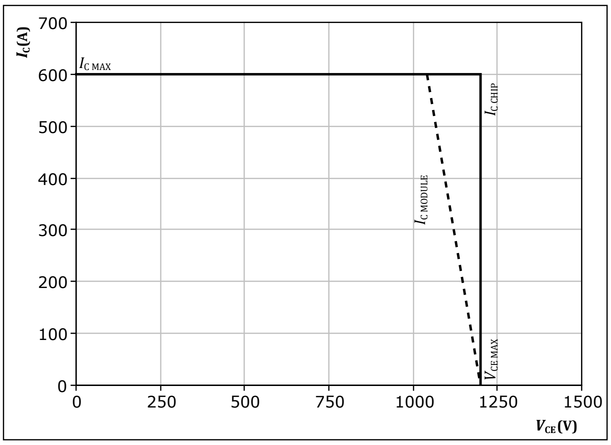
With an inductive load at

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

figure 38. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



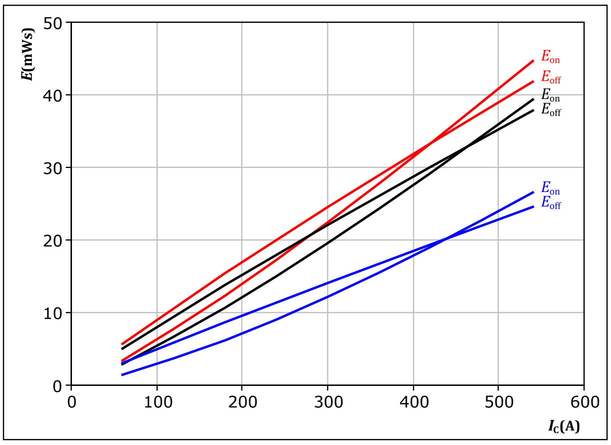
At	T_j =	150	°C
	R_{gon} =	2	Ω
	R_{goff} =	2	Ω

