Vincotech

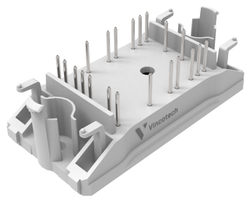
10-F007NRA050SG-P966F09
datasheet

***flow*NPC 0 IGBT** — **1200 V / 50 A**

Features

- Neutral point clamped inverter
- Reactive power capability
- Low inductance layout
- Improved LVRT capability

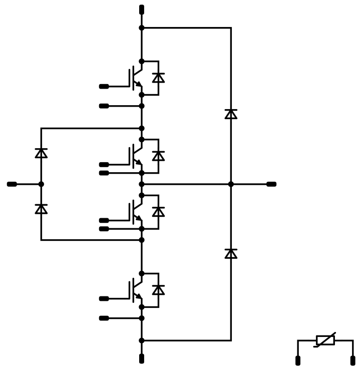
flow 0 17 mm housing



Target applications

- Solar inverter
- UPS

Schematic



Types

- 10-F007NRA050SG-P966F09

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Buck Switch					
Collector-emitter voltage	V_{CES}			650	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	51	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	119	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V, V_{CC} = 400 V	T_j = 150 °C	5	μs
Maximum junction temperature	T_{jmax}			175	°C
Buck Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	23	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		70	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 8,3 ms	T_j = 150 °C	50	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	47	W
Maximum junction temperature	T_{jmax}			175	°C
Buck Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	18	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	33	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	42	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		105	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	101	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	25	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	100	A
Surge current capability	I^2t			50	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	61	W
Maximum junction temperature	T_{jmax}			175	°C
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	16	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		14	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	36	W
Maximum junction temperature	T_{jmax}			150	°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	4000	V
Isolation voltage	V_{isol}	AC Voltage	t_p = 1 min	2500	V
Creepage distance				>12,7	mm
Clearance				>12,7	mm
Comparative Tracking Index	CTI			≥ 200	

*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	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0008	25	4,2	5,1	5,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 125	1,38	1,89 2,17	2,22(1)	V
Collector-emitter cut-off current	I_{CES}		0	650		25			2,8	µA
Gate-emitter leakage current	I_{GES}		0	0		25			150	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	20		25		3100		pF
Reverse transfer capacitance	C_{res}							90		pF
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,8		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 4 Ω R_{goff} = 4 Ω	±15	350	35	25 125 150		66 66,6 67		ns
Rise time	t_r					25 125 150		7,4 8,8 9		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		103,2 124 129,8		ns
Fall time	t_f					25 125 150		6,92 11,96 16,34		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,072 µC Q_{rFWD}=0,075 µC Q_{rFWD}=0,075 µC				25 125 150		0,134 0,18 0,192		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,254 0,455 0,498		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				16	25 125 150		1,37 1,55 1,63	1,55(1)	V
Reverse leakage current	I_R	V_r = 650 V				25 150		3,2 48	320	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,03		K/W
Dynamic										
Peak recovery current	I_{RRM}	d*i*/d*t*=3796 A/µs d*i*/d*t*=5003 A/µs d*i*/d*t*=4290 A/µs	±15	350	35	25 125 150		20,69 19,95 19,58		A
Reverse recovery time	t_{rr}					25 125 150		9,07 8,95 8,97		ns
Recovered charge	Q_r					25 125 150		0,072 0,075 0,075		µC
Reverse recovered energy	E_{rec}					25 125 150		$7,853x10^{-3}$ $6,428x10^{-3}$ $7,703x10^{-3}$		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		6945 6615 6348		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}				10	25 125	1,23	1,67 1,54	1,87(1)	V
Reverse leakage current	I_{R}	V_{r} = 650 V				25			0,14	μA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,87		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	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0012	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		35	25 125	1,58	2,07 2,13	2,07[1]	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			5	µA
Gate-emitter leakage current	I_{GES}		20	0		25			120	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		2000		pF
Reverse transfer capacitance	C_{res}							70		pF
Gate charge	Q_g		15		0	25		270		nC
Thermal										
Thermal resistance junction to sink [2]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,94		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 4 Ω R_{goff} = 4 Ω	±15	350	35	25 125		44,2 44,6		ns
Rise time	t_r					25 125		5,4 8,4		ns
Turn-off delay time	$t_{d(off)}$					25 125		147,6 192,2		ns
Fall time	t_f					25 125		70,47 110,11		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=2,24 µC Q_{rFWD}=4,25 µC				25 125		0,372 0,631		mWs
Turn-off energy (per pulse)	E_{off}					25 125		1,25 1,92		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
Boost Diode										
Static										
Forward voltage	V_F				25	25 125 150		2,3 2,41	2,74(1) 2,79(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25 150		 1600	60 3300	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,56		K/W
Dynamic										
Peak recovery current	I_{RRM}	d*i*/d*t*=2585 A/µs d*i*/d*t*=2622 A/µs	±15	350	35	25 125		65,21 66,56		A
Reverse recovery time	t_{rr}					25 125		43,39 122,12		ns
Recovered charge	Q_r					25 125		2,24 4,25		µC
Reverse recovered energy	E_{rec}					25 125		0,591 1,18		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		5361 3861		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. Protection Diode										
Static										
Forward voltage	V_F				7	25 125		2,01 1,66	3,5[(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} = 3,4 W/mK (PSX)						1,92		K/W
Thermistor										
Static										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P							5		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

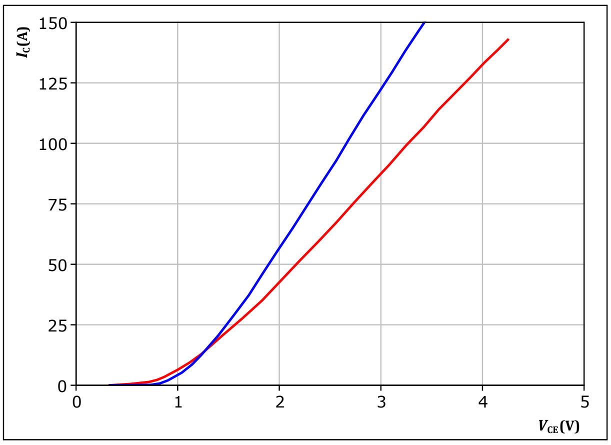
(2) Only valid with pre-applied Vincotech thermal interface material.

Buck Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

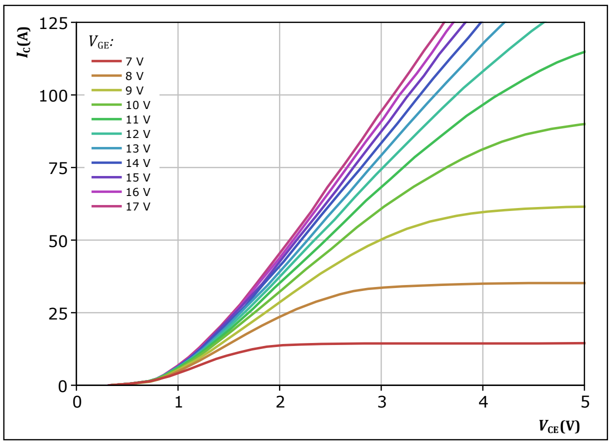


t_p =	250	µs	T_j:	25 °C
V_{GE} =	15	V		125 °C

figure 2. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



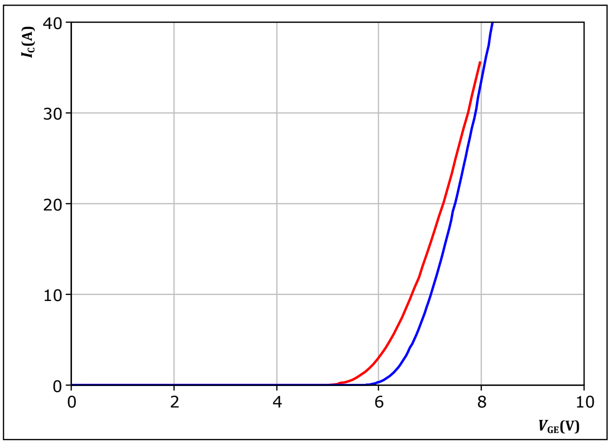
t_p =	250	µs
T_j =	125	°C

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

figure 3. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})

