70-W212NMA600M7-LC09F71
datasheet

VINcoMNPC X4 **1200 V / 600 A**

Topology features

- Common Emitter configuration
- Desaturation Pins
- Mixed Voltage Neutral Point Clamped Topology (T-Type)
- On-board Capacitors
- Temperature sensor

Component features

- Easy paralleling
- Low turn-off losses
- Low collector emitter saturation voltage
- Positive temperature coefficient
- Short tail current
- Switching optimized for EMC

Housing features

- Base isolation: Al_2O_3
- Optimized for three-level topologies
- Enables high switching frequencies
- Low inductive package
- Easy paralleling
- Optimal current sharing
- Thermo-mechanical push-and-pull force relief
- M6 High Power Screw Contact
- M4 Low Inductive Interface
- Press-fit connection to driver PCB

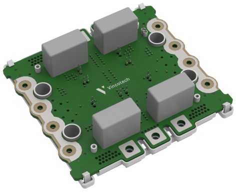
Target applications

- Solar Inverters
- UPS

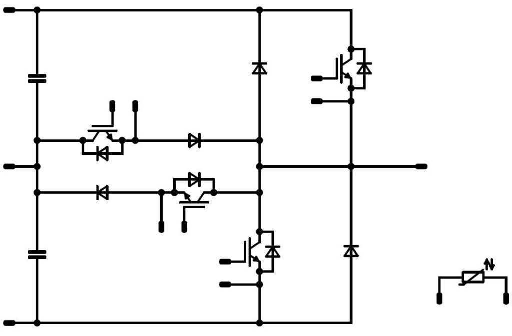
Types

- 70-W212NMA600M7-LC09F71

VINco X4 12 mm housing



Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Buck Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	475	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	819	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	9,5	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	352	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	475	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	35	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		40	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	77	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}	Relative moisture level	≤ 50% > 50%	650 500	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	468	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		1200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	625	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	9	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	338	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	511	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	48	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		80	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	84	W
Maximum junction temperature	T_{jmax}			175	°C
Capacitor (DC)					
Maximum DC voltage	V_{MAX}			630	V
Operation Temperature	T_{op}			-40 … 105	°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
Maximum allowed PCB temperature	T_{PCB}			125	°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	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 Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$			10	0,06	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		600	25 125 150		1,58 1,8 1,86	1,85(1)	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			400	µA
Gate-emitter leakage current	I_{GES}		20	0		25			2000	nA
Internal gate resistance	r_g							0,75		Ω
Input capacitance	C_{ies}							120000		pF
Output capacitance	C_{oes}		0	10		25		3520		pF
Reverse transfer capacitance	C_{res}							1280		pF
Gate charge	Q_g	V_{CC} = 600 V	0/15		600	25		4000		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,12		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$					25 125		458 472		ns
Rise time	t_r	R_{gon} = 1 Ω R_{goff} = 1 Ω				25 125		76 89		ns
Turn-off delay time	$t_{d(off)}$		±15	350	600	25 125		360 386		ns
Fall time	t_f					25 125		62,1 84,31		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=45,44 µC Q_{rFWD}=83,52 µC				25 125		28,01 38,42		mWs
Turn-off energy (per pulse)	E_{off}					25 125		24,43 31,55		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				600	25 125 150		1,62 1,63 1,64	1,85(1)	V
Reverse leakage current	I_R	V_r = 650 V				25			200	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,2		K/W
Dynamic										
Peak recovery current	I_{RM}	di/dt=10600 A/µs di/dt=4275 A/µs	±15	350	600	25 125		321,31 348,23		A
Reverse recovery time	t_{rr}					25 125		353,62 631,4		ns
Recovered charge	Q_r					25 125		45,44 83,52		µC
Reverse recovered energy	E_{rec}					25 125		10,47 20,26		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		3597 2787		A/µs

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Values Min	Typ	Max	Unit
Buck Sw. Protection Diode										
Static										
Forward voltage	V_F				20	25 125 150		1,61 1,69 1,7	1,9(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25			50	μA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,23		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	$V_{GE(th)}$			10	0,06	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		600	25 125 150		1,37 1,43 1,45	1,6(1)	V
Collector-emitter cut-off current	I_{CES}		0	650		25			200	µA
Gate-emitter leakage current	I_{GES}		20	0		25			800	nA
Internal gate resistance	r_g							1		Ω
Input capacitance	C_{ies}		0	10		25		76000		pF
Output capacitance	C_{oes}							3280		pF
Reverse transfer capacitance	C_{res}							1400		pF
Gate charge	Q_g	V_{CC} = 300 V	15		600	25		2480		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,15		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 1 Ω R_{goff} = 1 Ω	±15	350	600	25 125		324 333		ns
Rise time	t_r					25 125		65 82		ns
Turn-off delay time	$t_{d(off)}$					25 125		284 309		ns
Fall time	t_f					25 125		69,98 82,78		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=56,27 µC Q_{rFWD}=73,47 µC				25 125		18,5 27,76		mWs
Turn-off energy (per pulse)	E_{off}					25 125		22,3 29,76		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				600	25 125 150		1,8 1,9 1,9	2,1(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25			160	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,19		K/W
Dynamic										
Peak recovery current	I_{RM}	d*i*/d*t*=11600 A/µs d*i*/d*t*=5938 A/µs	±15	350	600	25 125		408,32 397,79		A
Reverse recovery time	t_{rr}					25 125		334,88 476,52		ns
Recovered charge	Q_r					25 125		56,27 73,47		µC
Reverse recovered energy	E_{rec}					25 125		13,77 17,42		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		4382 2758		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				40	25 125 150	1,23	1,74 1,65 1,61	1,87(1)	V
Reverse leakage current	I_R	V_r = 650 V				25			0,48	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,14		K/W
Capacitor (DC)										
Static										
Capacitance	C	DC bias voltage = 0 V				25		1360		nF
Tolerance							-10		10	%
Dissipation factor									0,04	%
Climatic category								40/105/56		%
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					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	

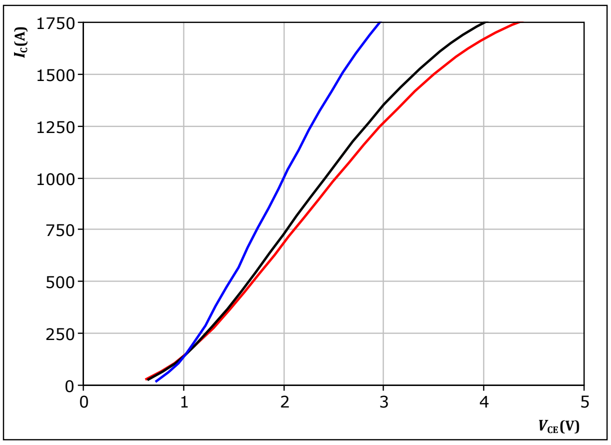
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Buck Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

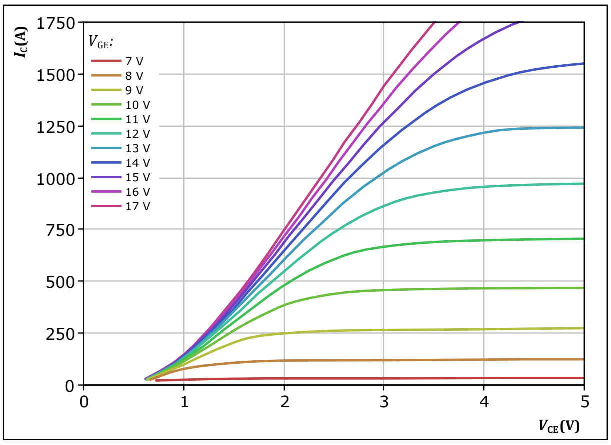


t_p =	250	μs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



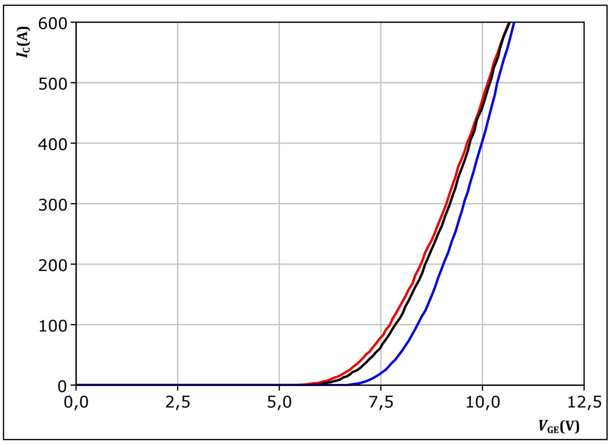
t_p =	250	μs
T_j =	150	°C

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

figure 3. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})