Boost Switching Characteristics

figure 39. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



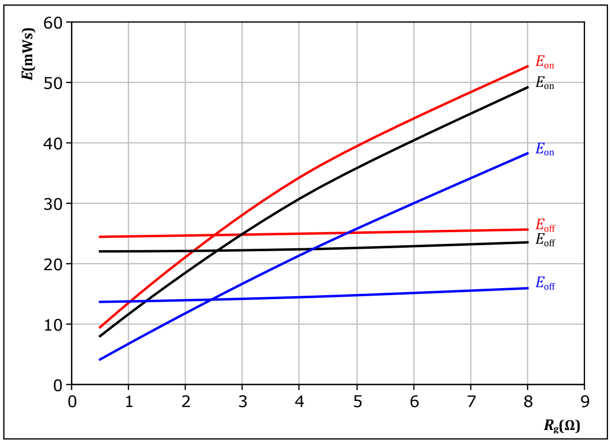
With an inductive load at

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

figure 40. **IGBT**

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

$E = f(R_g)$



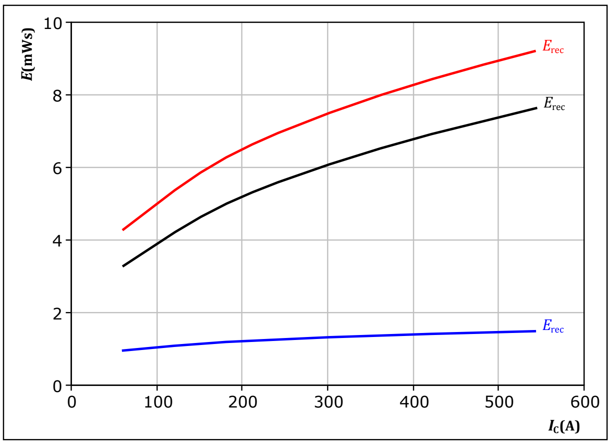
With an inductive load at

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

figure 41. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



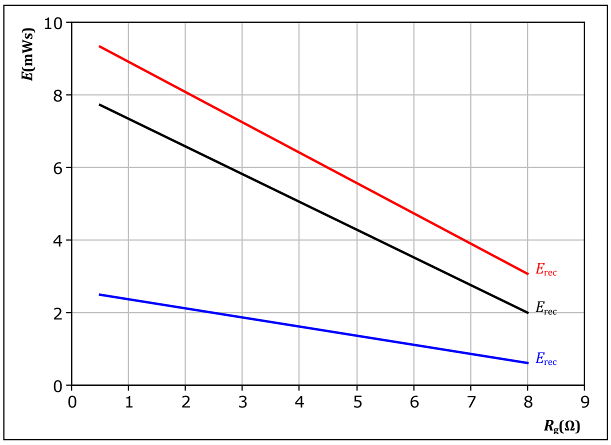
With an inductive load at

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

figure 42. **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

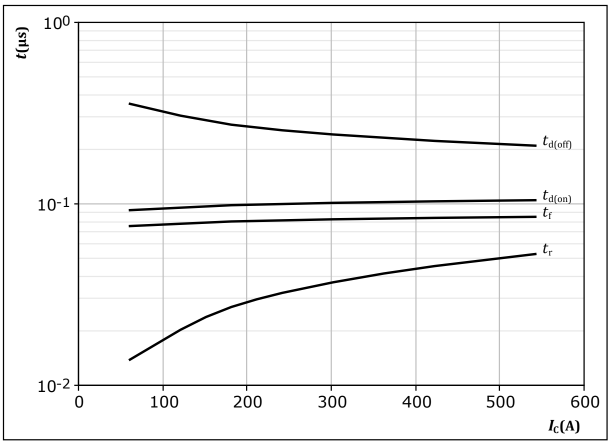
V_{CE} =	600	V	T_j:	25 °C / 125 °C / 150 °C
V_{GE} =	±15	V		
I_C =	300	A		

Boost Switching Characteristics

figure 43. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



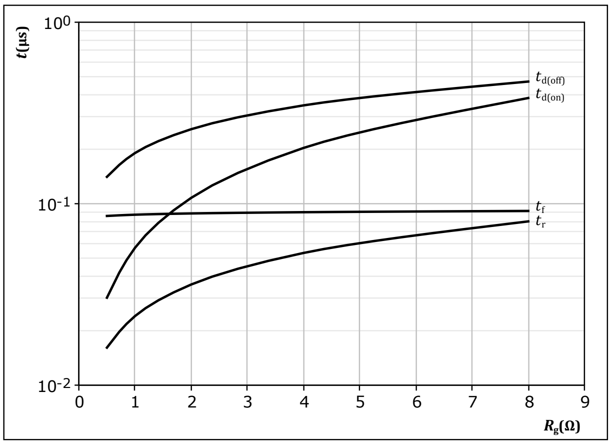
With an inductive load at

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

figure 44. **IGBT**

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

t = f(R_g)



