V23990-P635-A-PM
datasheet

Vincotech

flow PIM 1 — 600 V / 30 A

Features

- Trench Fieldstop Technology IGBT3 for low saturation loss
- Supports design with 90° mounting angle between heatsink and PCB
- Clip-in PCB mounting
- Clip or screw on heatsink mounting

Target applications

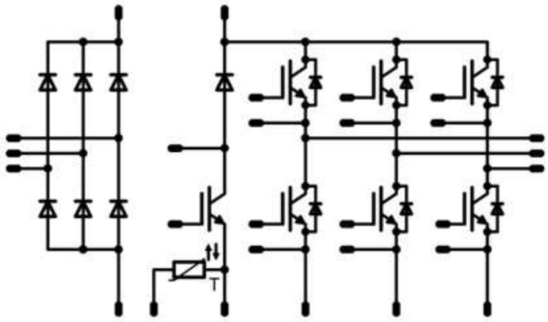
- Industrial drives

Types

- V23990-P635-A-PM

flow 90 1 housing

Schematic



Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Inverter Switch					
Collector-emitter voltage	V_{CES}			600	V
Collector current	I_C	T_j=$T_j$max	T_s=80°C	36	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_j$max		90	A
Total power dissipation	P_{tot}	T_j=$T_j$max	T_s=80°C	73	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions		Value	Unit
Inverter Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
Continuous (direct) forward current	I_F	$T_j=T_{jmax}$	T_h=80°C	32	A
Repetitive peak forward current	I_{FRM}			90	A
Total power dissipation	P_{tot}	$T_j=T_{jmax}$	T_h=80°C	52	W
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Condition		Value	Unit
Brake Switch					
Collector-emitter voltage	V_{CES}			600	V
Collector current	I_C	$T_j=T_j$max	T_S=80°C	24	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_j$max		60	A
Total power dissipation	P_{tot}	$T_j=T_j$max	T_S=80°C	53	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC} V_{CC}	$T_j \leq 150$°C V_{GE} = 15V		6 360	µs V
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions		Value	Unit
Brake Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			600	V
Continuous (direct) forward current	I_F	$T_j=T_{jmax}$	T_h=80°C	24	A
Repetitive peak forward current	I_{FRM}			40	A
Total power dissipation	P_{tot}	$T_j=T_{jmax}$	T_h=80°C	40	W
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions		Value	Unit
Rectifier Diode					
Repetitive peak reverse voltage	V_{RRM}			1600	V
Mean forward current	I_{FAV}	$T_j = T_{jmax}$	$T_s = 80$ °C	33	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave		200	A
Surge current capability	I^2t	$t_p = 10$ ms 50 Hz sine	$T_j = 150$ °C	200	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	$T_s = 80$ °C	43	W
Maximum Junction Temperature	T_{jmax}			150	°C

Parameter	Symbol	Conditions		Value	Unit
Module Properties					
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation Junction Temperature	T_{jop}			-40…+(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC voltage	t_p=2s	4000	V
Creepage distance				min 12,7	mm
Clearance				min 11,84	mm
Comparative Tracking Index	CTI			>200	

Characteristic Values

Inverter Switch

Parameter	Symbol	Conditions	V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}$			0,00015	25 125	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		30	25 125	1,1	1,51 1,71	1,9	V
Collector-emitter cut-off current	I_{CES}		0	600		25 125			1,6	μA
Gate-emitter leakage current	I_{GES}		20	0		25 125			300	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f=1 MHz	0	25		25		1630		pF
Output capacitance	C_{oes}							108		
Reverse transfer capacitance	C_{res}							50		
Gate charge	Q_g		15	400	30	25		167		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						1,29		K/W
IGBT Switching										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 8 Ω	15/0	300	30	25 125		20 19		ns
Rise time	t_r					25 125		17 19		
Turn-off delay time	$t_{d(off)}$					25 125		165 181		
Fall time	t_f					25 125		78 85		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 1,4 μC Q_{rFWD} = 2,4 μC				25 125		0,673 0,877		mWs
Turn-off energy (per pulse)	E_{off}					25 125		0,676 0,852		