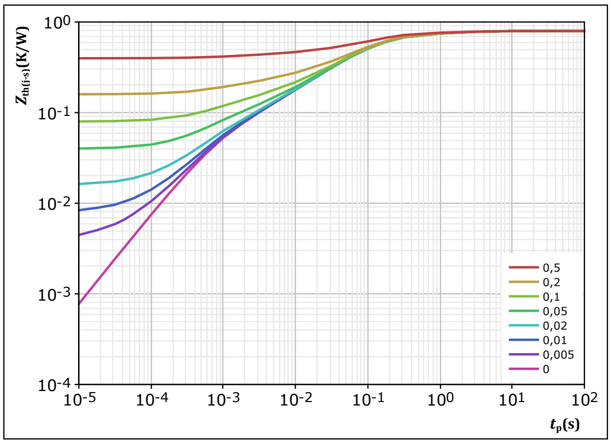


t_p =	250	µs	T_j:	25 °C
V_{CE} =	10	V		125 °C

figure 4. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,795	K/W

IGBT thermal model values

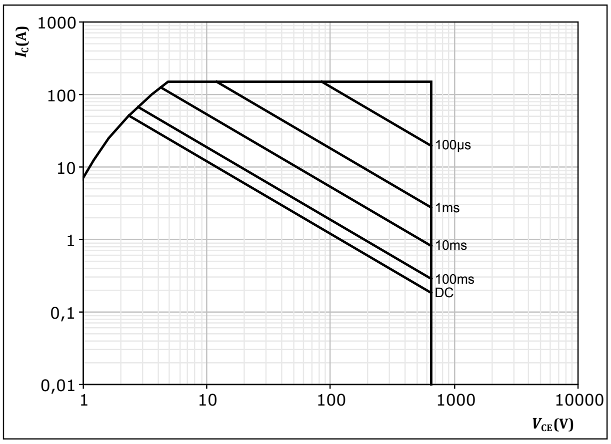
R (K/W)	τ (s)
6,19E-02	2,26E+00
1,10E-01	4,08E-01
4,12E-01	9,23E-02
1,04E-01	2,31E-02
5,73E-02	5,67E-03
4,98E-02	8,49E-04

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

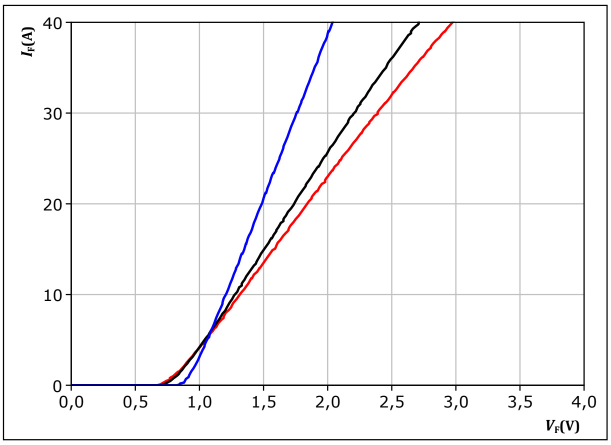
T_j = T_{jmax}

Buck Diode Characteristics

figure 6. **FWD**

Typical forward characteristics

I_F = f(V_F)



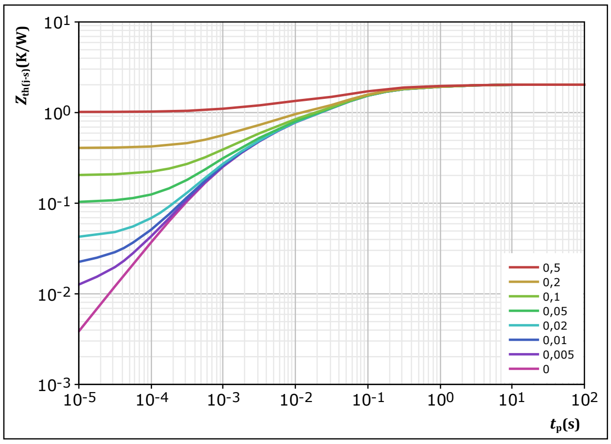
t_p = 250 µs

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

$R_{th(j-s)}$ = 2,032 K/W

FWD thermal model values

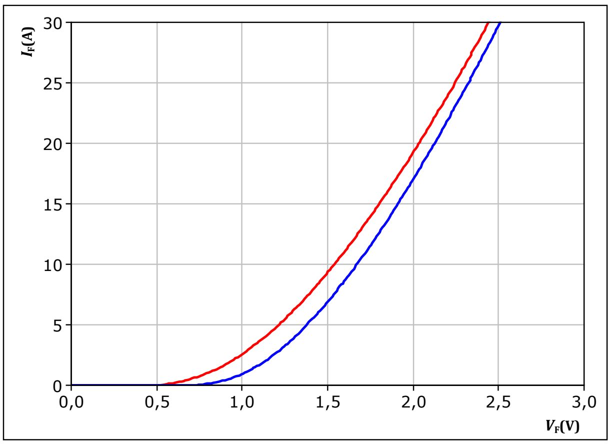
R (K/W)	τ (s)
1,81E-01	1,80E+00
4,90E-01	1,58E-01
7,30E-01	4,04E-02
4,51E-01	4,19E-03
1,81E-01	6,96E-04

Buck Sw. Protection Diode Characteristics

figure 8. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



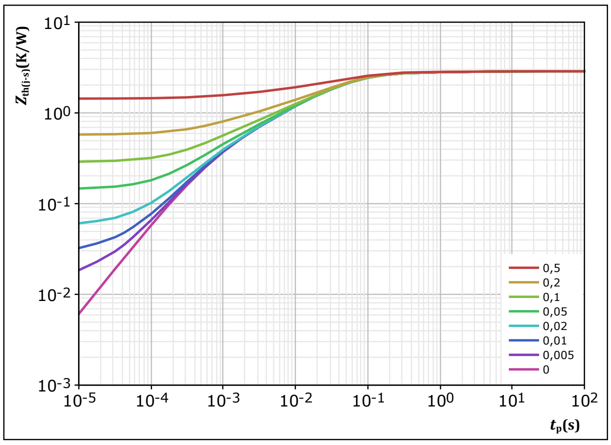
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 9. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 2,873 K/W

FWD thermal model values

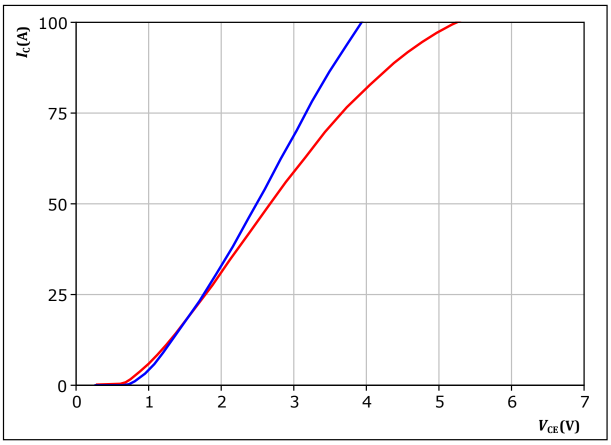
R (K/W)	τ (s)
6,53E-02	3,94E+00
1,48E-01	4,48E-01
1,31E+00	5,96E-02
7,32E-01	1,36E-02
4,04E-01	2,79E-03
2,11E-01	5,37E-04

Boost Switch Characteristics

figure 10. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

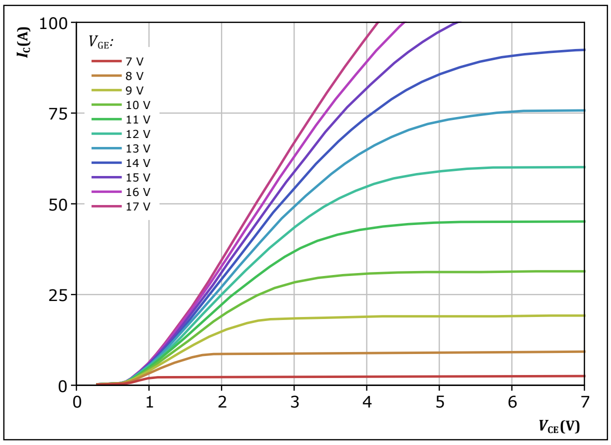


t_p =	250	µs	T_j:	25 °C
V_{GE} =	15	V		125 °C

figure 11. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



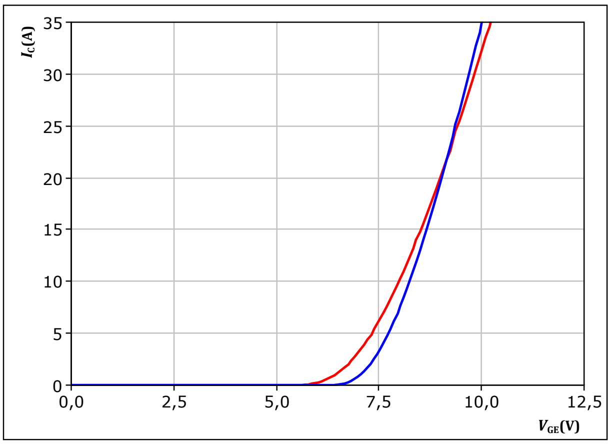
t_p =	250	µs
T_j =	125	°C

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

figure 12. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})