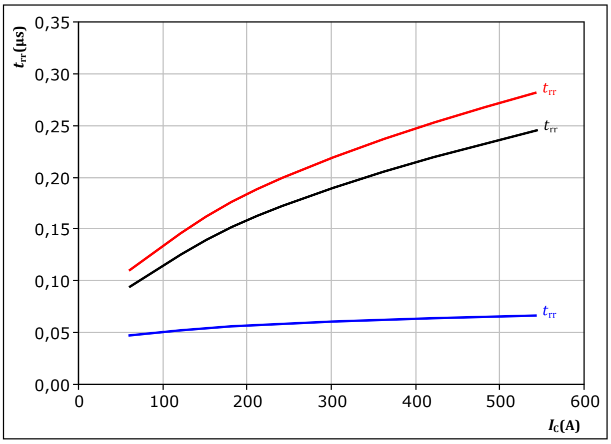
With an inductive load at

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

figure 45. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

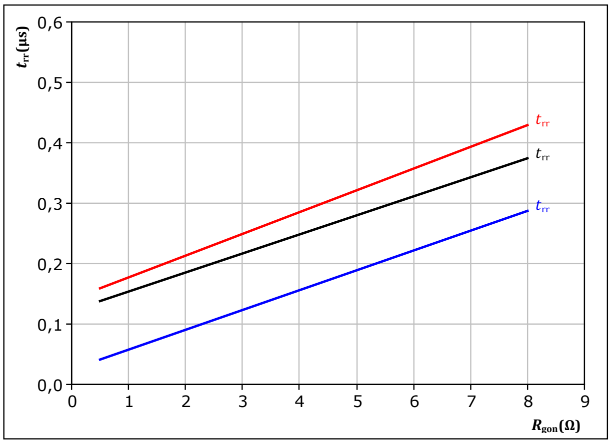
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 46. **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

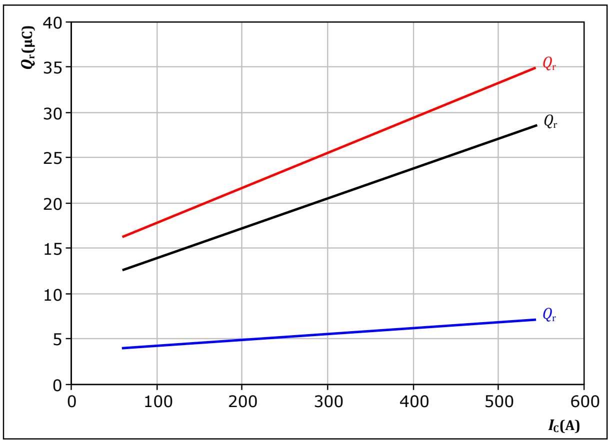
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 47. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$



