30-FT12NMA200H705-M660F56
datasheet

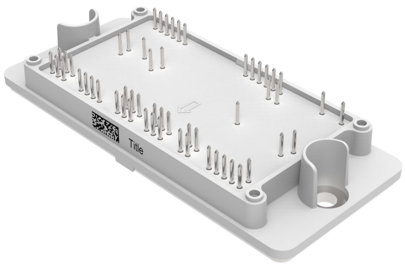
Vincotech

***flow*MNPC 2** **1200 V / 200 A**

Topology features

- Mixed Voltage Neutral Point Clamped Topology (T-Type)
- Kelvin Emitter for improved switching performance
- Split output for elimination of X-conduction at fast turn-on
- Low inductive commutation loop
- Temperature sensor

flow 2 13 mm housing



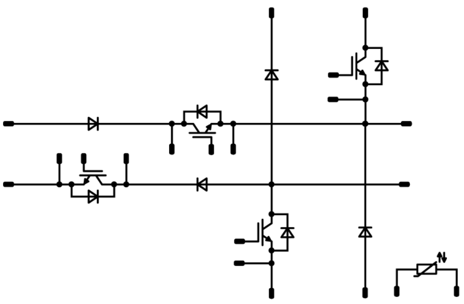
Component features

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

Housing features

- Base isolation: Al_2O_3
- Convex shaped baseplate for superior thermal contact
- Cu baseplate
- Thermo-mechanical push-and-pull force relief
- Solder pin

Schematic



Target applications

- Energy Storage Systems
- Power Supply
- Solar Inverters
- UPS

Types

- 30-FT12NMA200H705-M660F56

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	165	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		600	A
Turn off safe operating area		T_j = 150°C, V_{CE} = 1200 V		600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	314	W
Gate-emitter voltage	V_{GES}			±20	V
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	117	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		240	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	176	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	16 (1)	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		16	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 8,3 ms	T_j = 25 °C	110	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	44	W
Maximum junction temperature	T_{jmax}			175	°C

(1) limited by I_{FRM}

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Boost Switch					
Collector-emitter voltage	V_{CES}			650	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	126	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		300	A
Turn off safe operating area		T_j = 150°C, V_{CE} = 1200 V		300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	192	W
Gate-emitter voltage	V_{GES}			±20	V
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	125	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		300	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	196	W
Maximum junction temperature	T_{jmax}			175	°C
Boost 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	22	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	43	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	6000	V
Creepage distance				>12,7	mm
Clearance				>12,7	mm
Comparative Tracking Index	CTI			≥ 200	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Values Min	Values Typ	Values Max	Unit
Buck Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0032	25	4,7	5,5	6,2	V
Collector-emitter saturation voltage	V_{CEsat}		15		200	25 125 150		1,78 1,94 1,98	2,15(2)	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			8	μA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 100 kHz	0	25		25		26000		pF
Output capacitance	C_{oes}							480		pF
Reverse transfer capacitance	C_{res}							144		pF
Gate charge	Q_g	V_{CC} = 960 V	0/15		200	25		1428		nC
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,3		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	350	150	25 125 150		161,8 164,43 165,47		ns
Rise time	t_r					25 125 150		18,32 22,52 23,81		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		162,46 192,66 200,64		ns
Fall time	t_f					25 125 150		43,32 77,44 79,05		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,41 μC Q_{rFWD}=0,435 μC Q_{rFWD}=0,432 μC				25 125 150		1,88 2,18 2,43		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		2,5 4,46 4,98		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	
Buck Diode										
Static										
Forward voltage	V_F				120	25 125 150		1,34 1,44 1,49	1,4(2) 1,55(2)	V
Reverse leakage current	I_R	V_r = 650 V				25		8	600	µA
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,54		K/W
Dynamic										
Peak recovery current	I_{RM}	d*i*/d*t*=4629 A/µs d*i*/d*t*=5544 A/µs d*i*/d*t*=4158 A/µs	±15	350	150	25 125 150		39,6 40,14 39,75		A
Reverse recovery time	t_{rr}					25 125 150		18,65 17,5 17,39		ns
Recovered charge	Q_r					25 125 150		0,41 0,435 0,432		µC
Reverse recovered energy	E_{rec}					25 125 150		0,024 0,028 0,028		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		4858,71 6718,55 6242,45		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}				8	25 125 150		2,75 2,26 2,15	3,2(2)	V
Reverse leakage current	I_{R}	V_{r} = 1200 V				25 150			100 500	µA
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,17		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	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,0015	25	3,25	4	4,75	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 125 150	1,15	1,44 1,56 1,6	1,8(2)	V
Collector-emitter cut-off current	I_{CES}		0	650		25			38	µA
Gate-emitter leakage current	I_{GES}		20	0		25			200	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		8120		pF
Output capacitance	C_{oes}							240		pF
Reverse transfer capacitance	C_{res}							29,2		pF
Gate charge	Q_g	V_{CC} = 400 V	±15		150	25		610		nC
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,5		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	350	107	25 125 150		43,09 43,45 43,92		ns
Rise time	t_r					25 125 150		8,59 10,81 11,63		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		71,12 91,53 97,1		ns
Fall time	t_f					25 125 150		10,72 28,91 32,9		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=7,66 µC Q_{rFWD}=14,96 µC Q_{rFWD}=16,7 µC				25 125 150		0,549 0,968 1,1		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		1,19 1,83 2,25		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				150	25 125 150	1,45	1,75 1,7 1,68	1,95(2)	V
Reverse leakage current	I_R	V_r = 1200 V				25			1,52	µA
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,49		K/W
Dynamic										
Peak recovery current	I_{RM}	d*i*/d*t*=10604 A/µs d*i*/d*t*=9271 A/µs d*i*/d*t*=9922 A/µs	±15	350	107	25 125 150		207,41 239,06 245,93		A
Reverse recovery time	t_{rr}					25 125 150		132,33 226,47 252,94		ns
Recovered charge	Q_r					25 125 150		7,66 14,96 16,7		µC
Reverse recovered energy	E_{rec}					25 125 150		2,1 4,02 4,46		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		12922,41 8935,77 8486,1		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				8	25 125 150		2,12 1,57 1,45	3(2)	V
Reverse leakage current	I_R	V_r = 650 V				25			10	µA
Thermal										
Thermal resistance junction to sink(3)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,21		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	

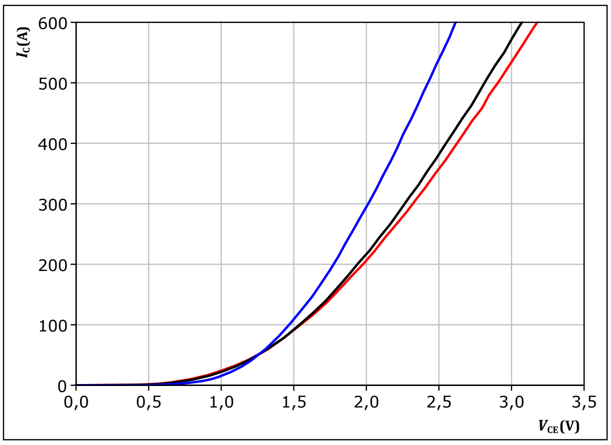
(2) Value at chip level
(3) Only valid with pre-applied Vincotech thermal interface material.

Buck Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

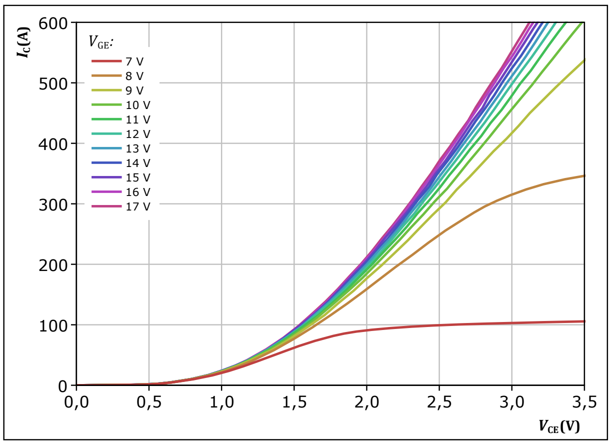


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



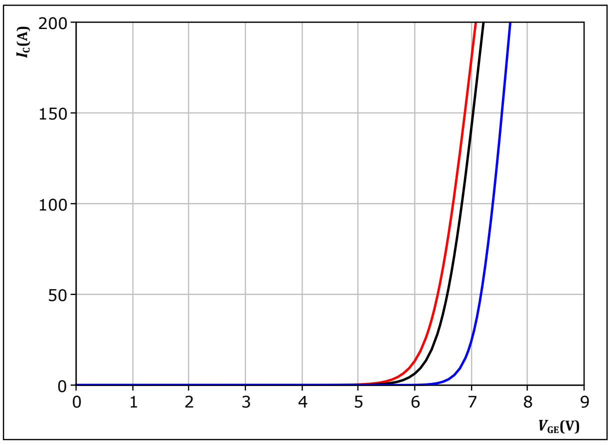
t_p =	250	µs
T_j =	150	°C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