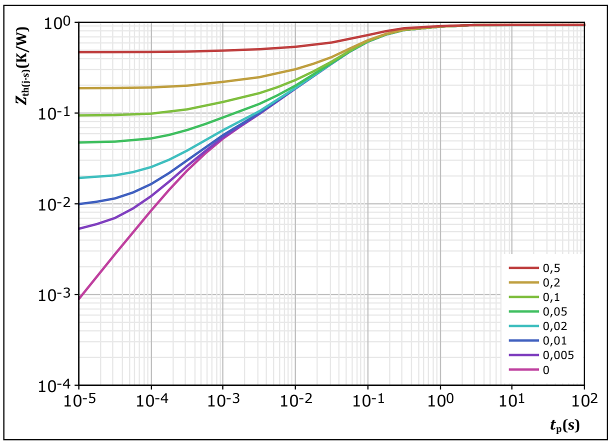


t_p =	250	µs	T_j:	25 °C
V_{CE} =	10	V		125 °C

figure 13. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,938	K/W

IGBT thermal model values

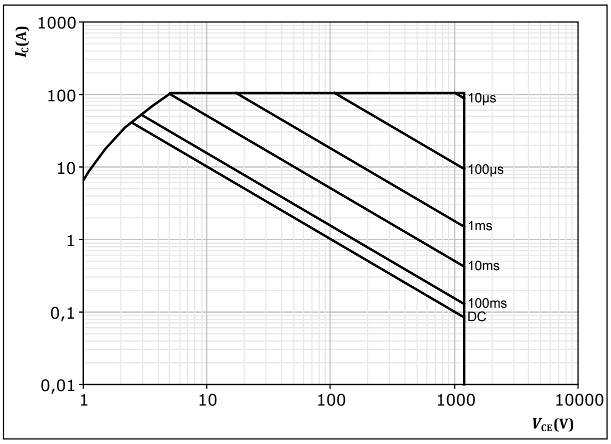
R (K/W)	τ (s)
1,15E-01	9,47E-01
4,15E-01	1,24E-01
2,99E-01	4,81E-02
7,22E-02	5,86E-03
3,82E-02	5,62E-04

Boost Switch Characteristics

figure 14.	IGBT

Safe operating area

I_C = f(V_{CE})



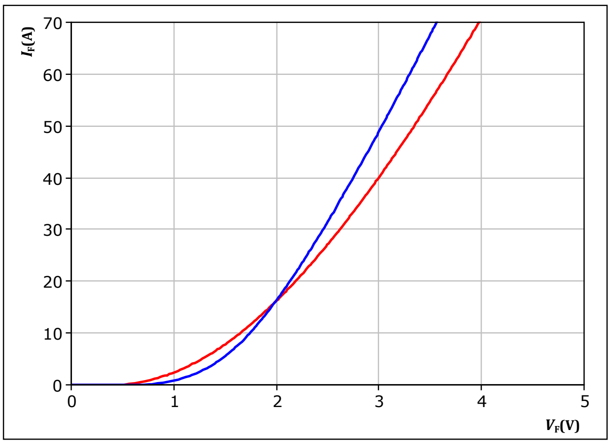
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 15. **FWD**

Typical forward characteristics

I_F = f(V_F)



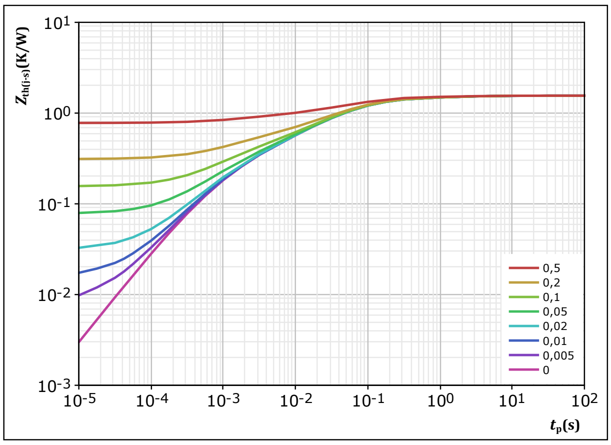
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 16. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,556 K/W

FWD thermal model values

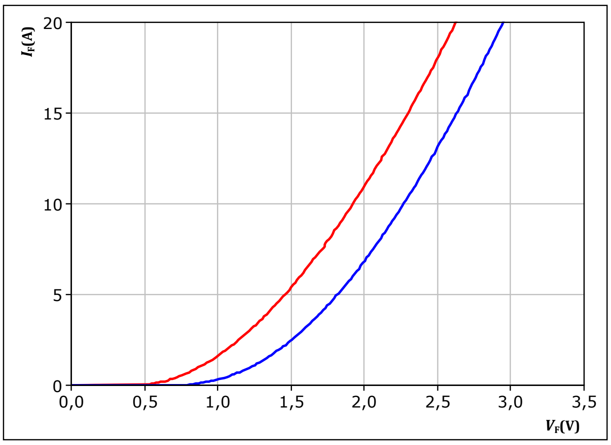
R (K/W)	τ (s)
4,65E-02	4,86E+00
1,06E-01	8,11E-01
4,71E-01	1,09E-01
4,83E-01	3,07E-02
2,34E-01	7,03E-03
1,81E-01	1,25E-03
3,38E-02	3,28E-04

Boost Sw. Protection Diode Characteristics

figure 17. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



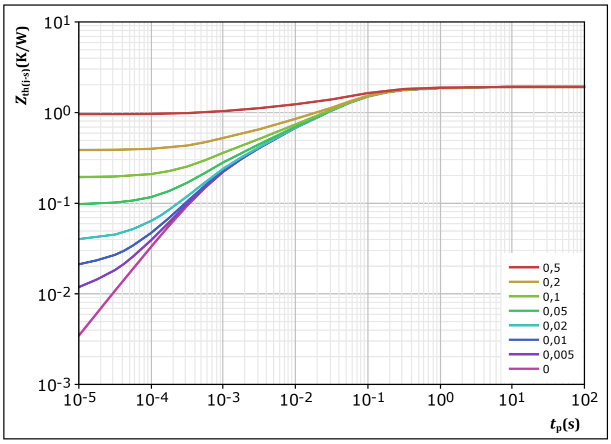
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 18. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,919 K/W

FWD thermal model values

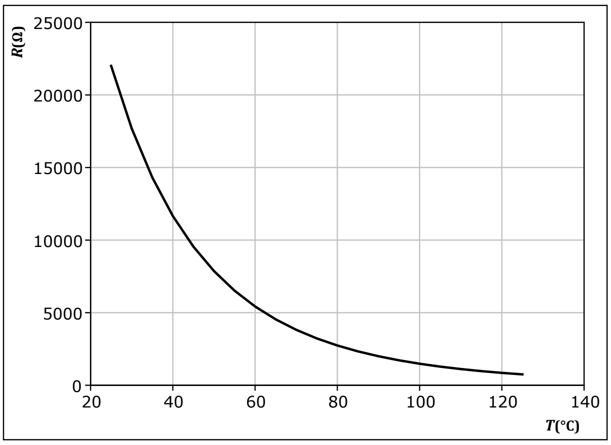
R (K/W)	τ (s)
8,83E-02	2,18E+00
4,61E-01	1,63E-01
8,36E-01	4,26E-02
3,41E-01	5,57E-03
1,94E-01	7,35E-04