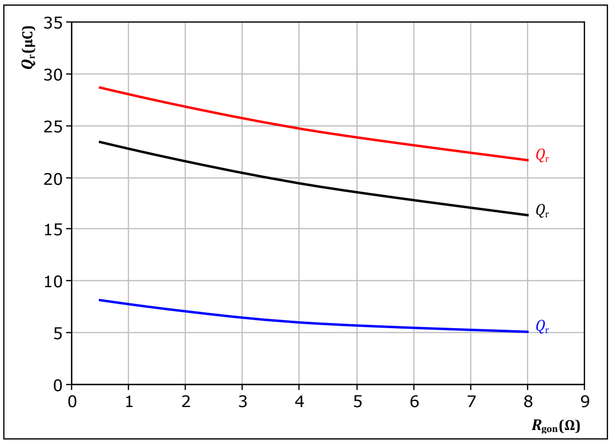
With an inductive load at

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

figure 48. **FWD**

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

$Q_r = f(R_{gon})$



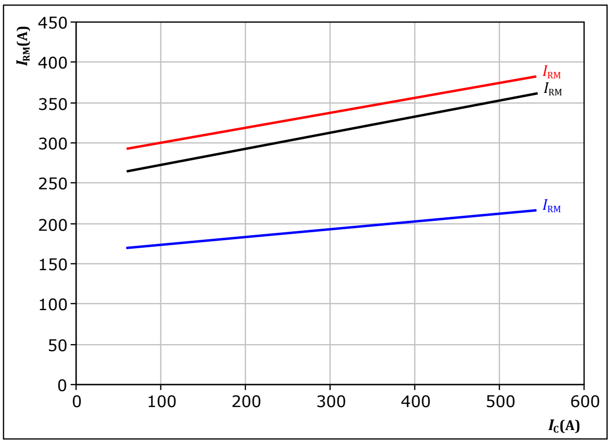
With an inductive load at

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

figure 49. **FWD**

Typical peak reverse recovery current as a function of collector current

$I_{RM} = f(I_C)$



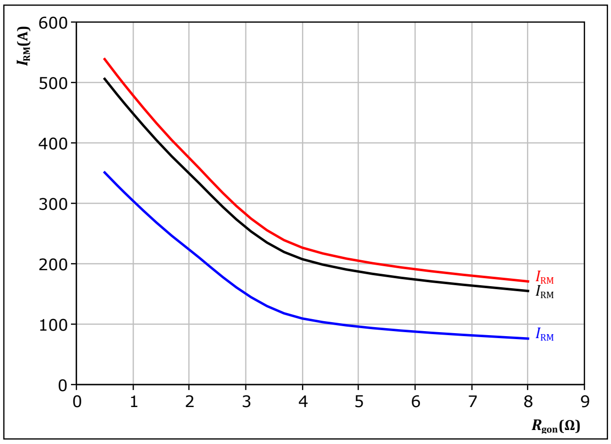
With an inductive load at

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

figure 50. **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

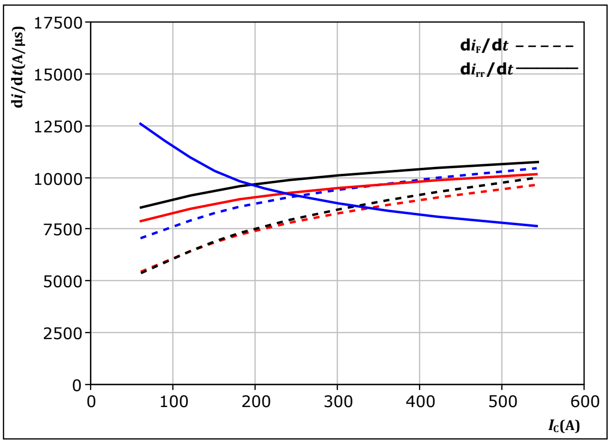
V_{CE} =	600	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	300	A		150 °C

Boost Switching Characteristics

figure 51. **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)



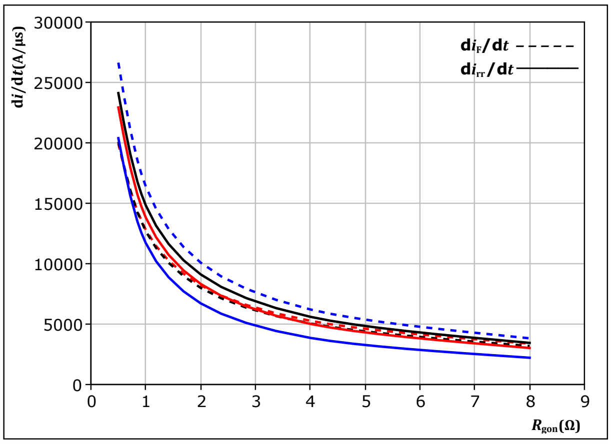
With an inductive load at

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

figure 52. **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})