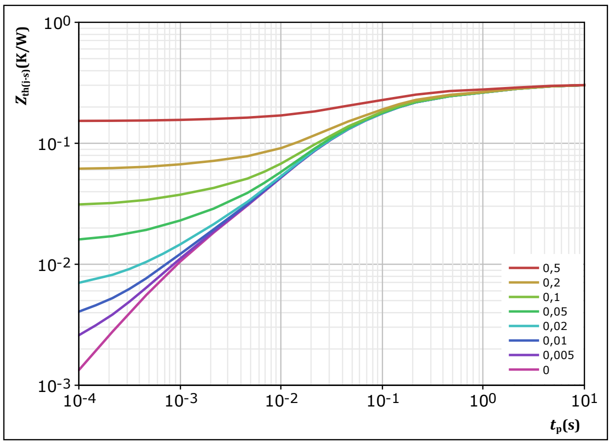


t_p =	250	µs		25 °C
V_{CE} =	48	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,303	K/W

IGBT thermal model values

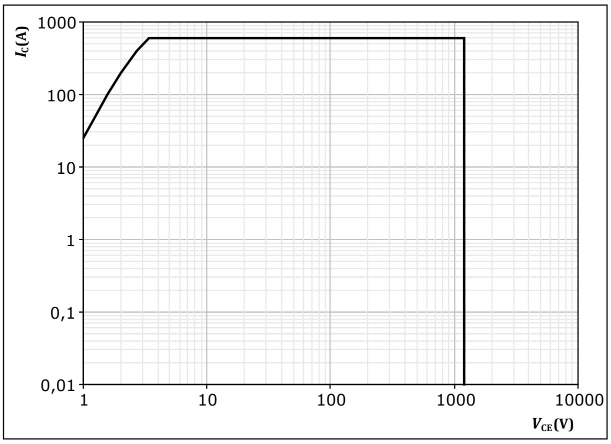
R (K/W)	τ (s)
2,02E-02	5,47E+00
5,92E-02	1,21E+00
1,38E-01	1,07E-01
8,03E-02	2,05E-02
8,33E-03	9,78E-04

Buck Switch Characteristics

figure 5. **IGBT**

Safe operating area

I_C = f(V_{CE})

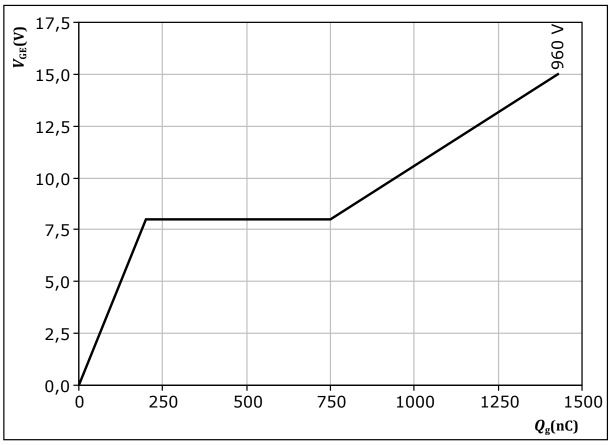


D = single pulse
T_s = 80 °C
V_{GE} = 15 V
T_j = T_{jmax}

figure 6. **IGBT**

Gate voltage vs gate charge

V_{GE} = f(Q_g)



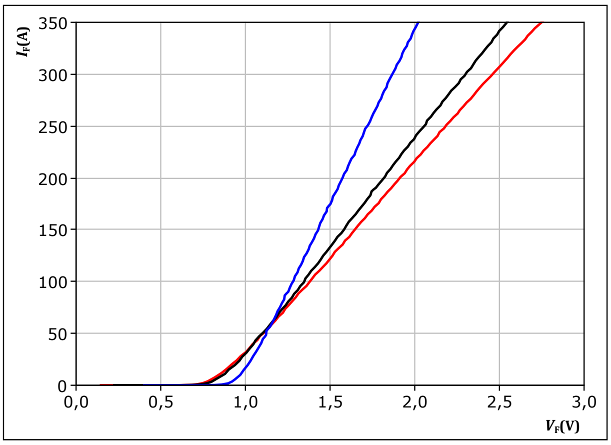
I_C = 200 A
T_j = 25 °C

Buck Diode Characteristics

figure 7. FWD

Typical forward characteristics

$I_F = f(V_F)$



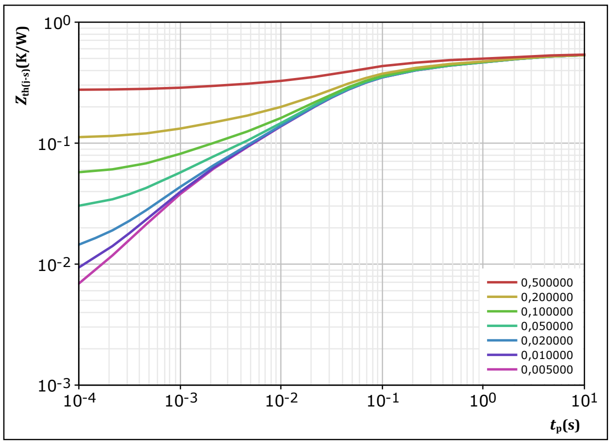
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 8. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,539 K/W

FWD thermal model values

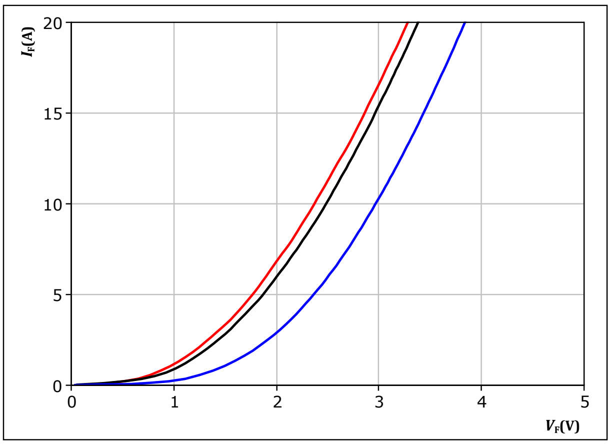
R (K/W)	τ (s)
3,71E-02	1,15E+01
9,49E-02	1,56E+00
1,18E-01	1,61E-01
2,15E-01	3,42E-02
4,91E-02	6,13E-03
3,57E-02	1,01E-03

Buck Sw. Protection Diode Characteristics

figure 9. **FWD**

Typical forward characteristics

I_F = f(V_F)



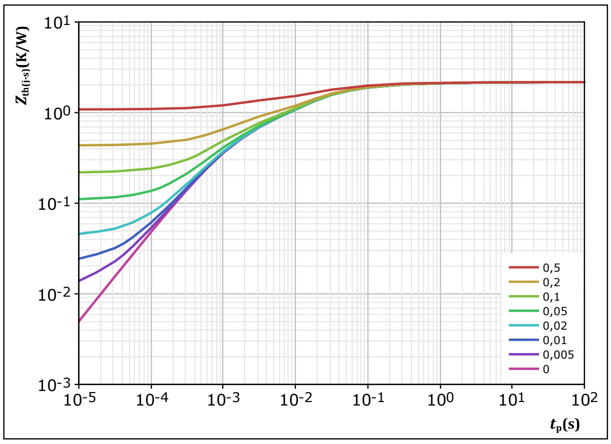
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 10. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 2,166 K/W

FWD thermal model values

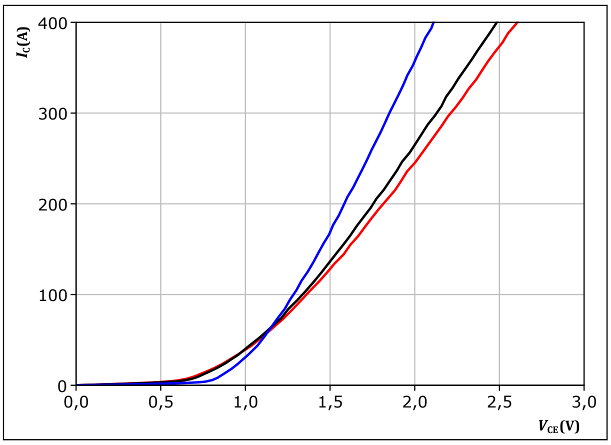
R (K/W)	τ (s)
3,45E-02	9,21E+00
1,30E-01	7,08E-01
5,36E-01	7,04E-02
9,64E-01	1,36E-02
5,02E-01	1,20E-03

