10-FY07NIB200S504-LH46F58
datasheet

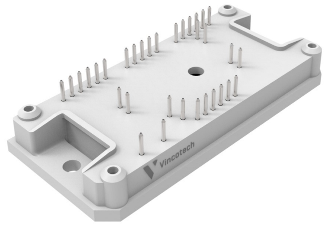
Vincotech

*flow*NPC 1	1200 V / 200 A

Features

- Three-level topology
- Optimized for Solar applications
- Enhanced efficiency
- Low inductive package

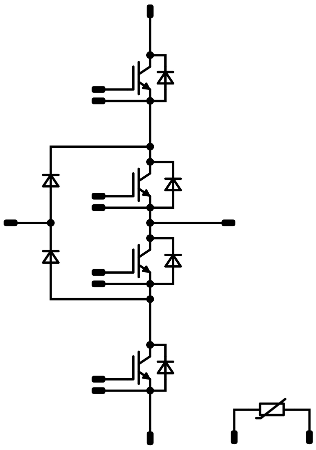
flow 1 12 mm housing



Target applications

- Industrial Drives
- Solar Inverters
- UPS

Schematic



Types

- 10-FY07NIB200S504-LH46F58

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Buck Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C	115	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	600	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	145	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum junction temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Buck Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	118	A
Repetitive peak forward current	I_{FRM}			400	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	136	W
Maximum junction temperature	T_{jmax}			175	°C
Boost Switch					
Collector-emitter voltage	V_{CES}			650	V
Collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	151	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		450	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	165	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	81	A
Repetitive peak forward current	I_{FRM}			200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	116	W
Maximum junction temperature	T_{jmax}			175	°C
Boost Sw.Inv.Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	81	A
Repetitive peak forward current	I_{FRM}			200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	116	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		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
		AC Voltage	t_p = 1 min	2500	V
Creepage distance				min. 12,7	mm
Clearance				min. 12,7	mm
Comparative Tracking Index	CTI			> 200	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions					Value			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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,002	25	3,2	4	4,8	V
Collector-emitter saturation voltage	V_{CEsat}		15		200	25 125 150		1,39 1,48 1,51	1,75	V
Collector-emitter cut-off current	I_{CES}		0	650		25			200	µA
Gate-emitter leakage current	I_{GES}		20	0		25			400	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f= 1 Mhz	0	25		25		12400		pF
Output capacitance	C_{oes}							352		
Reverse transfer capacitance	C_{res}							48		
Gate charge	Q_g		15	520	200	25		480		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,66		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 4 Ω R_{goff} = 4 Ω	-5 / 15	350	120	25 125 150		64 72 71		ns
Rise time	t_r					25 125 150		13 14 15		
Turn-off delay time	$t_{d(off)}$					25 125 150		183 207 218		
Fall time	t_f					25 125 150		11 20 22		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 4,4 µC Q_{rFWD} = 8,6 µC Q_{rFWD} = 10,1 µC				25 125 150		1,063 1,492 1,614		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		1,504 2,277 2,570		

Characteristic Values

Parameter	Symbol	Conditions					Value			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				200	25 125 150		1,50 1,44 1,42	1,92	V
Reverse leakage current	I_R			650		25			10,6	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,70		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 6128 A/µs di/dt = 5716 A/µs di/dt = 6273 A/µs	-5 / 15	350	120	25 125 150		126 181 194		A
Reverse recovery time	t_{rr}					25 125 150		49 70 78		ns
Recovered charge	Q_r					25 125 150		4,434 8,609 10,066		µC
Reverse recovered energy	E_{rec}					25 125 150		0,791 1,728 2,134		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		8291 5871 4983		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]	Value Min	Value Typ	Value Max	Unit
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,002	25	4,2	5	5,8	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 125 150		1,10 1,08 1,09	1,45	V
Collector-emitter cut-off current	I_{CES}		0	650		25			80	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		23250		pF
Reverse transfer capacitance	C_{res}	f= 1 Mhz	0	25		25		60		pF
Gate charge	Q_g		15	520	150	25		872		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,58		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	-5 / 15	350	90	25 125 150		95 94 94		ns
Rise time	t_r	R_{gon} = 2 Ω R_{goff} = 2 Ω	-5 / 15	350	90	25 125 150		7 9 9		ns
Turn-off delay time	$t_{d(off)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	-5 / 15	350	90	25 125 150		356 397 412		ns
Fall time	t_f	R_{gon} = 2 Ω R_{goff} = 2 Ω	-5 / 15	350	90	25 125 150		74 73 65		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 3,2 µC Q_{rFWD} = 5,9 µC Q_{rFWD} = 6,7 µC	-5 / 15	350	90	25 125 150		0,450 0,682 0,849		mWs
Turn-off energy (per pulse)	E_{off}		-5 / 15	350	90	25 125 150		4,431 6,677 7,032		mWs

Characteristic Values

Parameter	Symbol	Conditions					Value			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				100	25 125 150		1,61 1,58 1,57	1,92	V
Reverse leakage current	I_R			650		25			5,3	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,82		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 8581 A/µs di/dt = 8320 A/µs di/dt = 7500 A/µs	-5 / 15	350	90	25 125 150		103 130 137		A
Reverse recovery time	t_{rr}					25 125 150		51 86 94		ns
Recovered charge	Q_r					25 125 150		3,178 5,859 6,736		µC
Reverse recovered energy	E_{rec}					25 125 150		0,763 1,449 1,630		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		2631 2254 2303		A/µs
Boost Sw.Inv.Diode										
Static										
Forward voltage	V_F				100	25 125 150		1,61 1,58 1,57	1,92	V
Reverse leakage current	I_R			650		25			5,3	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,82		K/W

Characteristic Values

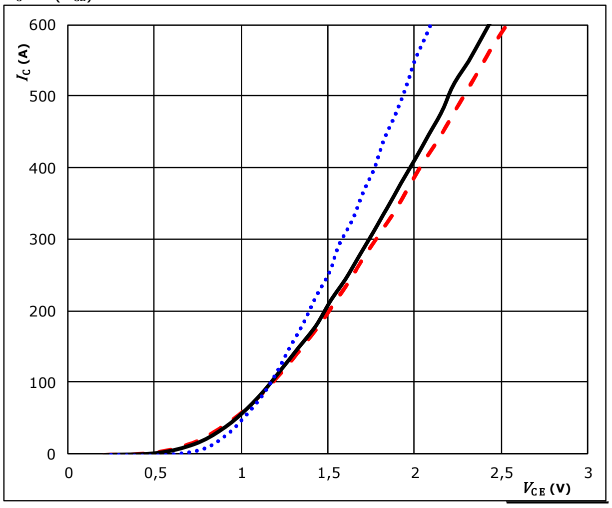
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P					25		5		mW
Power dissipation constant						25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %				25		3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %				25		4000		K
Vincotech NTC Reference									I	