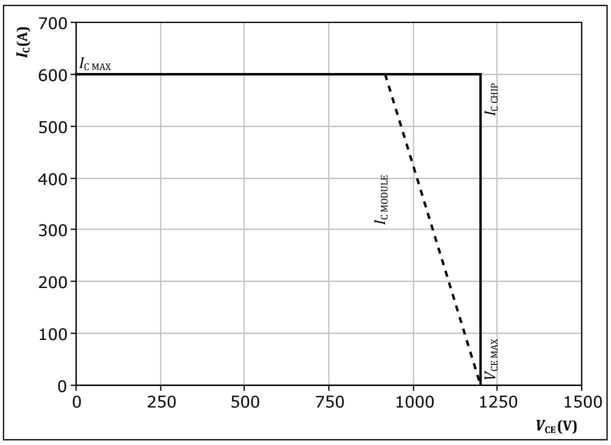
With an inductive load at

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

figure 53. **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 54. IGBT

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

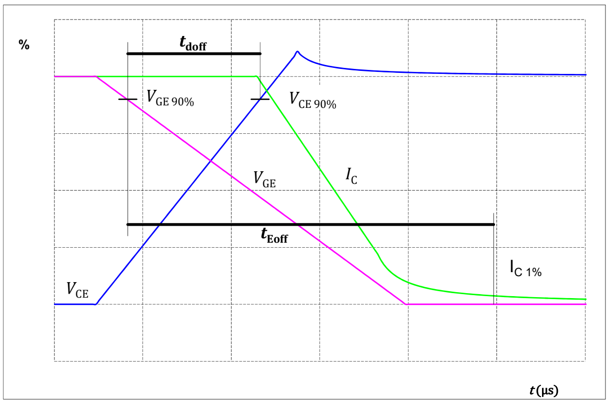


figure 55. IGBT

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

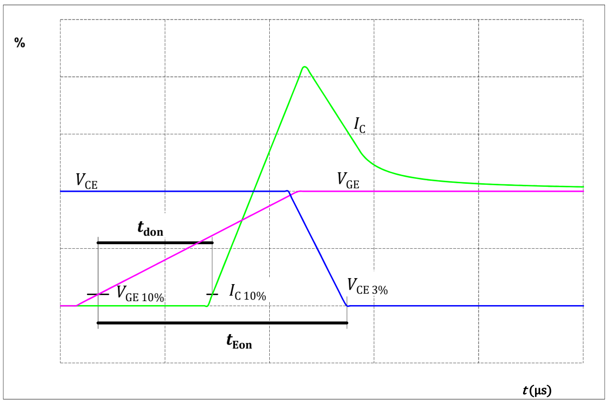


figure 56. IGBT

Turn-off Switching Waveforms & definition of t_f

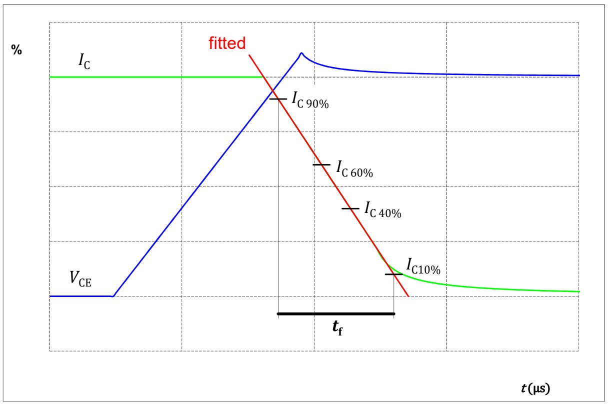
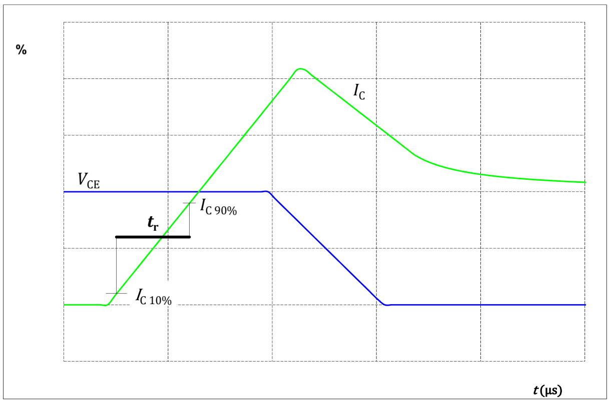