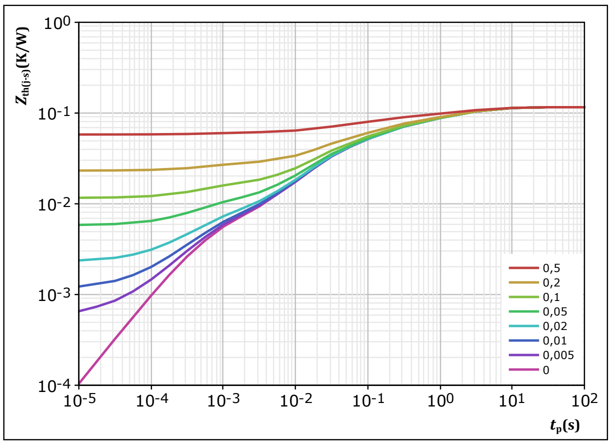


t_p =	250	μs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,116	K/W

IGBT thermal model values

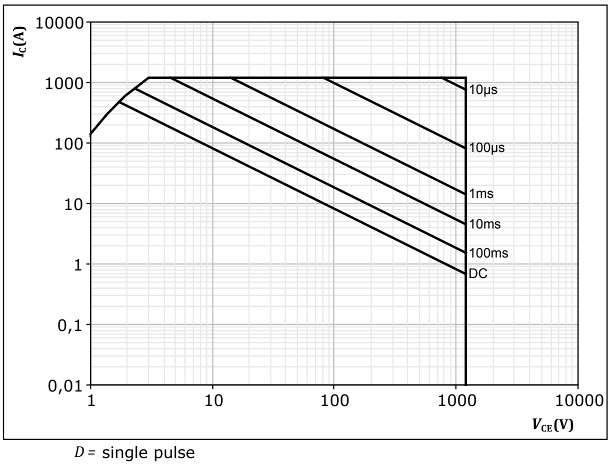
R (K/W)	τ (s)
1,98E-02	4,58E+00
3,00E-02	1,08E+00
3,39E-02	1,49E-01
2,73E-02	2,18E-02
4,89E-03	5,44E-04

Buck Switch Characteristics

figure 5. **IGBT**

Safe operating area

I_C = f(V_{CE})



D = single pulse

T_s = 80 °C

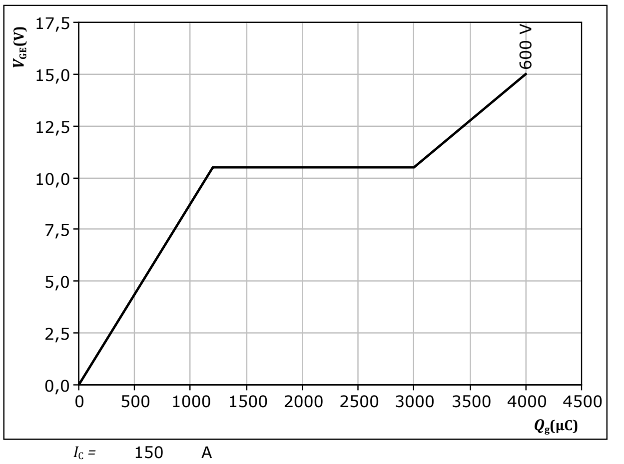
V_{GE} = 15 V

T_j = T_{jmax}

figure 6. **IGBT**

Gate voltage vs gate charge

V_{GE} = f(Q_g)



I_C = 150 A

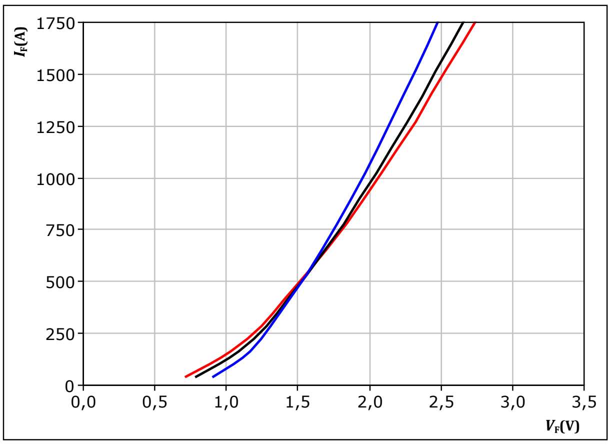
T_j = 25 °C

Buck Diode Characteristics

figure 7. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



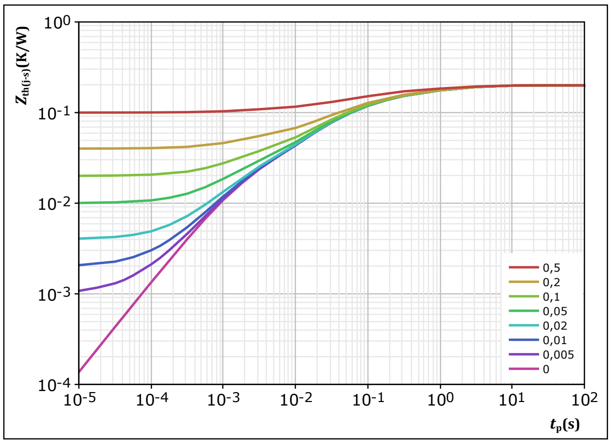
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 8. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,2 K/W

FWD thermal model values

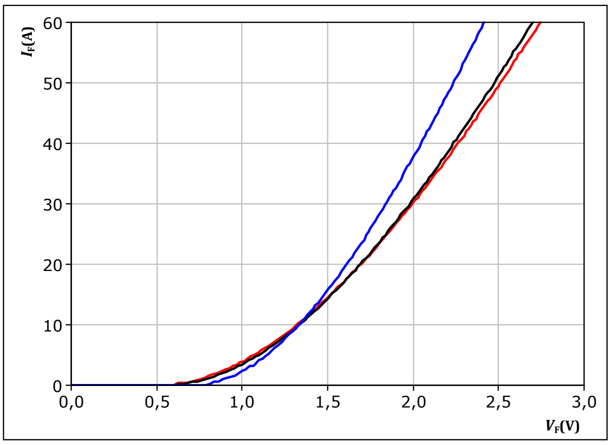
R (K/W)	τ (s)
1,88E-02	3,84E+00
4,51E-02	6,36E-01
7,10E-02	9,33E-02
4,92E-02	1,96E-02
1,59E-02	1,53E-03

Buck Sw. Protection Diode Characteristics

figure 9. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



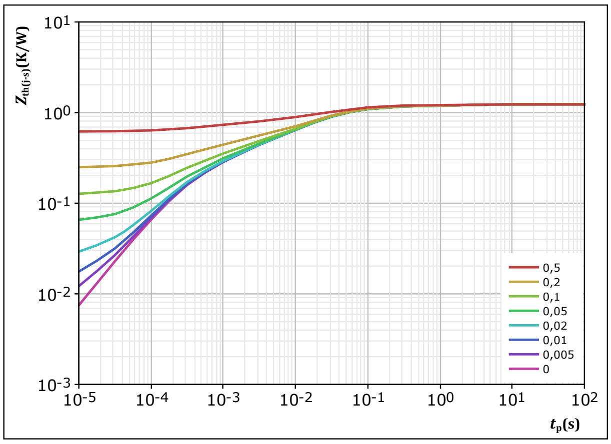
t_p = 250 μs

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

$R_{th(j-s)}$ = 1,234 K/W

FWD thermal model values

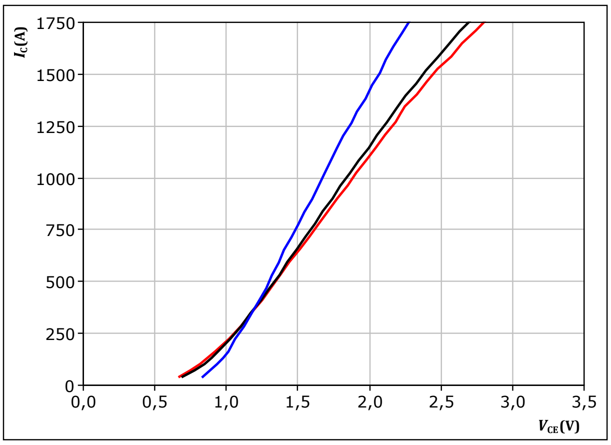
R (K/W)	τ (s)
6,37E-02	2,41E+00
2,23E-01	9,36E-02
5,35E-01	2,00E-02
2,37E-01	2,21E-03
1,75E-01	2,82E-04

Boost Switch Characteristics

figure 11. IGBT

Typical output characteristics

I_C = f(V_{CE})

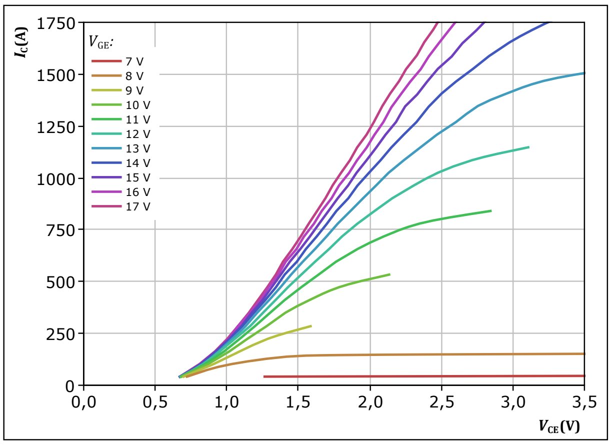


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 12. IGBT

Typical output characteristics

I_C = f(V_{CE})