Buck Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

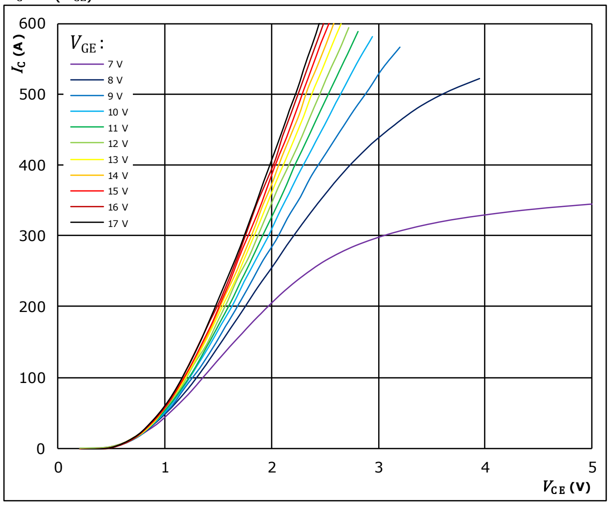


t_p =	250	μs		25 °C	··········
V_{GE} =	15	V	T_j:	125 °C	———
				150 °C	– – – –

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

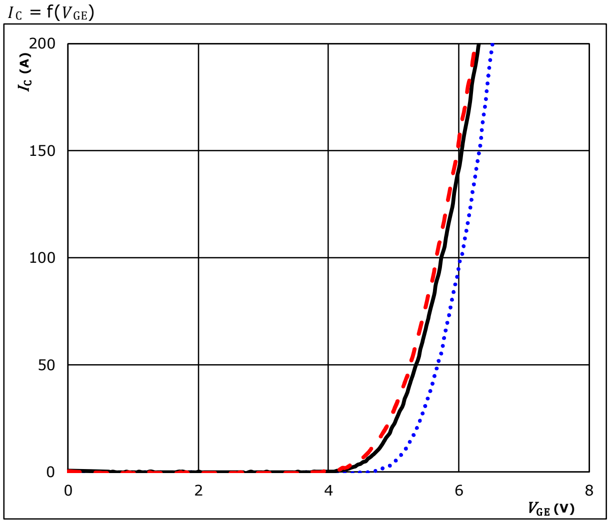


t_p =	250	μs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

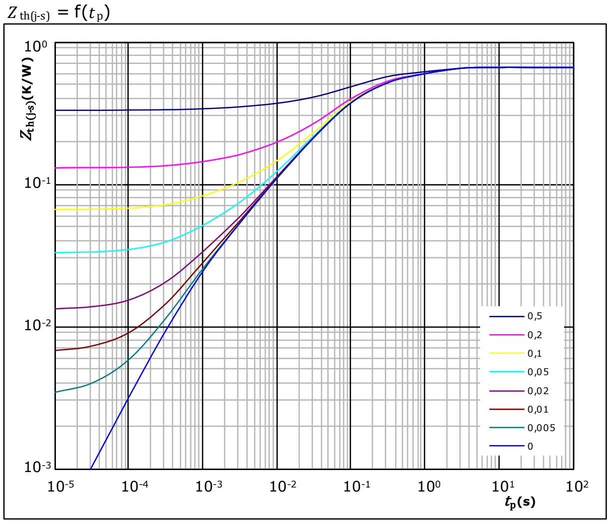


t_p =	100	μs		25 °C	··········
V_{CE} =	10	V	T_j:	125 °C	———
				150 °C	– – – –

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j-s)}$ = 0,66 K/W

IGBT thermal model values

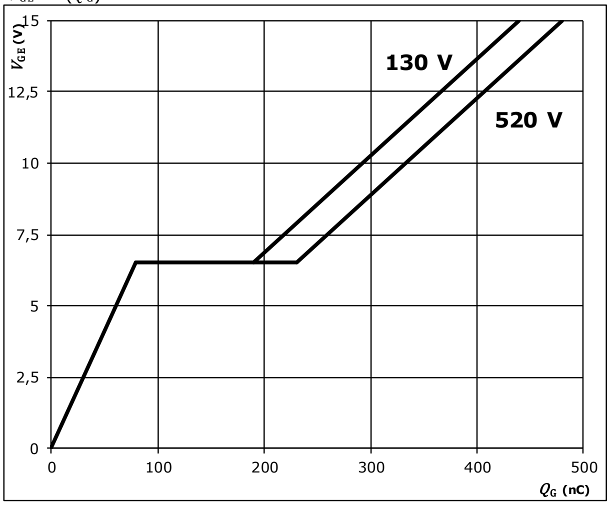
R (K/W)	τ (s)
1,51E-01	1,15E+00
2,63E-01	1,39E-01
1,76E-01	4,50E-02
4,82E-02	6,73E-03
1,72E-02	8,69E-04

Buck Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

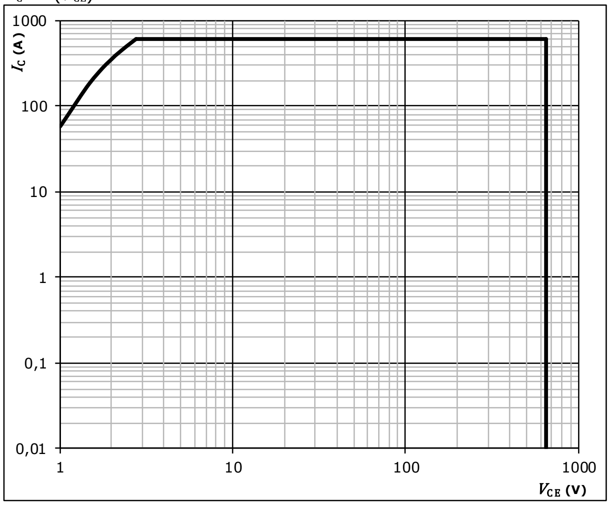


I_C = 200 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



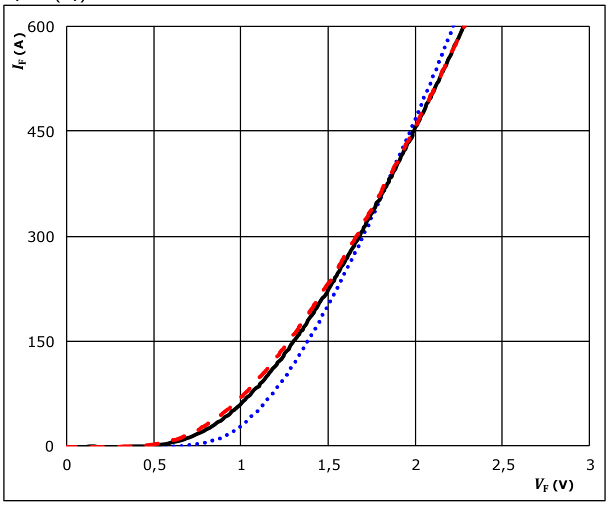
D = single pulse
T_s = 80 ºC
V_{GE} = ±15 V
T_j = T_{jmax}

Buck Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



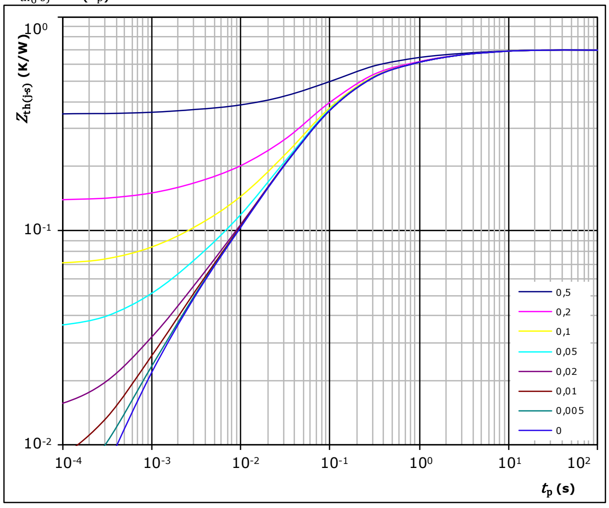
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,70 K/W

FWD thermal model values

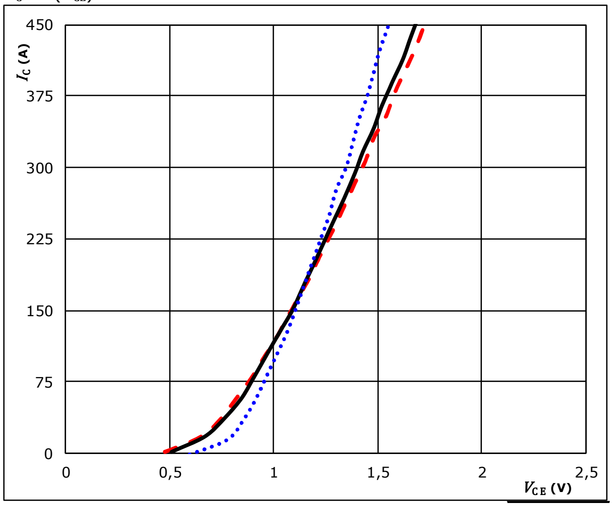
R (K/W)	τ (s)
4,31E-02	6,27E+00
1,11E-01	1,20E+00
2,38E-01	1,96E-01
2,33E-01	6,03E-02
5,20E-02	9,00E-03
2,09E-02	1,31E-03

Boost Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

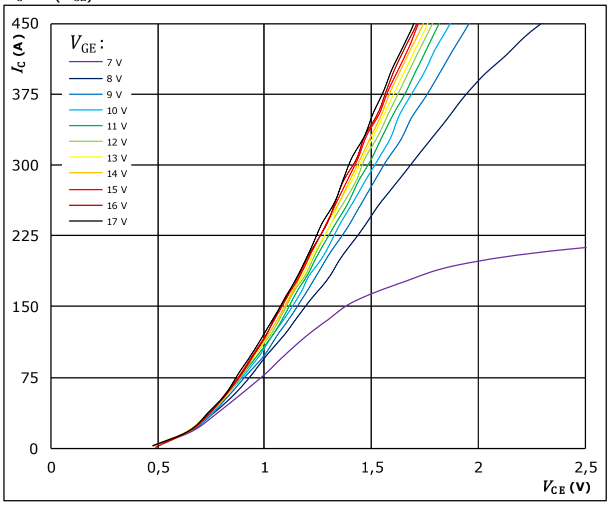


t_p =	250	µs		25 °C	···········
V_{GE} =	15	V	T_j:	125 °C	———
				150 °C	– – –

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



t_p = 250 µs

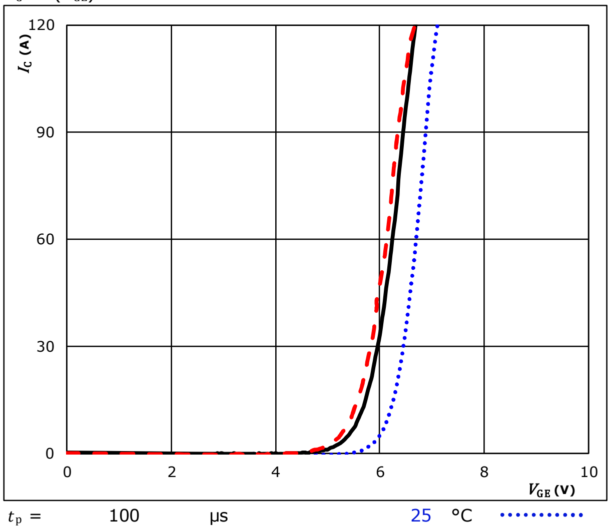
T_j = 150 °C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

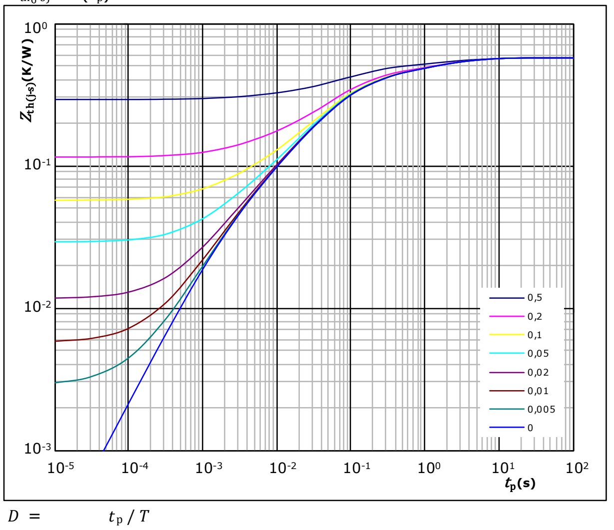


t_p =	100	µs		25 °C	···········
V_{CE} =	10	V	T_j:	125 °C	———
				150 °C	– – –

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j-s)}$ = 0,58 K/W

IGBT thermal model values

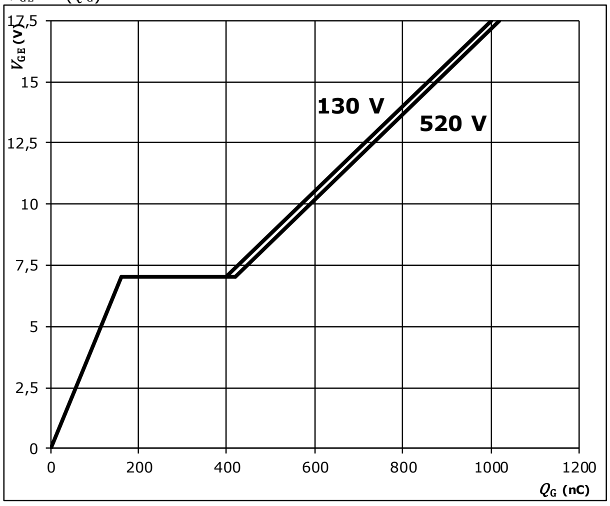
R (K/W)	τ (s)
5,98E-02	4,17E+00
1,01E-01	1,16E+00
1,46E-01	1,69E-01
1,95E-01	5,36E-02
5,46E-02	9,70E-03
1,61E-02	1,88E-03
4,01E-03	1,49E-03