figure 57. IGBT

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 58. **FWD**

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

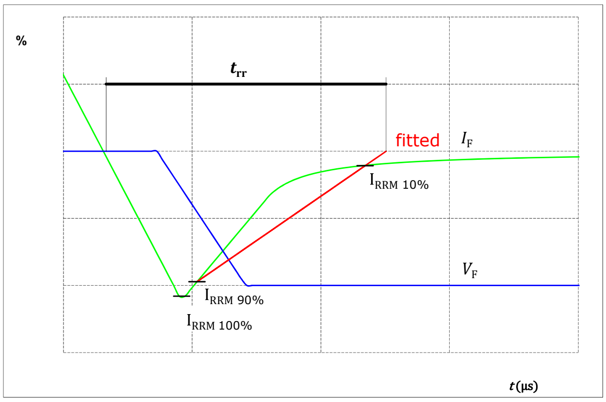
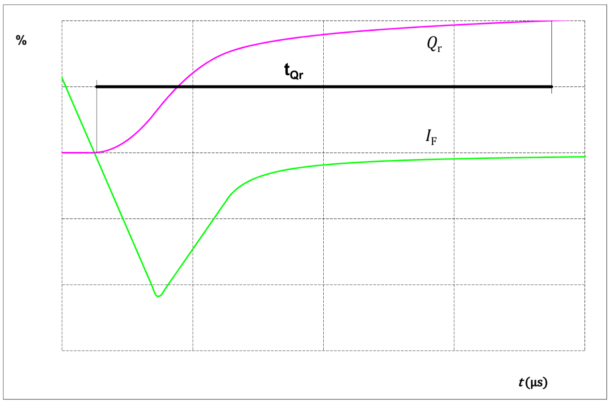


figure 59. **FWD**

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



Ordering Code

Version	Ordering Code
Without thermal paste	B0-SP12NIB300SH-PG39F08T
With thermal paste (5,2 W/mK, PTM6000HV)	B0-SP12NIB300SH-PG39F08T-/7/

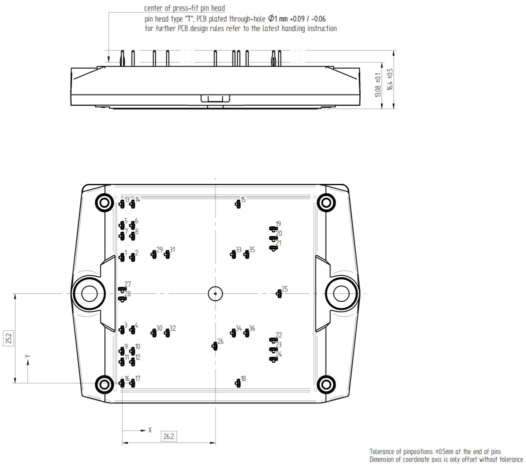
Marking

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

Outline

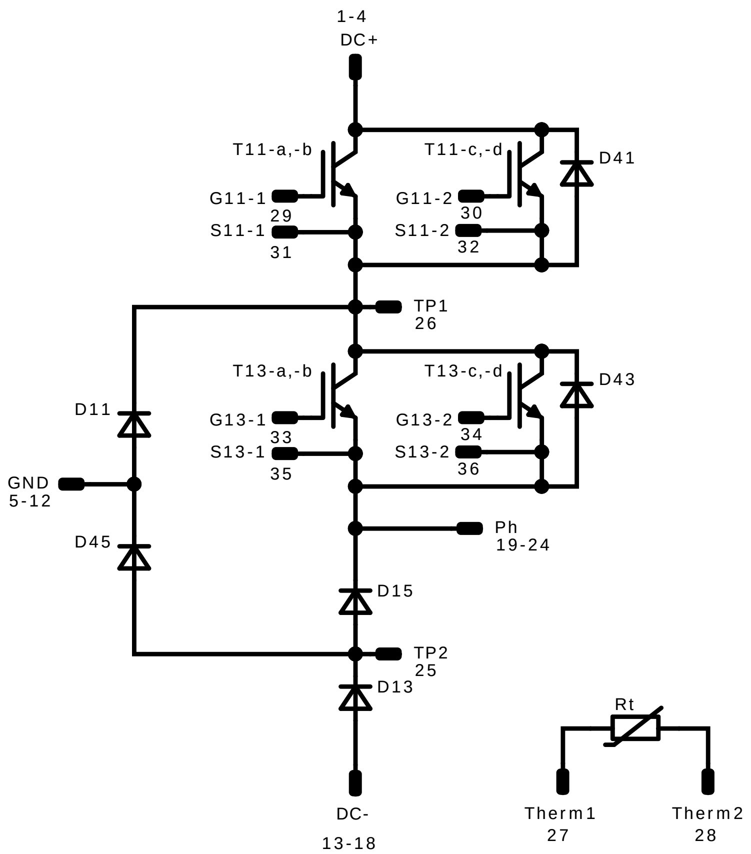
Pin table [mm]			
Pin	X	Y	Function
1	0	35,4	DC+
2	3	35,4	DC+
3	0	15	DC+
4	3	15	DC+
5	0	44,4	GND
6	3	44,4	GND
7	0	41,4	GND
8	3	41,4	GND
9	0	9	GND
10	3	9	GND
11	0	6	GND
12	3	6	GND
13	0	50,4	DC-
14	3	50,4	DC-
15	32,75	50,4	DC-
16	0	0	DC-
17	3	0	DC-
18	32,75	0	DC-
19	42,6	43,55	Ph
20	42,6	40,85	Ph
21	42,6	38,15	Ph
22	42,6	12,25	Ph
23	42,6	9,55	Ph
24	42,6	6,85	Ph
25	44,3	25,2	TP2
26	26,2	10,45	TP1
27	0	26,55	Therm1
28	0	23,85	Therm2
29	9	36,25	G11-1
30	9	14,15	G11-2
31	12,75	36,25	S11-1
32	12,75	14,15	S11-2
33	31,4	36,25	G13-1
34	31,4	14,15	G13-2
35	35,15	36,25	S13-1
36	35,15	14,15	S13-2