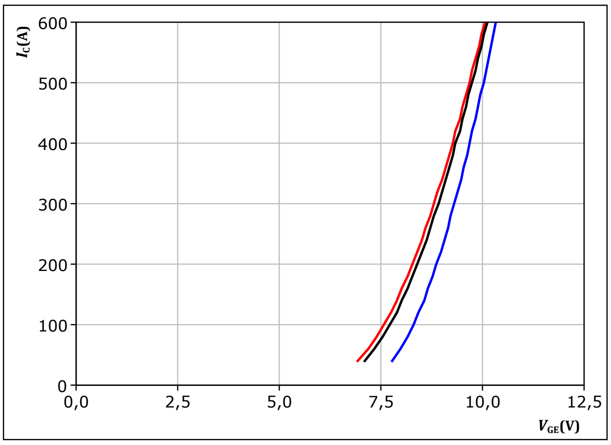
t_p =	250	µs
T_j =	150	°C

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

figure 13. IGBT

Typical transfer characteristics

I_C = f(V_{GE})

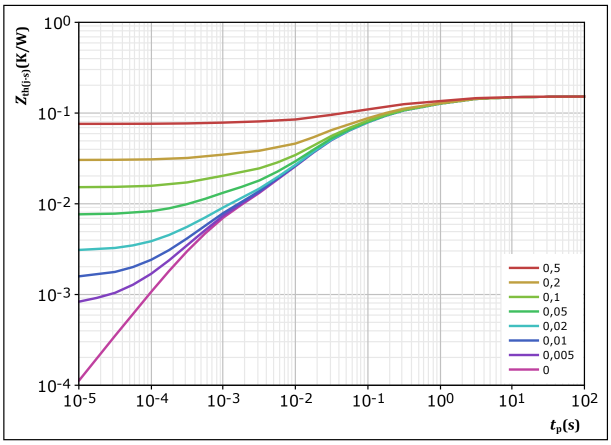


t_p =	250	µs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 14. IGBT

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,152	K/W

IGBT thermal model values

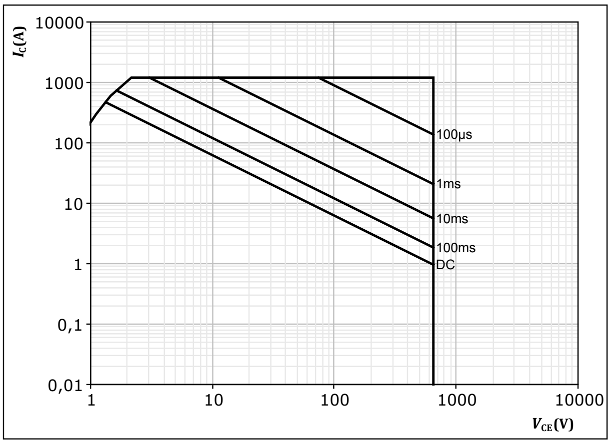
R (K/W)	τ (s)
9,58E-03	8,37E+00
4,22E-02	1,07E+00
5,54E-02	1,25E-01
3,88E-02	2,00E-02
6,10E-03	6,89E-04

Boost Switch Characteristics

figure 15. **IGBT**

Safe operating area

I_C = f(V_{CE})

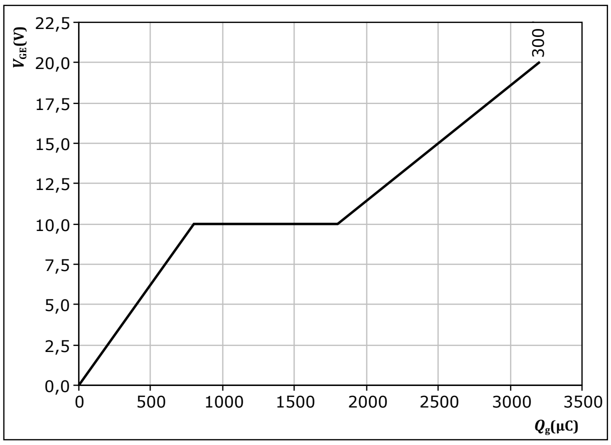


D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

figure 16. **IGBT**

Gate voltage vs gate charge

V_{GE} = f(Q_g)



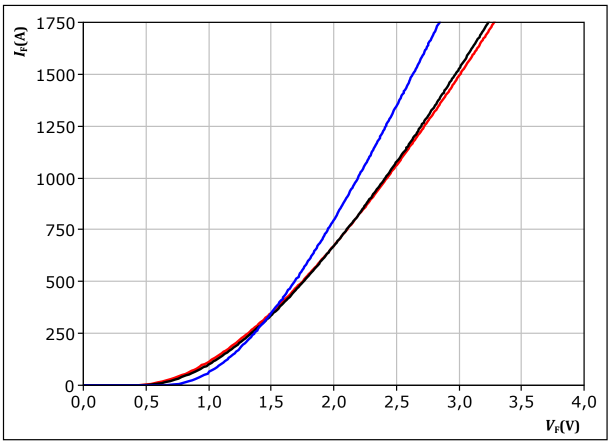
I_C =		A
T_j =	25	°C

Boost Diode Characteristics

figure 17. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



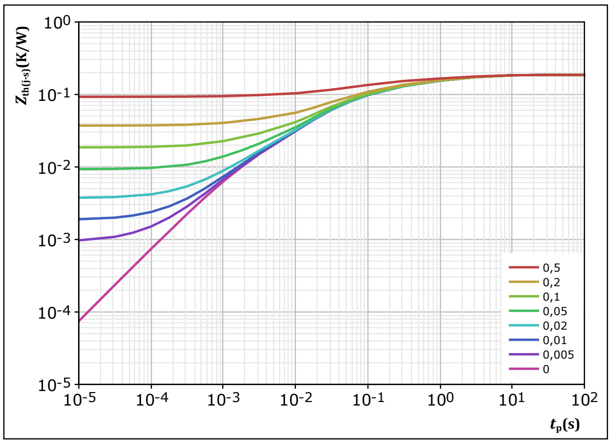
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 18. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,186 K/W

FWD thermal model values

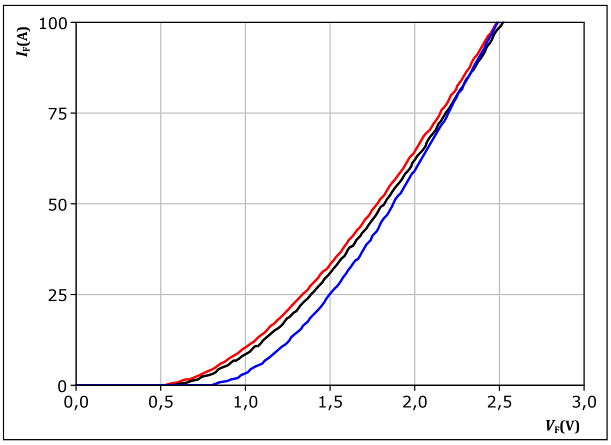
R (K/W)	τ (s)
2,79E-02	3,85E+00
4,32E-02	6,60E-01
5,97E-02	1,04E-01
4,70E-02	2,25E-02
8,15E-03	1,69E-03

Boost Sw. Protection Diode Characteristics

figure 19. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



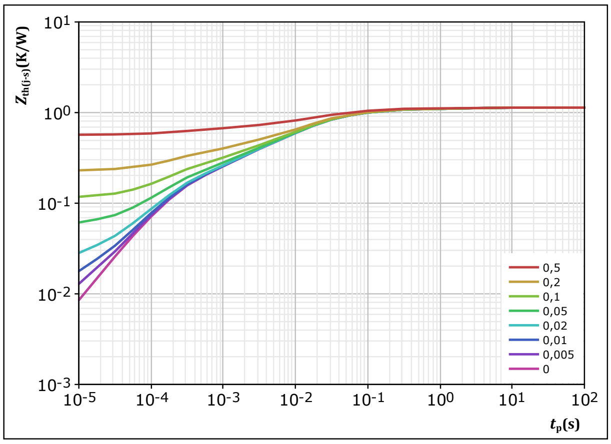
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 20. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,135 K/W

FWD thermal model values

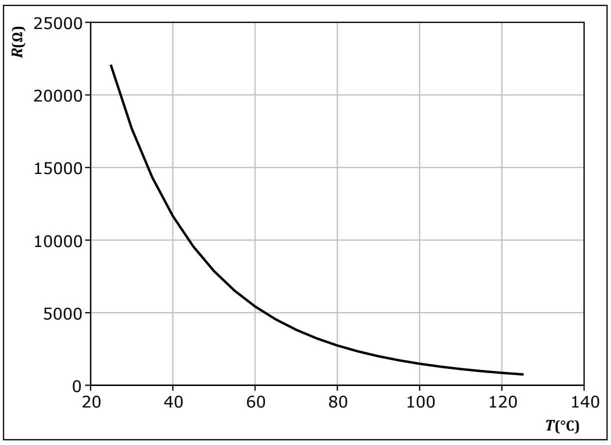
R (K/W)	τ (s)
5,28E-02	2,41E+00
2,30E-01	9,67E-02
5,00E-01	1,70E-02
1,99E-01	2,18E-03
1,53E-01	2,04E-04