Boost Switch Characteristics

figure 11. IGBT

Typical output characteristics

I_C = f(V_{CE})



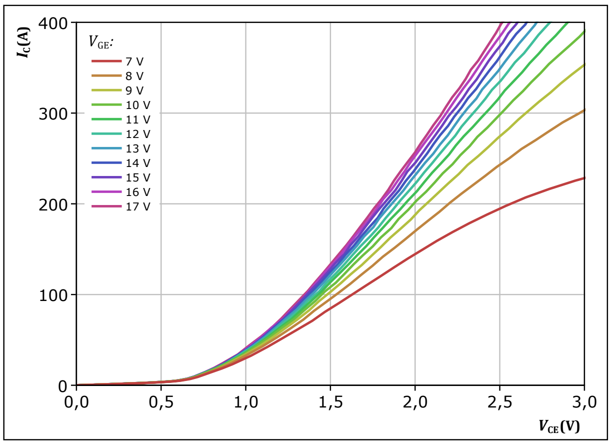
t_p = 250 µs
V_{GE} = 15 V

T_j: 25 °C, 125 °C, 150 °C

figure 12. IGBT

Typical output characteristics

I_C = f(V_{CE})

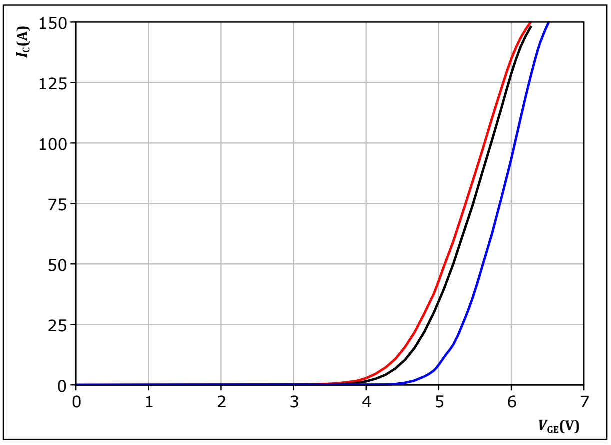


t_p = 250 µs
T_j = 150 °C
V_{GE} from 7 V to 17 V in steps of 1 V

figure 13. IGBT

Typical transfer characteristics

I_C = f(V_{GE})



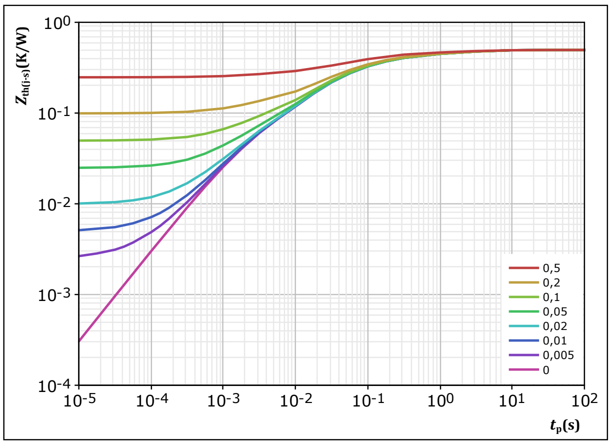
t_p = 250 µs
V_{CE} = 18 V

T_j: 25 °C, 125 °C, 150 °C

figure 14. IGBT

Transient thermal impedance as a function of pulse width

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



D = t_p / T
$R_{th(j-s)}$ = 0,496 K/W

IGBT thermal model values

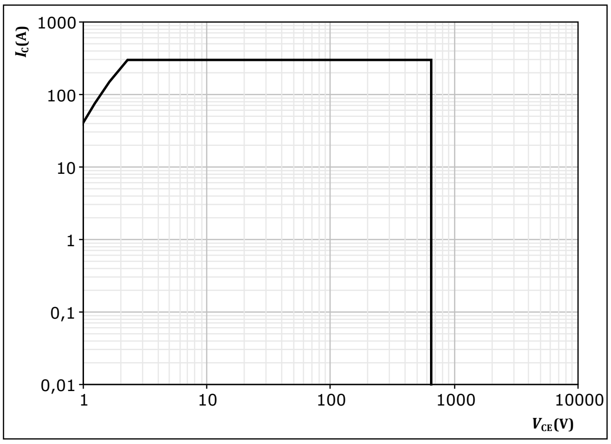
R (K/W)	τ (s)
4,21E-02	3,90E+00
7,66E-02	5,93E-01
1,73E-01	9,62E-02
1,65E-01	2,16E-02
3,90E-02	1,86E-03

Boost Switch Characteristics

figure 15. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



D = single pulse

T_s = 80 °C

V_{GE} = 15 V

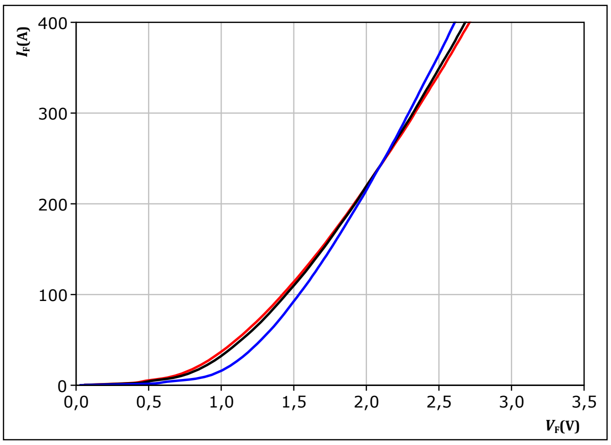
T_j = T_{jmax}

Boost Diode Characteristics

figure 16. **FWD**

Typical forward characteristics

I_F = f(V_F)



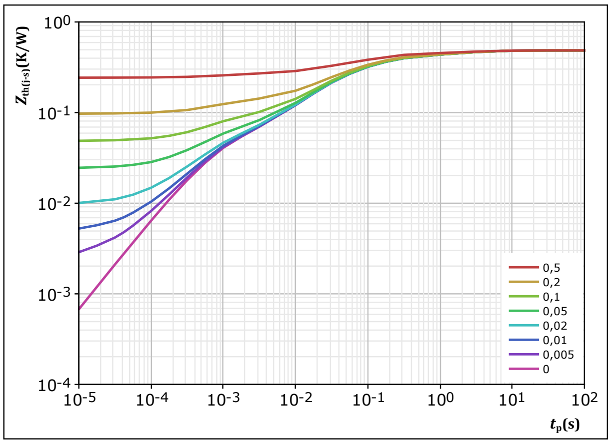
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 17. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,485 K/W

FWD thermal model values

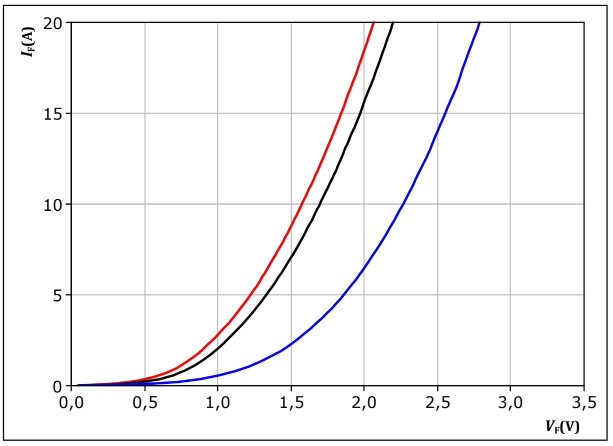
R (K/W)	τ (s)
4,75E-02	3,46E+00
6,47E-02	6,22E-01
2,09E-01	8,41E-02
1,22E-01	1,70E-02
4,15E-02	7,14E-04

Boost Sw. Protection Diode Characteristics

figure 18. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



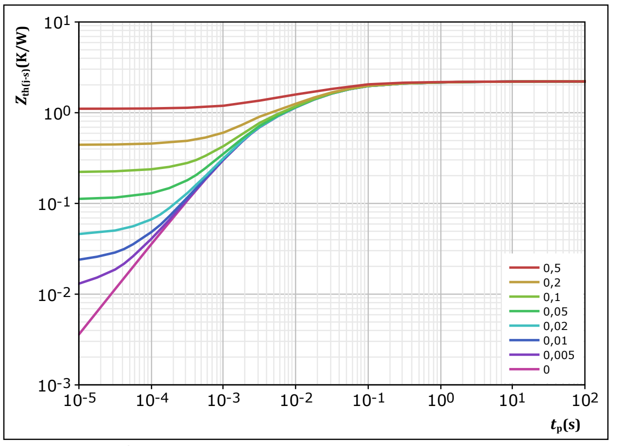
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 19. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 2,211 K/W