Boost Switch Characteristics

figure 5. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_G)$

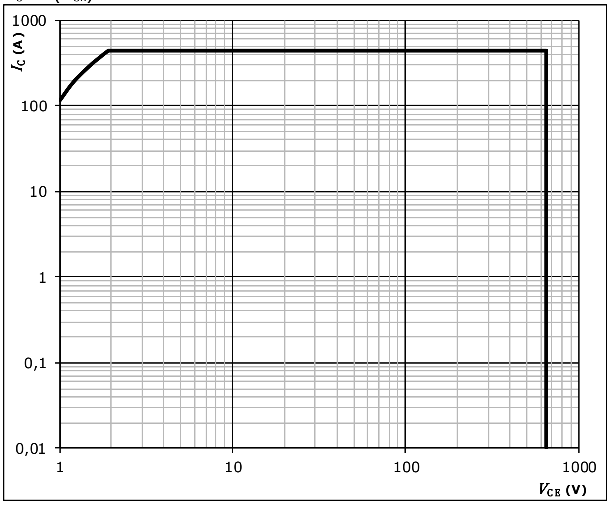


I_C = 150 A

figure 6. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



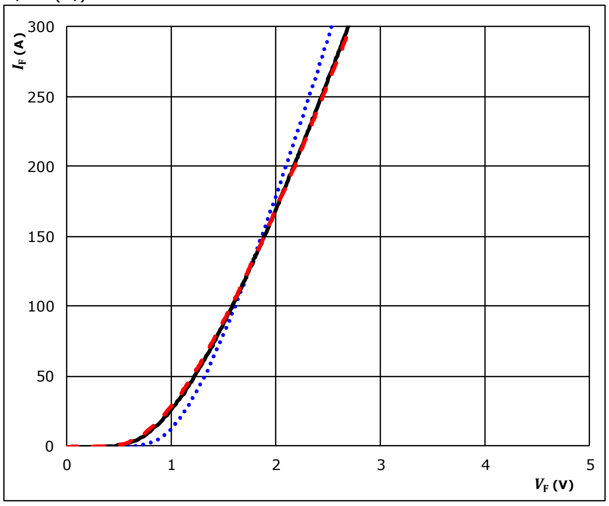
D = single pulse
T_s = 80 ºC
V_{GE} = ±15 V
T_j = T_{jmax}

Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



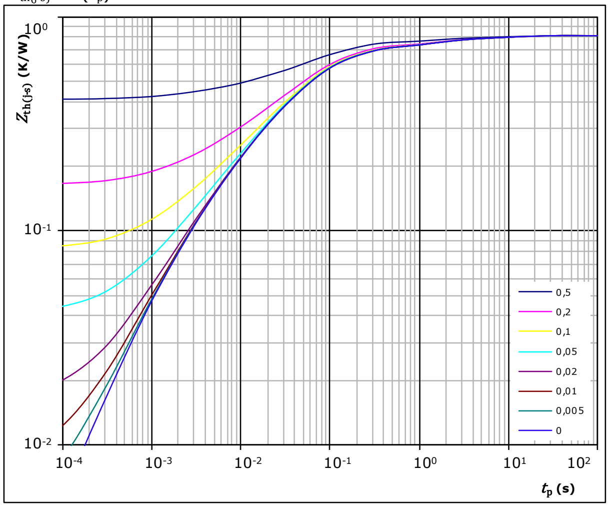
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,82 K/W

FWD thermal model values

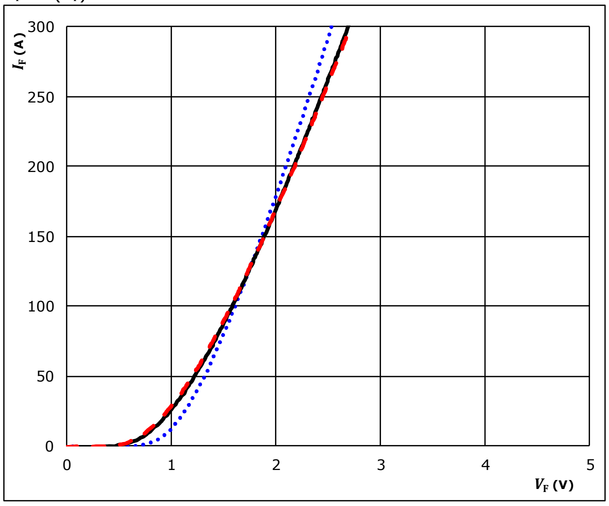
R (K/W)	τ (s)
5,00E-02	7,83E+00
8,76E-02	1,08E+00
3,17E-01	9,41E-02
2,26E-01	2,94E-02
1,07E-01	6,25E-03
3,28E-02	1,16E-03

Boost Sw.Inv.Diode Characteristics

figure 1. FWD

Typical forward characteristics

$I_F = f(V_F)$



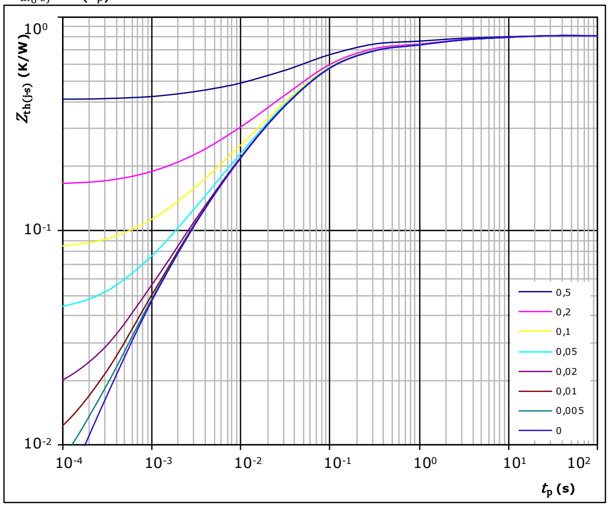
t_p = 250 µs

T_j: 25 °C; 125 °C; 150 °C

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j\text{-}s)}$ = 0,82 K/W

FWD thermal model values

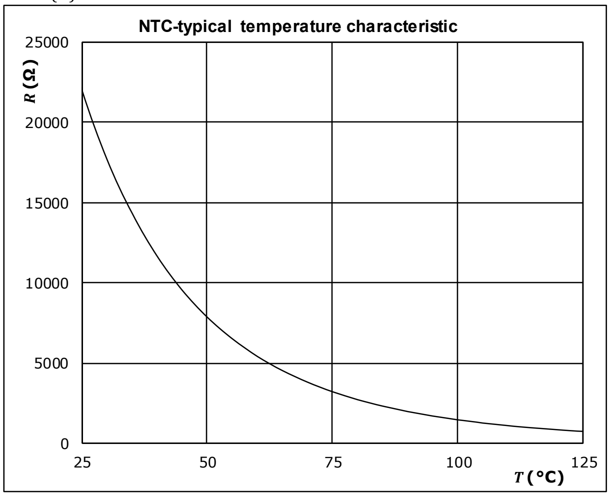
R (K/W)	τ (s)
5,00E-02	7,83E+00
8,76E-02	1,08E+00
3,17E-01	9,41E-02
2,26E-01	2,94E-02
1,07E-01	6,25E-03
3,28E-02	1,16E-03

Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic as a function of temperature

$R = f(T)$

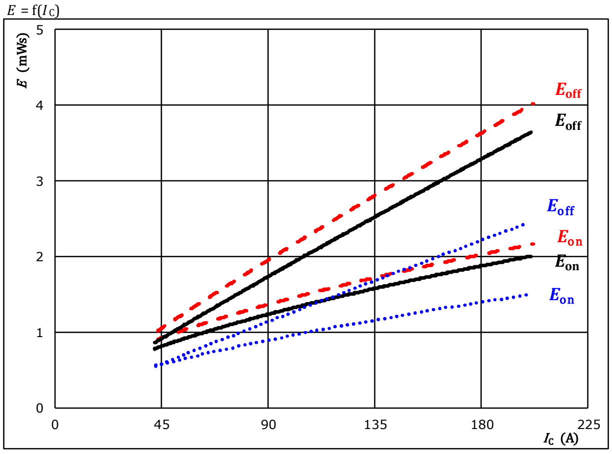


Buck Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



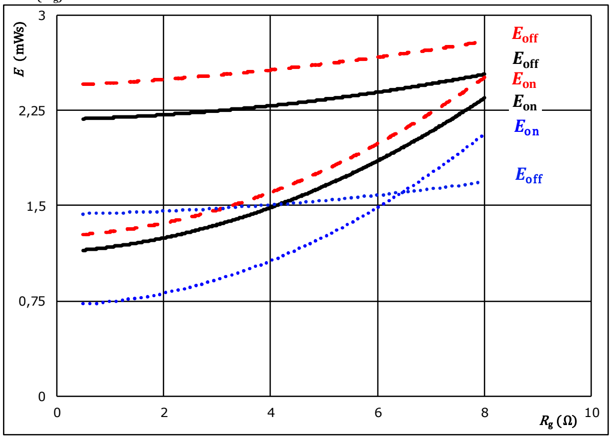
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	-5 / 15	V		125 °C	solid
R_{gon} =	4	Ω		150 °C	dashed
R_{goff} =	4	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