Inverter Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				30	25 125 150		1,65 1,62 -	1,95	V
Reverse leakage current	I_r			600		25 150			200 -	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						1,84		K/W
FWD Switching										
Peak recovery current	I_{RRM}	di/dt = 1640 A/µs di/dt = 1459 A/µs	15/0	300	30	25 125		20 22		A
Reverse recovery time	t_{rr}					25 125		210 291		ns
Recovered charge	Q_r					25 125		1,390 2,445		µC
Reverse recovered energy	E_{rec}					25 125		0,263 0,491		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		1153 648		A/µs

Vincotech

V23990-P635-A-PM
datasheet

Brake Switch

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j[°C]	Min	Typ	Max	
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}$			0,00029	25 125	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		20	25 125 150	1,1	1,52 - 1,84	1,9	V
Collector-emitter cut-off current	I_{CES}		0	600		25 125			1,1	µA
Gate-emitter leakage current	I_{GES}		20	0		25 125			300	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f=1 MHz	0	25		25		1100		pF
Output capacitance	C_{oes}							71		
Reverse transfer capacitance	C_{res}							32		
Gate charge	Q_g		15	480	20	25		120		nC

Parameter	Symbol	Conditions					Min	Typ	Max	Unit
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						1,81		K/W

Parameter	Symbol	Conditions					Min	Typ	Max	Unit
IGBT Switching										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 16 Ω R_{gon} = 16 Ω	±15	300	20	25 150		71 70		ns
Rise time	t_r					25 150		11 16		
Turn-off delay time	$t_{d(off)}$					25 150		122 143		
Fall time	t_f					25 150		91 111		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,8 µC Q_{rFWD} = 1,7 µC				25 150		0,259 0,380		mWs
Turn-off energy (per pulse)	E_{off}					25 150		0,448 0,613		

Brake Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				20	25 125 150		1,70 1,58 -	1,95	V
Reverse leakage current	I_r			600		25 150			27 -	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						2,37		K/W
FWD Switching										
Peak recovery current	I_{RRM}	d*i*/d*t* = 2072 A/µs d*i*/d*t* = 1922 A/µs	±15	300	20	25 150		22 26		A
Reverse recovery time	t_{rr}					25 150		125 204		ns
Recovered charge	Q_r					25 150		0,809 1,713		µC
Reverse recovered energy	E_{rec}					25 150		0,171 0,373		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		2050 741		A/µs

Rectifier Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j	Min	Typ	Max	
Static										
Forward voltage	V_F				25	25°C 125°C 150°C		1,22 1,21 -	1,9	V
Reverse leakage current	I_R			1600		25°C 150°C			50 1100	µA
Thermal										
Thermal resistance junction to case	$R_{th(j-c)}$	Phase-Change Material λ=3,4W/mK						1,61		K/W

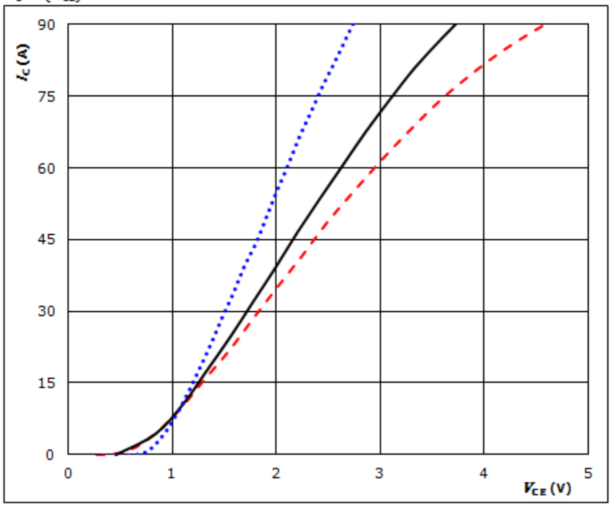
Thermistor

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	
Rated resistance	R					25		22		kΩ
Deviation of R100	$\Delta_{R/R}$	R100=1486 Ω				100	-12		+12	%
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	