FWD thermal model values

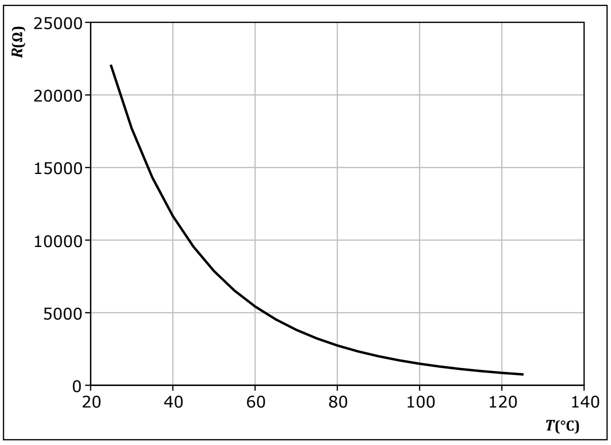
R (K/W)	τ (s)
3,45E-02	6,06E+00
9,85E-02	6,99E-01
3,23E-01	9,89E-02
1,03E+00	2,04E-02
7,22E-01	2,35E-03

Thermistor Characteristics

figure 20.	Thermistor

Typical NTC characteristic as function of temperature

R_T = f(T)

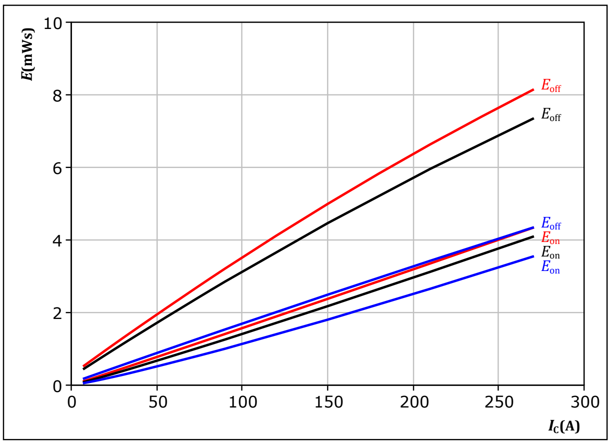


Buck Switching Characteristics

figure 21. **IGBT**

Typical switching energy losses as a function of collector current

E = f(I_C)



With an inductive load at

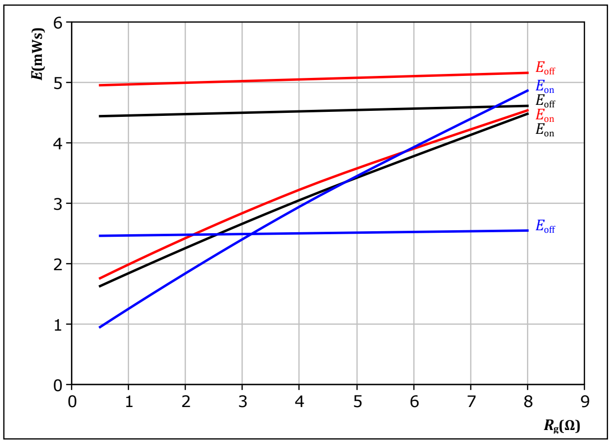
V_{CE} =	350	V	
V_{GE} =	±15	V	
R_{gon} =	2	Ω	
R_{goff} =	2	Ω	

T_j: 25 °C (blue), 125 °C (black), 150 °C (red)

figure 22. **IGBT**

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

E = f(R_g)



With an inductive load at

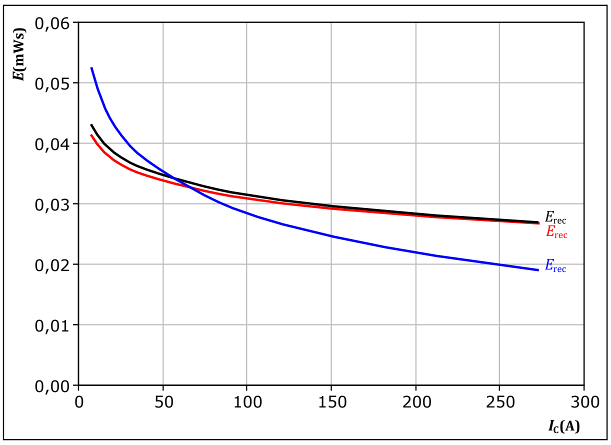
V_{CE} =	350	V	
V_{GE} =	±15	V	
I_C =	150	A	

T_j: 25 °C (blue), 125 °C (black), 150 °C (red)

figure 23. **FWD**

Typical reverse recovered energy loss as a function of collector current

E_{rec} = f(I_C)



With an inductive load at

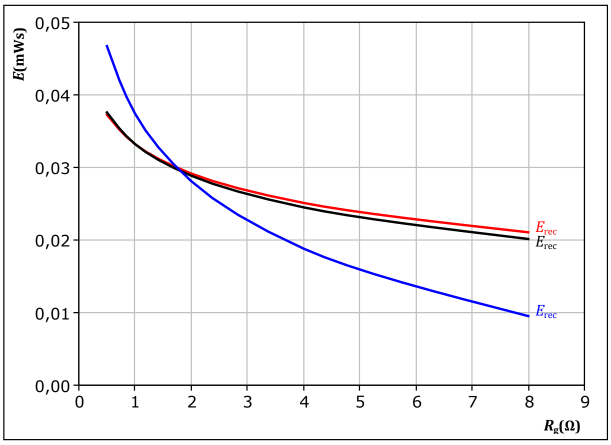
V_{CE} =	350	V	
V_{GE} =	±15	V	
R_{gon} =	2	Ω	

T_j: 25 °C (blue), 125 °C (black), 150 °C (red)

figure 24. **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} =	350	V	
V_{GE} =	±15	V	
I_C =	150	A	

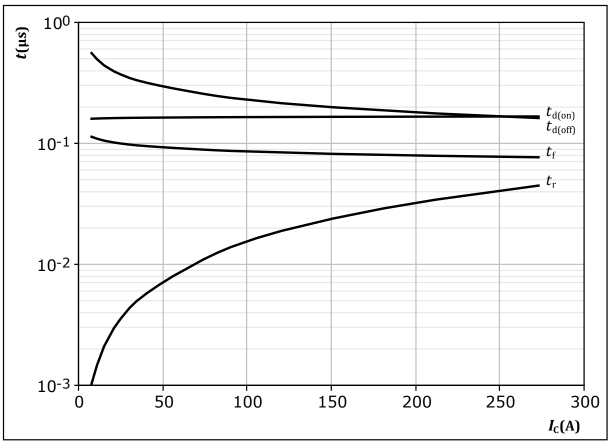
T_j: 25 °C (blue), 125 °C (black), 150 °C (red)

Buck Switching Characteristics

figure 25. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



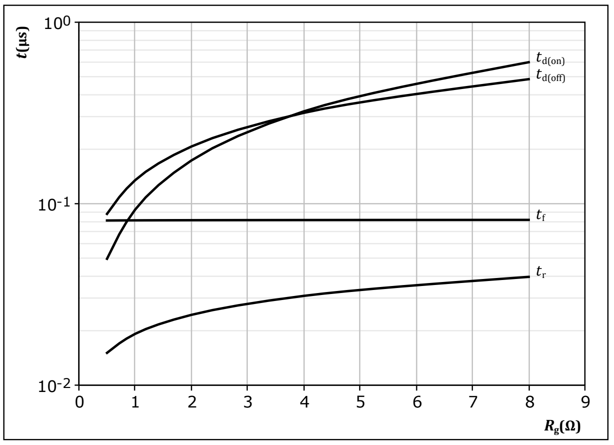
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 26. **IGBT**

