Vincotech

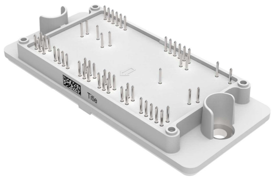
30-FT12NMA200SH01-M660F18
30-PT12NMA200SH01-M660F18Y
datasheet

flow MNPC 2	1200 V / 200 A

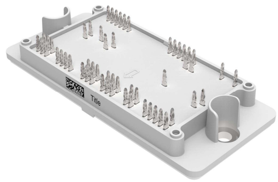
Features

- Three-level MNPC topology
- Reactive power capability
- High speed IGBTs
- Low inductive layout

flow 2 13 mm housing



Solder pin

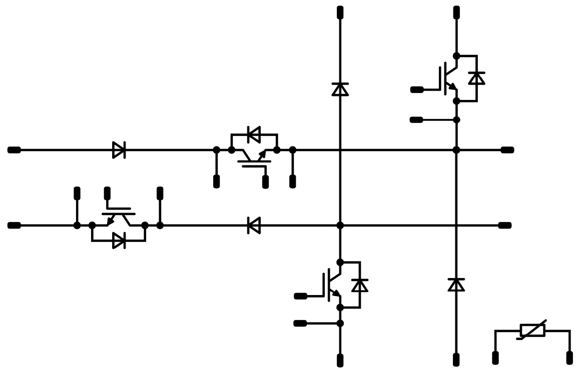


press-fit pin

Target applications

- Industrial Drives
- Solar Inverters
- UPS

Schematic



Types

- 30-FT12NMA200SH01-M660F18
- 30-PT12NMA200SH01-M660F18Y

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition			Value	Unit
Buck Switch						
Collector-emitter voltage	V_{CES}				1200	V
Collector current	I_C	$T_j = T_{jmax}$		T_s = 80 °C	171	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	434	W
Gate-emitter voltage	V_{GES}				±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V	V_{cc} = 800 V	T_j = 150 °C	10	µs
Maximum junction temperature	T_{jmax}				175	°C

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Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Buck Diode				
Peak repetitive reverse voltage	V_{RRM}		700	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	87	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	109	W
Maximum junction temperature	T_{jmax}		150	°C
Buck Sw. Protection Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F		15	A
Repetitive peak forward current	I_{FRM}		30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	52	W
Maximum junction temperature	T_{jmax}		150	°C
Boost Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C	125	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	198	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V V_{cc} = 360 V T_j = 150 °C	6	µs
Maximum junction temperature	T_{jmax}		175	°C
Boost Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	84	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 10 ms T_j = 150 °C	540	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	186	W
Maximum junction temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Boost Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	50	A
Repetitive peak forward current	I_{FRM}			100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	82	W
Maximum junction temperature	T_{jmax}			175	°C

Module Properties

Parameter	Symbol	Condition		Value	Unit
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{jop}			-40…(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC Test Voltage*	t_p = 2 s	4000	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

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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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0068	25	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		200	25 125	2	2,17 2,58	2,42	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			24	µA
Gate-emitter leakage current	I_{GES}		20	0		25			480	nA
Internal gate resistance	r_g							1		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		11080		pF
Reverse transfer capacitance	C_{res}							640		
Gate charge	Q_g		±15	600	200	25		1,52		µC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 1 W/mK (P12)						0,22		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	350	200	25 125		124 126		ns
Rise time	t_r					25 125		27 32		
Turn-off delay time	$t_{d(off)}$					25 125		190 234		
Fall time	t_f					25 125		41 61		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 4,5 µC Q_{rFWD} = 11 µC				25 125		2,38 4,20		mWs
Turn-off energy (per pulse)	E_{off}					25 125		5,02 7,97		

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				150	25 125	1,4	1,79 1,61	3,3	V
Reverse leakage current	I_R			700		25			50	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 1 W/mK (P12)						0,64		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 7630 A/µs di/dt = 6381 A/µs	±15	350	200	25 125		130 169		A
Reverse recovery time	t_{rr}					25 125		93 118		ns
Recovered charge	Q_r					25 125		4,47 11,00		µC
Reverse recovered energy	E_{rec}					25 125		0,905 2,39		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		5241 1766		A/µs
Buck Sw. Protection Diode										
Static										
Forward voltage	V_F				15	25 125	1,6	2,13 1,74	2,6	V
Reverse leakage current	I_R			1200		25			27	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 1 W/mK (P12)						1,35		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	
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0024	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		150	25 125	1,05	1,57 1,68	1,85	V
Collector-emitter cut-off current	I_{CES}		0	650		25			7,6	µA
Gate-emitter leakage current	I_{GES}		20	0		25			1200	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		9240		pF
Output capacitance	C_{oes}							376		
Reverse transfer capacitance	C_{res}							274		
Gate charge	Q_g		15	480	150	25		940		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 1 W/mK (P12)						0,48		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 2 Ω R_{goff} = 2 Ω	±15	350	150	25 125		123 114		ns
Rise time	t_r					25 125		21 21		
Turn-off delay time	$t_{d(off)}$					25 125		168 177		
Fall time	t_f					25 125		38 59		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 6,6 µC Q_{rFWD} = 12,9 µC				25 125		1,19 1,72		mWs
Turn-off energy (per pulse)	E_{off}					25 125		3,59 5,13		

Characteristic Values

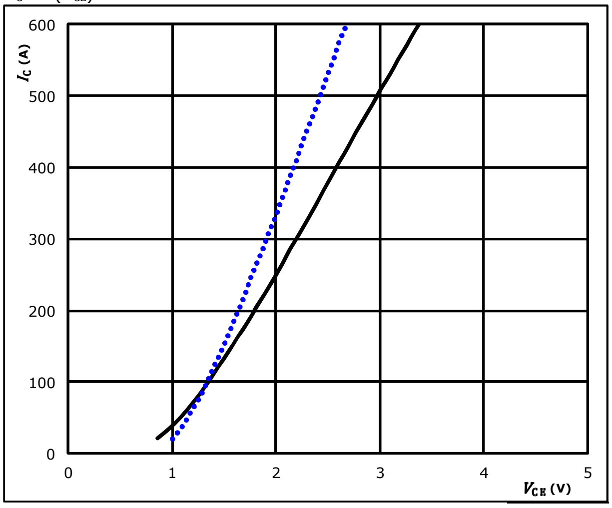
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Boost Diode										
Static										
Forward voltage	V_F				100	25 125	1,5	2,23 2,34	2,54	V
Reverse leakage current	I_R			1200		25 150			120 17600	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 1 W/mK (P12)						0,51		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 9114 A/µs di/dt = 8387 A/µs	±15	350	150	25 125		184 216		A
Reverse recovery time	t_{rr}					25 125		48 114		ns
Recovered charge	Q_r					25 125		6,619 12,94		µC
Reverse recovered energy	E_{rec}					25 125		1,62 3,42		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		11659 9489		A/µs
Boost Sw. Protection Diode										
Static										
Forward voltage	V_F				50	25 125	1,20	1,78 1,70	1,90	V
Reverse leakage current	I_R			650		25			0,6	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 1 W/mK (P12)						1,16		K/W
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1486 Ω				100	-12		+14	%
Power dissipation	P					25		200		mW
Power dissipation constant						25		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				25		3950		K
B-value	$B_{(25/100)}$	Tol. ±3%				25		3998		K
Vincotech NTC Reference									B	

Buck Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

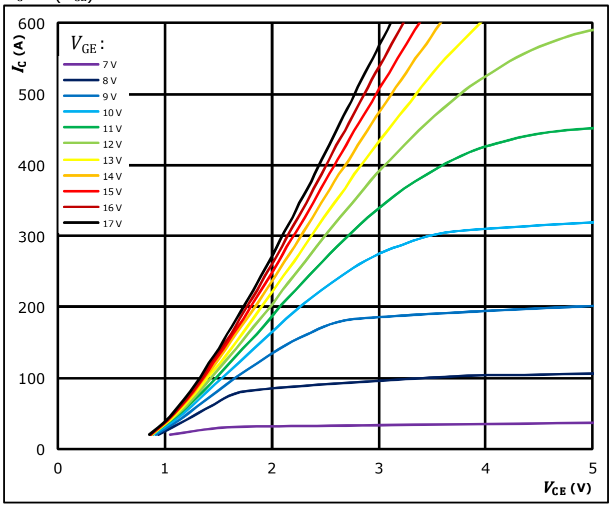


t_p =	250	µs	T_j:	25 °C	··········
V_{GE} =	15	V		125 °C	——

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

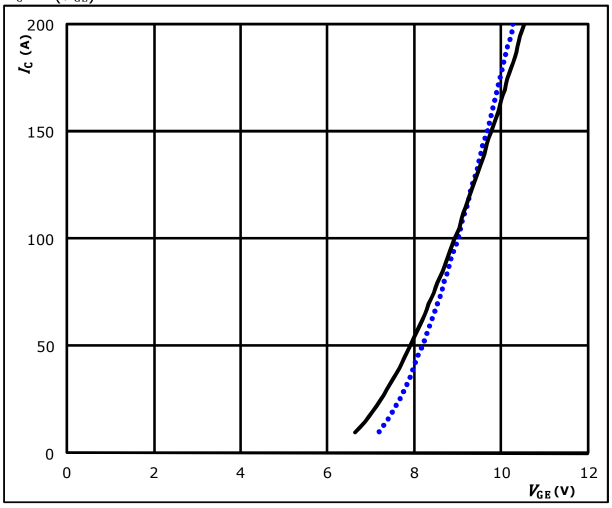


t_p = 250 µs
T_j = 125 °C
V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

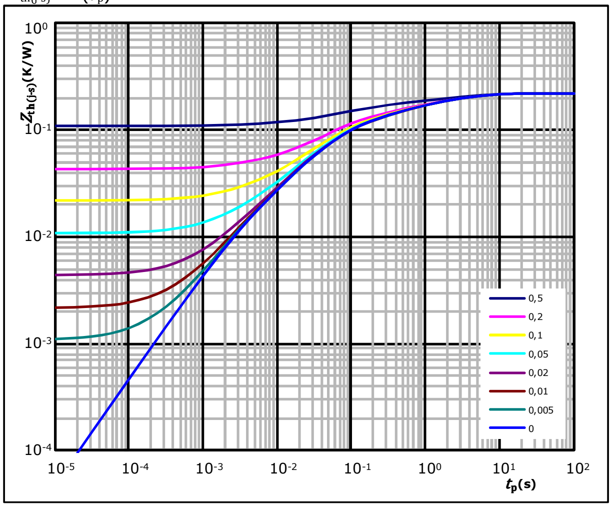


t_p =	100	µs	T_j:	25 °C	··········
V_{CE} =	10	V		125 °C	——

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T
$R_{th(j\text{-}s)}$ = 0,22 K/W