Thermistor Characteristics

figure 19.	Thermistor

Typical NTC characteristic as function of temperature

R_T = f(T)

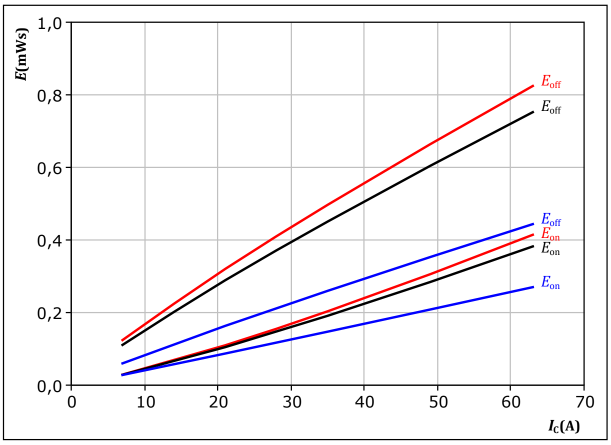


Buck Switching Characteristics

figure 20. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



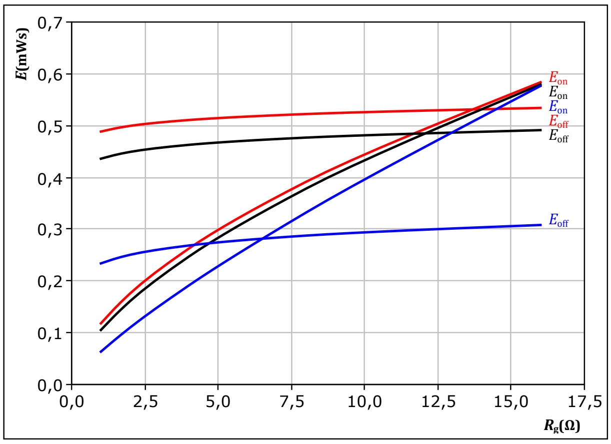
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	4	Ω		150 °C
R_{goff} =	4	Ω		

figure 21. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



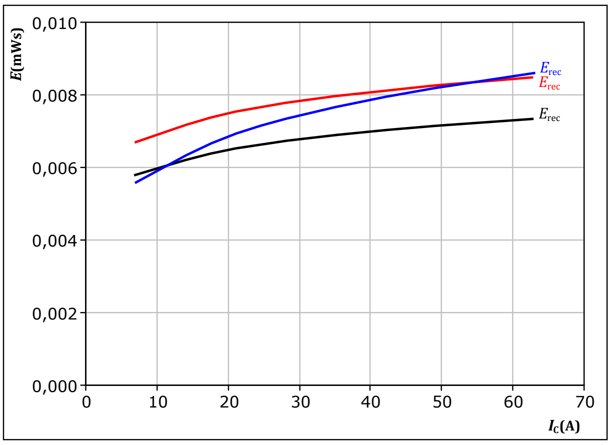
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	35	A		150 °C

figure 22. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



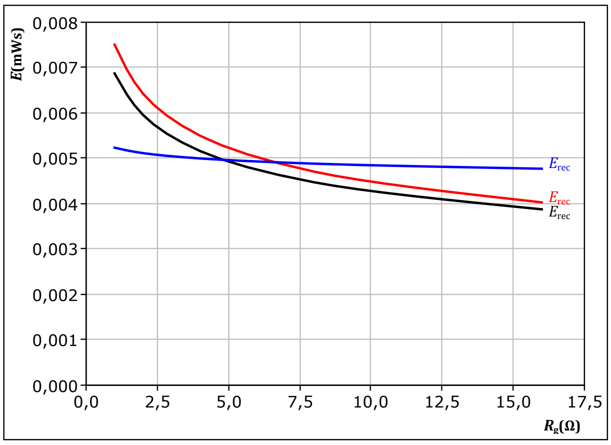
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	4	Ω		150 °C

figure 23. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

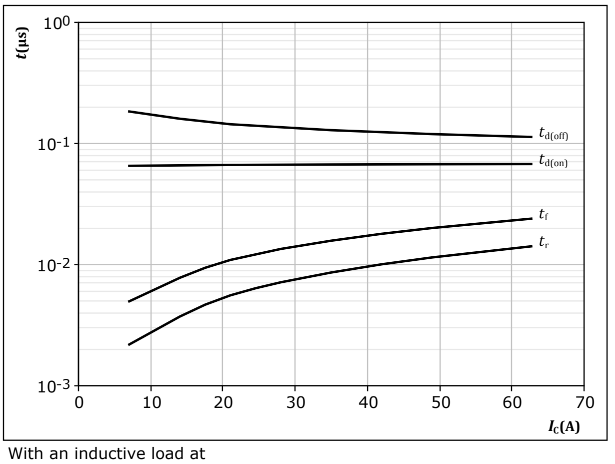
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	35	A		150 °C

Buck Switching Characteristics

figure 24. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



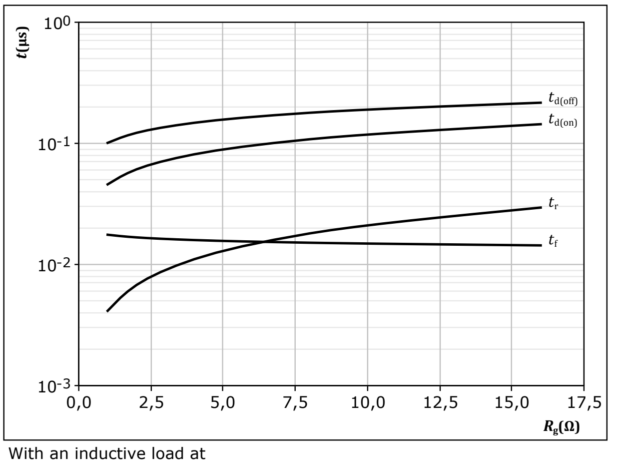
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 25. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



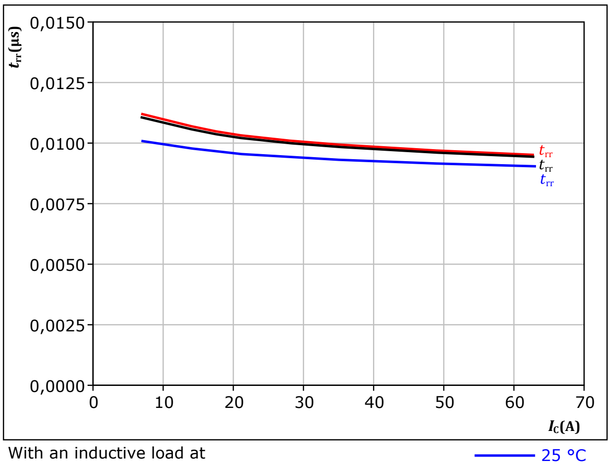
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	35	A

figure 26. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

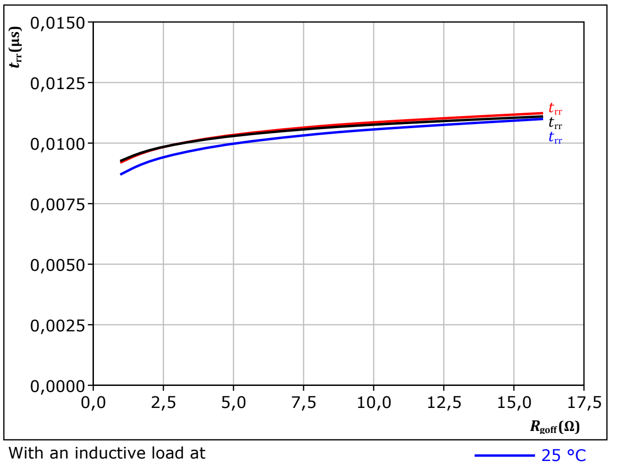
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