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

$t = f(R_g)$



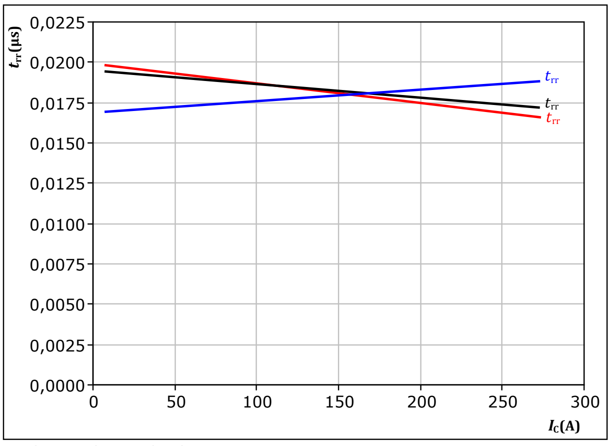
With an inductive load at

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

figure 27. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

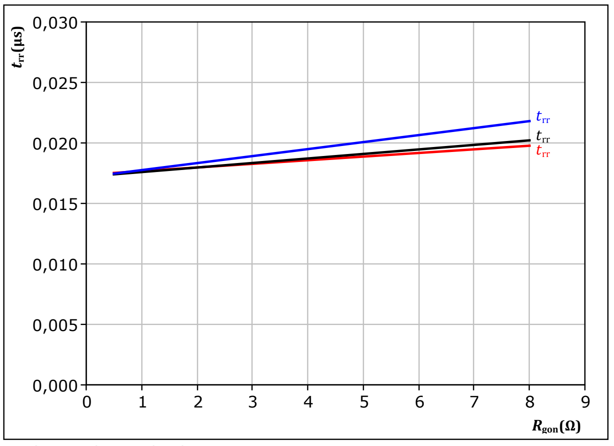
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 28. **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} =	350	V
V_{GE} =	±15	V
I_C =	150	A

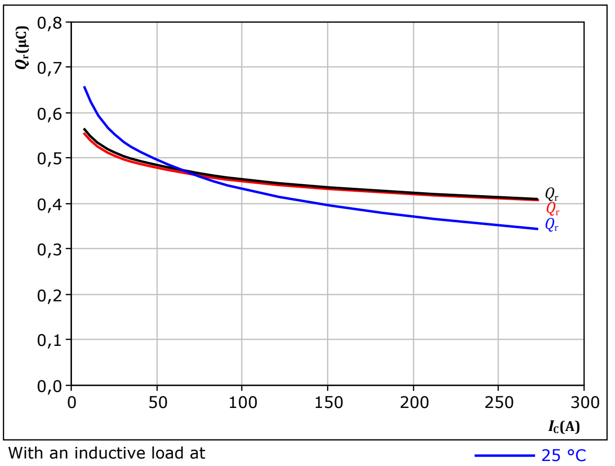
T_j: 25 °C, 125 °C, 150 °C

Buck Switching Characteristics

figure 29. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



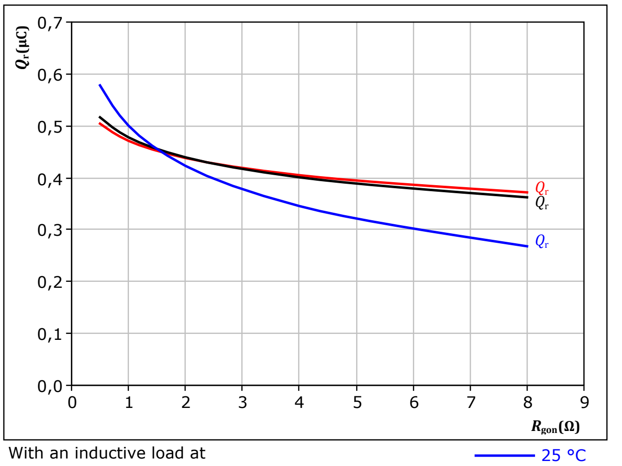
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 30. **FWD**

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

Q_r = f(R_{gon})



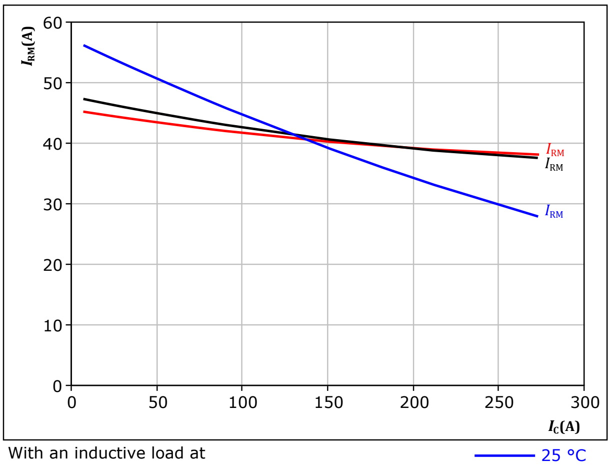
With an inductive load at

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

figure 31. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



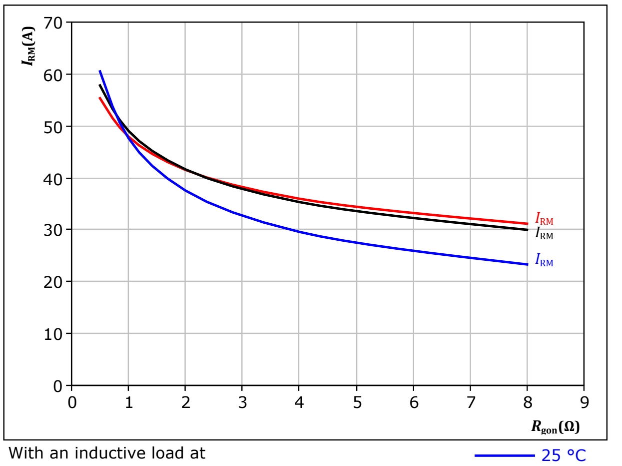
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 32. **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

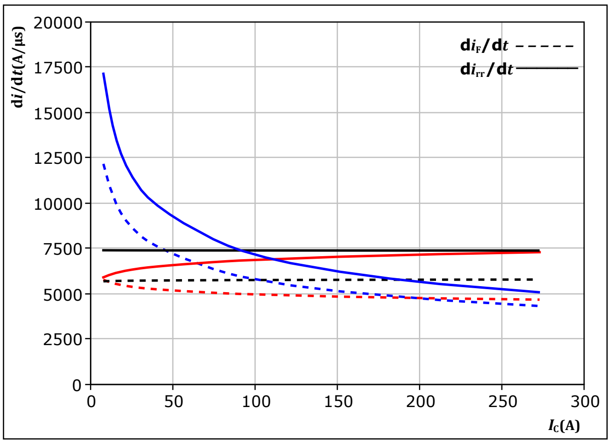
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	150	A		150 °C

Buck Switching Characteristics

figure 33. **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)



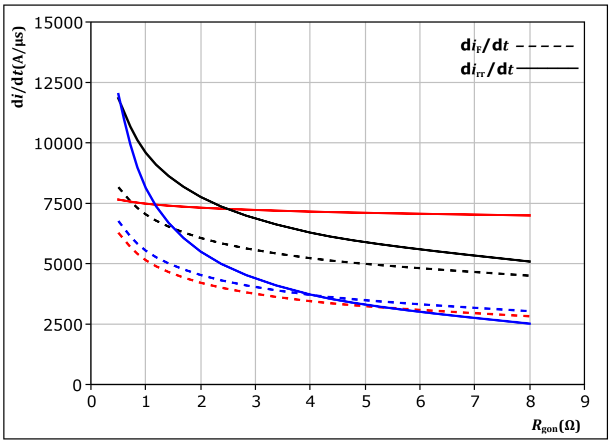
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		150 °C

figure 34. **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})



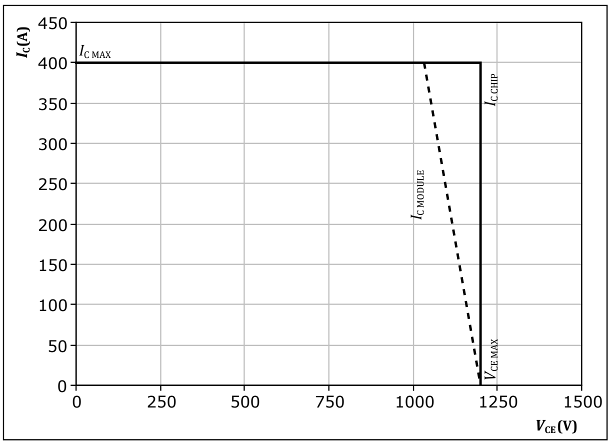
With an inductive load at

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

figure 35. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



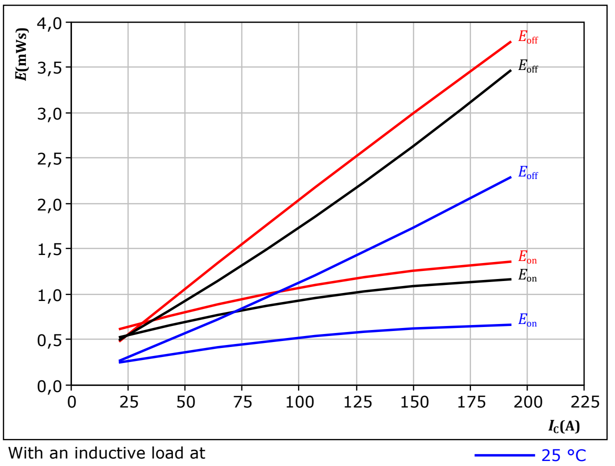
At	T_j =	150	°C
	R_{gon} =	2	Ω
	R_{goff} =	2	Ω