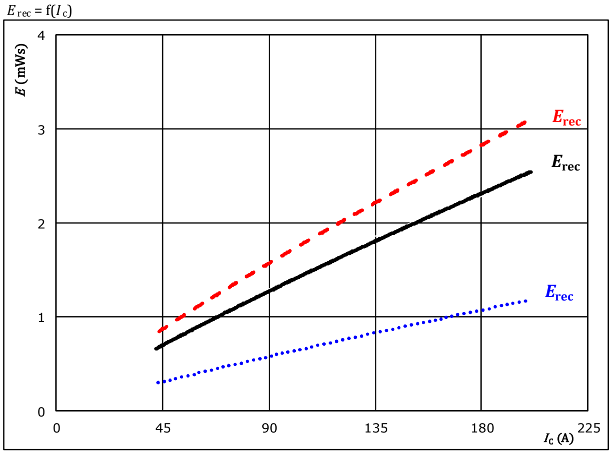
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	-5 / 15	V		125 °C	solid
I_C =	120	A		150 °C	dashed

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



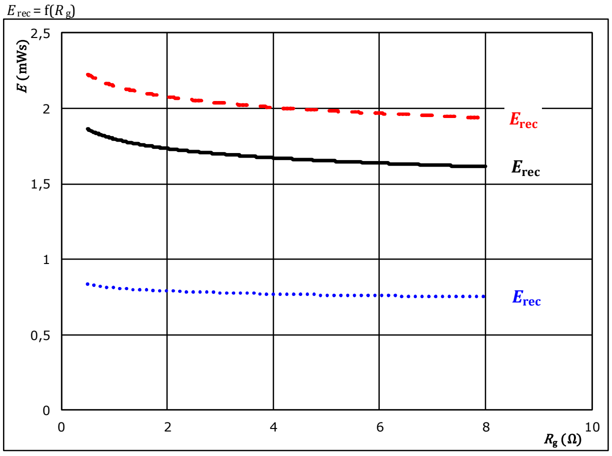
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	-5 / 15	V		125 °C	solid
R_{gon} =	4	Ω		150 °C	dashed

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

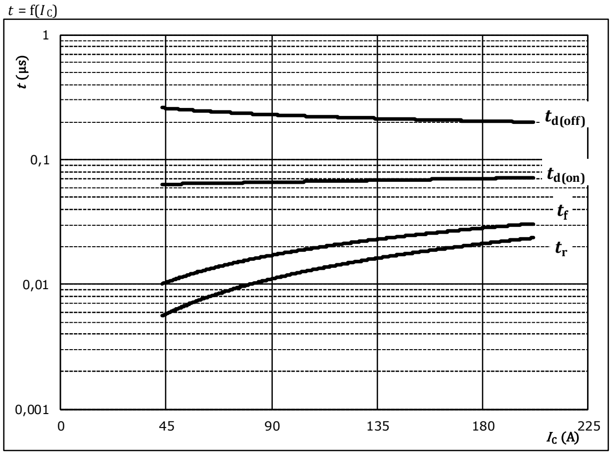
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	-5 / 15	V		125 °C	solid
I_C =	120	A		150 °C	dashed

Buck Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



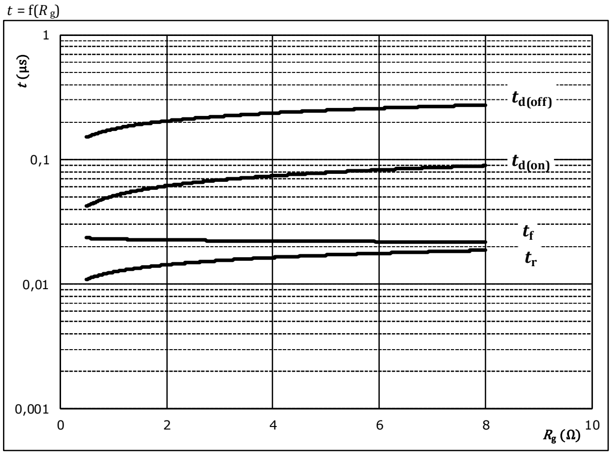
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	-5 / 15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



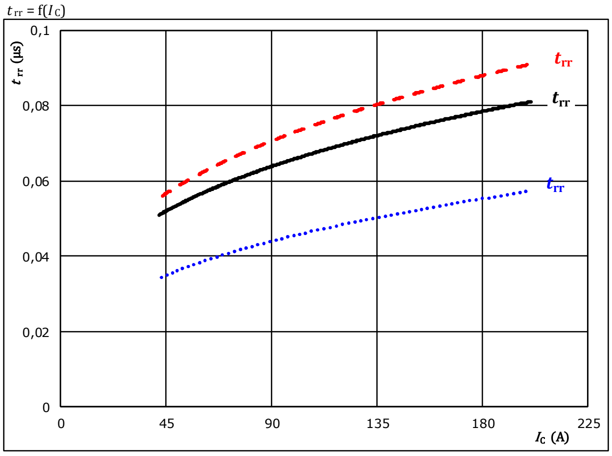
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	-5 / 15	V
I_C =	120	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

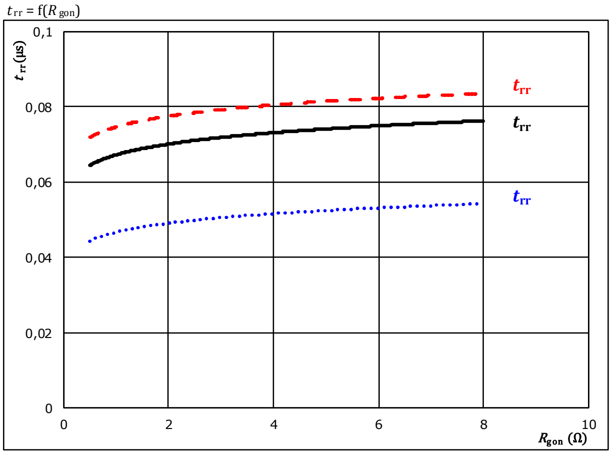


At					
V_{CE} =	350	V		25 °C	···········
V_{GE} =	-5 / 15	V	T_j:	125 °C	———
R_{gon} =	4	Ω		150 °C	– – –

figure 8. **FWD**

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

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



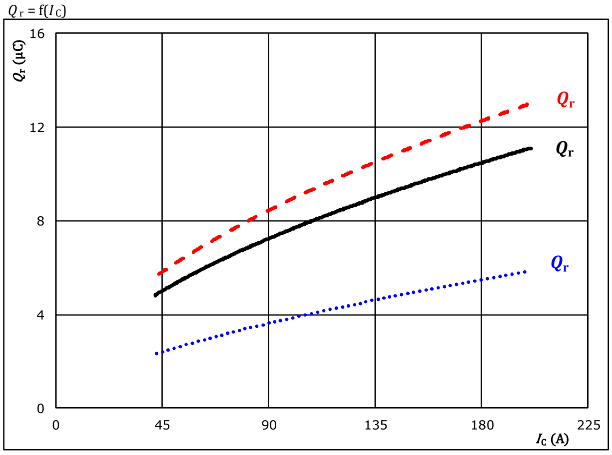
At					
V_{CE} =	350	V		25 °C	···········
V_{GE} =	-5 / 15	V	T_j:	125 °C	———
I_C =	120	A		150 °C	– – –

Buck Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

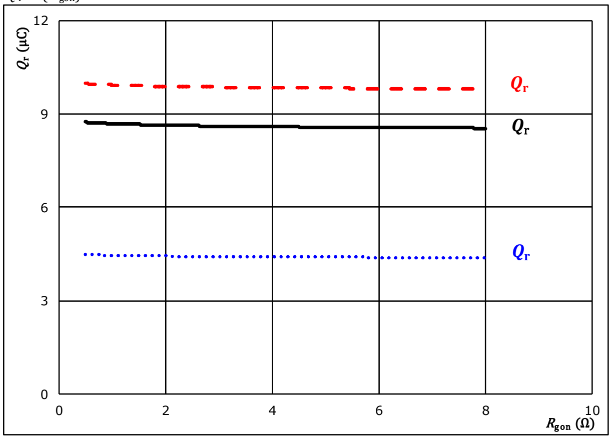


At	V_{CE} =	350	V	T_j:	25 °C	dotted
	V_{GE} =	-5 / 15	V		125 °C	solid
	R_{gon} =	4	Ω		150 °C	dashed