Thermistor Characteristics

figure 21.	Thermistor

Typical NTC characteristic as function of temperature

R_T = f(T)

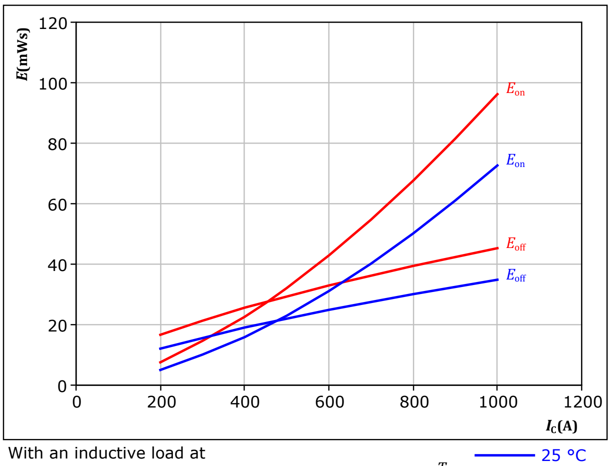


Buck Switching Characteristics

figure 22. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



With an inductive load at

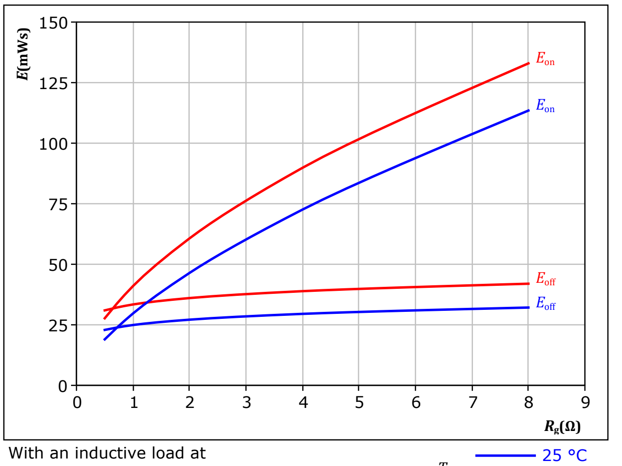
V_{CE} =	350	V	
V_{GE} =	±15	V	
R_{gon} =	1	Ω	
R_{goff} =	1	Ω	

T_j: 25 °C (blue), 125 °C (red)

figure 23. **IGBT**

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

$E = f(R_g)$



With an inductive load at

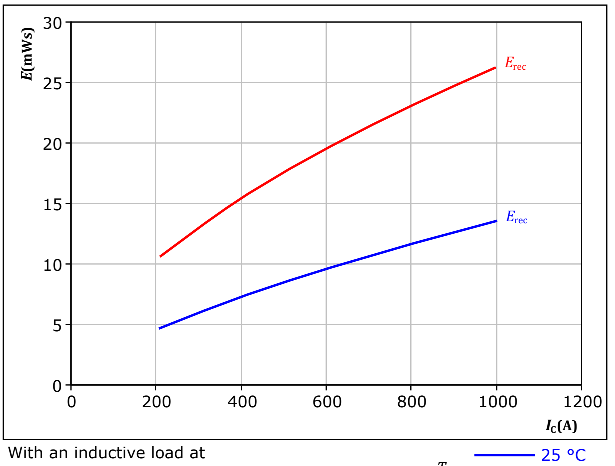
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	600	A

T_j: 25 °C (blue), 125 °C (red)

figure 24. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



With an inductive load at

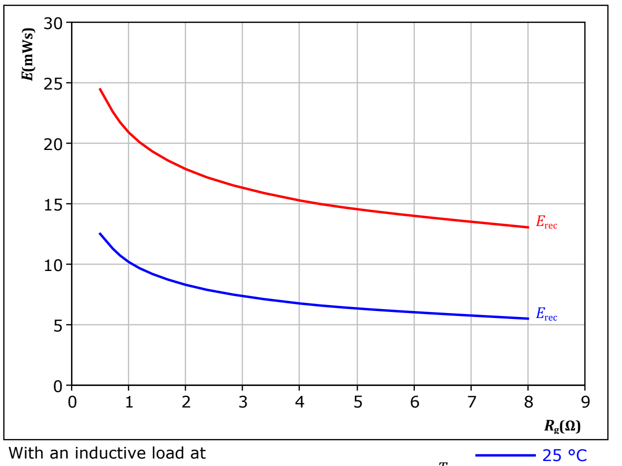
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	1	Ω

T_j: 25 °C (blue), 125 °C (red)

figure 25. **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 =	600	A

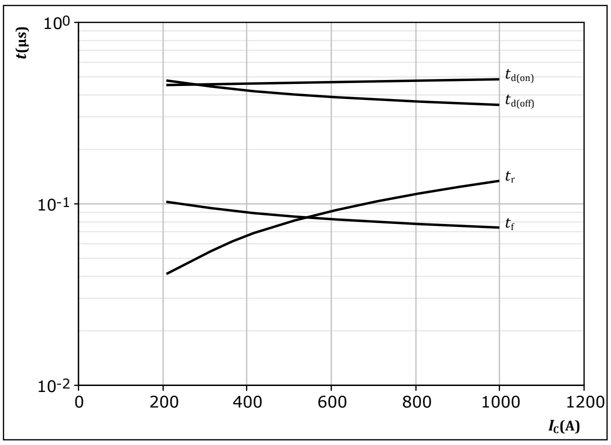
T_j: 25 °C (blue), 125 °C (red)

Buck Switching Characteristics

figure 26. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



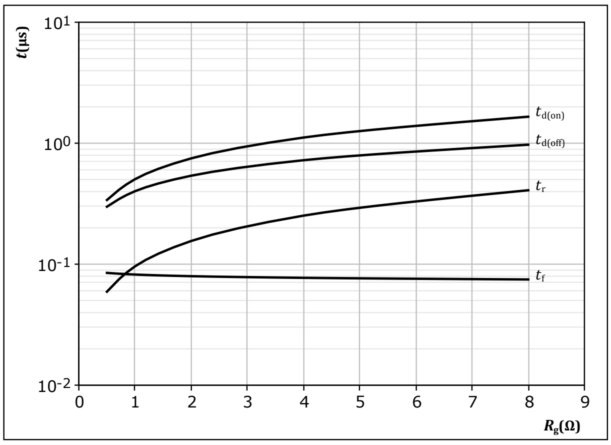
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	1	Ω
R_{goff} =	1	Ω

figure 27. **IGBT**

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

t = f(R_g)



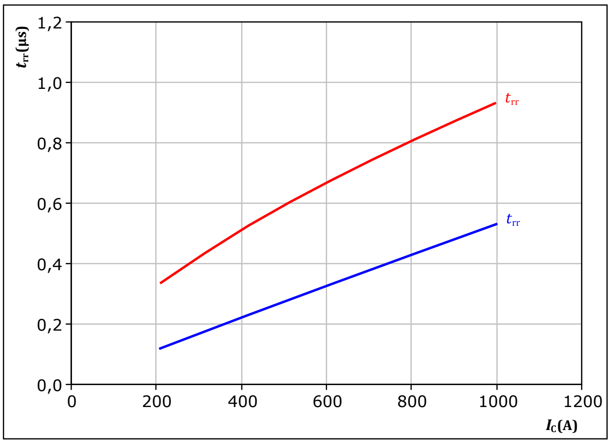
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	600	A

figure 28. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

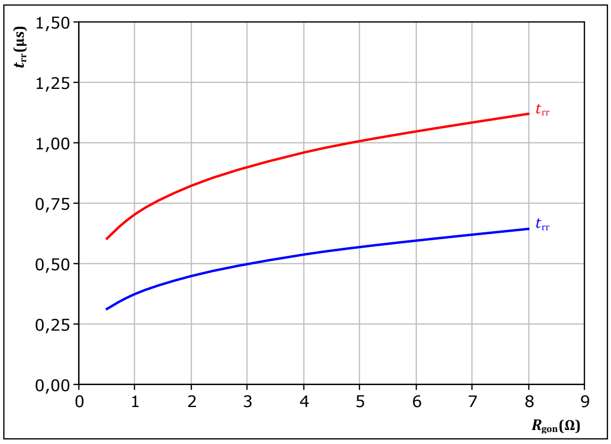
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	1	Ω