T_j: 25 °C / 125 °C / 150 °C

figure 27. **FWD**

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

$t_{rr} = f(R_{goff})$



With an inductive load at

V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	35	A

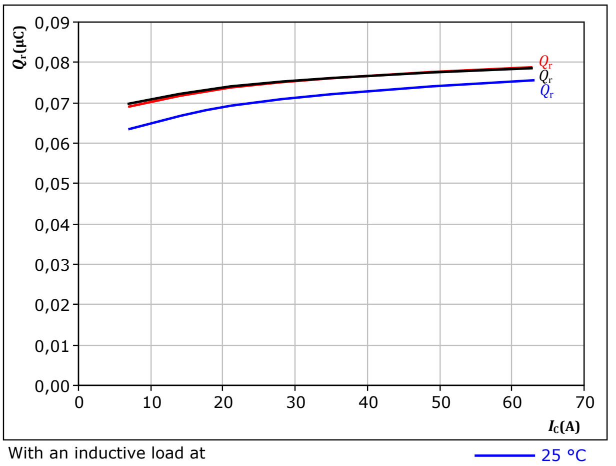
T_j: 25 °C / 125 °C / 150 °C

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

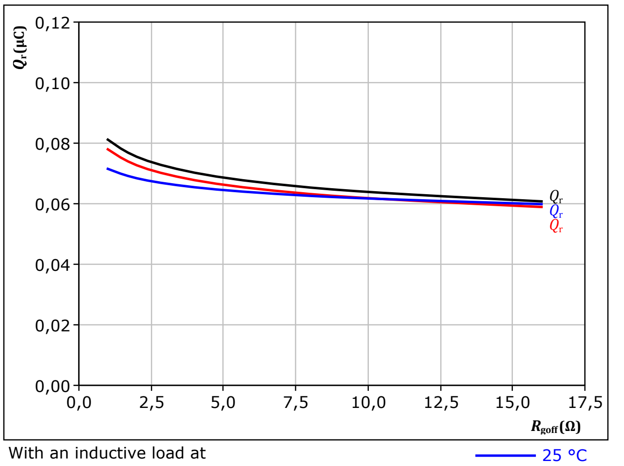
V_{CE} = 350 V
V_{GE} = ±15 V
R_{gon} = 4 Ω

T_j: 25 °C, 125 °C, 150 °C

figure 29. **FWD**

Typical recovered charge as a function of turn off gate resistor

Q_r = f(R_{goff})



With an inductive load at

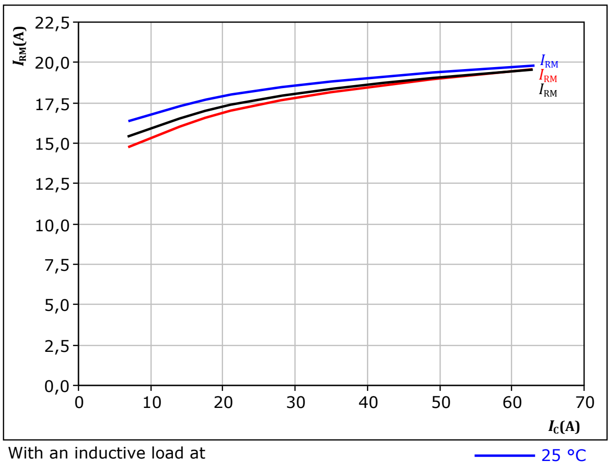
V_{CE} = 350 V
V_{GE} = ±15 V
I_C = 35 A

T_j: 25 °C, 125 °C, 150 °C

figure 30. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



With an inductive load at

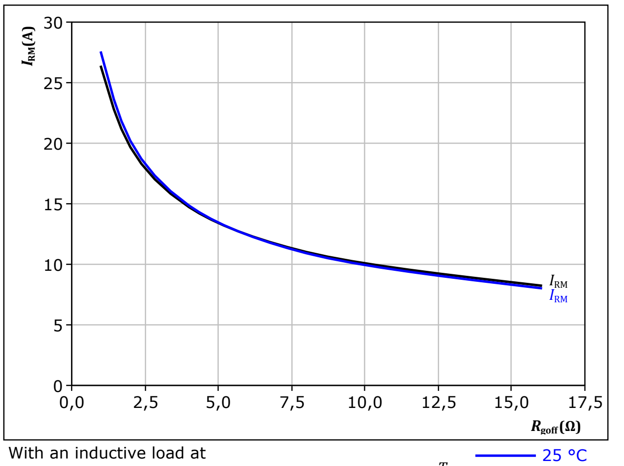
V_{CE} = 350 V
V_{GE} = ±15 V
R_{gon} = 4 Ω

T_j: 25 °C, 125 °C, 150 °C

figure 31. **FWD**

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

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



With an inductive load at

V_{CE} = 350 V
V_{GE} = ±15 V
I_C = 35 A

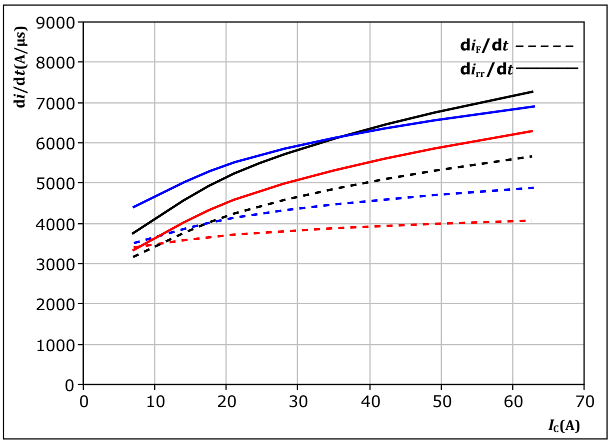
T_j: 25 °C, 125 °C

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)



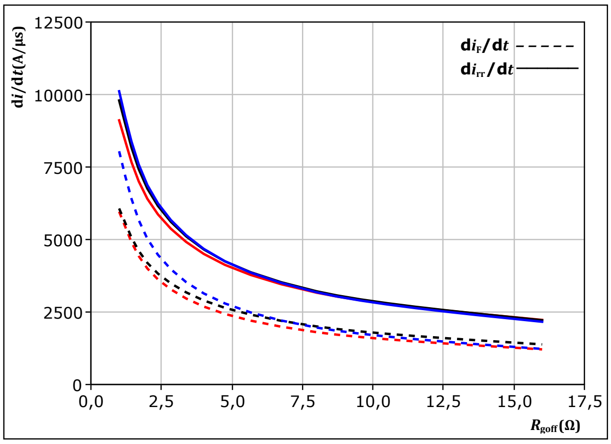
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	4	Ω		150 °C

figure 33. **FWD**

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

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



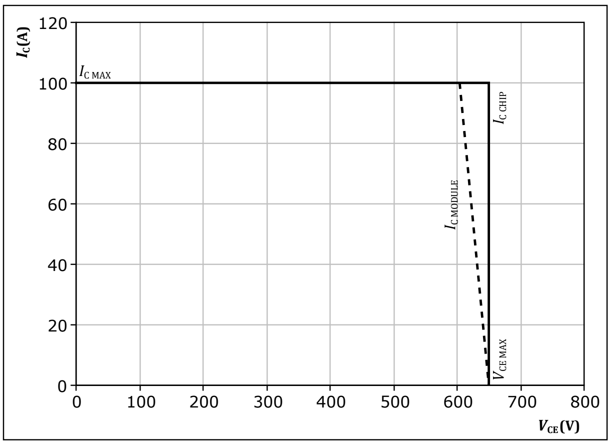
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	35	A		150 °C

figure 34. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



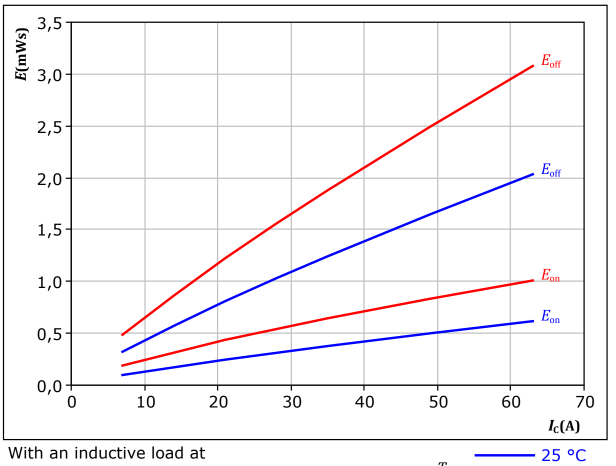
At	T_j =	150	°C
	R_{gon} =	4	Ω
	R_{goff} =	4	Ω