Inverter Switch Characteristics

Typical output characteristics IGBT

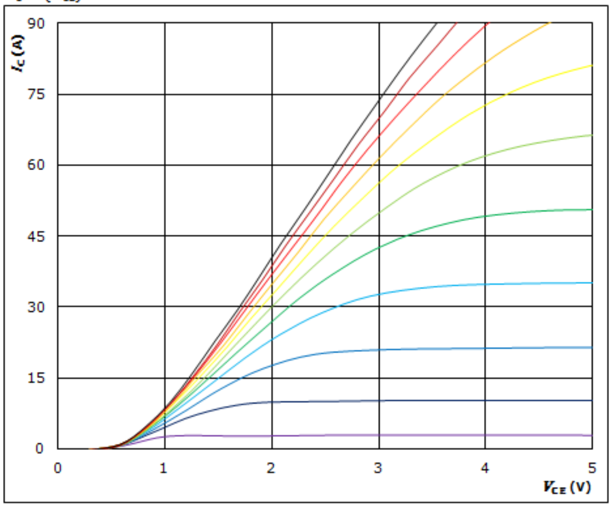
$I_C = f(V_{CE})$



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

Typical output characteristics IGBT

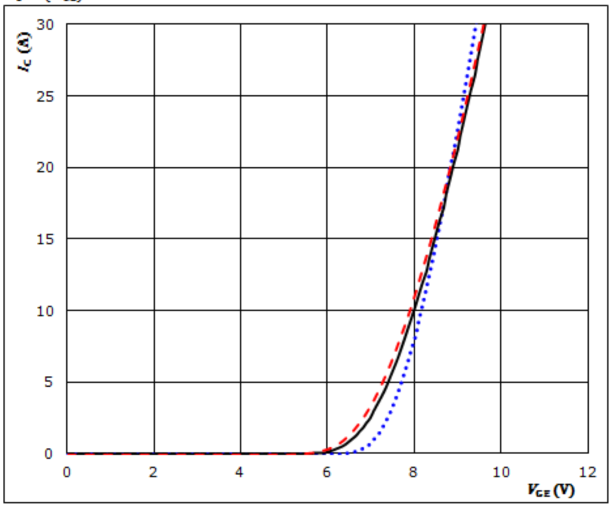
$I_C = f(V_{CE})$



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

Typical transfer characteristics IGBT

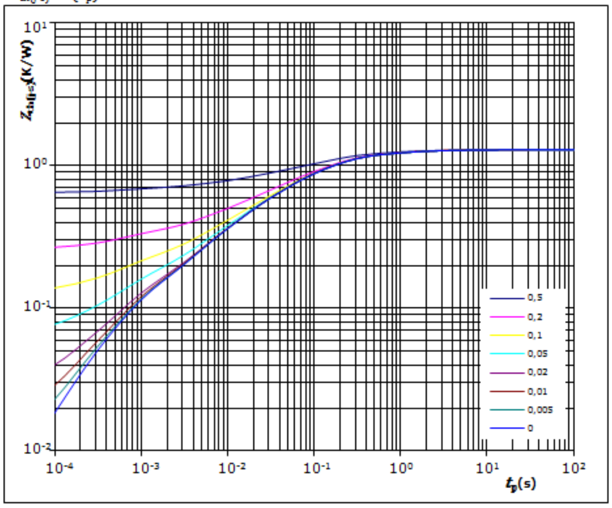
$I_C = f(V_{GE})$



t_p =	100	μs	25 °C	
V_{CE} =	10	V	125 °C	
			150 °C	

Transient Thermal Impedance as function of Pulse duration IGBT

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



D = t_p / T
$R_{th(j-s)}$ = 1,29 K/W

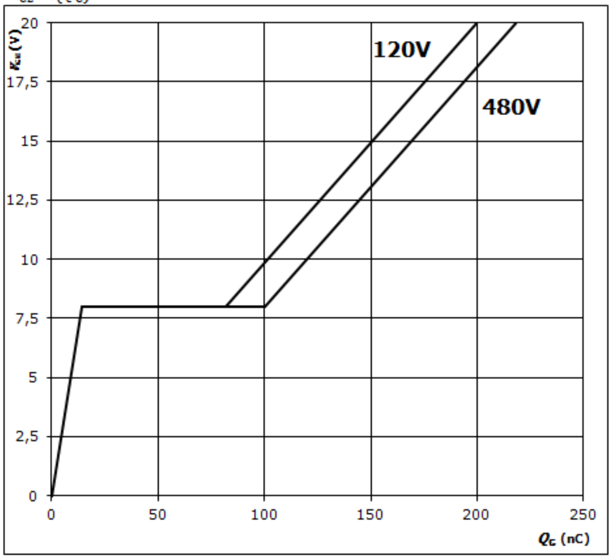
IGBT thermal model values

R_{th} (K/W)	τ (s)
2,21E-02	9,93E+00
1,52E-01	1,02E+00
5,97E-01	1,46E-01
3,86E-01	3,59E-02
2,40E-01	7,53E-03
1,08E-01	6,03E-04