IGBT thermal model values

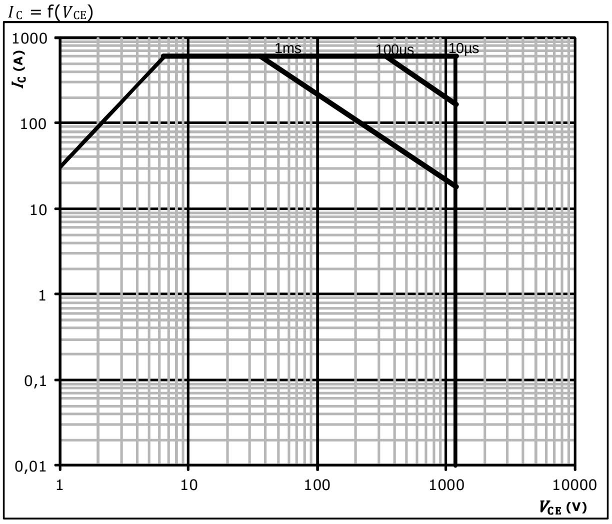
R (K/W)	τ (s)
4,22E-02	3,98E+00
4,51E-02	9,40E-01
4,08E-02	2,28E-01
6,82E-02	5,37E-02
1,62E-02	1,58E-02
6,17E-03	2,79E-03

Buck Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



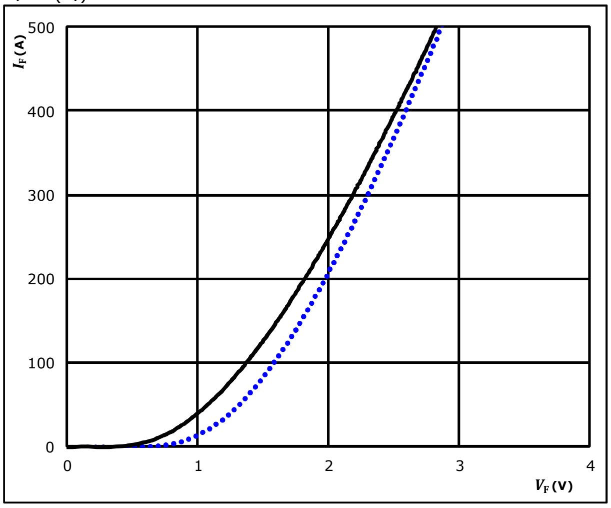
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Buck Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



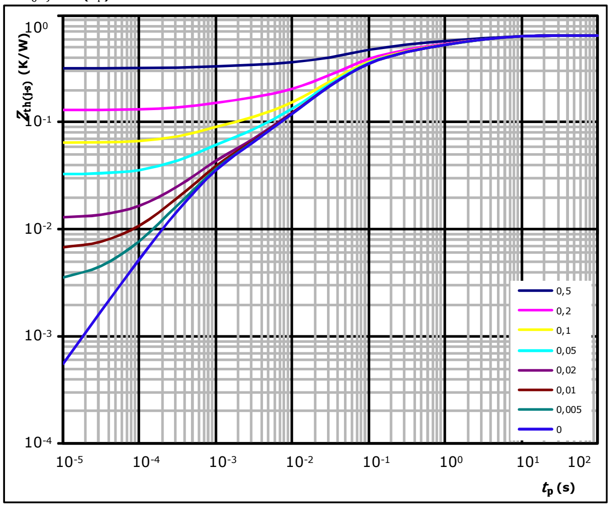
t_p = 250 µs

T_j: 25 °C (dotted), 125 °C (solid)

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 0,64 K/W

FWD thermal model values

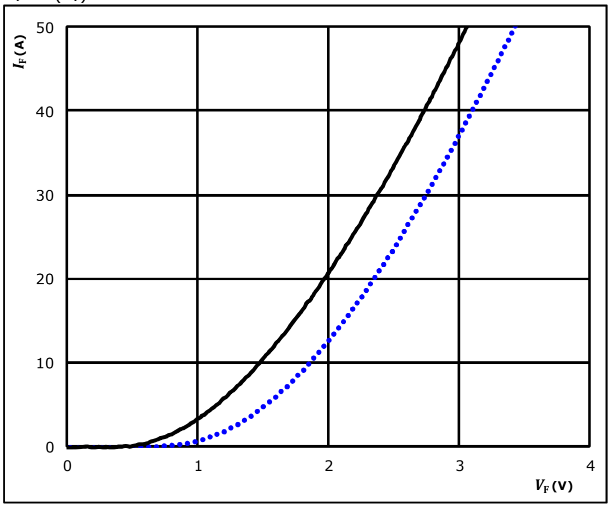
R (K/W)	τ (s)
8,64E-02	4,57E+00
1,07E-01	1,16E+00
1,60E-01	1,83E-01
2,26E-01	3,83E-02
3,16E-02	5,84E-03
3,18E-02	7,41E-04

Buck Sw. Protection Diode Characteristics

figure 1. FWD

Typical forward characteristics

$I_F = f(V_F)$



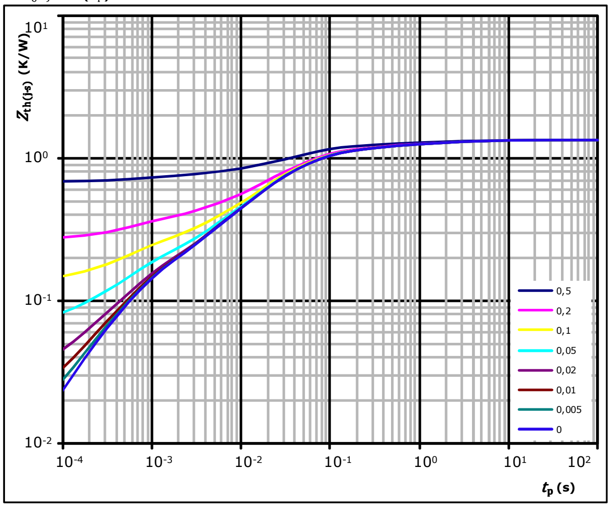
t_p = 250 μs

T_j: 25 °C (dotted), 125 °C (solid)

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,35 K/W

FWD thermal model values

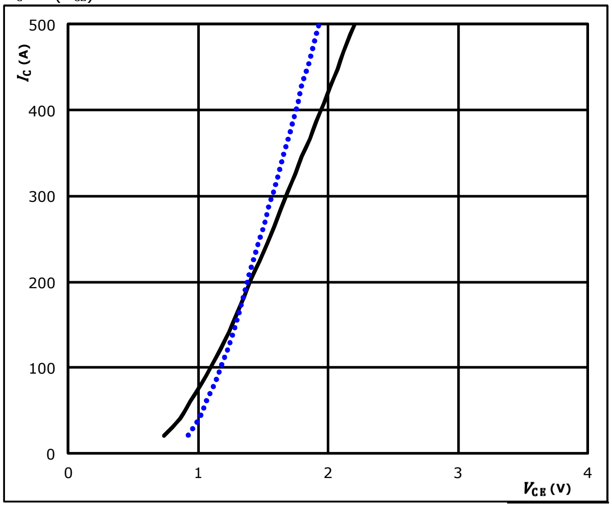
R (K/W)	τ (s)
6,28E-02	4,29E+00
1,37E-01	7,41E-01
2,22E-01	1,16E-01
6,61E-01	2,97E-02
1,45E-01	5,97E-03
1,19E-01	5,93E-04