T_j: 25 °C, 125 °C

figure 29. **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 =	600	A

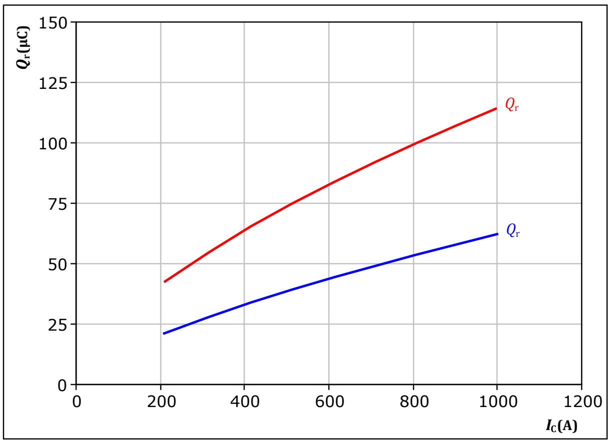
T_j: 25 °C, 125 °C

Buck Switching Characteristics

figure 30. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



With an inductive load at

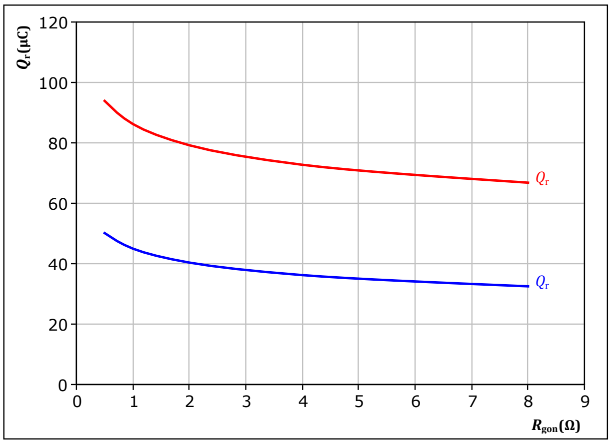
T_j: 25 °C / 125 °C

V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	1	Ω

figure 31. **FWD**

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

Q_r = f(R_{gon})



With an inductive load at

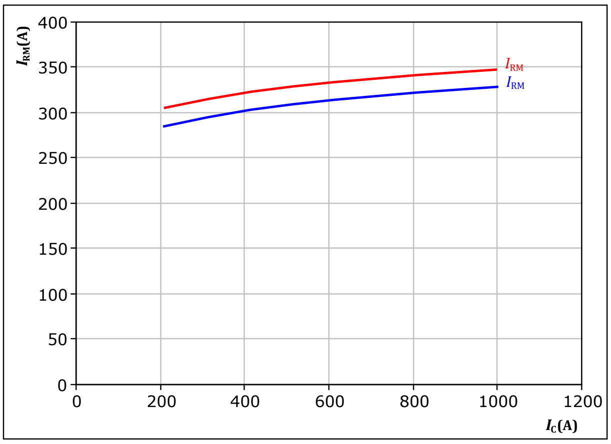
T_j: 25 °C / 125 °C

V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	600	A

figure 32. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



With an inductive load at

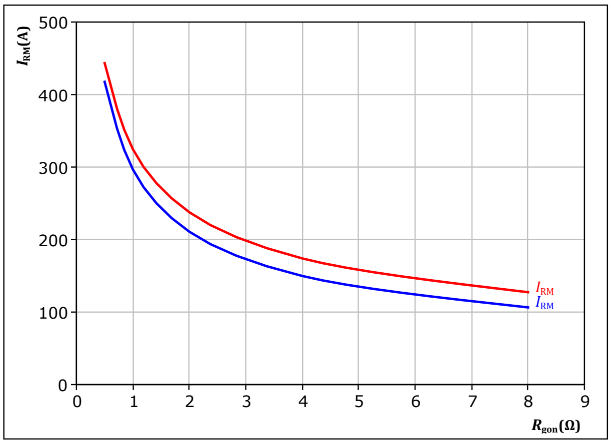
T_j: 25 °C / 125 °C

V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	1	Ω

figure 33. **FWD**

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

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



With an inductive load at

T_j: 25 °C / 125 °C

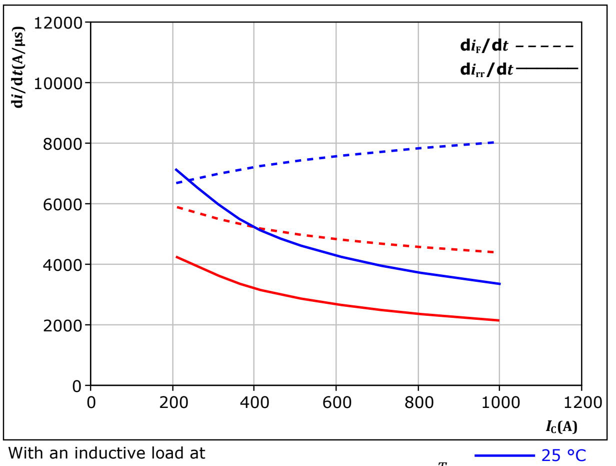
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	600	A

Buck Switching Characteristics

figure 34. **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

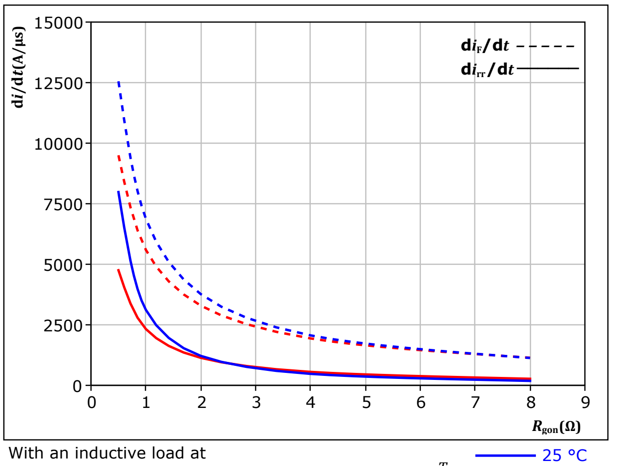
V_{CE} =	350	V	
V_{GE} =	±15	V	
R_{gon} =	1	Ω	

T_j: 25 °C, 125 °C

figure 35. **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

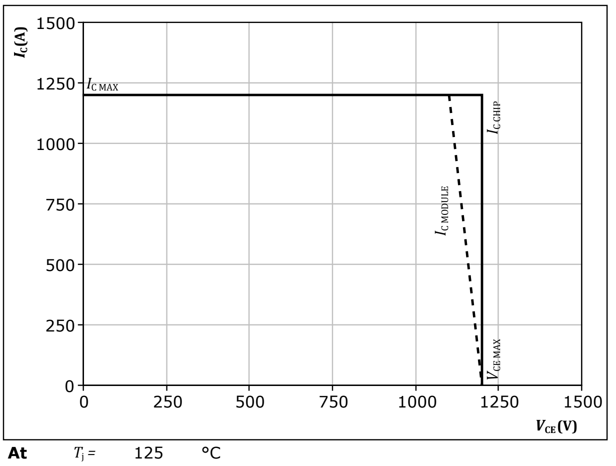
V_{CE} =	350	V	
V_{GE} =	±15	V	
I_C =	600	A	

T_j: 25 °C, 125 °C

figure 36. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



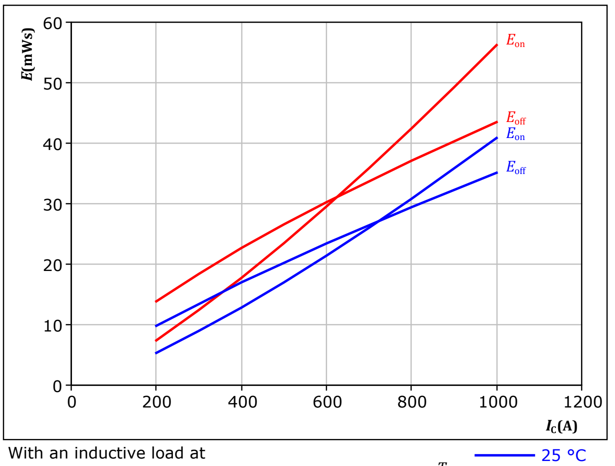
At			
	T_j =	125	°C
	R_{gon} =	1	Ω
	R_{goff} =	1	Ω