Inverter Switch Characteristics

Gate voltage vs Gate charge IGBT

$V_{GE} = f(Q_G)$

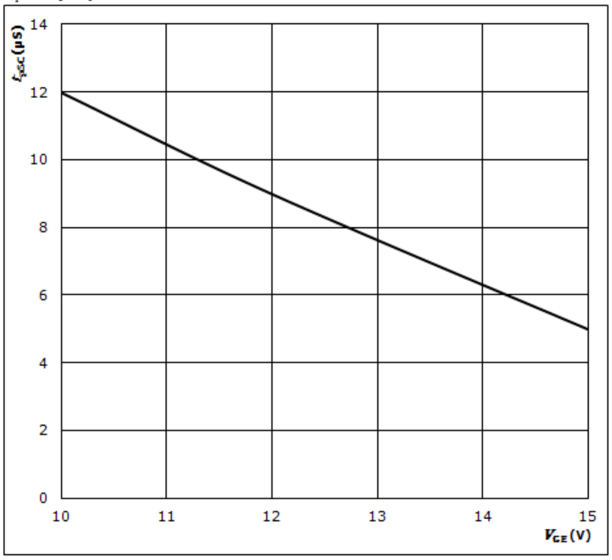


At

I_C=	30	A

Short circuit duration as a function of V_{GE} IGBT

$t_{pSC} = f(V_{GE})$

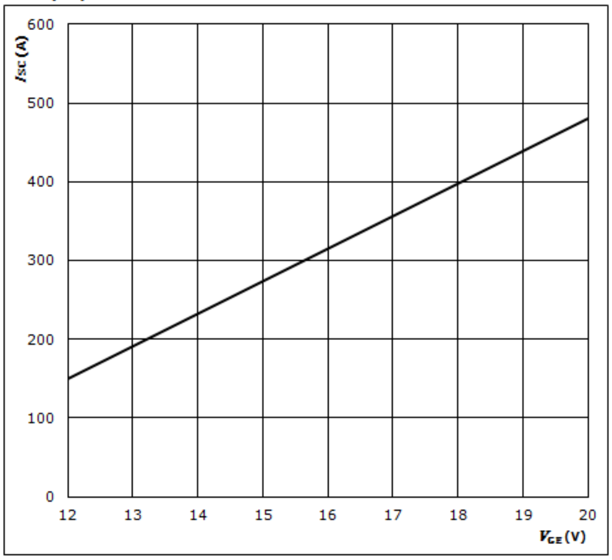


At

V_{CE} =	400	V
$T_j \leq$	150	ºC

Typical short circuit current as a function of V_{GE} IGBT

$I_{SC} = f(V_{GE})$



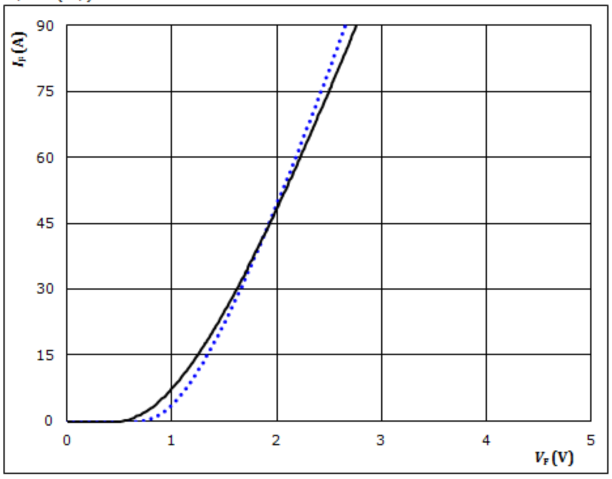
At

$V_{CE} \leq$	400	V
$T_j \leq$	150	ºC

Inverter Diode Characteristics