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

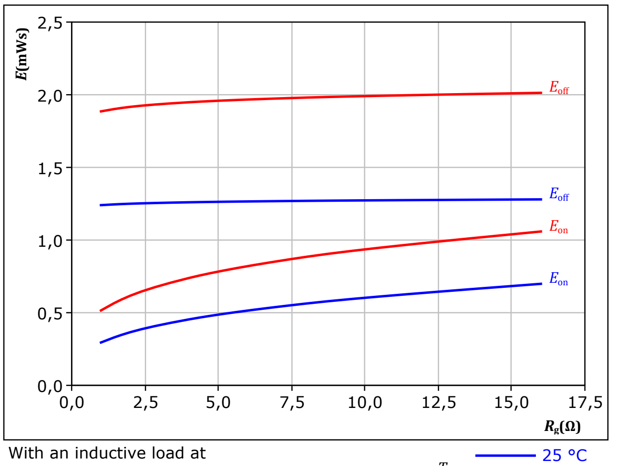
V_{CE} =	350	V	
V_{GE} =	±15	V	
R_{gon} =	4	Ω	
R_{goff} =	4	Ω	

T_j: 25 °C, 125 °C

figure 36. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



With an inductive load at

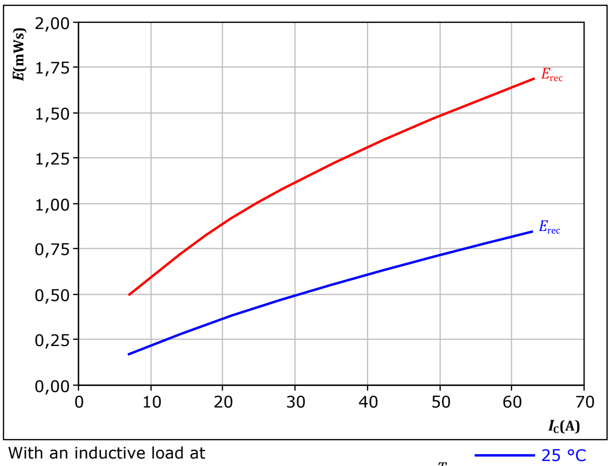
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	35	A

T_j: 25 °C, 125 °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

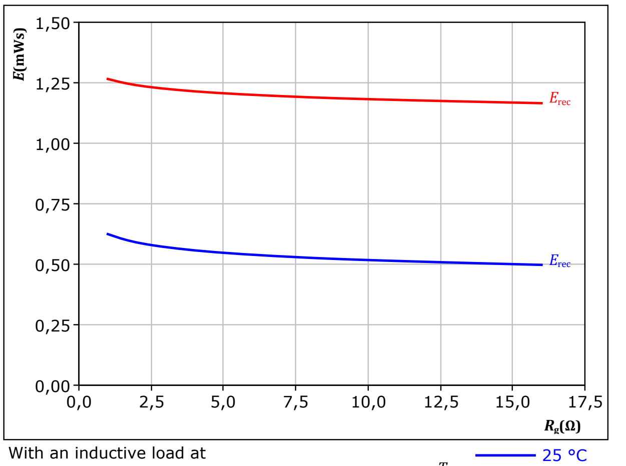
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

T_j: 25 °C, 125 °C

figure 38. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	35	A

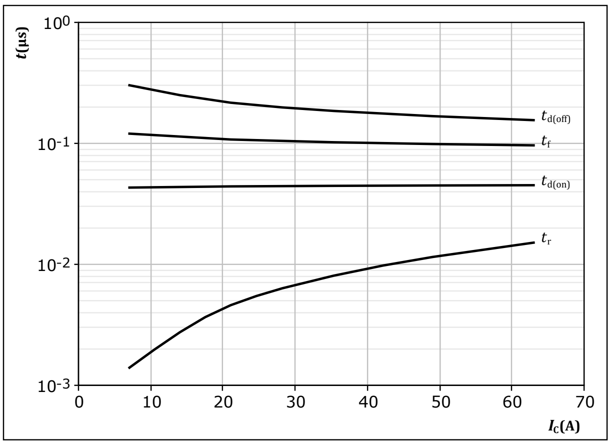
T_j: 25 °C, 125 °C

Boost Switching Characteristics

figure 39. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



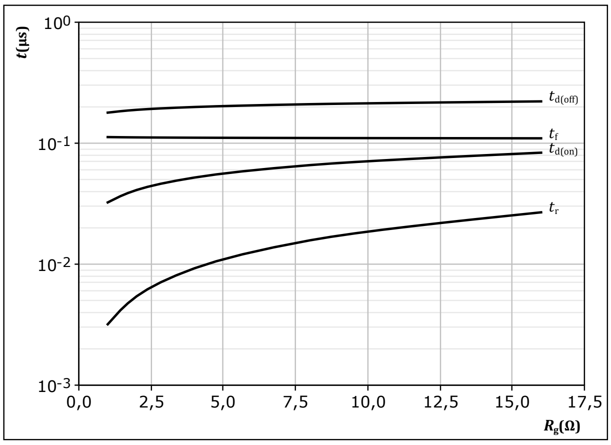
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 40. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



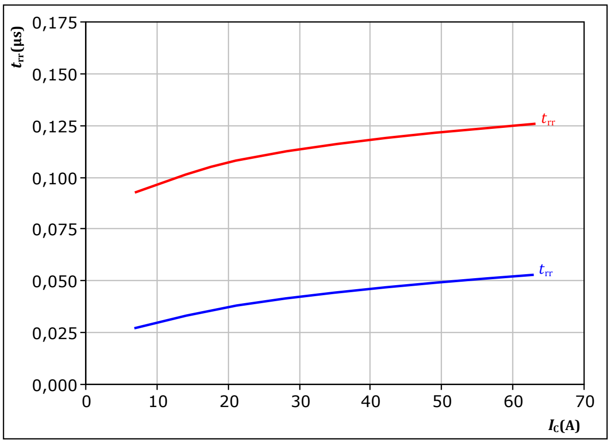
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	35	A

figure 41. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

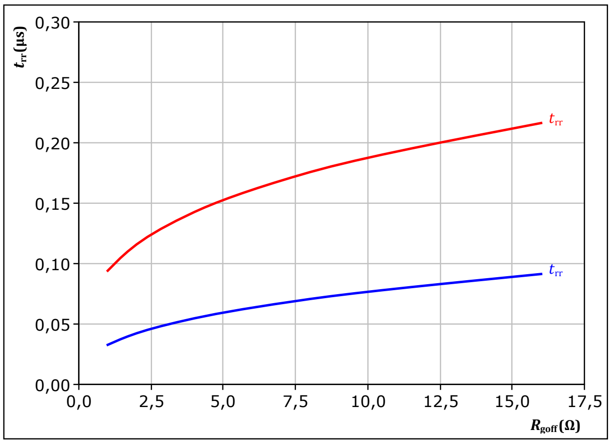
T_j: 25 °C / 125 °C

V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

figure 42. **FWD**

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

$t_{rr} = f(R_{goff})$



With an inductive load at

T_j: 25 °C / 125 °C

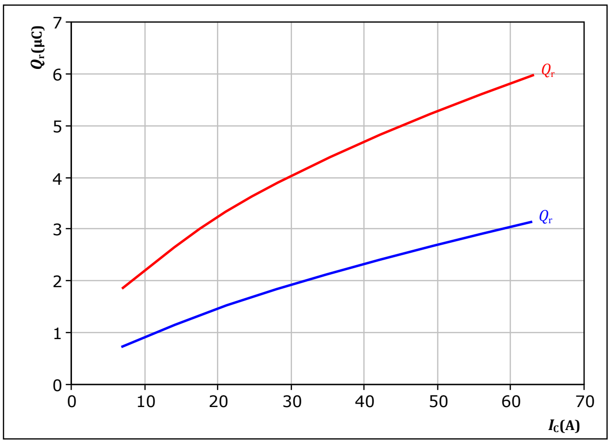
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	35	A