Boost Switching Characteristics

figure 37. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



With an inductive load at

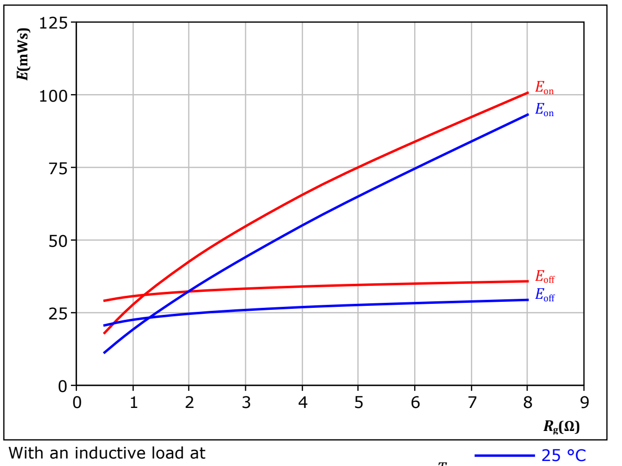
T_j: 25 °C / 125 °C

V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	1	Ω
R_{goff} =	1	Ω

figure 38. **IGBT**

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

$E = f(R_g)$



With an inductive load at

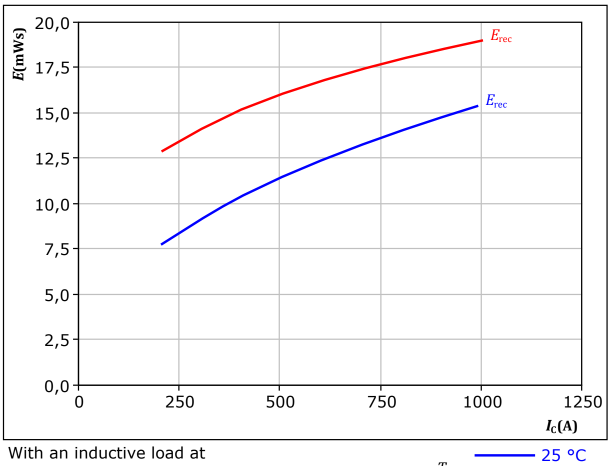
T_j: 25 °C / 125 °C

V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	600	A

figure 39. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



With an inductive load at

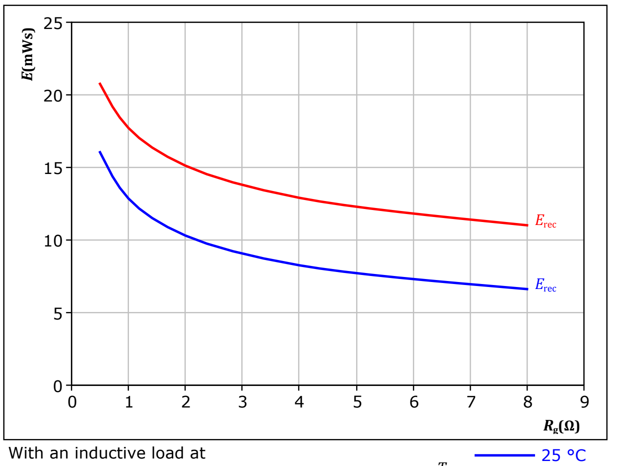
T_j: 25 °C / 125 °C

V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	1	Ω

figure 40. **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

T_j: 25 °C / 125 °C

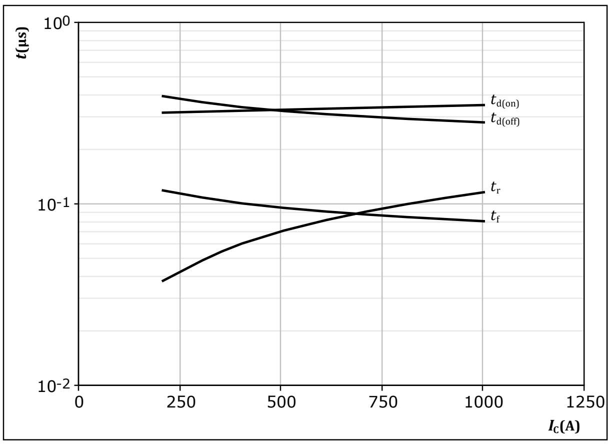
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	600	A

Boost Switching Characteristics

figure 41. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



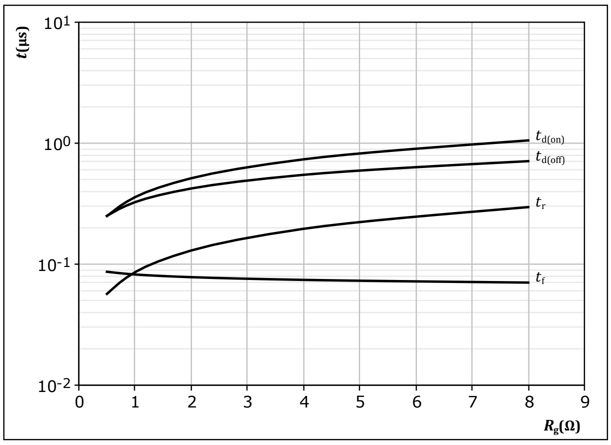
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	1	Ω
R_{goff} =	1	Ω

figure 42. **IGBT**

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

t = f(R_g)



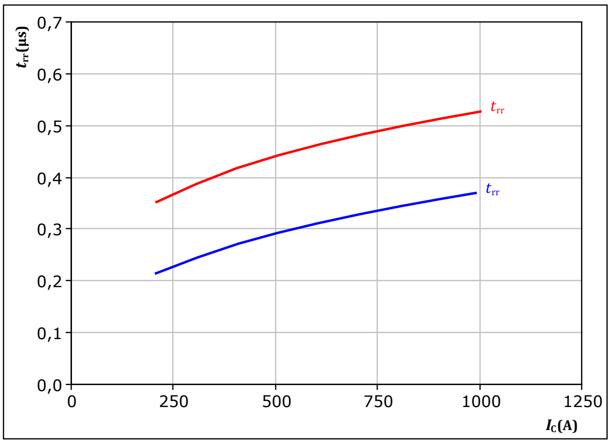
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	600	A

figure 43. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

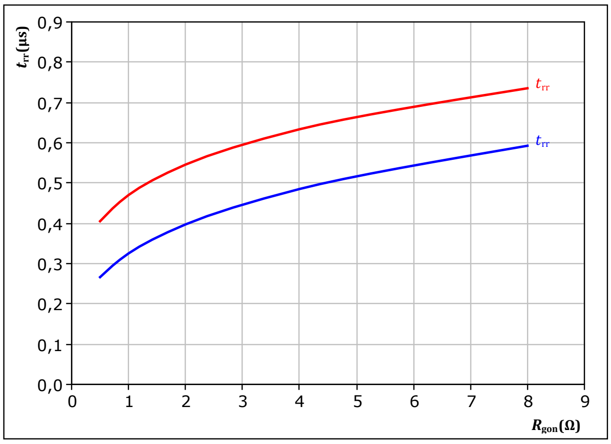
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	1	Ω

T_j: 25 °C, 125 °C

figure 44. **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 =	600	A

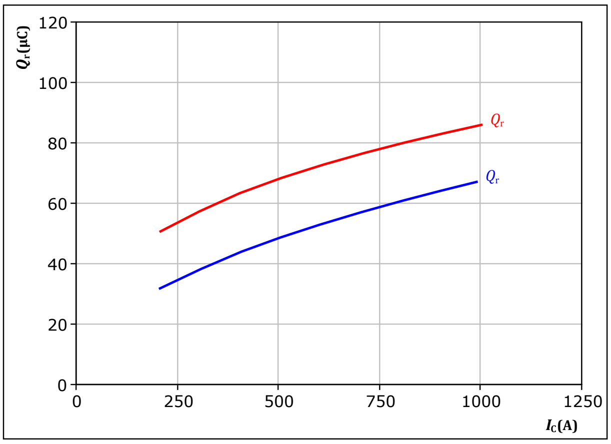
T_j: 25 °C, 125 °C

Boost Switching Characteristics

figure 45. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



With an inductive load at

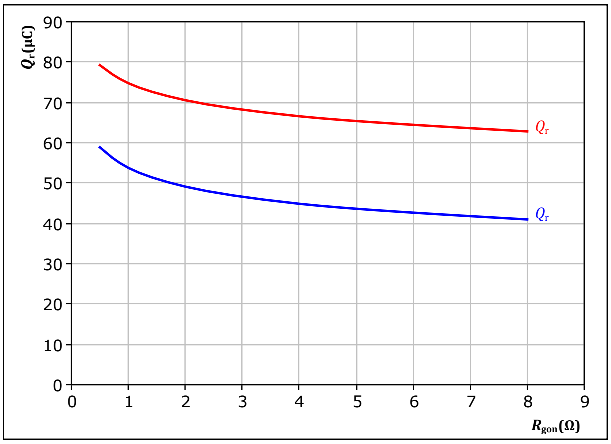
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	1	Ω

T_j: 25 °C, 125 °C

figure 46. **FWD**

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

Q_r = f(R_{gon})



With an inductive load at

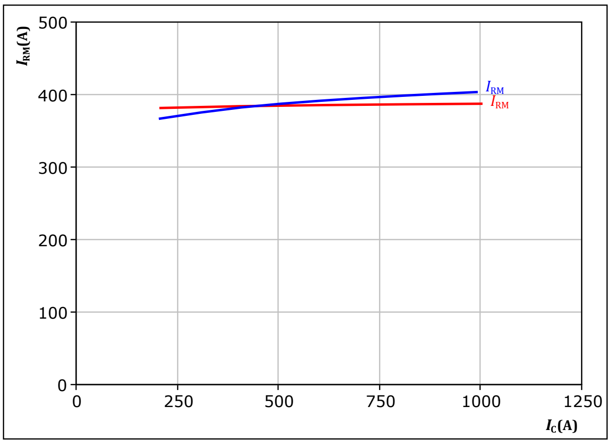
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	600	A