B0-SP12NIB300SH-PG39F08T



B0-SP12NIB300SH-PG39F08T

Pinout



TPx pins are for Vincotech internal test purpose only - don't connect.

Identification

ID	Component	Voltage	Current	Function	Comment
T11	IGBT	1200 V	300 A	Buck Switch	
D11	FWD	1200 V	300 A	Buck Diode	
D41	FWD	1200 V	50 A	Buck Sw. Protection Diode	
T13	IGBT	1200 V	300 A	Boost Switch	
D13	FWD	1200 V	300 A	Boost Diode	
D15	Rectifier	1600 V	100 A	Boost Sw. Inv. Diode	
D43	FWD	1200 V	50 A	Boost Sw. Protection Diode	
D45	FWD	1200 V	50 A	Boost D. Protection Diode	
Rt	Thermistor			Thermistor	

Ordering Code

Version	Ordering Code
Without thermal paste	B0-SP12NIC300SH-PG49F08T
With thermal paste (5,2 W/mK, PTM6000HV)	B0-SP12NIC300SH-PG49F08T-/7/

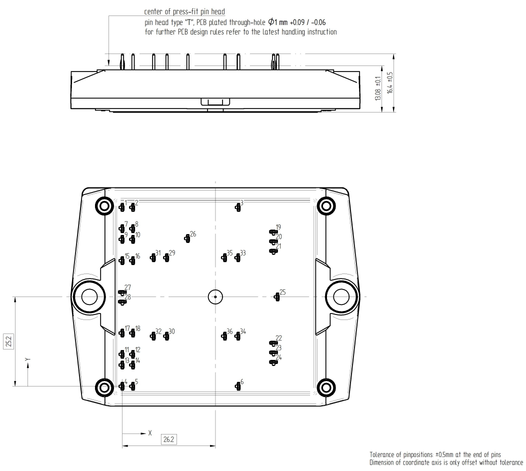
Marking

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

Outline

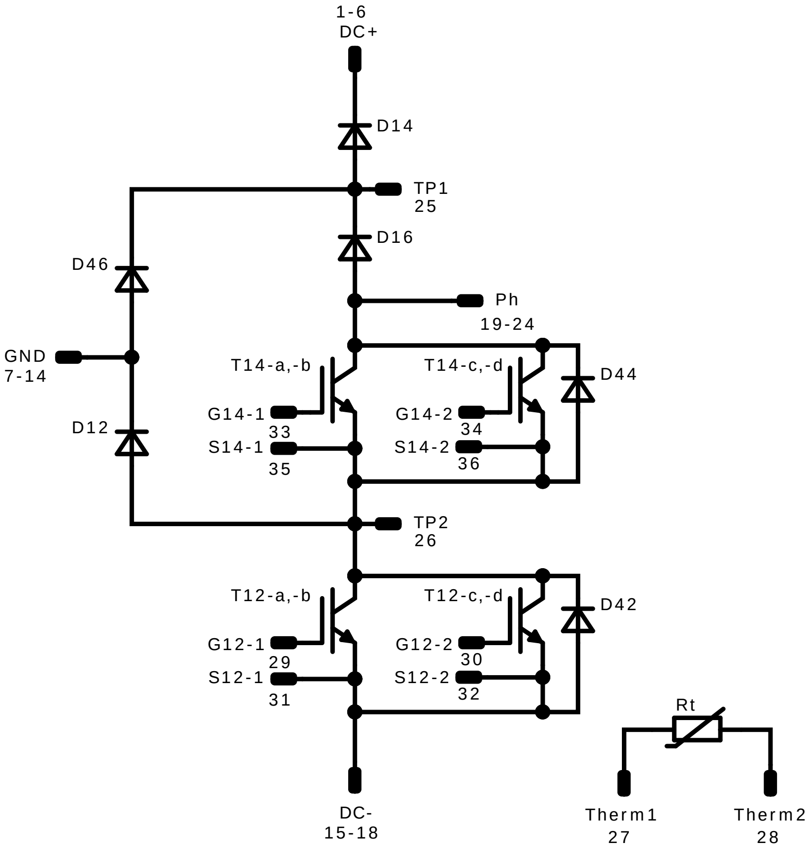
Pin table [mm]			
Pin	X	Y	Function
1	0	50,4	DC+
2	3	50,4	DC+
3	32,75	50,4	DC+
4	0	0	DC+
5	3	0	DC+
6	32,75	0	DC+
7	0	44,4	GND
8	3	44,4	GND
9	0	41,4	GND
10	3	41,4	GND
11	0	9	GND
12	3	9	GND
13	0	6	GND
14	3	6	GND