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

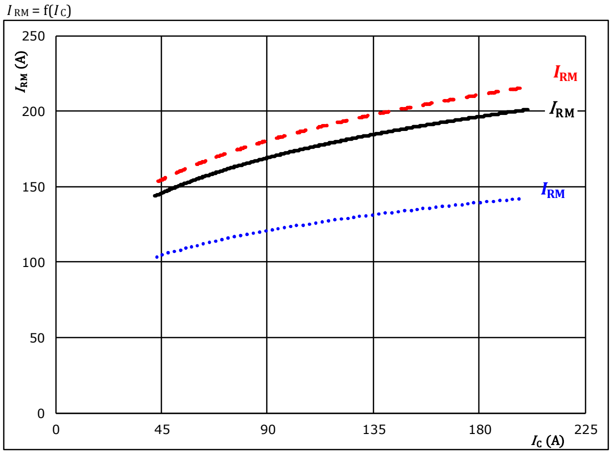


At	V_{CE}=	350	V	T_j:	25 °C	dotted
	V_{GE} =	-5 / 15	V		125 °C	solid
	I_C=	120	A		150 °C	dashed

figure 11. **FWD**

Typical peak reverse recovery current current as a function of collector current

$I_{RM} = f(I_C)$

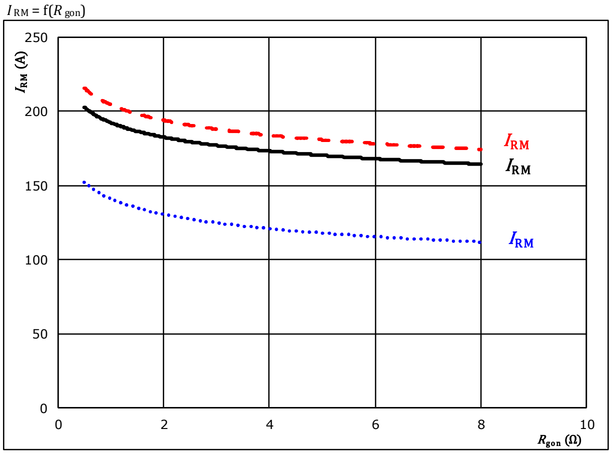


At	V_{CE}:	350	V	T_j:	25 °C	dotted
	V_{GE} =	-5 / 15	V		125 °C	solid
	R_{gon} =	4	Ω		150 °C	dashed

figure 12. **FWD**

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

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



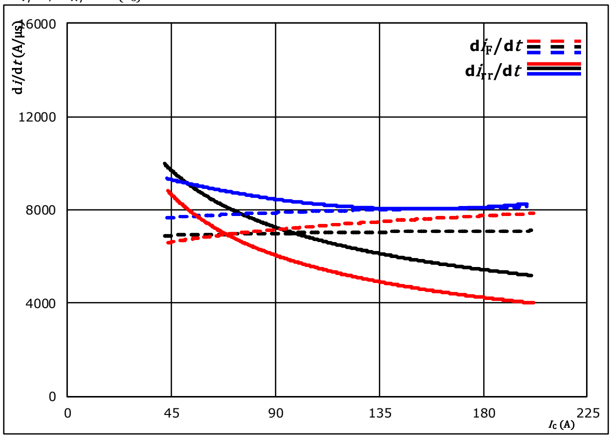
At	V_{CE} =	350	V	T_j:	25 °C	dotted
	V_{GE} =	-5 / 15	V		125 °C	solid
	I_C =	120	A		150 °C	dashed

Buck Switching Characteristics

figure 13. **FWD**

Typical rate of fall of forward and reverse recovery current as a function of collector current

$di_F/dt, di_{rr}/dt = f(I_C)$

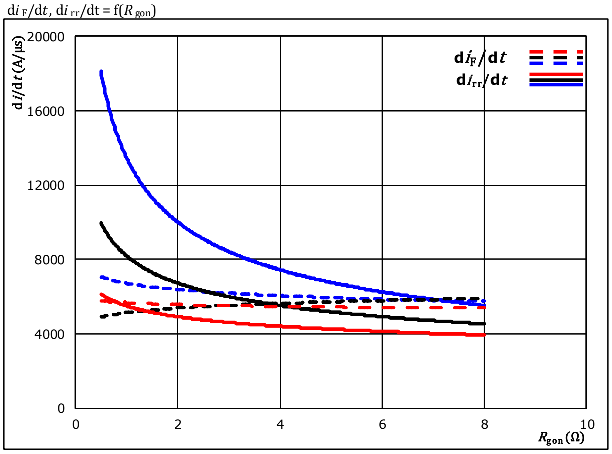


At					
V_{CE} =	350	V		25	°C
V_{GE} =	-5 / 15	V	T_j:	125	°C
R_{gon} =	4	Ω		150	°C

figure 14. **FWD**

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

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

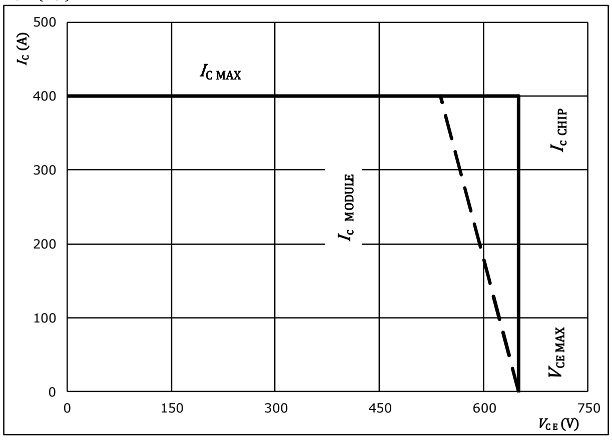


At					
V_{CE} =	350	V		25	°C
V_{GE} =	-5 / 15	V	T_j:	125	°C
I_C =	120	A		150	°C

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



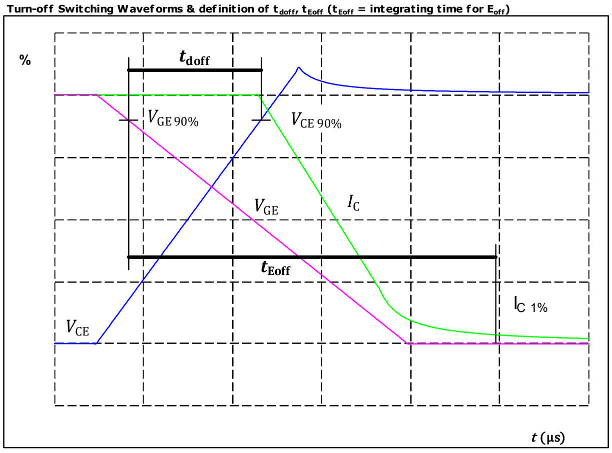
At		
T_j =	175	°C
R_{gon} =	4	Ω
R_{goff} =	4	Ω

Buck Switching Definitions

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

figure 1. **IGBT**

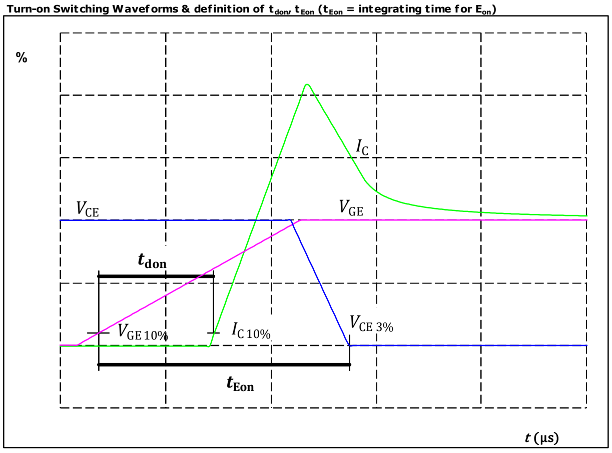
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-5	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	120	A
t_{doff} =	207	ns

figure 2. **IGBT**

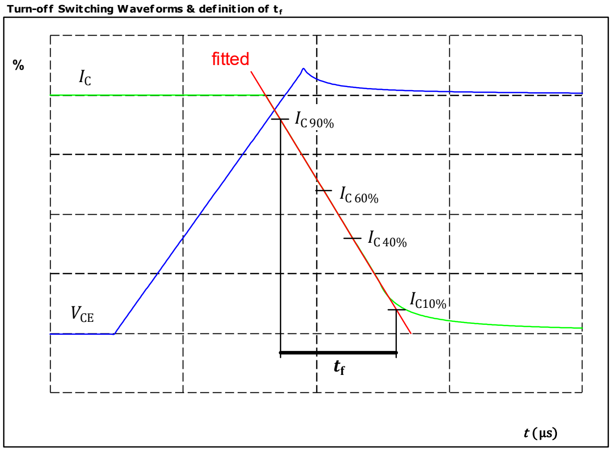
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-5	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	120	A
t_{don} =	72	ns

figure 3. **IGBT**

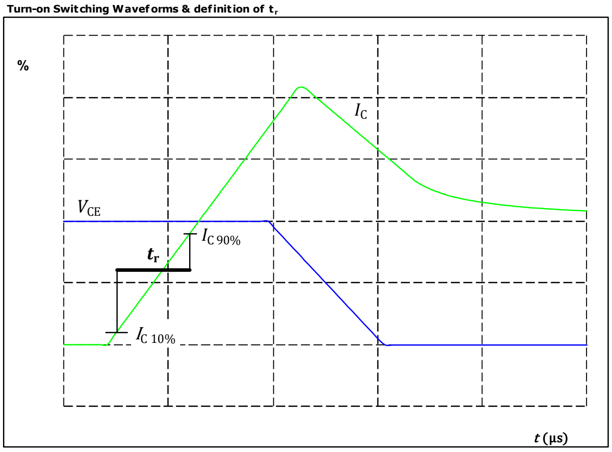
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	120	A
t_f =	20	ns