Boost Switch Characteristics

figure 1. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

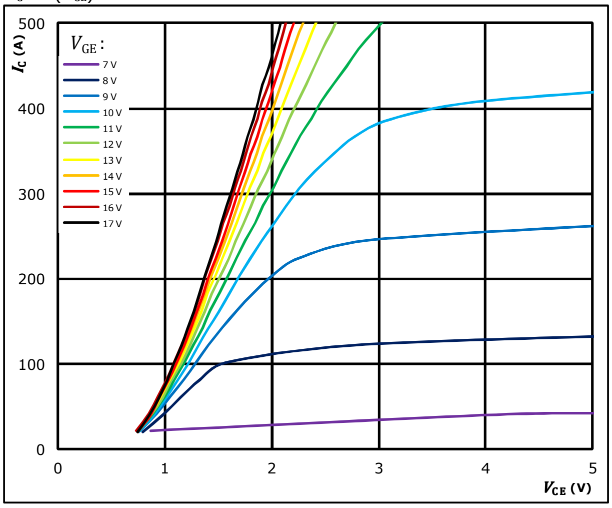


t_p =	250	µs	T_j:	25 °C	dotted
V_{GE} =	15	V		125 °C	solid

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

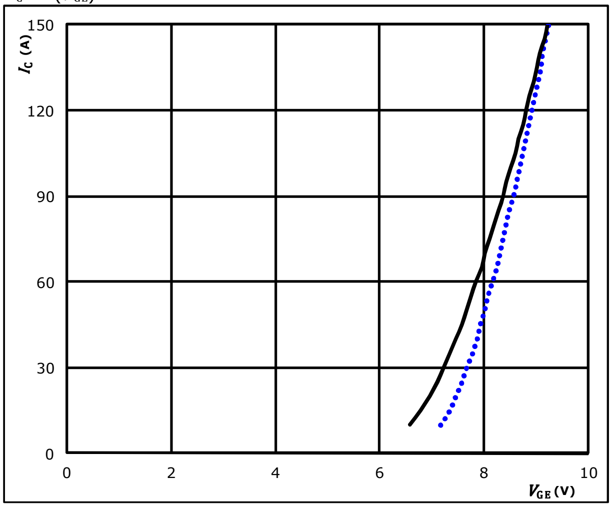


t_p = 250 µs
T_j = 125 °C
V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

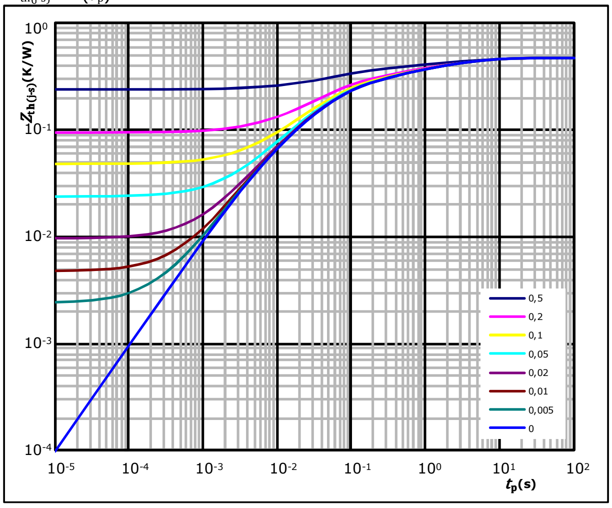


t_p =	100	µs	T_j:	25 °C	dotted
V_{CE} =	10	V		125 °C	solid

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



D = t_p / T
$R_{th(j-s)}$ = 0,48 K/W

IGBT thermal model values

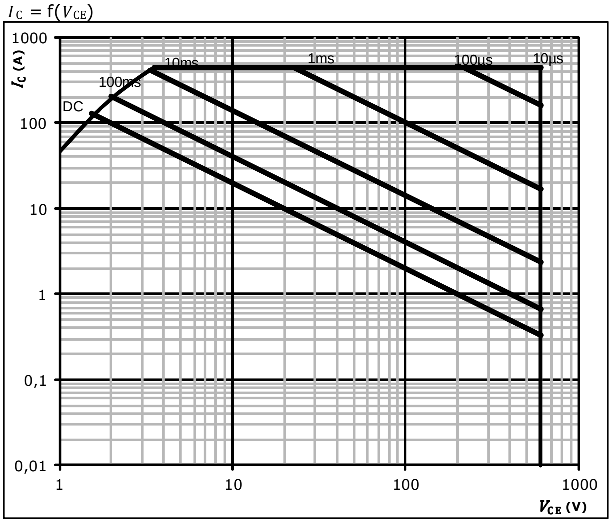
R (K/W)	τ (s)
8,90E-02	4,40E+00
1,10E-01	7,62E-01
1,05E-01	1,32E-01
1,51E-01	3,41E-02
2,43E-02	5,47E-03

Boost Switch Characteristics

figure 5.	IGBT

Safe operating area

$I_C = f(V_{CE})$



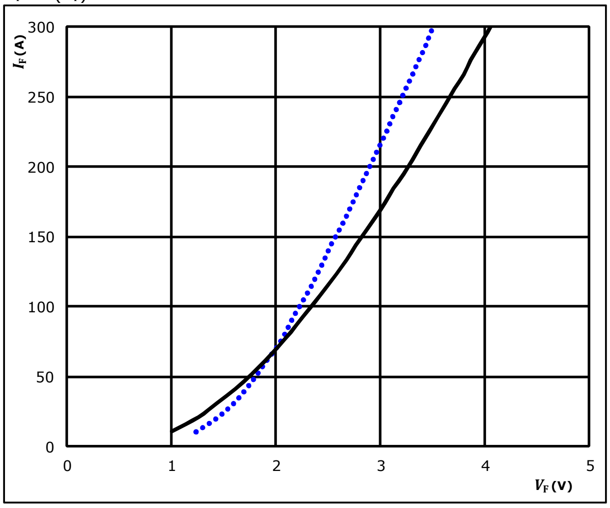
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Boost Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



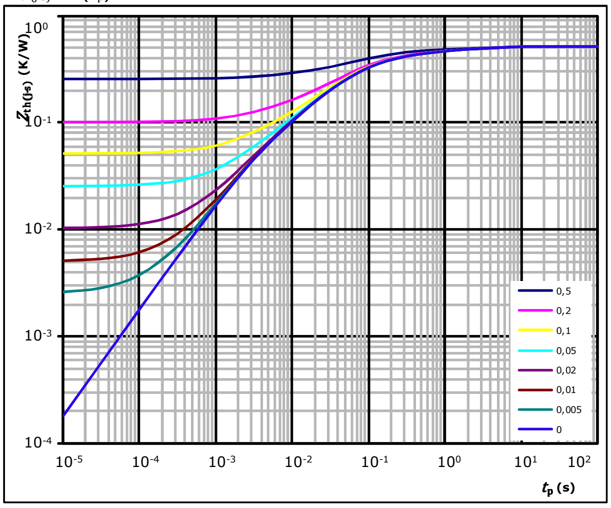
t_p = 250 μs

T_j: 25 °C (dotted line); 125 °C (solid line)

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 0,51 K/W

FWD thermal model values

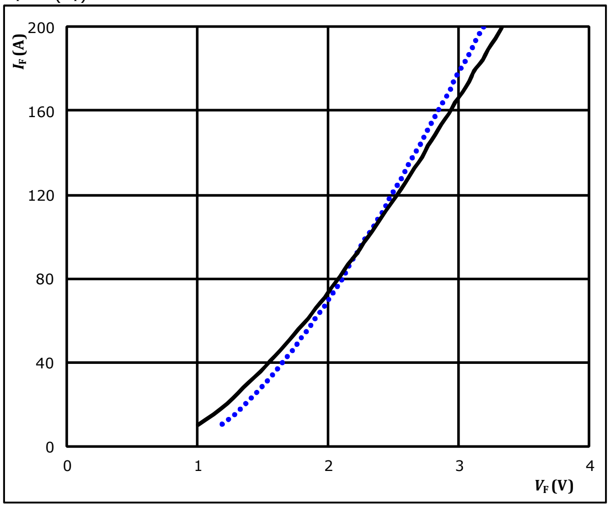
R (K/W)	τ (s)
5,62E-02	3,05E+00
8,02E-02	4,55E-01
1,97E-01	8,90E-02
1,39E-01	2,65E-02
3,83E-02	3,64E-03

Boost Sw. Protection Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



t_p = 250 µs

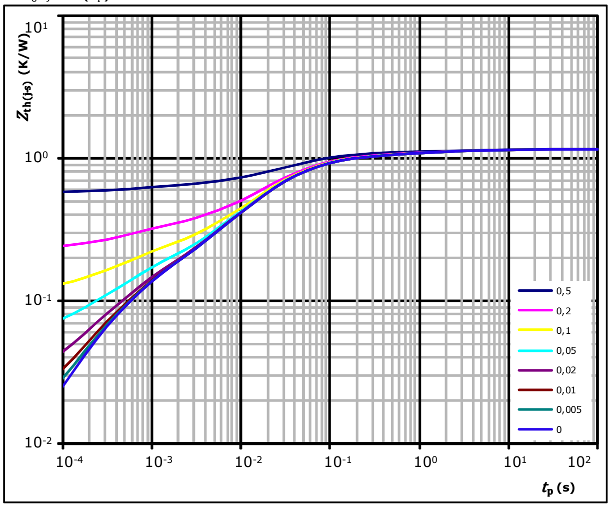
T_j: 25 °C ············

125 °C ———

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j\text{-}s)}$ = 1,16 K/W

FWD thermal model values

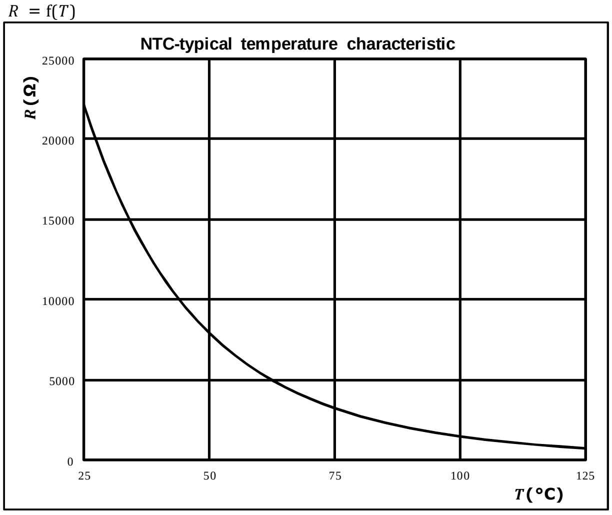
R (K/W)	τ (s)
5,64E-02	5,13E+00
1,01E-01	6,20E-01
2,54E-01	8,75E-02
5,53E-01	2,26E-02
9,80E-02	3,72E-03
9,63E-02	4,43E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic
as a function of temperature