15	0	35,4	DC-
16	3	35,4	DC-
17	0	15	DC-
18	3	15	DC-
19	42,6	43,55	Ph
20	42,6	40,85	Ph
21	42,6	38,15	Ph
22	42,6	12,25	Ph
23	42,6	9,55	Ph
24	42,6	6,85	Ph
25	43,75	25,2	TP1
26	18,45	41,65	TP2
27	0	26,55	Therm1
28	0	23,85	Therm2
29	12,55	36,25	G12-1
30	12,55	14,15	G12-2
31	8,8	36,25	S12-1
32	8,8	14,15	S12-2
33	32,65	36,25	G14-1
34	32,65	14,15	G14-2
35	28,9	36,25	S14-1
36	28,9	14,15	S14-2

B0-SP12NIC300SH-PG49F08T



B0-SP12NIC300SH-PG49F08T

Pinout



TPx pins are for Vincotech internal test purpose only - don't connect.

Identification

ID	Component	Voltage	Current	Function	Comment
T12	IGBT	1200 V	300 A	Buck Switch	
D12	FWD	1200 V	300 A	Buck Diode	
D42	FWD	1200 V	50 A	Buck Sw. Protection Diode	
T14	IGBT	1200 V	300 A	Boost Switch	
D14	FWD	1200 V	300 A	Boost Diode	
D16	Rectifier	1600 V	100 A	Boost Sw. Inv. Diode	
D44	FWD	1200 V	50 A	Boost Sw. Protection Diode	
D46	FWD	1200 V	50 A	Boost D. Protection 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 certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
B0-SP12NIx300SH-PGx9F08T-D1-14	30 Jun. 2023		