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

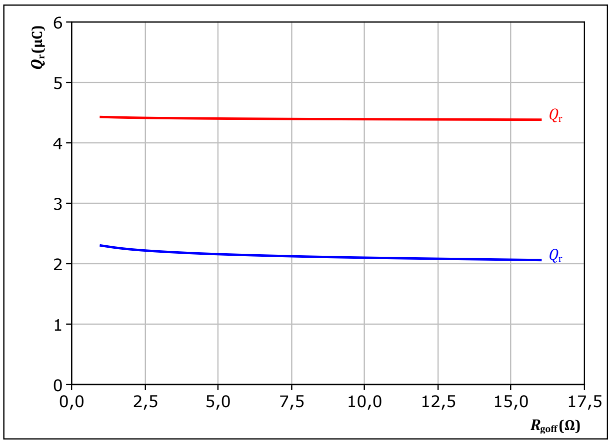
T_j: 25 °C, 125 °C

V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

figure 44. FWD

Typical recovered charge as a function of turn off gate resistor

Q_r = f(R_{goff})



With an inductive load at

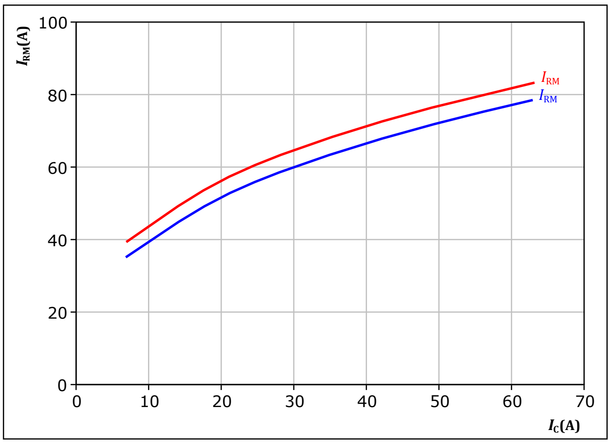
T_j: 25 °C, 125 °C

V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	35	A

figure 45. FWD

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



With an inductive load at

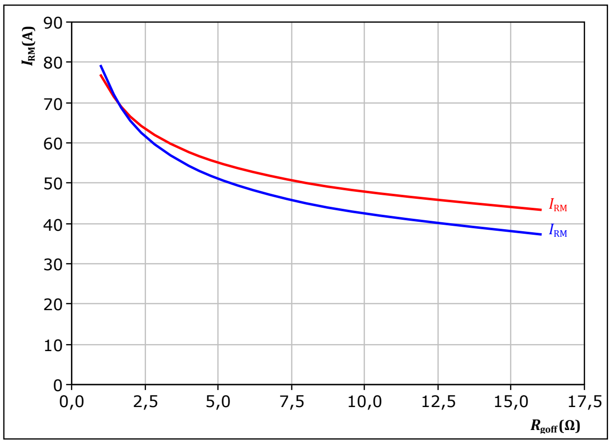
T_j: 25 °C, 125 °C

V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	4	Ω

figure 46. FWD

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

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



With an inductive load at

T_j: 25 °C, 125 °C

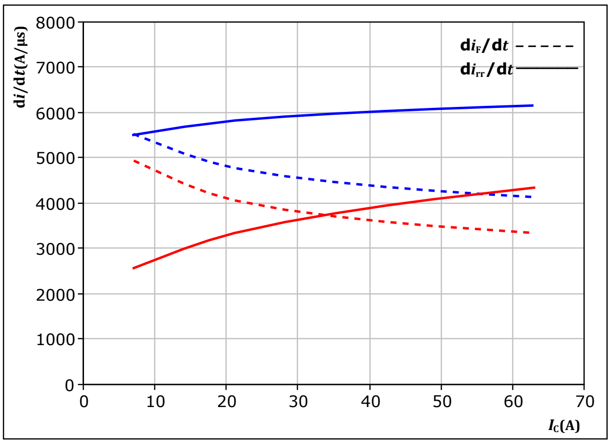
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	35	A

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

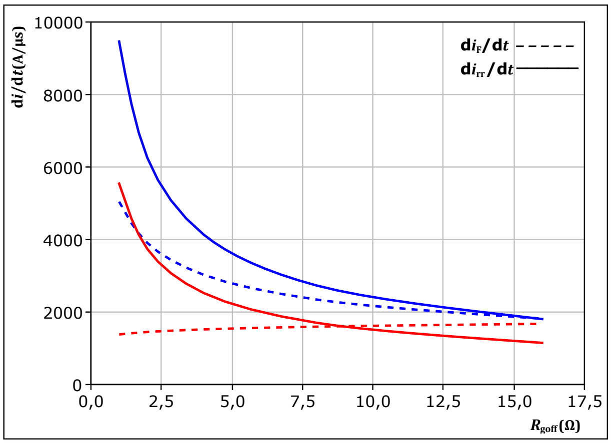
V_{CE} =	350	V	
V_{GE} =	±15	V	
R_{gon} =	4	Ω	

T_j: 25 °C, 125 °C

figure 48. FWD

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

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



With an inductive load at

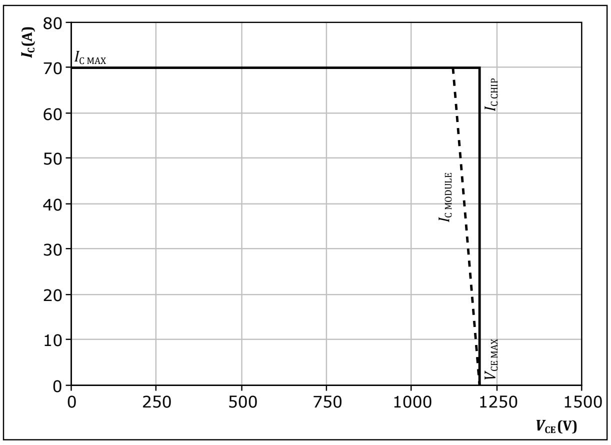
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	35	A

T_j: 25 °C, 125 °C

figure 49. IGBT

Reverse bias safe operating area

I_C = f(V_{CE})



At			
	T_j =	125	°C
	R_{gon} =	4	Ω
	R_{goff} =	4	Ω

Switching Definitions

figure 50. **IGBT**

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

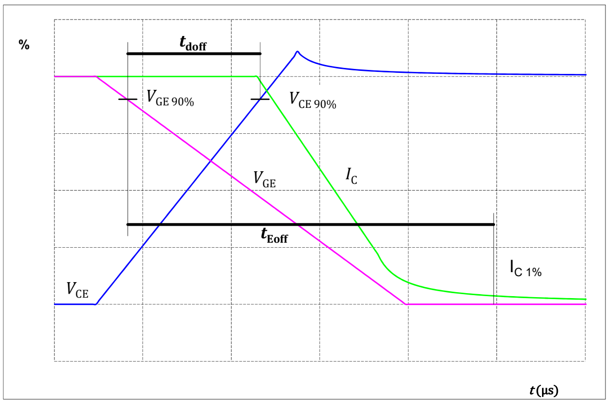


figure 51. **IGBT**

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

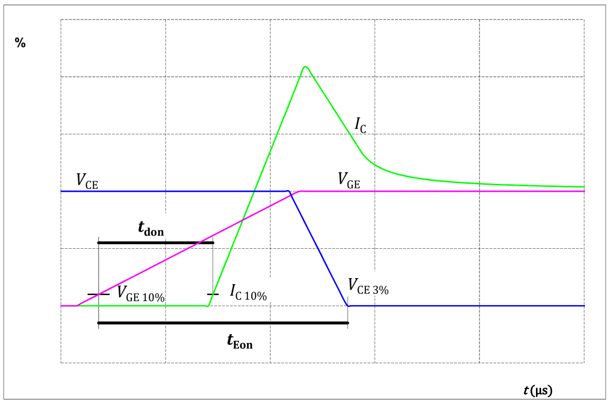


figure 52. **IGBT**

Turn-off Switching Waveforms & definition of t_f

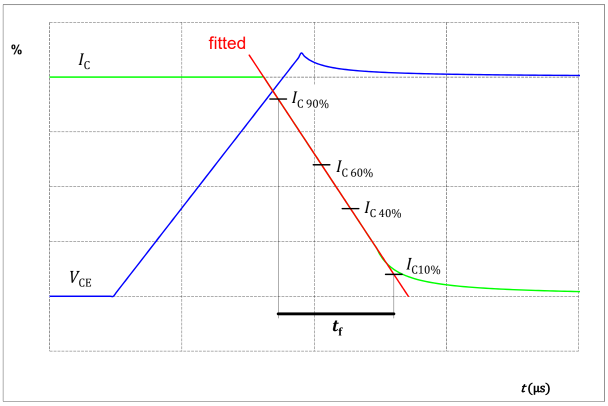
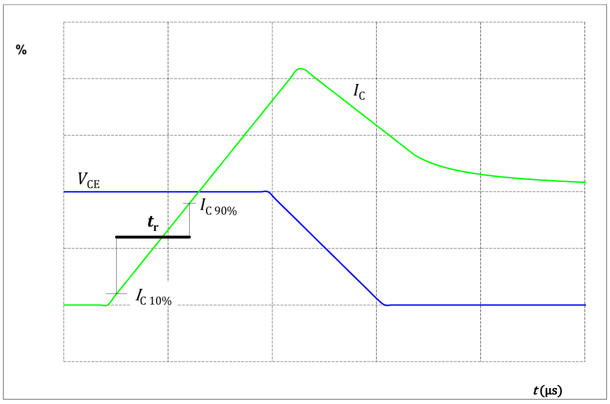