$R = f(T)$

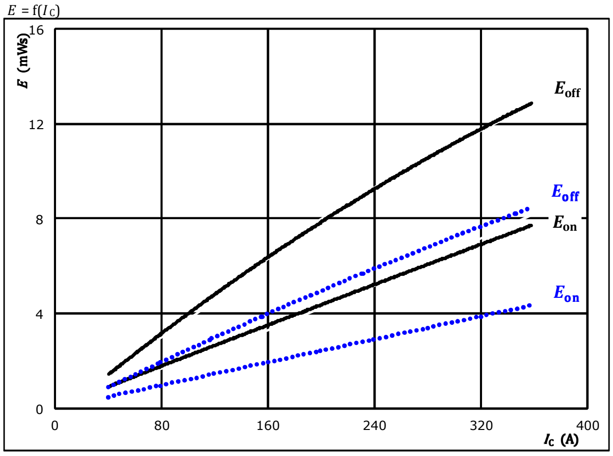


Buck Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



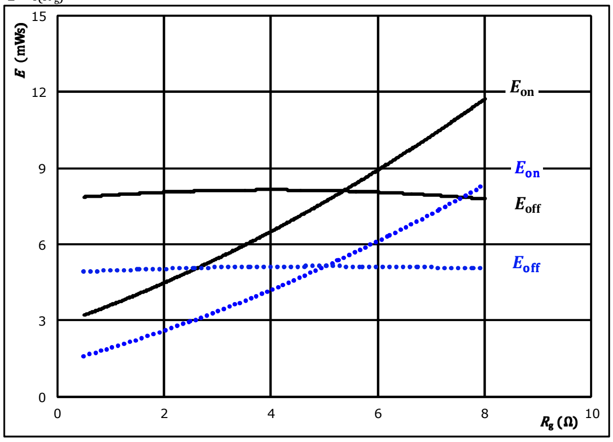
With an inductive load at

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

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



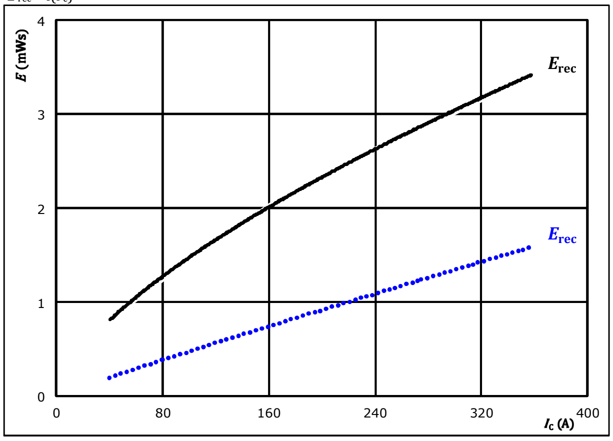
With an inductive load at

V_{CE} =	350	V	T_j: 25 °C	dotted
V_{GE} =	±15	V	T_j: 125 °C	solid
I_C =	200	A		

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



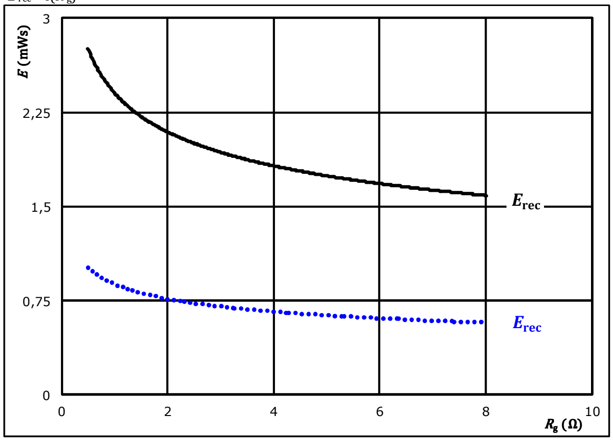
With an inductive load at

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

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

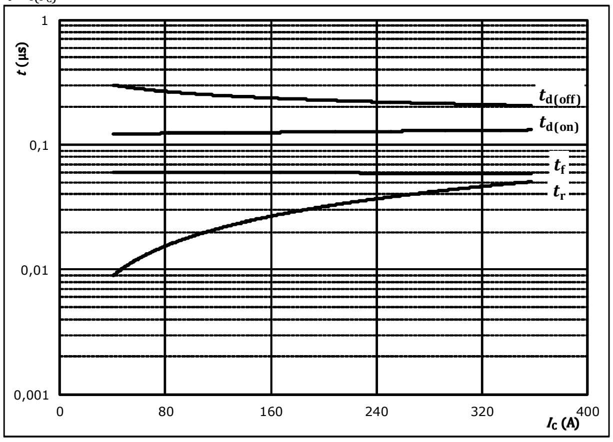
V_{CE} =	350	V	T_j: 25 °C	dotted
V_{GE} =	±15	V	T_j: 125 °C	solid
I_C =	200	A		

Buck Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



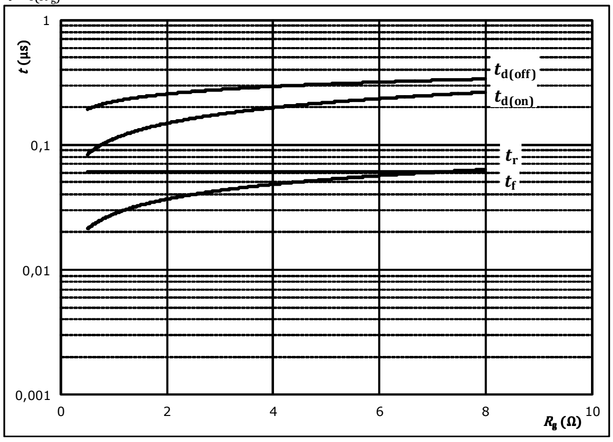
With an inductive load at

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

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



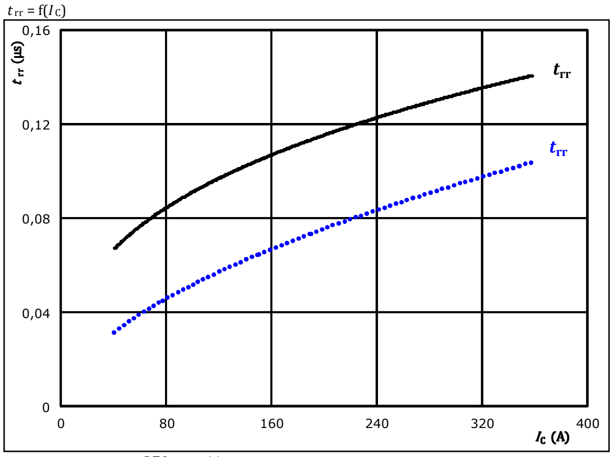
With an inductive load at

T_j =	125	°C
V_{CE} =	350	V
V_{GE} =	±15	V
I_C =	200	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



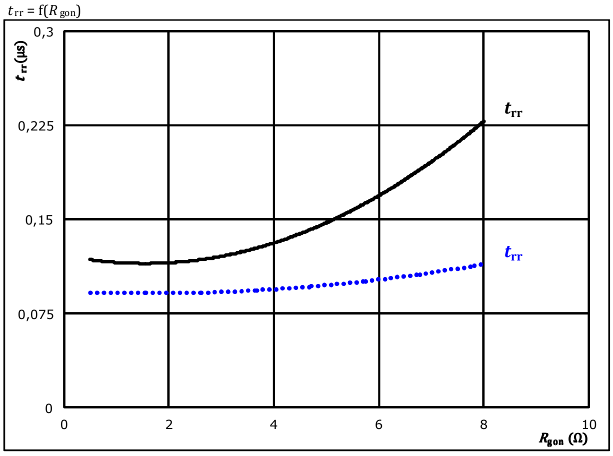
At

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

figure 8. **FWD**

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

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



At

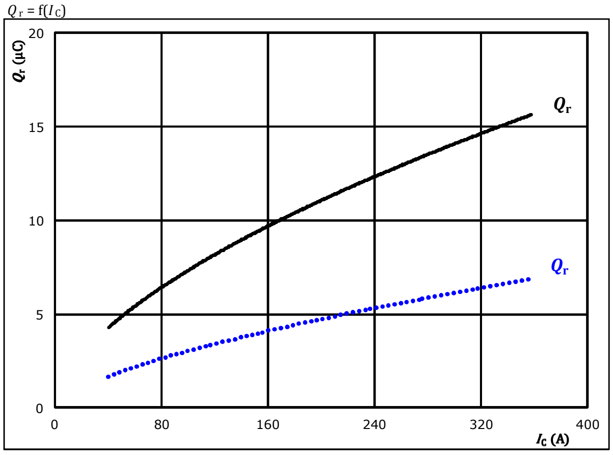
V_{CE} =	350	V	T_j:	25 °C (dotted)
V_{GE} =	±15	V		125 °C (solid)
I_C =	200	A		