Typical forward characteristics **FWD**

$I_F = f(V_F)$

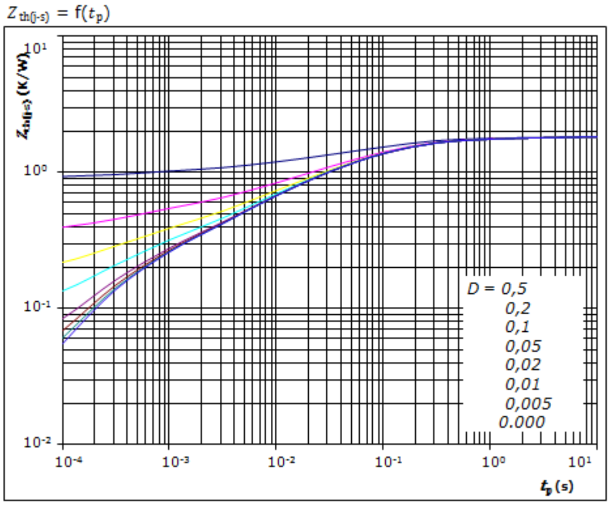


t_p = 250 µs

T_j: 25 °C; 125 °C; 150 °C

Transient thermal impedance as a function of pulse width **FWD**

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



D = t_p / T

$R_{th(j-s)}$ = 1,84 K/W

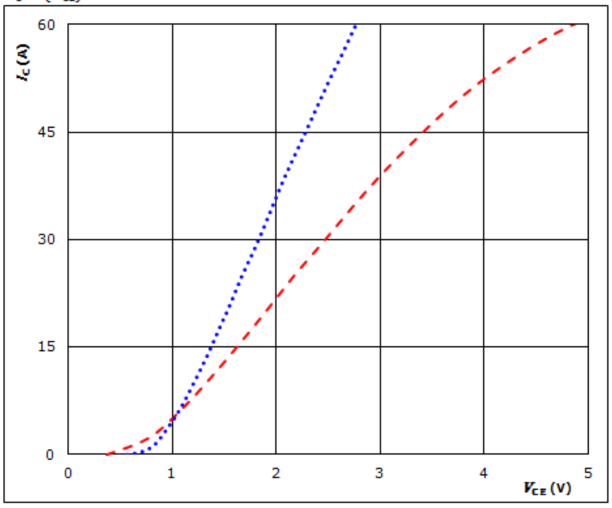
FWD thermal model values

R (K/W)	τ (s)
8,11E-02	3,72E+00
2,10E-01	4,02E-01
7,18E-01	8,35E-02
4,48E-01	1,56E-02
2,16E-01	2,93E-03
1,71E-01	3,31E-04