Boost Switching Characteristics

figure 36. 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} = 2 Ω

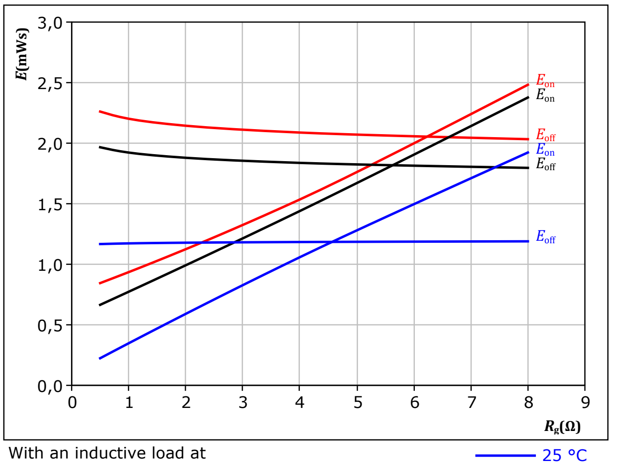
R_{goff} = 2 Ω

T_j: 25 °C, 125 °C, 150 °C

figure 37. 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} = 350 V

V_{GE} = ±15 V

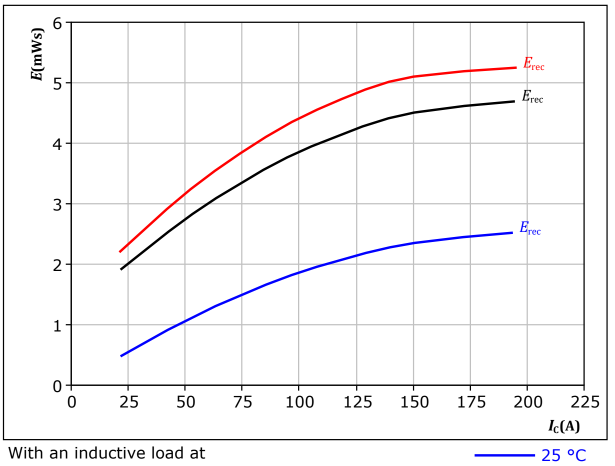
I_C = 107 A

T_j: 25 °C, 125 °C, 150 °C

figure 38. 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

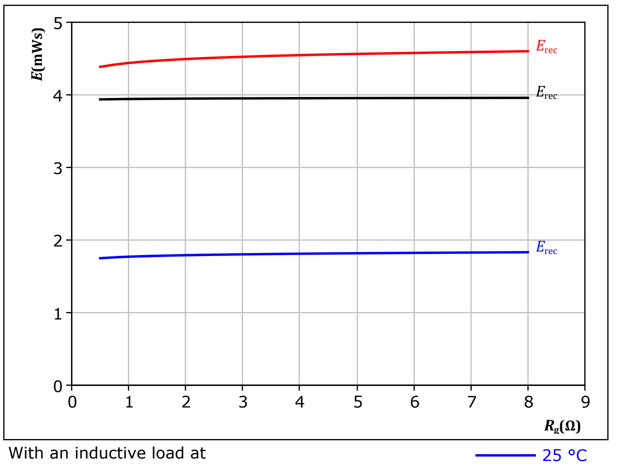
R_{gon} = 2 Ω

T_j: 25 °C, 125 °C, 150 °C

figure 39. 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} = 350 V

V_{GE} = ±15 V

I_C = 107 A

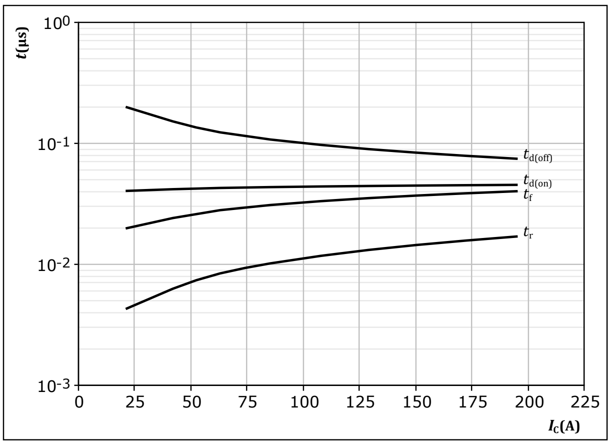
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 40. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



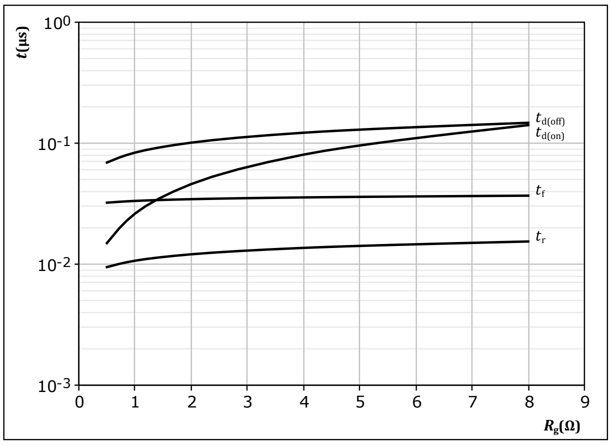
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 41. **IGBT**

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

t = f(R_g)



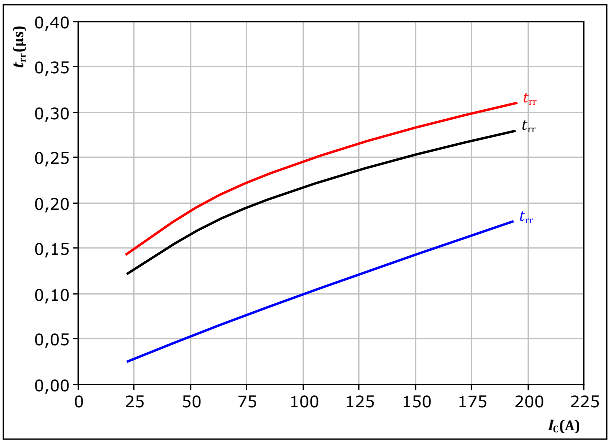
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	107	A

figure 42. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

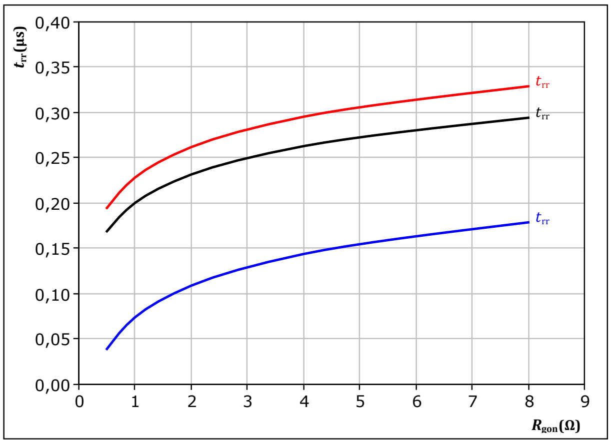
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	2	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 43. **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} =	350	V
V_{GE} =	±15	V
I_C =	107	A

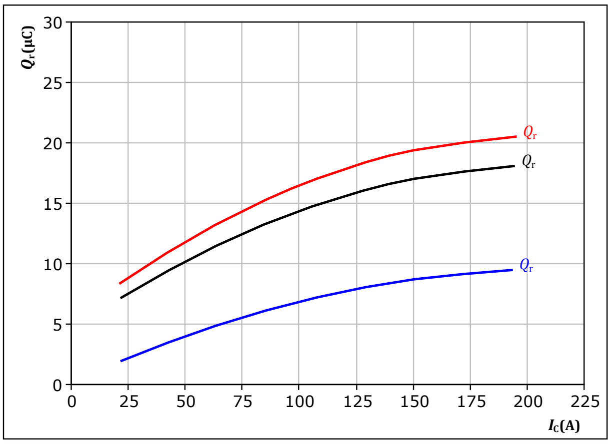
T_j: 25 °C, 125 °C, 150 °C

Boost Switching Characteristics

figure 44. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



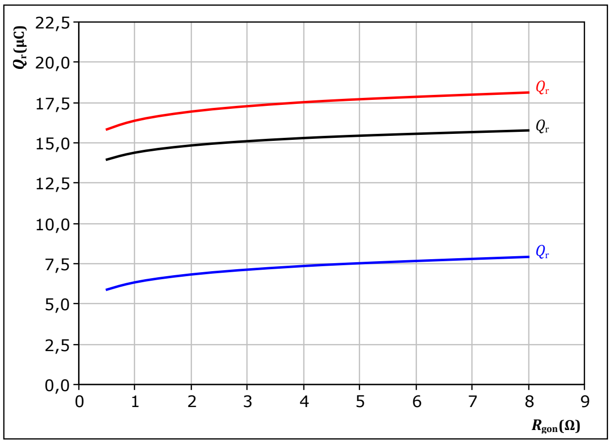
With an inductive load at

V_{CE} =	350	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
R_{gon} =	2	Ω	

figure 45. **FWD**

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

Q_r = f(R_{gon})