Buck Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

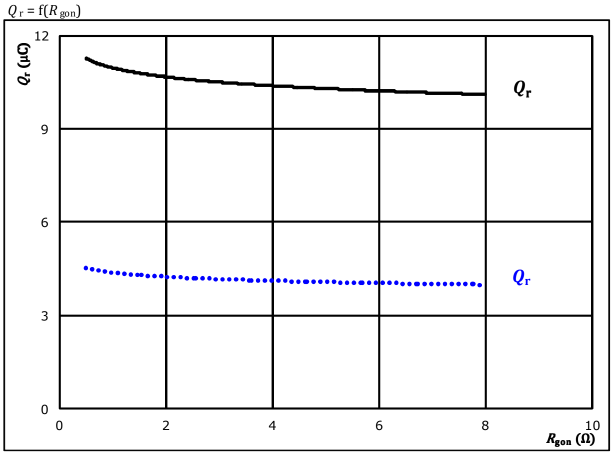


At	V_{CE} =	350	V	T_j:	25 °C	dotted
	V_{GE} =	±15	V		125 °C	solid
	R_{gon} =	2	Ω			

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

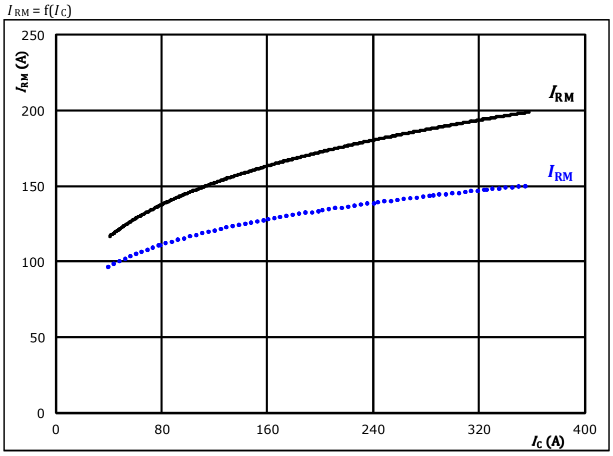


At	V_{CE}=	350	V	T_j:	25 °C	dotted
	V_{GE} =	±15	V		125 °C	solid
	I_C=	200	A			

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

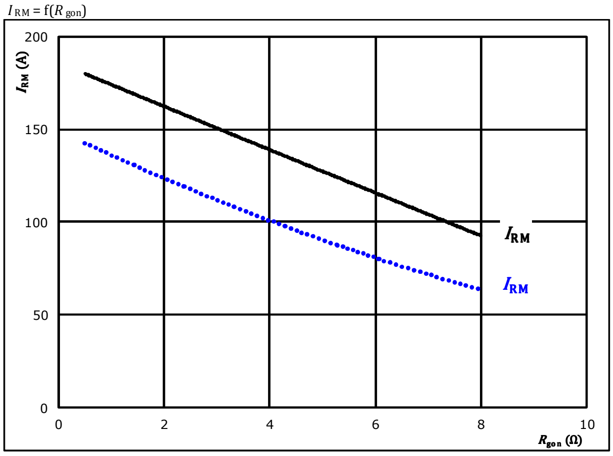


At	V_{CE} =	350	V	T_j:	25 °C	dotted
	V_{GE} =	±15	V		125 °C	solid
	R_{gon} =	2	Ω			

figure 12. **FWD**

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

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



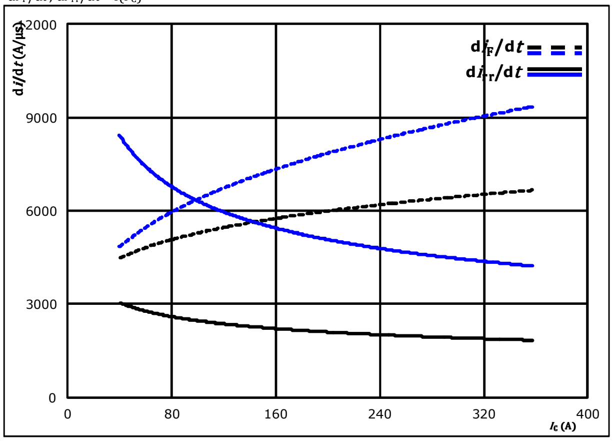
At	V_{CE} =	350	V	T_j:	25 °C	dotted
	V_{GE} =	±15	V		125 °C	solid
	I_C =	200	A			

Buck Switching Characteristics

figure 13. **FWD**

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

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

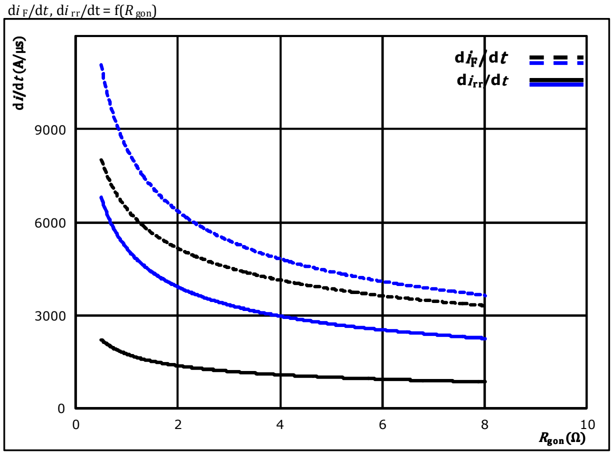


At				
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	2	Ω		

figure 14. **FWD**

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

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

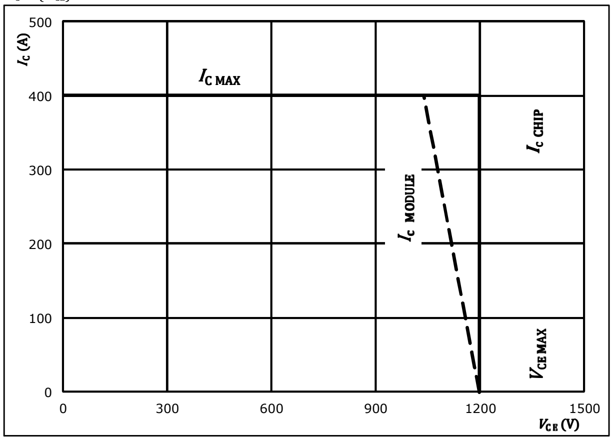


At				
V_{CE} =	350	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	200	A		

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	175	°C
R_{gon} =	2	Ω
R_{goff} =	2	Ω

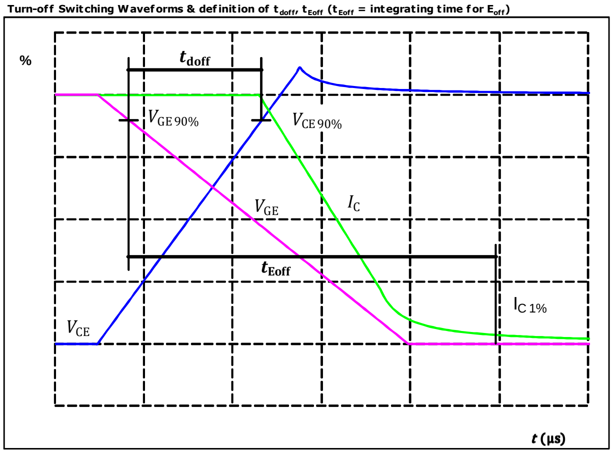
Buck Switching Definitions

General conditions

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

figure 1. **IGBT**

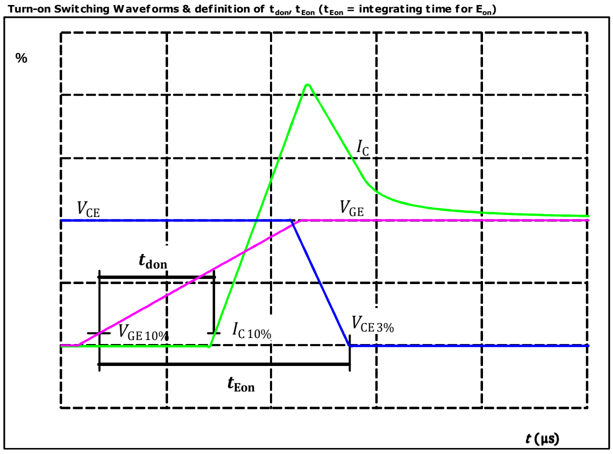
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



V_{GE}(0%) =	-15	V
V_{GE}(100%) =	15	V
V_C(100%) =	350	V
I_C(100%) =	200	A
t_{doff} =	234	ns

figure 2. **IGBT**

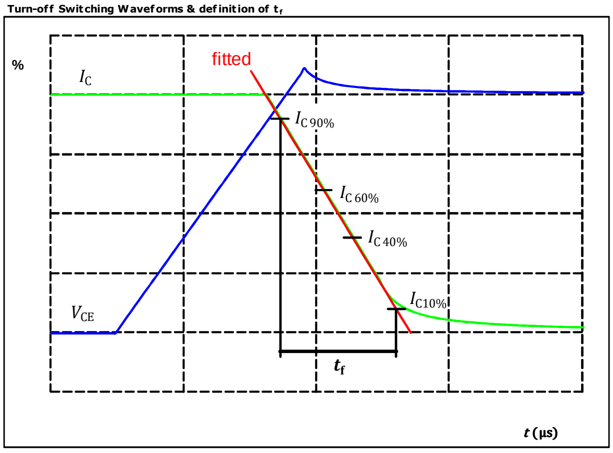
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



V_{GE}(0%) =	-15	V
V_{GE}(100%) =	15	V
V_C(100%) =	350	V
I_C(100%) =	200	A
t_{don} =	126	ns

figure 3. **IGBT**

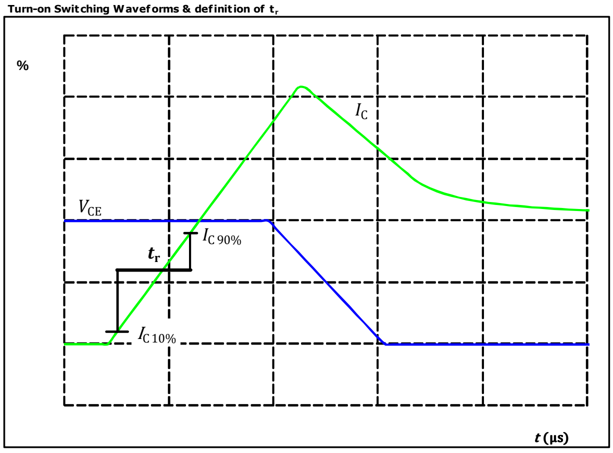
Turn-off Switching Waveforms & definition of t_f