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

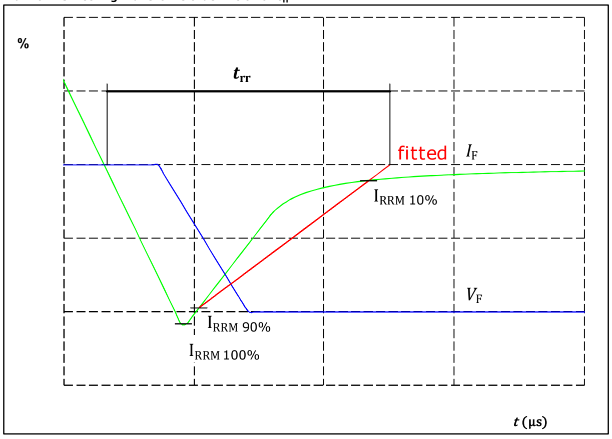


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	120	A
t_r =	14	ns

Buck Switching Characteristics

figure 5.	FWD

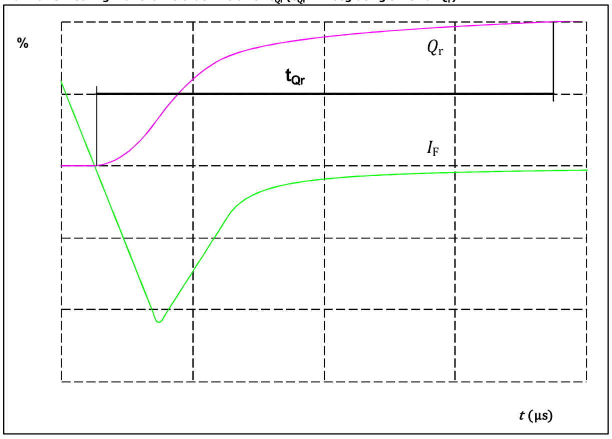
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	350	V
I_F (100%) =	120	A
I_{RRM} (100%) =	181	A
t_{rr} =	70	ns

figure 6.	FWD

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



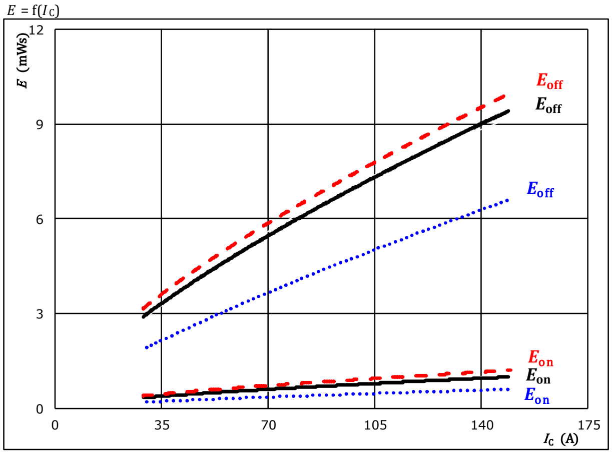
I_F (100%) =	120	A
Q_r (100%) =	8,61	µC

Boost Switching Characteristics

figure 1. — **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



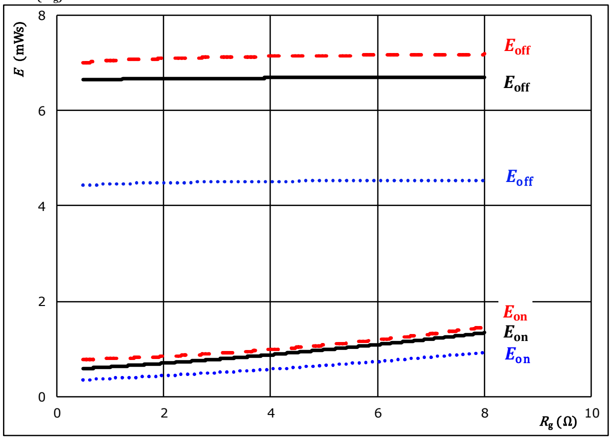
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	dotted (blue)
V_{GE} =	-5 / 15	V		125 °C	solid (black)
R_{gon} =	2	Ω		150 °C	dashed (red)
R_{goff} =	2	Ω			

figure 2. — **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



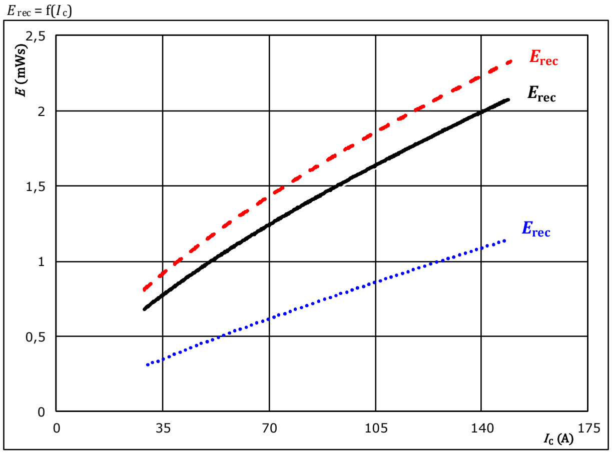
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	dotted (blue)
V_{GE} =	-5 / 15	V		125 °C	solid (black)
I_C =	90	A		150 °C	dashed (red)

figure 3. — **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



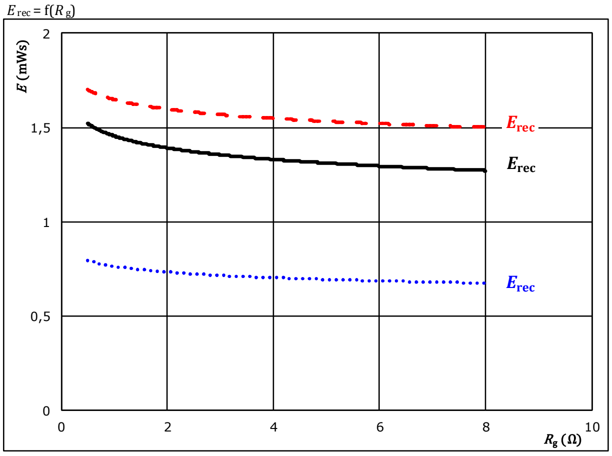
With an inductive load at

V_{CE} =	350	V	T_j:	25 °C	dotted (blue)
V_{GE} =	-5 / 15	V		125 °C	solid (black)
R_{gon} =	2	Ω		150 °C	dashed (red)

figure 4. — **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	dotted (blue)
V_{GE} =	-5 / 15	V		125 °C	solid (black)
I_C =	90	A		150 °C	dashed (red)

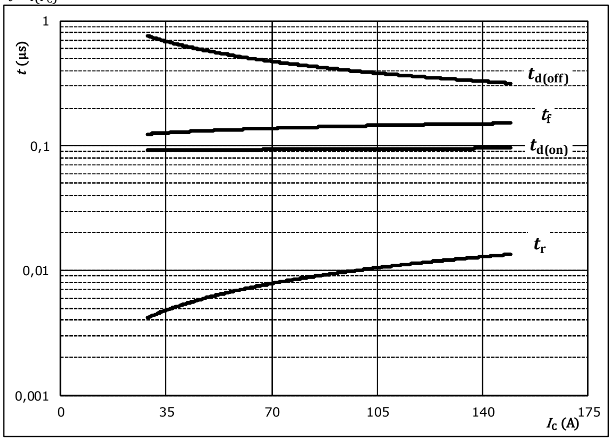
Vincotech

Boost Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



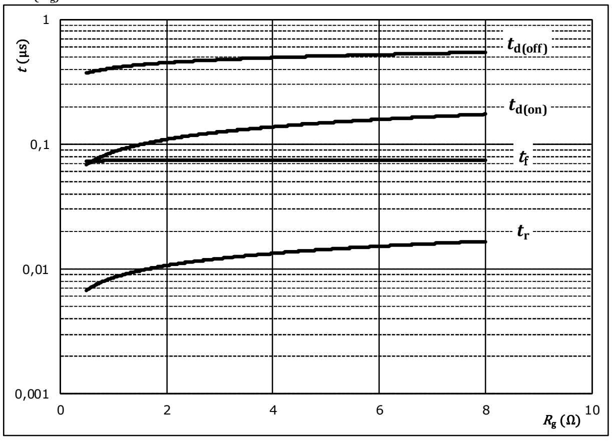
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	-5 / 15	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



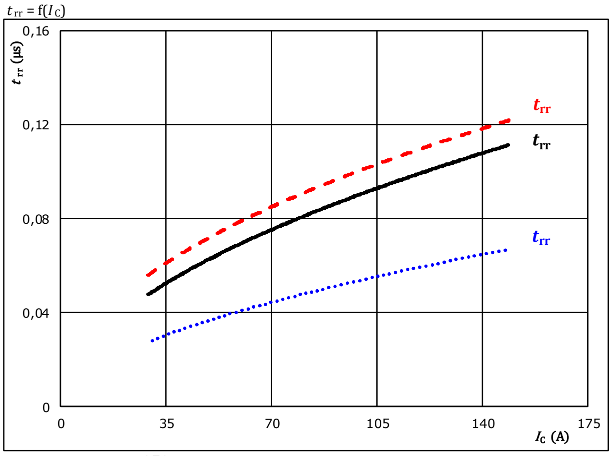
With an inductive load at

T_j =	150	°C
V_{CE} =	350	V
V_{GE} =	-5 / 15	V
I_C =	90	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

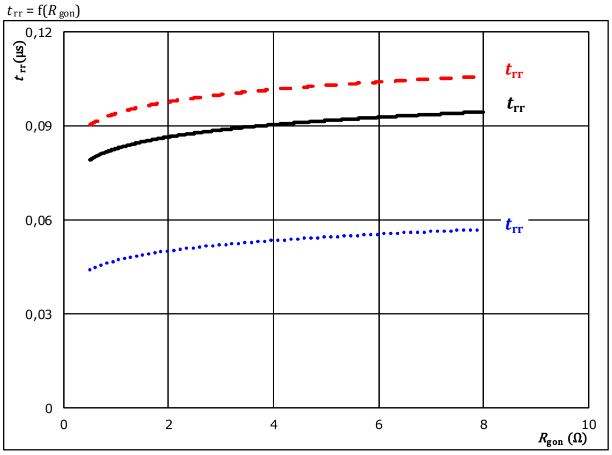


At					
V_{CE}=	350	V		25 °C	dotted (blue)
V_{GE} =	-5 / 15	V	T_j:	125 °C	solid (black)
R_{gon} =	2	Ω		150 °C	dashed (red)

figure 8. **FWD**

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

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



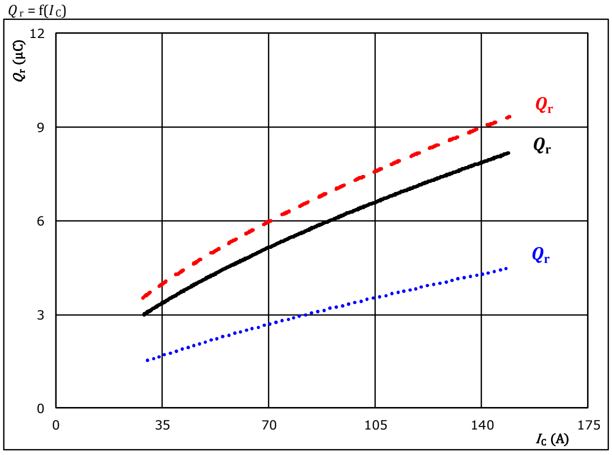
At					
V_{CE} =	350	V		25 °C	dotted (blue)
V_{GE} =	-5 / 15	V	T_j:	125 °C	solid (black)
I_C =	90	A		150 °C	dashed (red)