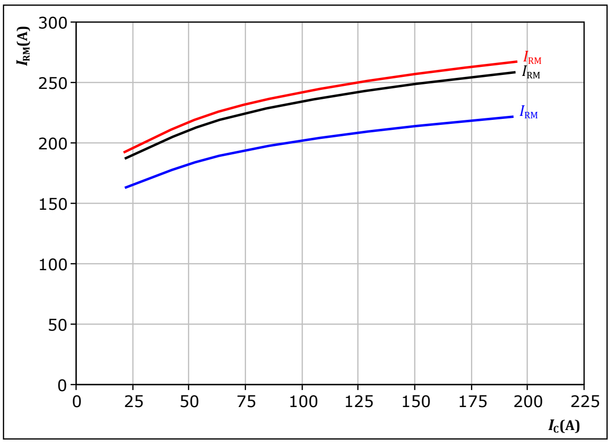
With an inductive load at

V_{CE} =	350	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
I_C =	107	A	

figure 46. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



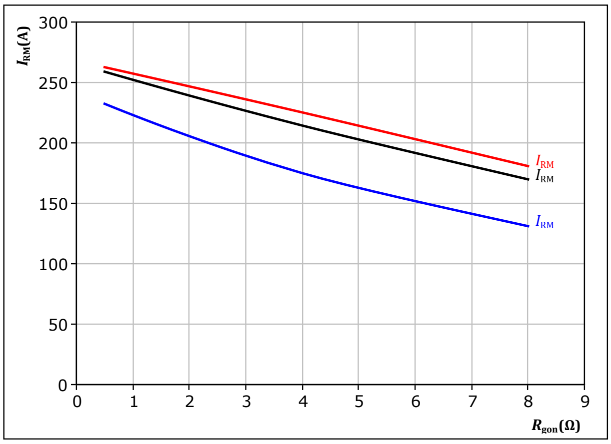
With an inductive load at

V_{CE} =	350	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
R_{gon} =	2	Ω	

figure 47. **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

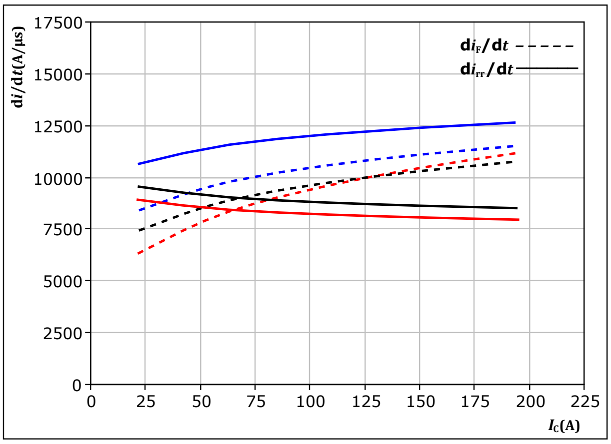
V_{CE} =	350	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
I_C =	107	A	

Boost Switching Characteristics

figure 48. **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

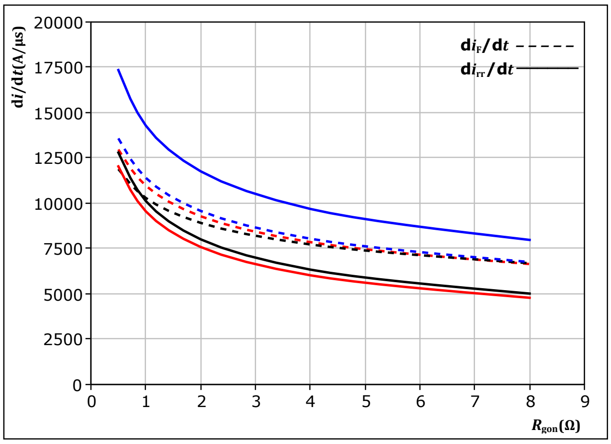
V_{CE} =	350	V	
V_{GE} =	±15	V	
R_{gon} =	2	Ω	

T_j: 25 °C, 125 °C, 150 °C

figure 49. **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

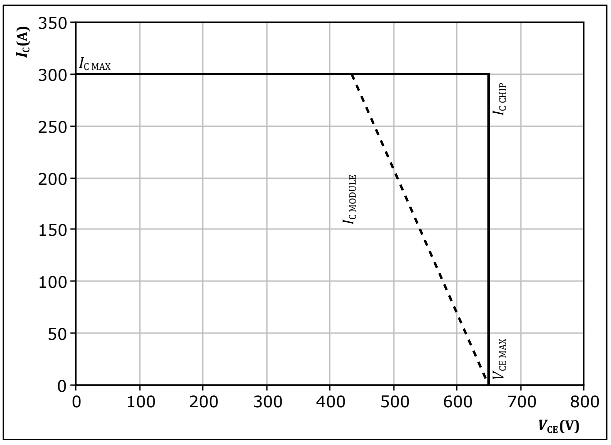
V_{CE} =	350	V	
V_{GE} =	±15	V	
I_C =	107	A	

T_j: 25 °C, 125 °C, 150 °C

figure 50. **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 51. **IGBT**

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

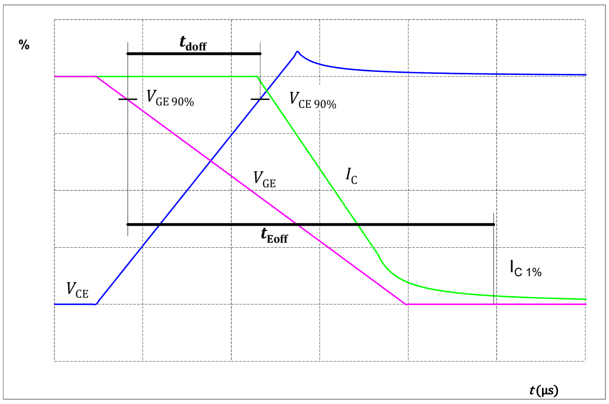


figure 52. **IGBT**

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

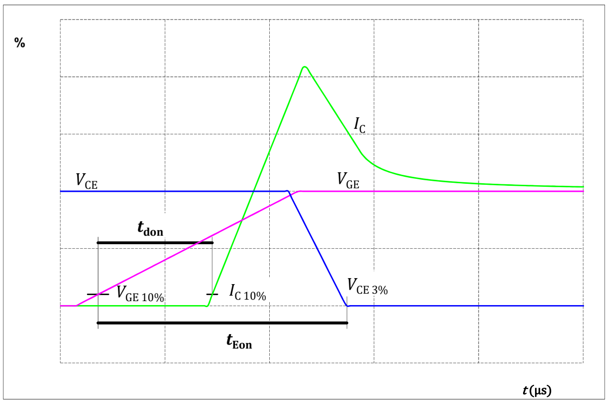


figure 53. **IGBT**

Turn-off Switching Waveforms & definition of t_f

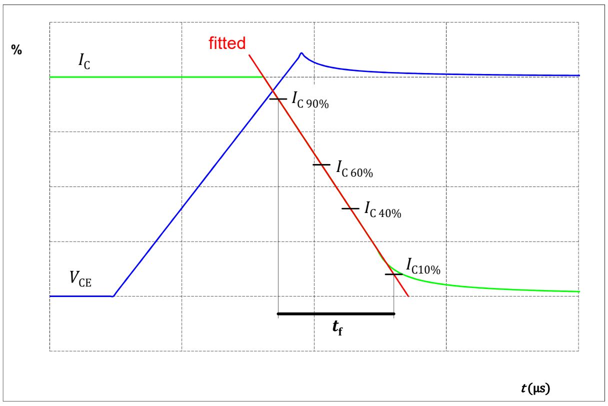
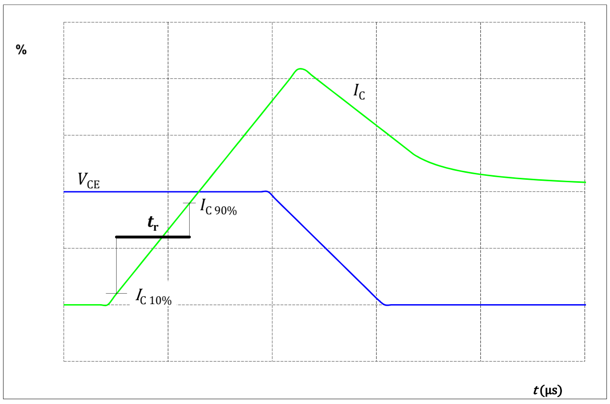