T_j: 25 °C, 125 °C

figure 47. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



With an inductive load at

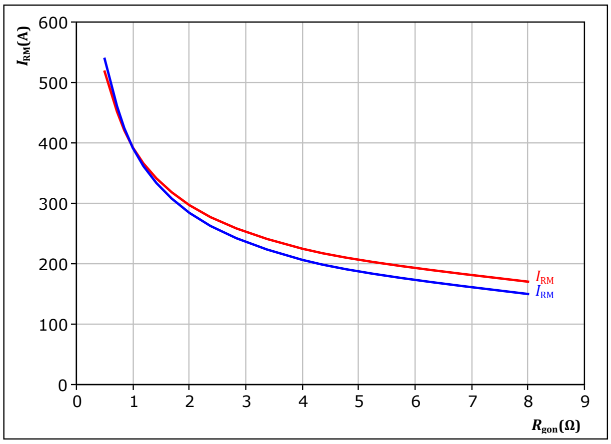
V_{CE} =	350	V
V_{GE} =	±15	V
R_{gon} =	1	Ω

T_j: 25 °C, 125 °C

figure 48. **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
V_{GE} =	±15	V
I_C =	600	A

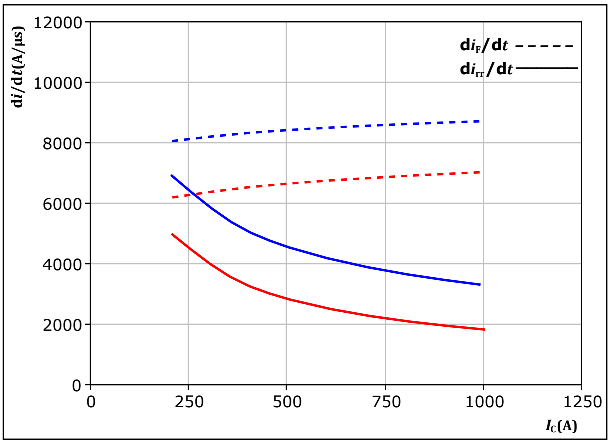
T_j: 25 °C, 125 °C

Boost Switching Characteristics

figure 49. **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)



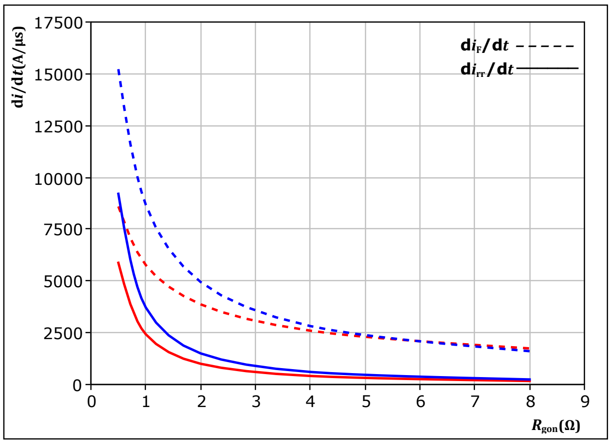
With an inductive load at

V_{CE} =	350	V	
V_{GE} =	±15	V	T_j: 25 °C / 125 °C
R_{gon} =	1	Ω	

figure 50. **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})



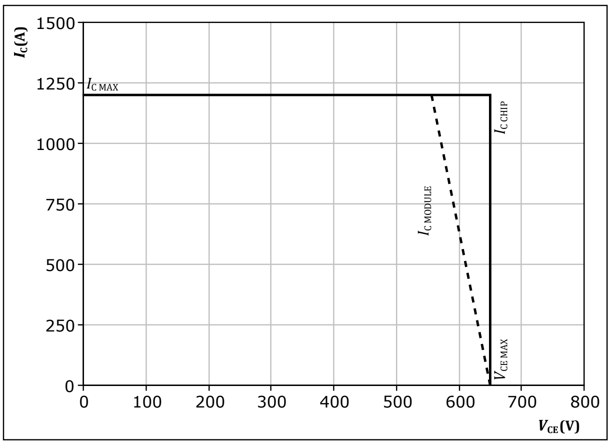
With an inductive load at

V_{CE} =	350	V	
V_{GE} =	±15	V	T_j: 25 °C / 125 °C
I_C =	600	A	

figure 51. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At			
	T_j =	125	°C
	R_{gon} =	1	Ω
	R_{goff} =	1	Ω

Switching Definitions

figure 52. **IGBT**

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

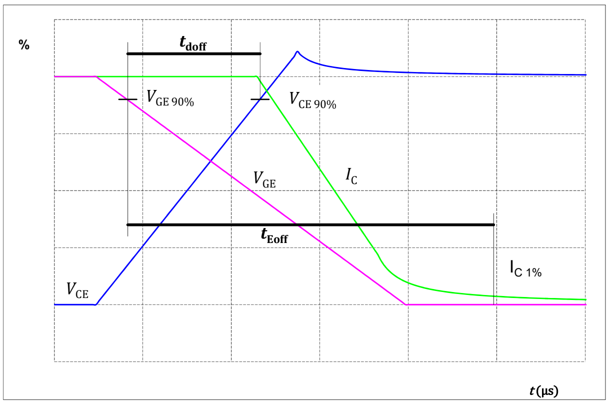


figure 53. **IGBT**

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

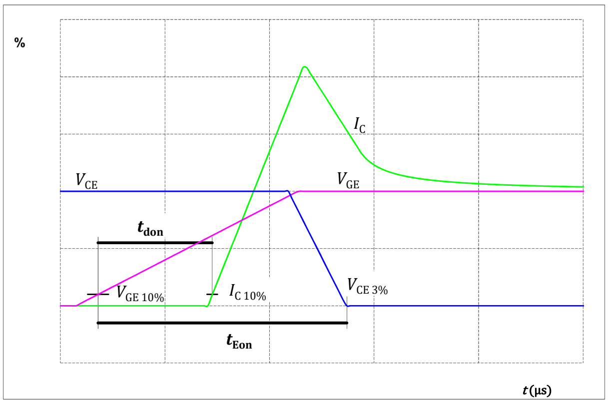


figure 54. **IGBT**

Turn-off Switching Waveforms & definition of t_f

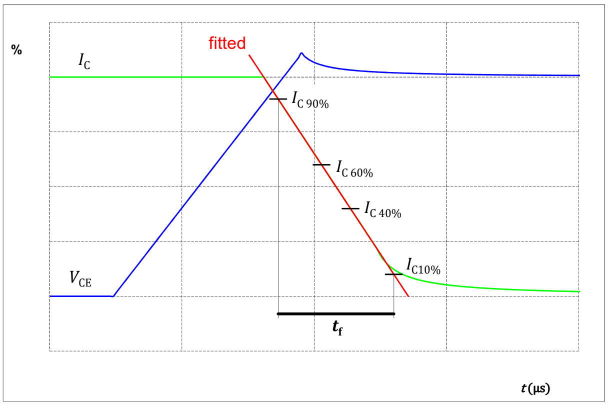
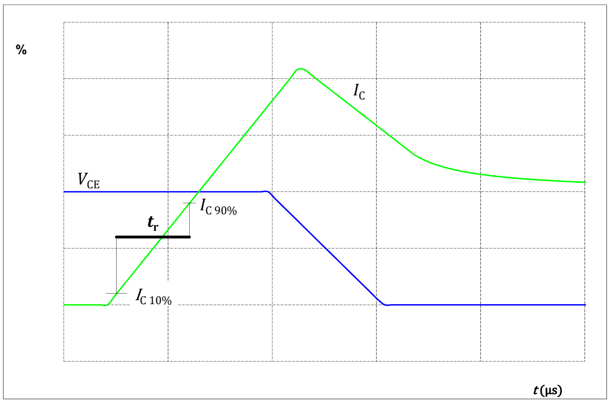


figure 55. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 56. **FWD**

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

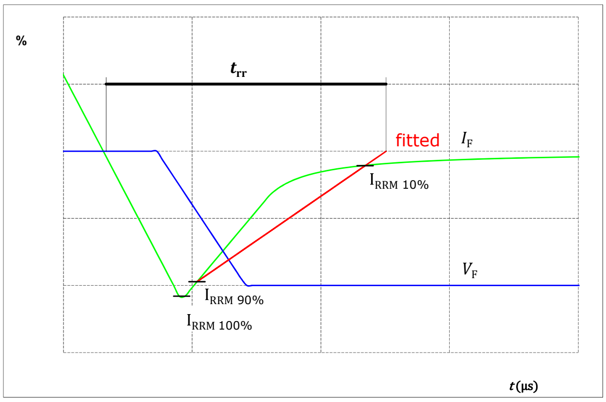
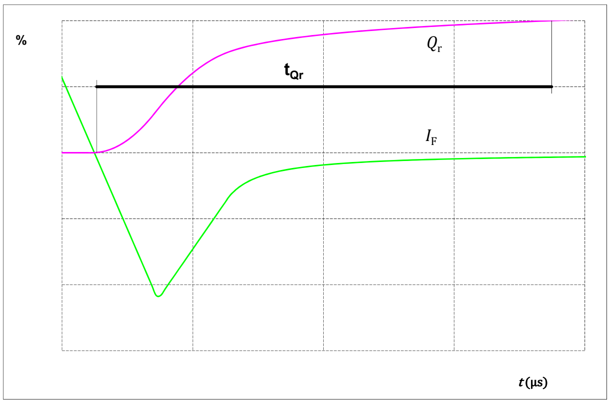


figure 57. **FWD**

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



Ordering Code

Version	Ordering Code
Without thermal paste	70-W212NMA600M7-LC09F71
With thermal paste (3,4 W/mK, PSX-P7)	70-W212NMA600M7-LC09F71-/3/