Brake Switch Characteristics

Typical output characteristics IGBT

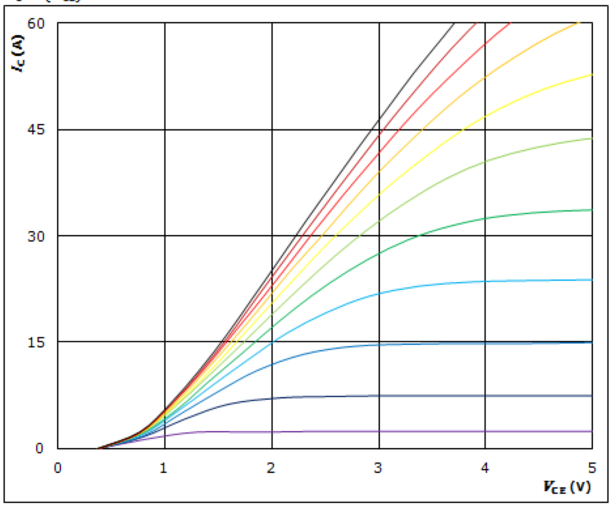
$I_C = f(V_{CE})$



t_p =	250	μs	25 °C	dotted
V_{GE}=	15	V	125 °C	solid
			150 °C	dashed

Typical output characteristics IGBT

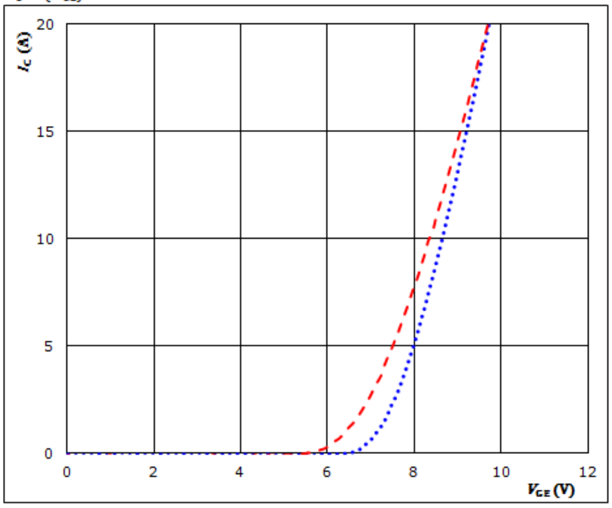
$I_C = f(V_{CE})$



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

Typical transfer characteristics IGBT

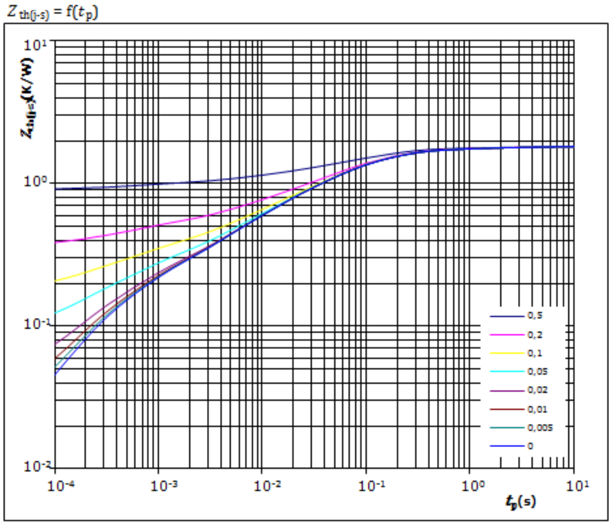
$I_C = f(V_{GE})$



t_p =	100	μs	25 °C	dotted
V_{CE} =	10	V	125 °C	solid
			150 °C	dashed

Transient Thermal Impedance as function of Pulse duration IGBT

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



D = t_p / T

$R_{th(j-s)}$ = 1,81 K/W

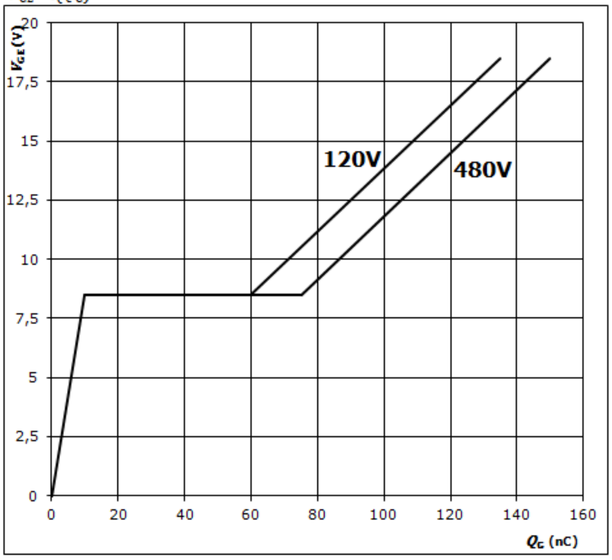
IGBT thermal model values

R_{th} (K/W)	τ (s)
6,63E-02	3,68E+00
1,83E-01	4,61E-01
8,24E-01	8,38E-02
3,93E-01	1,82E-02
1,96E-01	3,57E-03
1,49E-01	3,52E-04