Boost Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

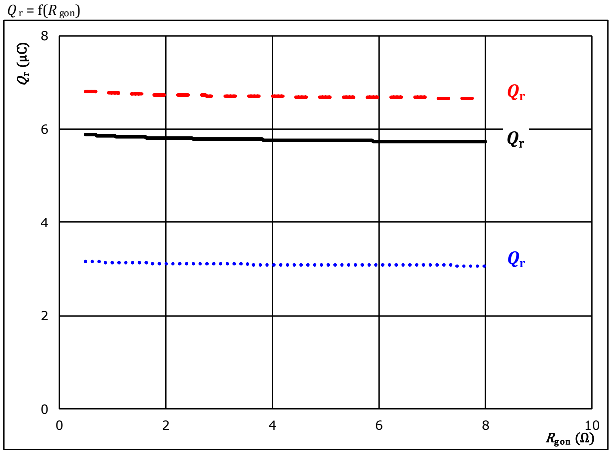


At						
V_{CE} =	350	V		25 °C	···········
V_{GE} =	-5 / 15	V	T_j:	125 °C	———
R_{gon} =	2	Ω		150 °C	– – –

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

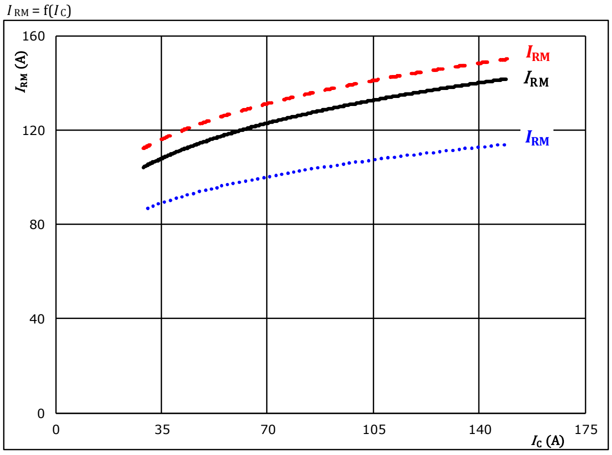


At						
V_{CE} =	350	V		25 °C	···········
V_{GE} =	-5 / 15	V	T_j:	125 °C	———
I_C =	90	A		150 °C	– – –

figure 11. **FWD**

Typical peak reverse recovery current current as a function of collector current

$I_{RM} = f(I_C)$

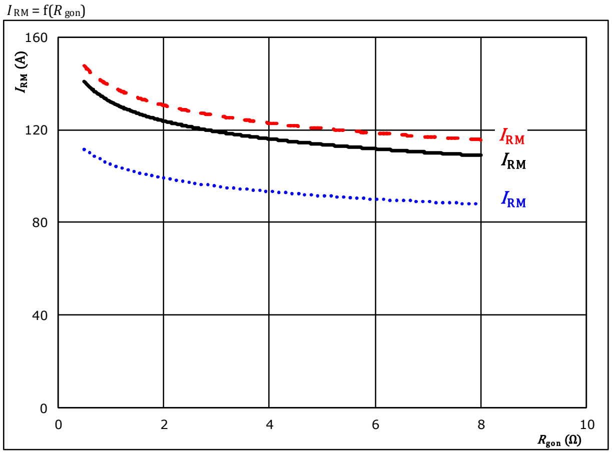


At						
V_{CE} =	350	V		25 °C	···········
V_{GE} =	-5 / 15	V	T_j:	125 °C	———
R_{gon} =	2	Ω		150 °C	– – –

figure 12. **FWD**

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

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



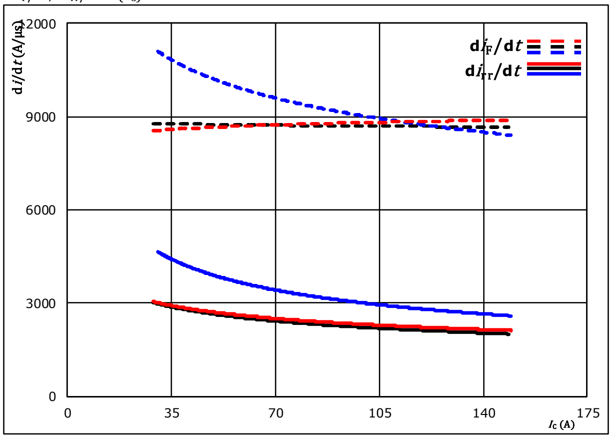
At						
V_{CE} =	350	V		25 °C	···········
V_{GE} =	-5 / 15	V	T_j:	125 °C	———
I_C =	90	A		150 °C	– – –

Boost Switching Characteristics

figure 13. FWD

Typical rate of fall of forward and reverse recovery current as a function of collector current

$di_F/dt, di_{rr}/dt = f(I_C)$

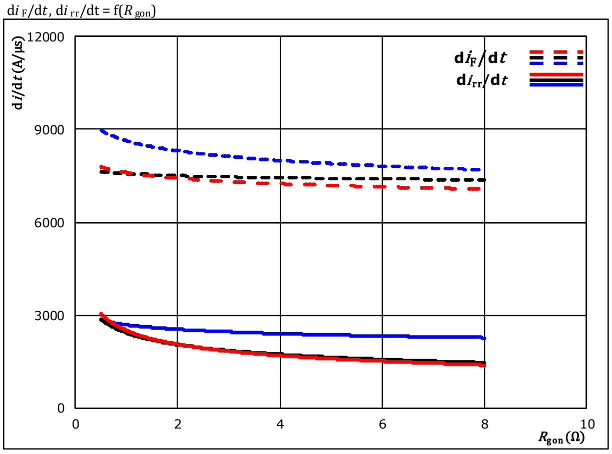


At					
V_{CE} =	350	V		25	°C
V_{GE} =	-5 / 15	V	T_j:	125	°C
R_{gon} =	2	Ω		150	°C

figure 14. FWD

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

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

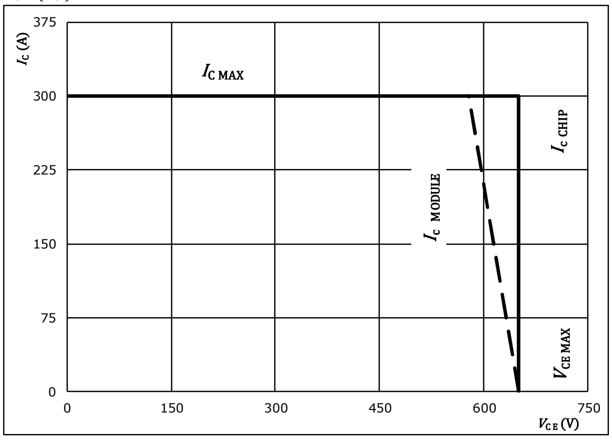


At					
V_{CE} =	350	V		25	°C
V_{GE} =	-5 / 15	V	T_j:	125	°C
I_C =	90	A		150	°C

figure 15. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	125	°C
R_{gon} =	2	Ω
R_{goff} =	2	Ω

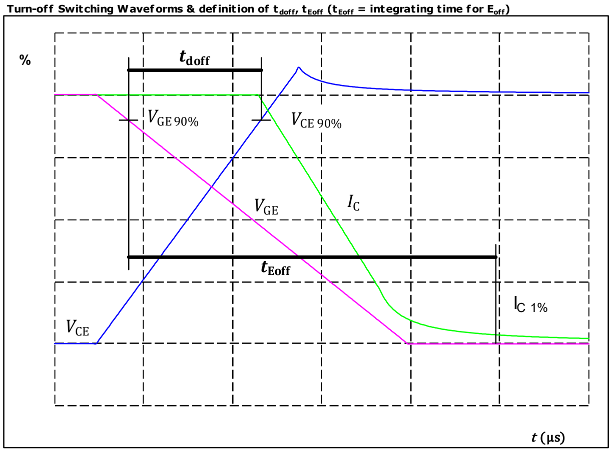
Boost Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	2 Ω
R_{goff}	=	2 Ω

figure 1. **IGBT**

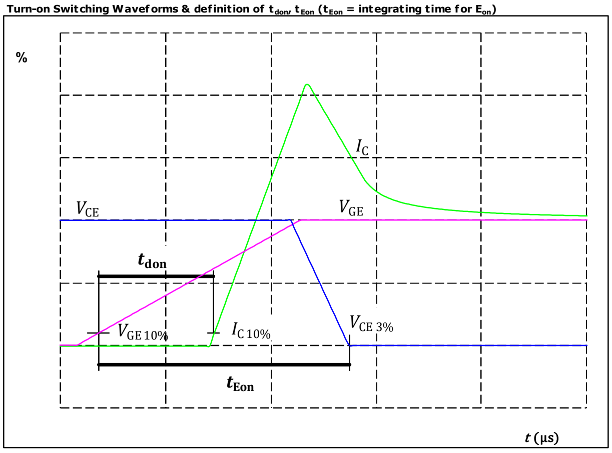
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-5	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	90	A
t_{doff} =	397	ns

figure 2. **IGBT**

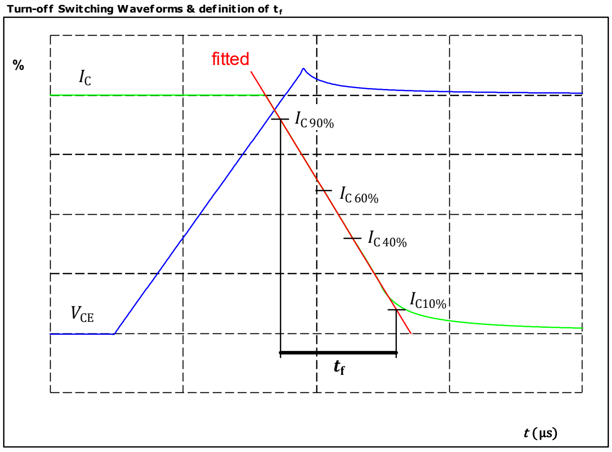
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-5	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	90	A
t_{don} =	94	ns

figure 3. **IGBT**

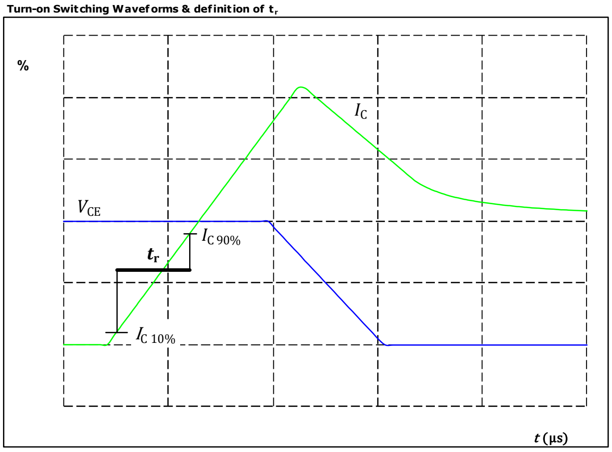
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	90	A
t_f =	73	ns