V_C(100%) =	350	V
I_C(100%) =	200	A
t_f =	61	ns

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

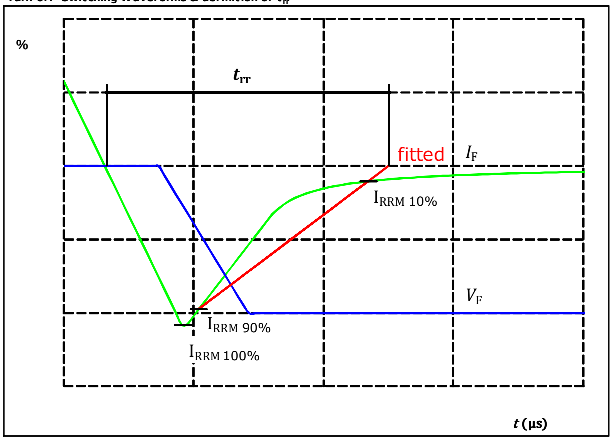


V_C(100%) =	350	V
I_C(100%) =	200	A
t_r =	32	ns

Buck Switching Characteristics

figure 5.	FWD

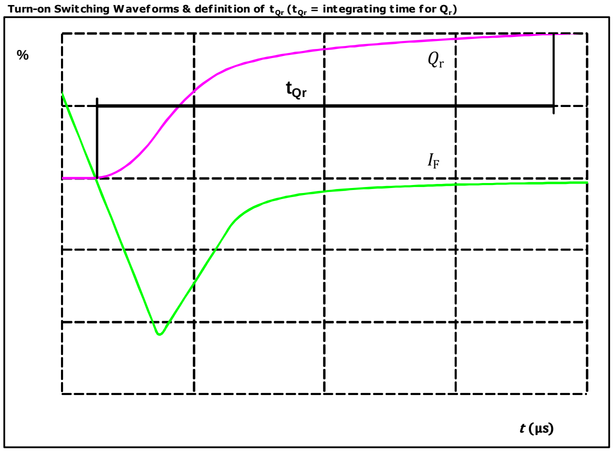
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	350	V
I_F (100%) =	200	A
I_{RRM} (100%) =	169	A
t_{rr} =	118	ns

figure 6.	FWD

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



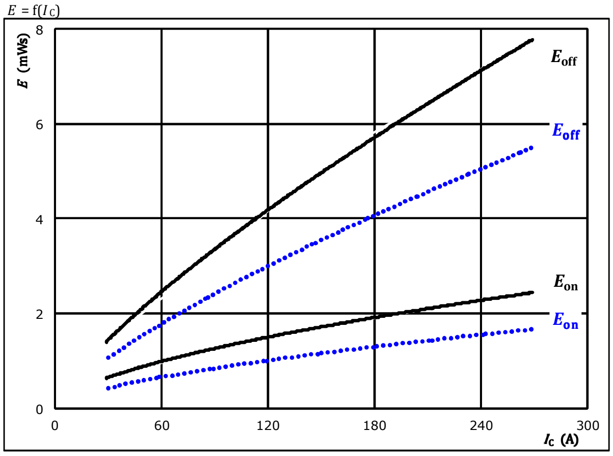
I_F (100%) =	200	A
Q_r (100%) =	11,00	µC

Boost Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



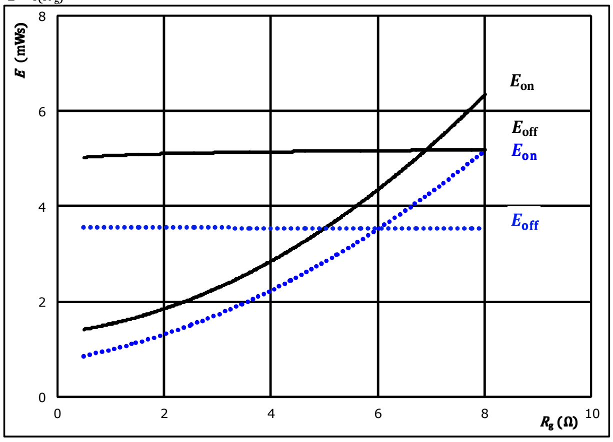
With an inductive load at

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

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



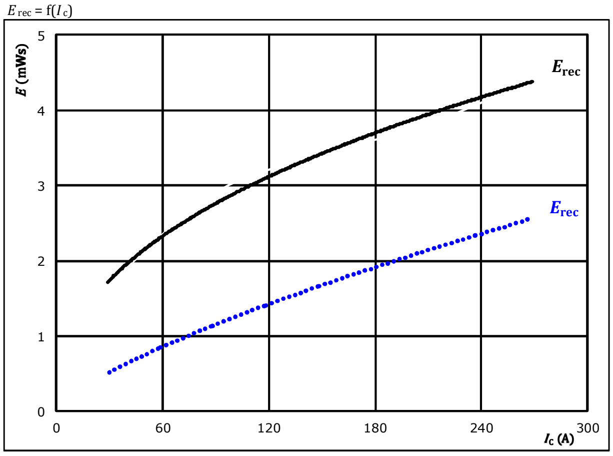
With an inductive load at

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

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



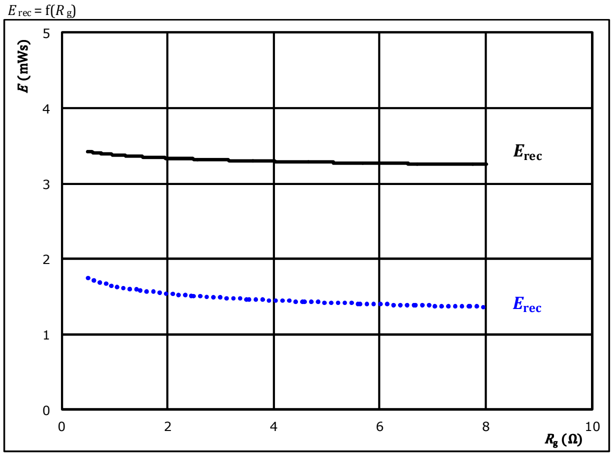
With an inductive load at

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

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	··········
V_{GE} =	±15	V		125 °C	――
I_C =	150	A			

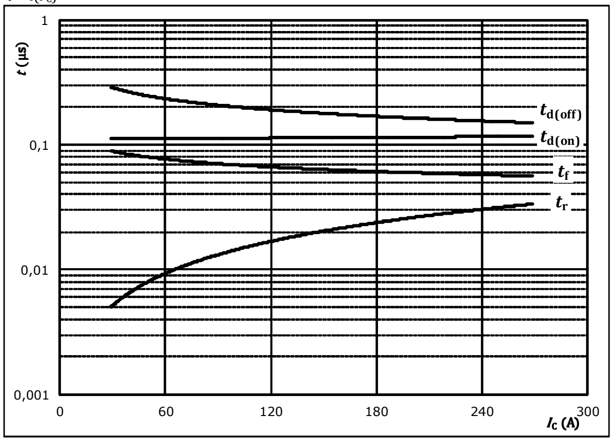
Vincotech

Boost Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



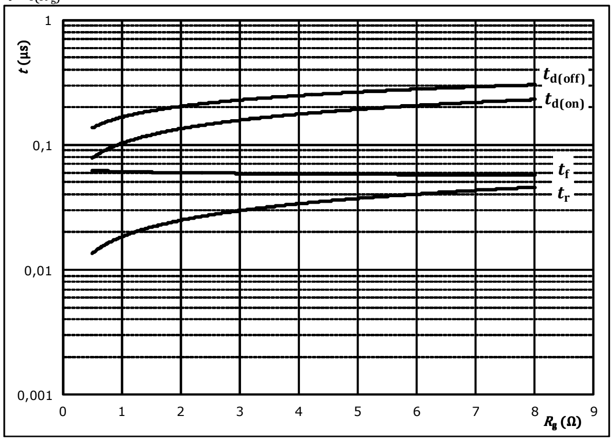
With an inductive load at

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

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



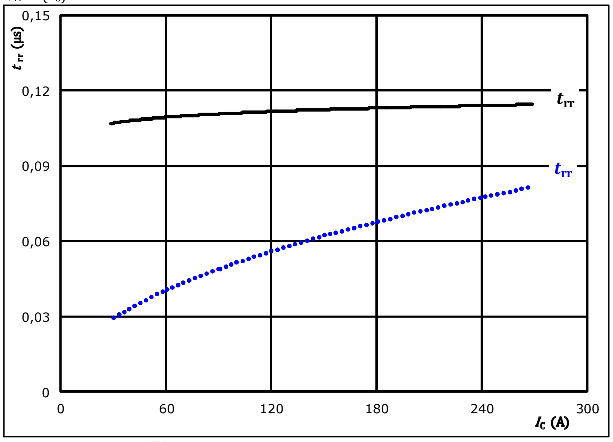
With an inductive load at

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

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

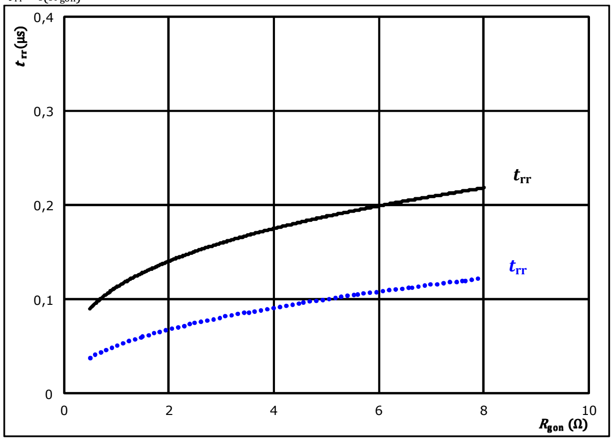


At V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	2	Ω			

figure 8. FWD

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

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



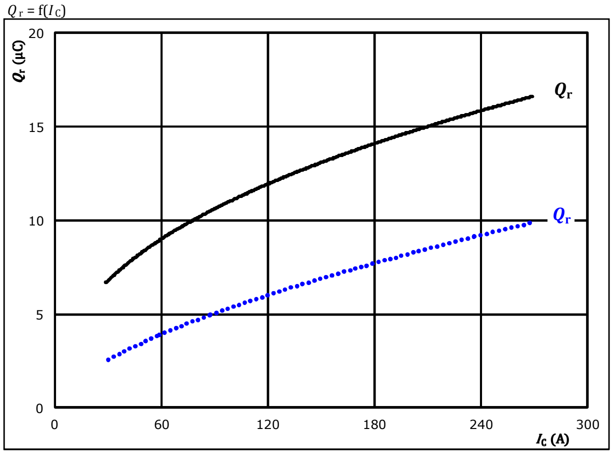
At V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	150	A			

Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

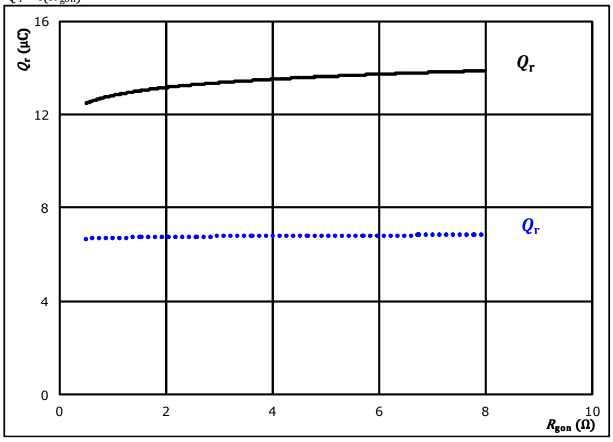


At					
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	2	Ω			

figure 10. FWD

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

$Q_r = f(R_{gon})$

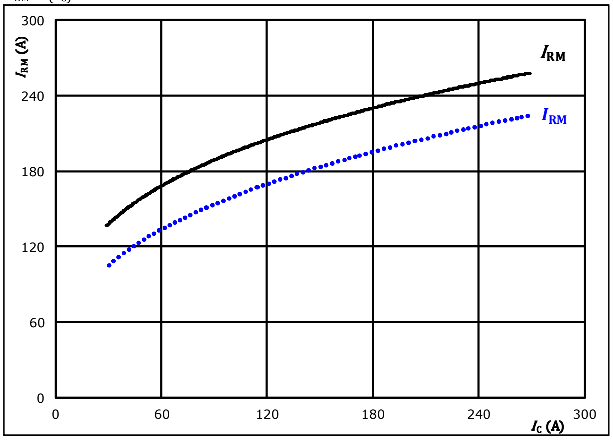


At					
V_{CE}=	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C=	150	A			

figure 11. FWD

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

$I_{RM} = f(I_C)$

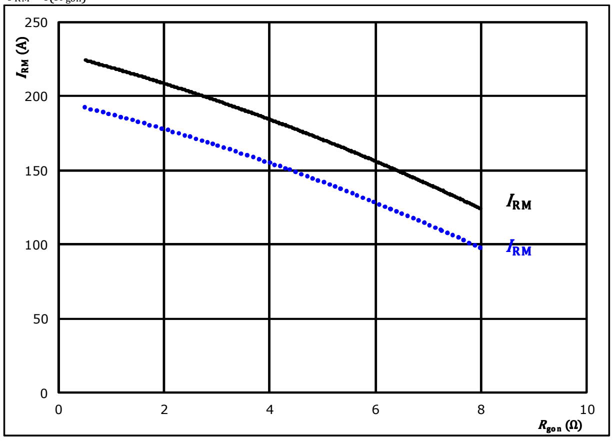


At					
V_{CE}:	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	2	Ω			

figure 12. FWD

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

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



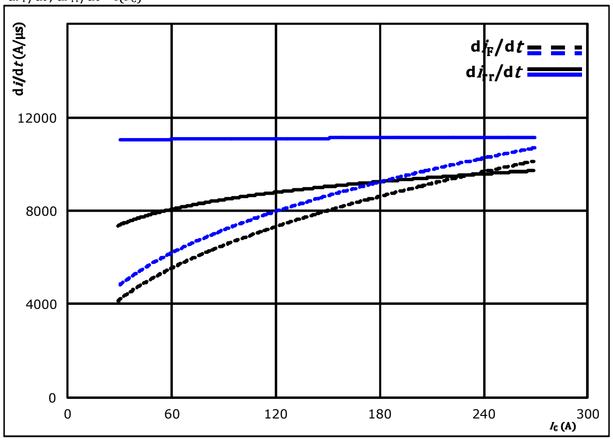
At					
V_{CE} =	350	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	150	A			

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

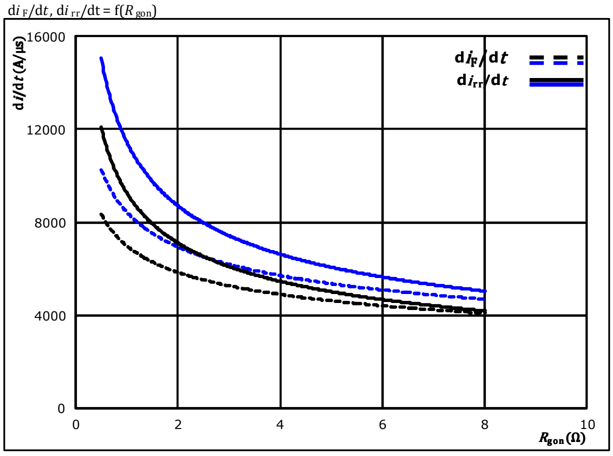


At					
V_{CE} =	350	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
R_{gon} =	2	Ω			

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

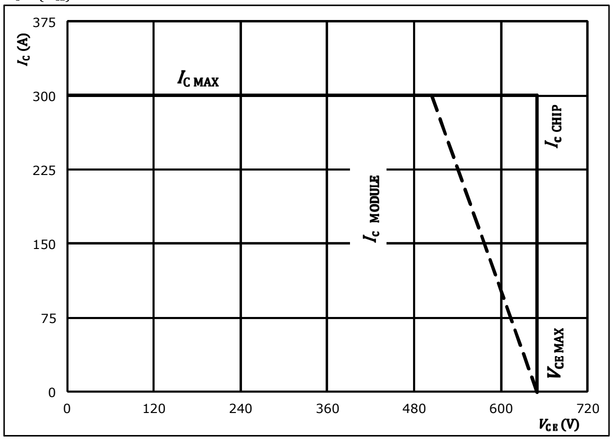


At					
V_{CE} =	350	V		25	°C
V_{GE} =	±15	V	T_j:	125	°C
I_C =	150	A			

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	175	°C
R_{gon} =	2	Ω
R_{goff} =	2	Ω

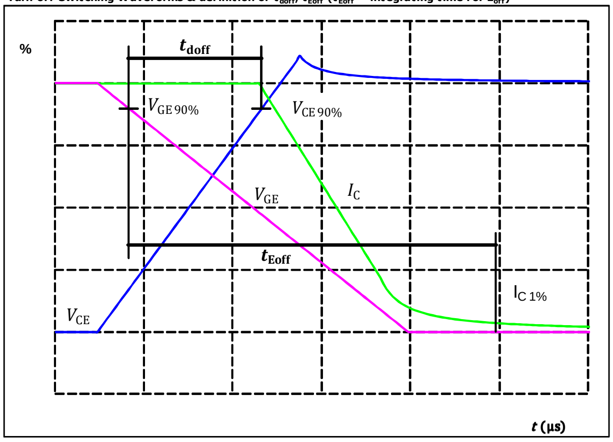
Boost Switching Definitions

General conditions

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

figure 1. IGBT

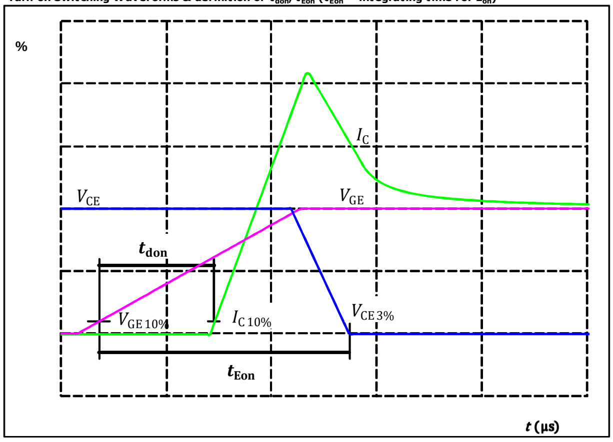
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



V_{GE}(0%) =	-15	V
V_{GE}(100%) =	15	V
V_C(100%) =	350	V
I_C(100%) =	150	A
t_{doff} =	177	ns

figure 2. IGBT

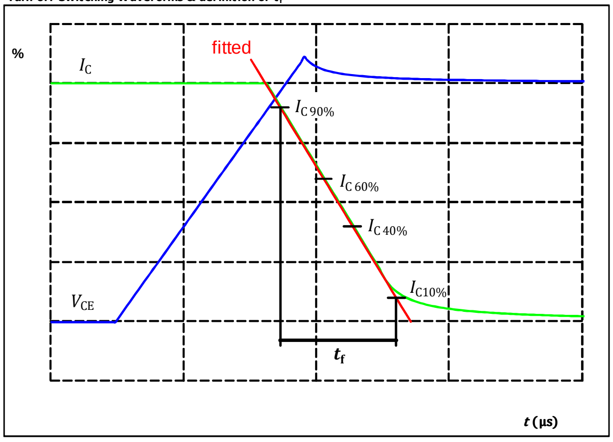
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



V_{GE}(0%) =	-15	V
V_{GE}(100%) =	15	V
V_C(100%) =	350	V
I_C(100%) =	150	A
t_{don} =	114	ns

figure 3. IGBT

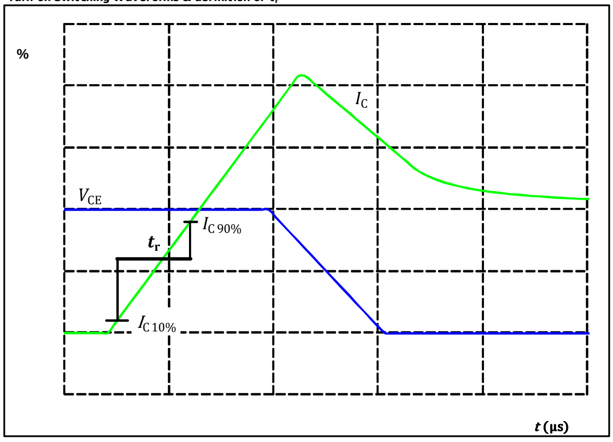
Turn-off Switching Waveforms & definition of t_f