figure 54. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 55. **FWD**

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

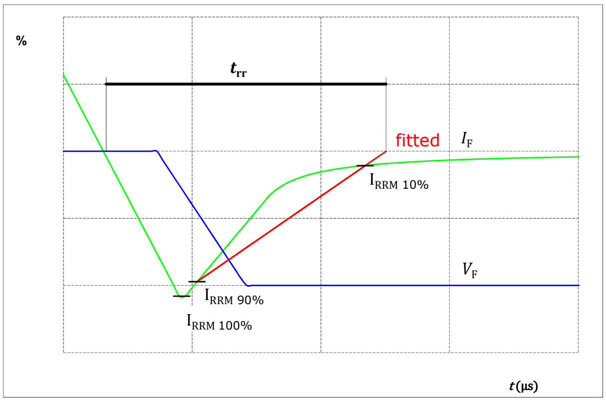
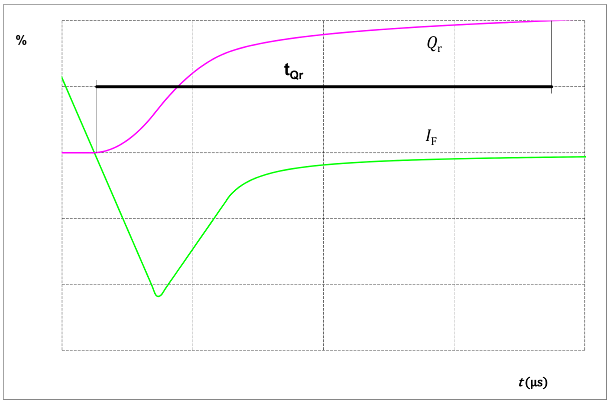


figure 56. **FWD**

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



Ordering Code

Version	Ordering Code
Without thermal paste	30-FT12NMA200H705-M660F56
With thermal paste (3,4 W/mK, PSX-P7)	30-FT12NMA200H705-M660F56-/3/

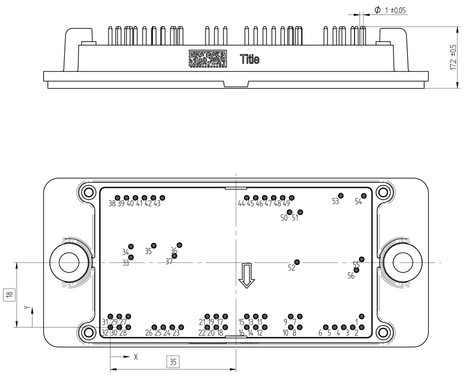
Marking

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

Outline

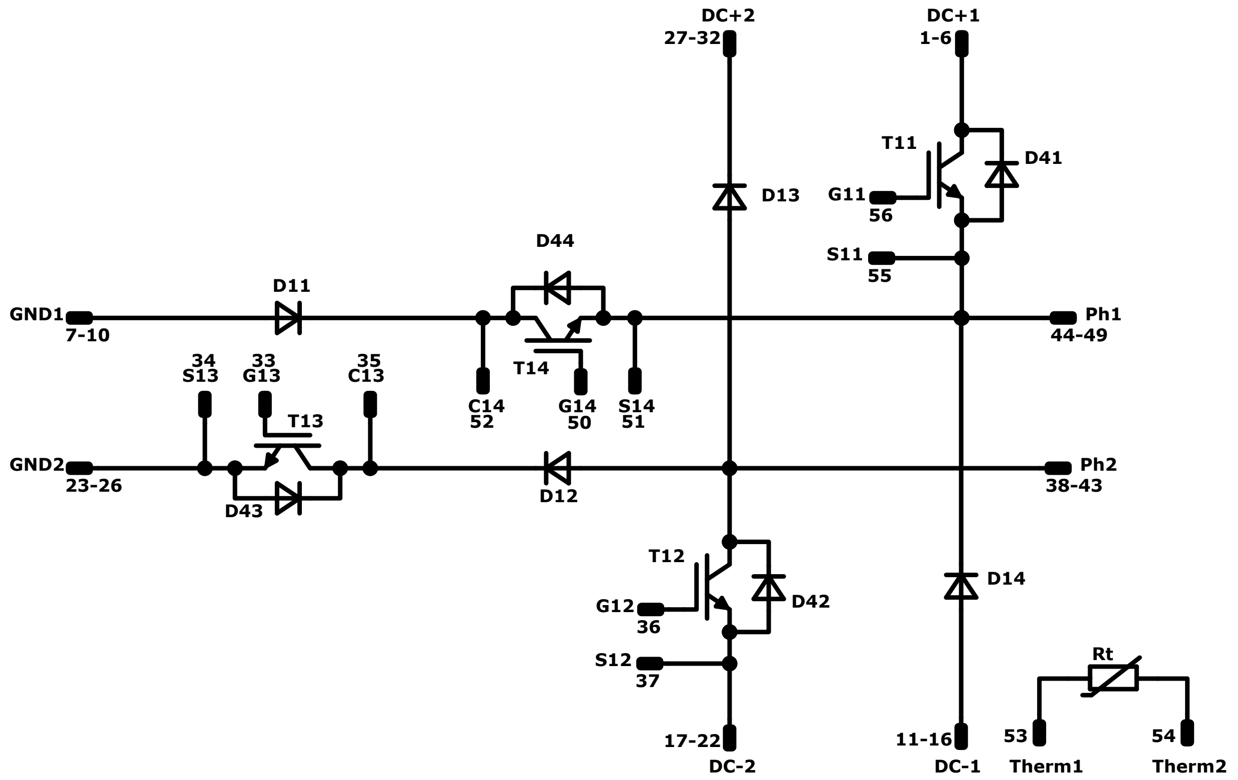
Pin table [mm]

Pin	X	Y	Function	Pin	X	Y	Function
1	70	3	DC+1	29	2,5	3	DC+2
2	70	0	DC+1	30	2,5	0	DC+2
3	67,5	0	DC+1	31	0	3	DC+2
4	65	0	DC+1	32	0	0	DC+2
5	62,5	0	DC+1	33	5,75	19,45	G13
6	60	0	DC+1	34	5,75	22,45	S13
7	52,75	3	GND1	35	12,1	22,7	C13
8	52,75	0	GND1	36	19,25	22,85	G12
9	50,25	3	GND1	37	17,85	19,85	S12
10	50,25	0	GND1	38	2	36	Ph2
11	43	3	DC-1	39	4,5	36	Ph2
12	43	0	DC-1	40	7	36	Ph2
13	40,5	3	DC-1	41	9,5	36	Ph2
14	40,5	0	DC-1	42	12	36	Ph2
15	38	3	DC-1	43	14,5	36	Ph2
16	38	0	DC-1	44	38	36	Ph1
17	32	3	DC-2	45	40,5	36	Ph1
18	32	0	DC-2	46	43	36	Ph1
19	29,5	3	DC-2	47	45,5	36	Ph1
20	29,5	0	DC-2	48	48	36	Ph1
21	27	3	DC-2	49	50,5	36	Ph1
22	27	0	DC-2	50	49,9	32	G14
23	19,75	0	GND2	51	52,9	32	S14
24	17,25	0	GND2	52	52	18,1	C14
25	14,75	0	GND2	53	64,2	36,6	Therm1
26	12,25	0	GND2	54	70,6	36,55	Therm2
27	5	3	DC+2	55	70	18,9	S11
28	5	0	DC+2	56	68,55	15,9	G11



Tolerance of pinpositions ±0,5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	1200 V	200 A	Buck Switch	
D11, D12	FWD	650 V	120 A	Buck Diode	
D41, D42	FWD	1200 V	8 A	Buck Sw. Protection Diode	
T13, T14	IGBT	650 V	150 A	Boost Switch	
D13, D14	FWD	1200 V	150 A	Boost Diode	
D43, D44	FWD	650 V	8 A	Boost Sw. Protection Diode	
Rt	Thermistor			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 36	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 2 packages see vincotech.com website.

Package data
Package data for *flow* 2 packages see vincotech.com website.

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

UL recognition and file number
This device is UL 1557 recognized under E192116 up to a junction temperature under switching condition $T_{j,op}$=175°C and up to 3500VAC/1min isolation voltage. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
30-FT12NMA200H705-M660F56-D1-14	5 Mar. 2026	Initial Release	