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

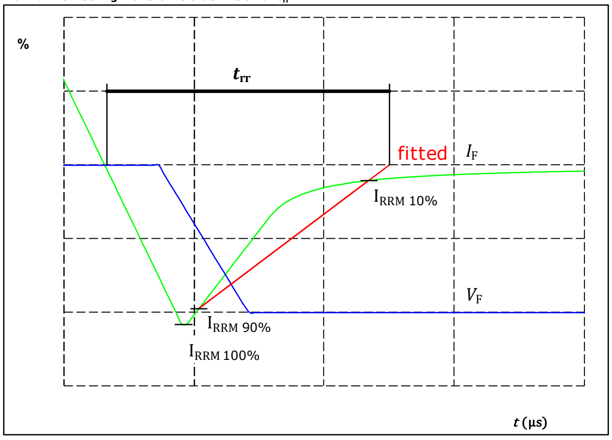


$V_C(100\%)$ =	350	V
$I_C(100\%)$ =	90	A
t_r =	9	ns

Boost Switching Characteristics

figure 5. **FWD**

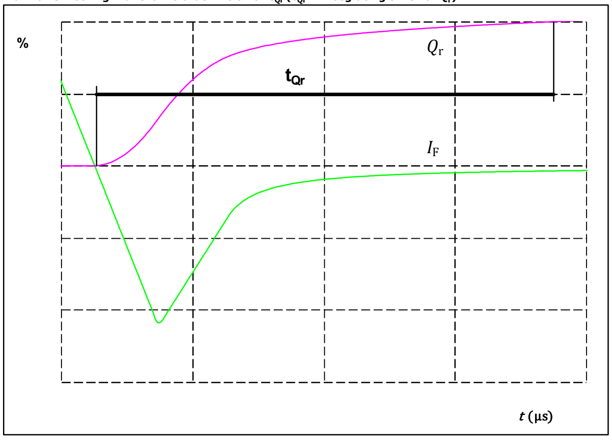
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	350	V
I_F (100%) =	90	A
I_{RRM} (100%) =	130	A
t_{rr} =	86	ns

figure 6. **FWD**

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



I_F (100%) =	90	A
Q_r (100%) =	5,86	µC

Ordering Code & Marking

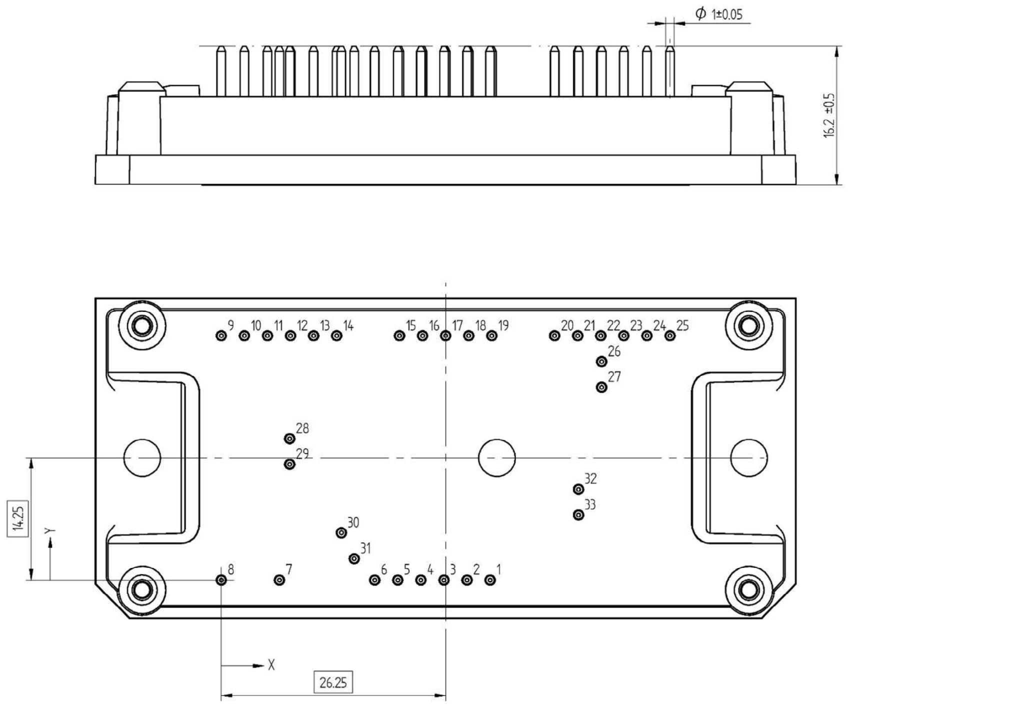
Version	Ordering Code
without thermal paste 12 mm housing with solder pins	10-FY07NIB200S504-LH46F58
with thermal paste 12 mm housing with solder pins	10-FY07NIB200S504-LH46F58-/3/

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

Outline

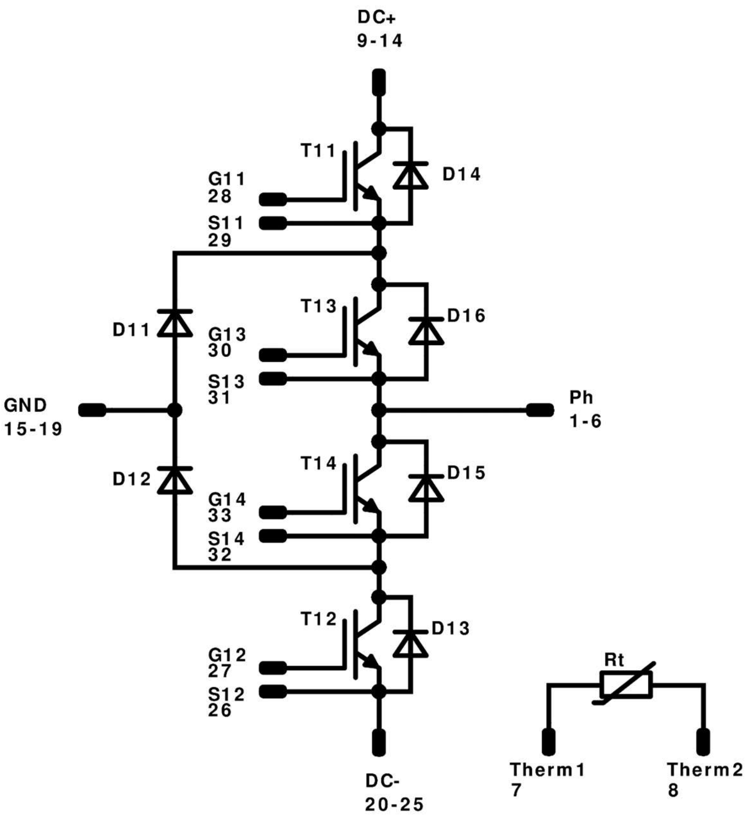
Pin table

Pin	X	Y	Function
1	31,45	0	Ph
2	28,75	0	Ph
3	26,05	0	Ph
4	23,35	0	Ph
5	20,65	0	Ph
6	17,95	0	Ph
7	6,8	0	Therm1
8	0	0	Therm2
9	0	28,5	DC+
10	2,7	28,5	DC+
11	5,4	28,5	DC+
12	8,1	28,5	DC+
13	10,8	28,5	DC+
14	13,5	28,5	DC+
15	20,85	28,5	GND
16	23,55	28,5	GND
17	26,25	28,5	GND
18	28,95	28,5	GND
19	31,65	28,5	GND
20	39	28,5	DC-
21	41,7	28,5	DC-
22	44,4	28,5	DC-
23	47,1	28,5	DC-
24	49,8	28,5	DC-
25	52,5	28,5	DC-
26	44,5	25,5	S12
27	44,5	22,5	G12
28	8	16,5	G11
29	8	13,5	S11
30	14,05	5,5	G13
31	15,55	2,5	S13
32	41,8	10,6	S14
33	41,8	7,6	G14



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	650 V	200 A	Buck Switch	
D11, D12	FWD	650 V	200 A	Buck Diode	
T13, T14	IGBT	650 V	150 A	Boost Switch	
D13, D14	FWD	650 V	100 A	Boost Diode	
D15, D16	FWD	650 V	100 A	Boost Sw.Inv.Diode	
Rt	NTC			Thermistor	

Vincotech

Packaging instruction				
Standard packaging quantity (SPQ) 100	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 1 packages see vincotech.com website.

Package data
Package data for *flow* 1 packages see 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-FY07NIB200S504-LH46F58-D2-14	16 May. 2019	Correction of I_c/I_f values	2