V_C(100%) =	350	V
I_C(100%) =	150	A
t_f =	59	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

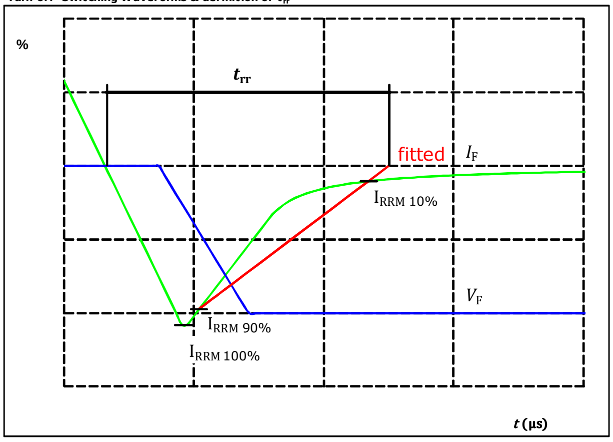


V_C(100%) =	350	V
I_C(100%) =	150	A
t_r =	21	ns

Boost Switching Characteristics

figure 5. **FWD**

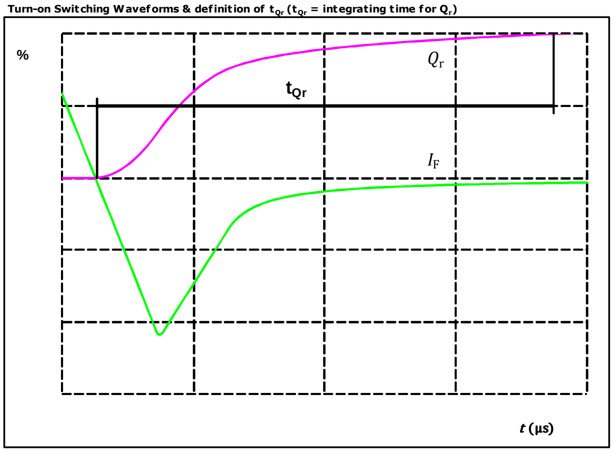
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	350	V
I_F (100%) =	150	A
I_{RRM} (100%) =	216	A
t_{rr} =	114	ns

figure 6. **FWD**

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



I_F (100%) =	150	A
Q_r (100%) =	12,94	µC

Ordering Code & Marking

Version	Ordering Code
without thermal paste 13 mm housing with solder pins	30-FT12NMA200SH01-M660F18
with thermal paste 13 mm housing with solder pins	30-FT12NMA200SH01-M660F18-/3/
without thermal paste 13 mm housing with press-fit pins	30-PT12NMA200SH01-M660F18Y
with thermal paste 13 mm housing with press-fit pins	30-PT12NMA200SH01-M660F18Y-/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		

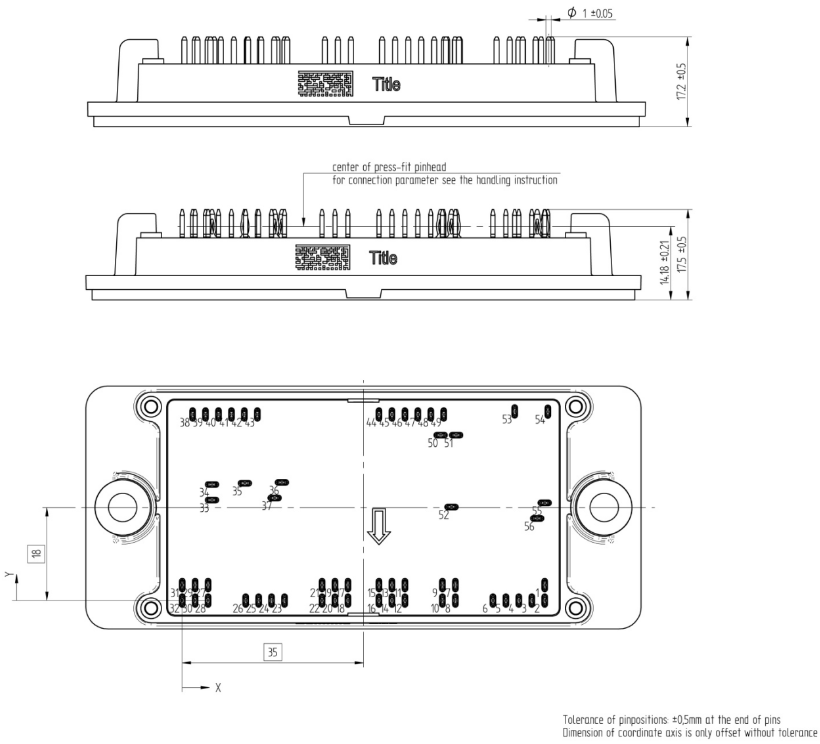
Outline

Pin table

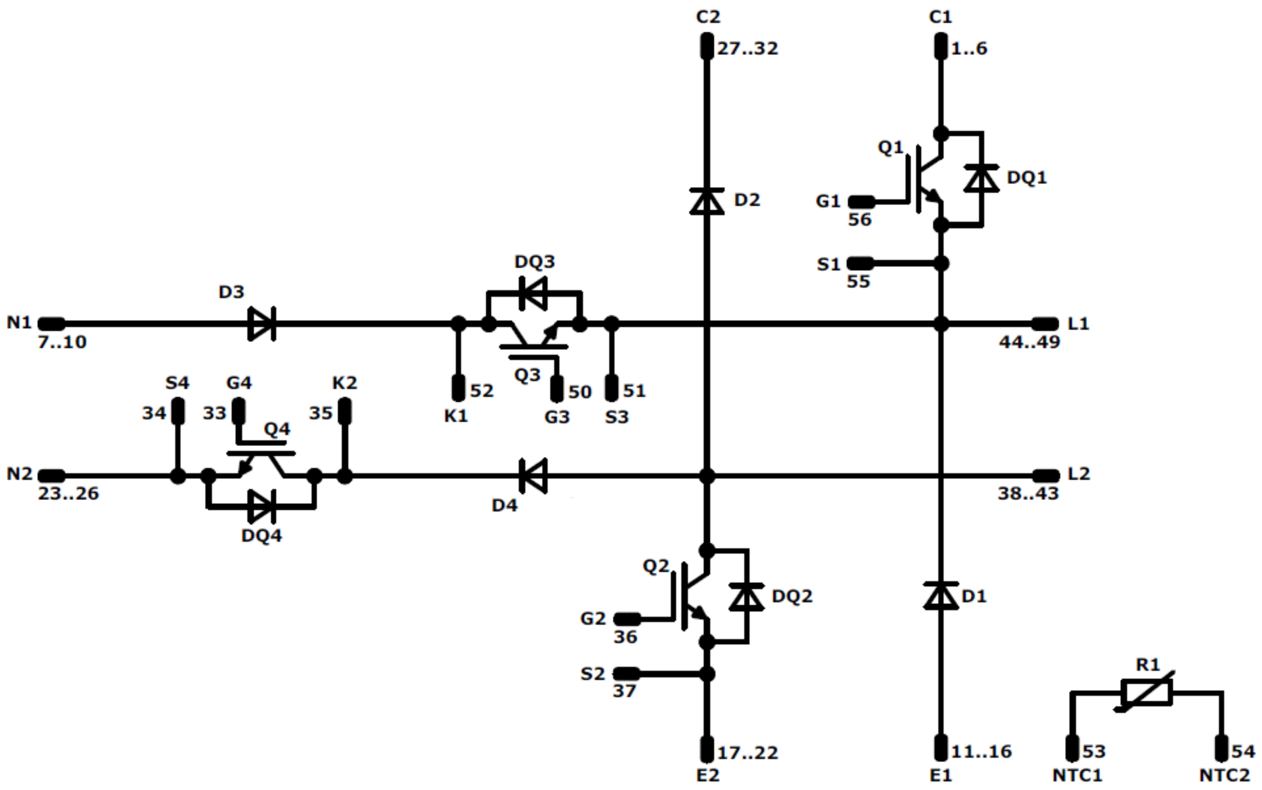
Pin	X	Y	Function
1	70	3	C1
2	70	0	C1
3	67,5	0	C1
4	65	0	C1
5	62,5	0	C1
6	60	0	C1
7	52,75	3	N1
8	52,75	0	N1
9	50,25	3	N1
10	50,25	0	N1
11	43	3	E1
12	43	0	E1
13	40,5	3	E1
14	40,5	0	E1
15	38	3	E1
16	38	0	E1
17	32	3	E2
18	32	0	E2
19	29,5	3	E2
20	29,5	0	E2
21	27	3	E2
22	27	0	E2
23	19,75	0	N2
24	17,25	0	N2
25	14,75	0	N2
26	12,25	0	N2
27	5	3	C2
28	5	0	C2
29	2,5	3	C2
30	2,5	0	C2
31	0	3	C2
32	0	0	C2
33	5,75	19,45	G4
34	5,75	22,45	S4
35	12,1	22,7	K2

Pin table

Pin	X	Y	Function
52	52	18,1	K1
53	64,2	36,6	NTC1
54	70,6	36,55	NTC2
55	70	18,9	S1
56	68,55	15,9	G1



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
Q1, Q2	IGBT	1200 V	200 A	Buck Switch	
D3, D4	FWD	700 V	150 A	Buck Diode	
DQ1 , DQ2	FWD	1200 V	15 A	Buck Sw. Protection Diode	
Q3, Q4	IGBT	650 V	150 A	Boost Switch	
D1, D2	FWD	1200 V	100 A	Boost Diode	
DQ3, DQ4	FWD	650 V	50 A	Boost Sw. Protection Diode	
R1	NTC			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.

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
30-xT12NMA200SH01-M660F18x-D1-14	10 Apr. 2018		

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