Marking

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

Outline

Driver pins

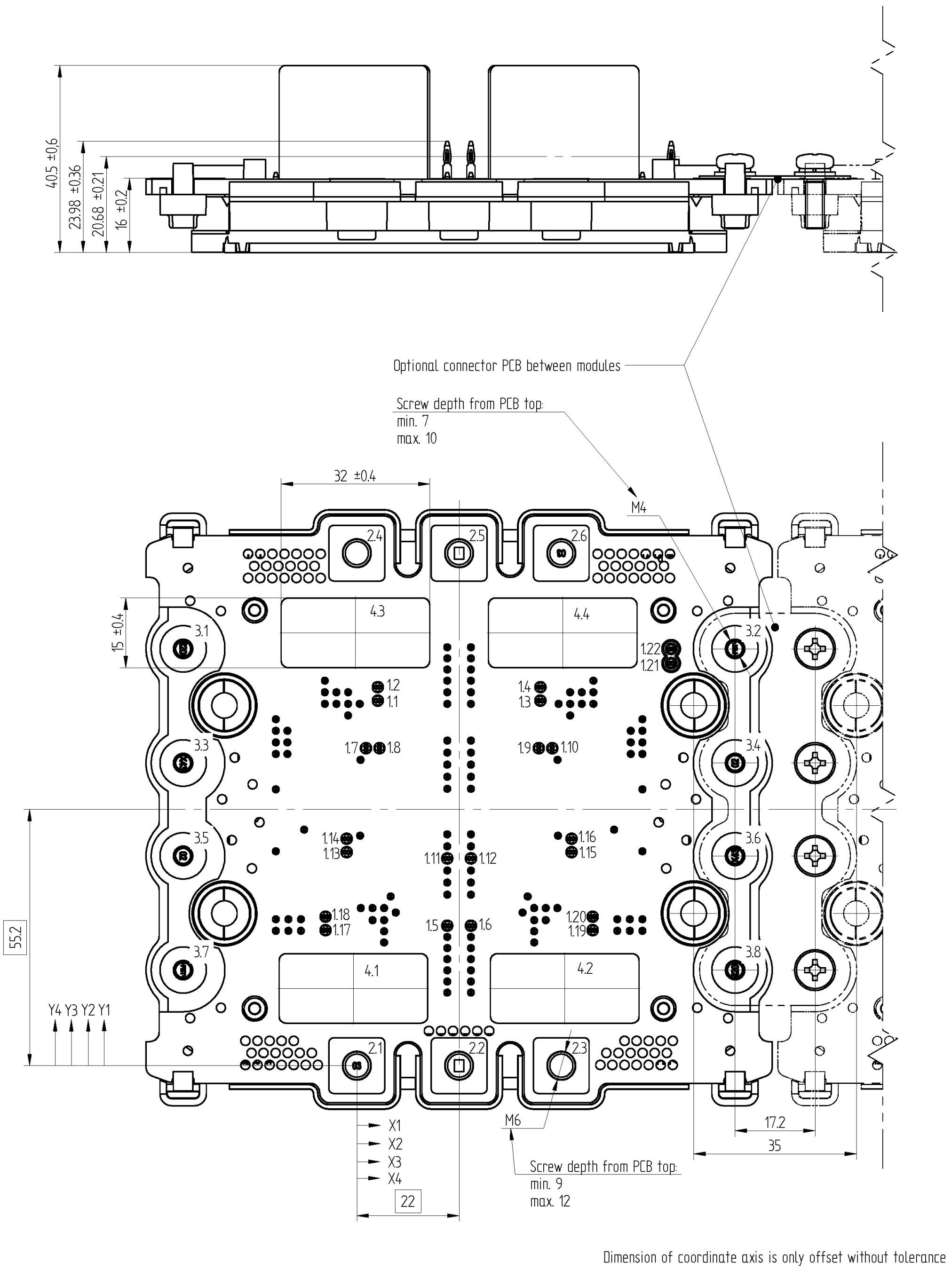
Pin	X1	Y1	Function
1.1	4,5	78,65	G11-1
1.2	4,5	81,55	S11-1
1.3	39,5	78,65	G11-2
1.4	39,5	81,55	S11-2
1.5	19,45	30,15	DC+desat
1.6	24,55	30,15	DC+desat
1.7	1,95	68,4	S14-1
1.8	4,85	68,4	G14-1
1.9	39,15	68,4	G14-2
1.10	42,05	68,4	S14-2
1.11	19,45	44,65	GND_desat
1.12	24,55	44,65	GND_desat
1.13	-2,2	46	G13-1
1.14	-2,2	48,9	S13-1
1.15	46,2	46	G13-2
1.16	46,2	48,9	S13-2
1.17	-6,75	29,2	S12-1
1.18	-6,75	32,1	G12-1
1.19	50,75	29,2	S12-2
1.20	50,75	32,1	G12-2
1.21	67,65	86,7	Therm2
1.22	67,65	89,8	Therm1

Power interconnections

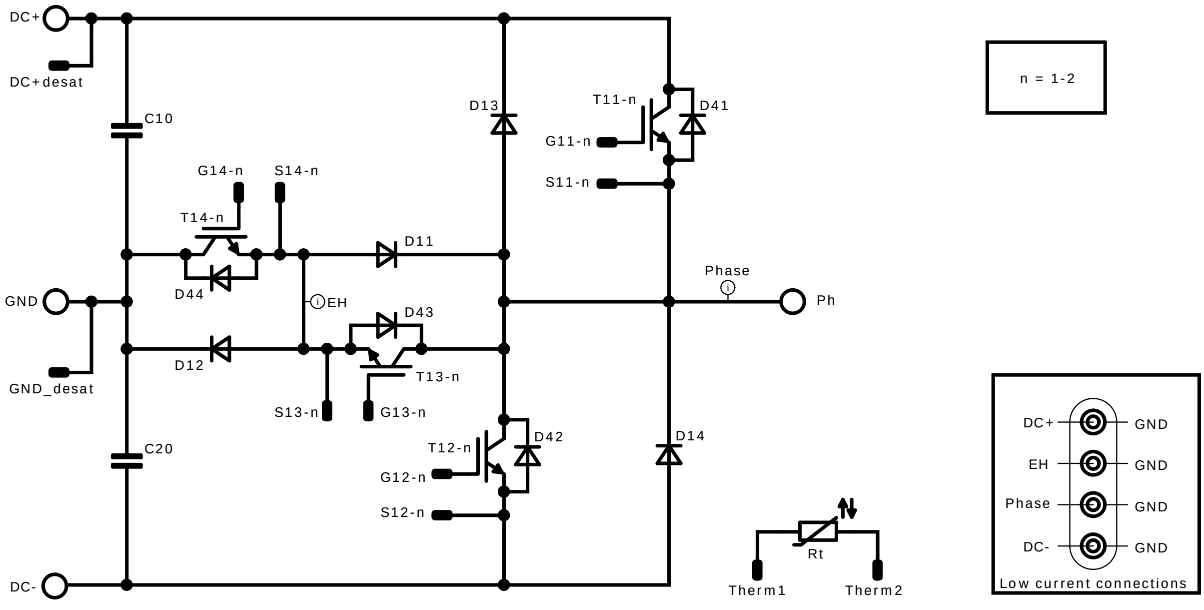
M6 screw	X2	Y2	Function
2.1	0	0	Phase
2.2	22	0	Phase
2.3	44	0	Phase
2.4	0	110,4	DC+
2.5	22	110,4	GND
2.6	44	110,4	DC-

Low current connections

M4 screw	X3	Y3	Function
3.1	-37,4	89,8	DC+
3.2	81,4	89,8	DC+
3.3	-37,4	65,2	EH
3.4	81,4	65,2	EH
3.5	-37,4	45,2	Phase
3.6	81,4	45,2	Phase
3.7	-37,4	20,6	DC-
3.8	81,4	20,6	DC-



Pinout



NOTE: Driver pins for parallel devices are not connected inside the module!

Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12	IGBT	1200 V	600 A	Buck Switch	
D11, D12	FWD	650 V	600 A	Buck Diode	
D41, D42	FWD	1200 V	20 A	Buck Sw. Protection Diode	
T13, T14	IGBT	650 V	600 A	Boost Switch	
D13, D14	FWD	1200 V	600 A	Boost Diode	
D43, D44	FWD	650 V	40 A	Boost Sw. Protection Diode	
C10, C20	Capacitor	630 V		Capacitor (DC)	
Rt	NTC			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 8	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for VINco X4 packages see vincotech.com website.

Package data
Package data for VINco X4 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
70-W212NMA600M7-LC09F71-D3-14	15 Jul. 2022	New Datasheet format, module is unchanged Correct tau values of thermal characteristic	