figure 53. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 54. **FWD**

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

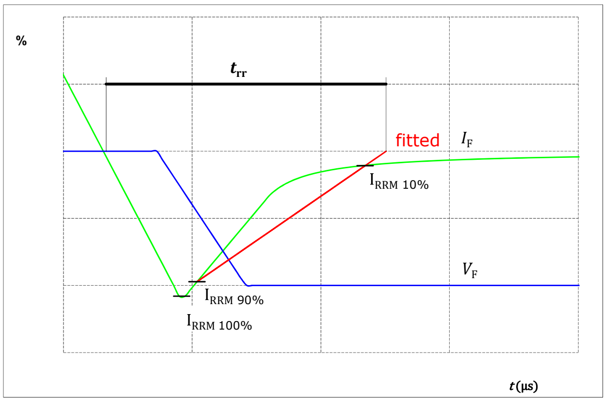
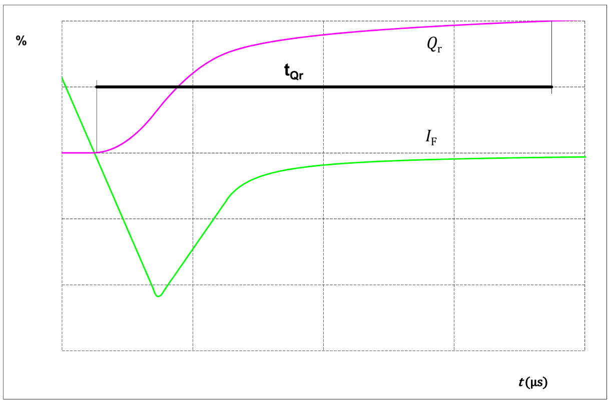


figure 55. **FWD**

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



Ordering Code

Version	Ordering Code
Without thermal paste	10-F007NRA050SG-P966F09
With thermal paste (4,4 W/mK, PTM6000)	10-F007NRA050SG-P966F09-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-F007NRA050SG-P966F09-/3/

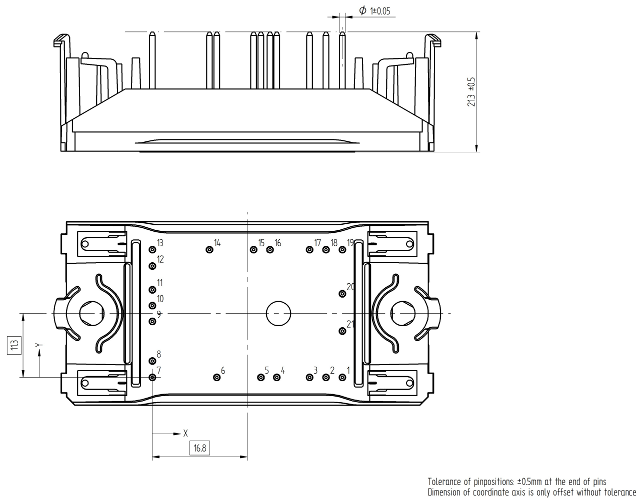
Marking

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		

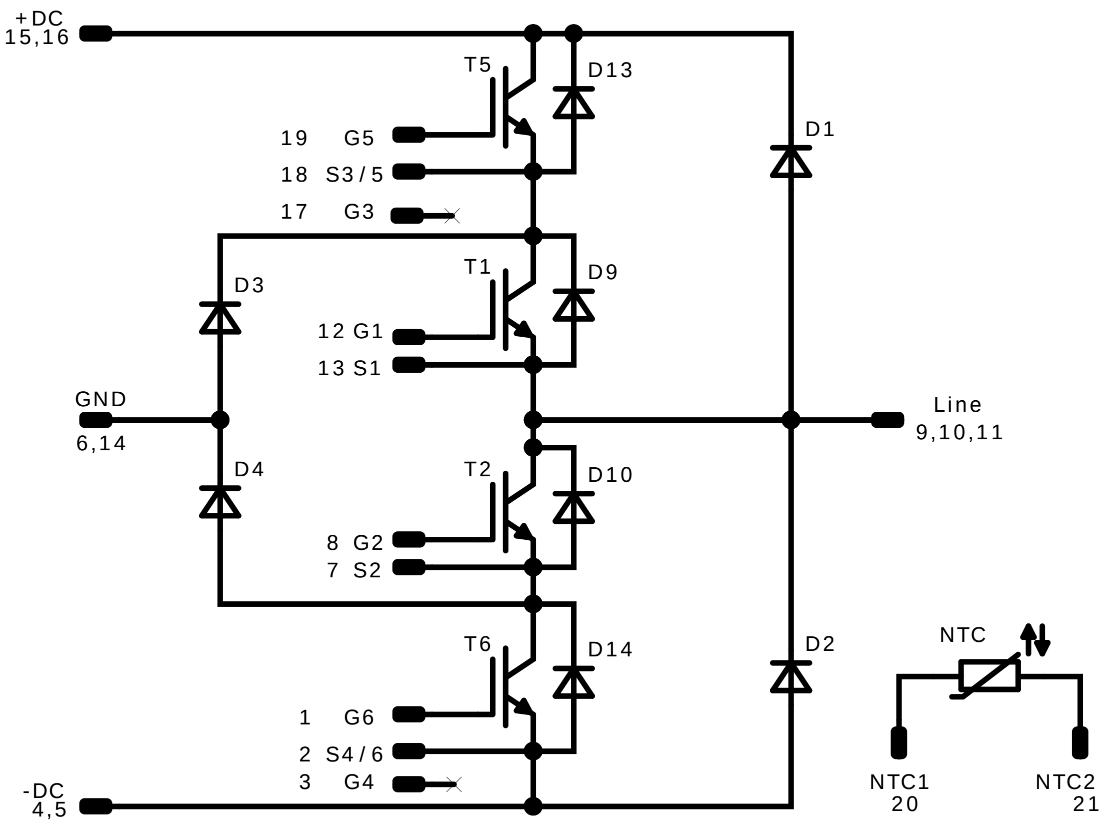
Outline

Pin table [mm]

Pin	X	Y	Function
1	33,6	0	G6
2	30,7	0	S4/6
3	27,8	0	G4
4	22	0	-DC
5	19,2	0	-DC
6	11,4	0	GND
7	0	0	S2
8	0	2,9	G2
9	0	9,9	Line
10	0	12,7	Line
11	0	15,5	Line
12	0	19,7	G1
13	0	22,6	S1
14	10,1	22,6	GND
15	17,9	22,6	+DC
16	20,8	22,6	+DC
17	27,8	22,6	G3
18	30,7	22,6	S3/5
19	33,6	22,6	G5
20	33,6	14,8	NTC1
21	33,6	8,2	NTC2



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T5, T6	IGBT	650 V	50 A	Buck Switch	
D3, D4	FWD	650 V	16 A	Buck Diode	
D13, D14	FWD	650 V	10 A	Buck Sw. Protection Diode	
T1, T2	IGBT	1200 V	35 A	Boost Switch	
D2, D1	FWD	1200 V	25 A	Boost Diode	
D9, D10	FWD	1200 V	7 A	Boost Sw. Protection Diode	
NTC	Thermistor			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 135	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 0 packages see vincotech.com website.

Package data
Package data for *flow* 0 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
10-F007NRA050SG-P966F09-D2-14	20 Jun. 2016	New brand, PCM Rth values	
10-F007NRA050SG-P966F09-D3-14	28 Jul. 2021	Buck Diode change	