Brake Switch Characteristics

Gate voltage vs Gate charge IGBT

$V_{GE} = f(Q_G)$

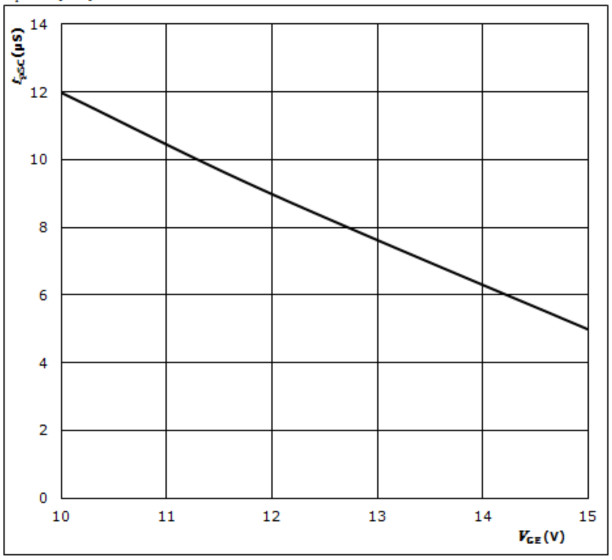


At

I_C=	20	A

Short circuit duration as a function of V_{GE} IGBT

$t_{pSC} = f(V_{GE})$

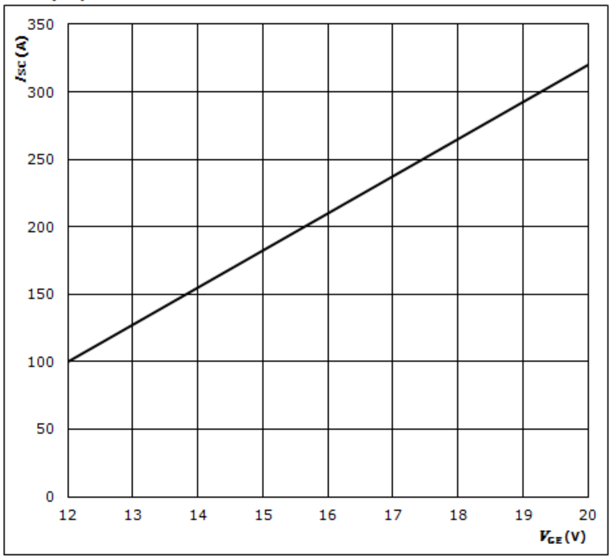


At

V_{CE} =	600	V
T_j ≤	175	ºC

Typical short circuit current as a function of V_{GE} IGBT

$I_{SC} = f(V_{GE})$



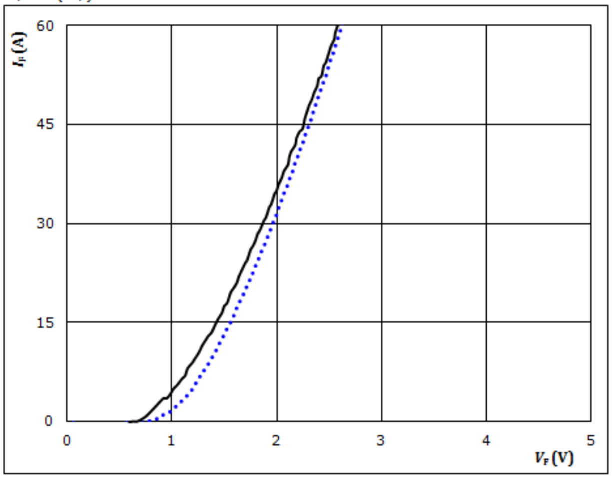
At

V_{CE} ≤	600	V
T_j ≤	175	ºC

Brake Diode Characteristics

Typical forward characteristics **FWD**

$I_F = f(V_F)$

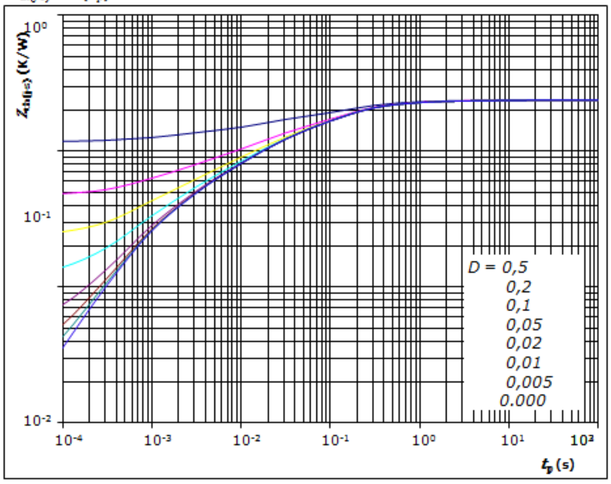


t_p = 250 μs

T_j: 25 °C, 125 °C, 150 °C

Transient thermal impedance as a function of pulse width **FWD**

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



D = t_p / T

$R_{th(j-s)}$ = 2,37 K/W

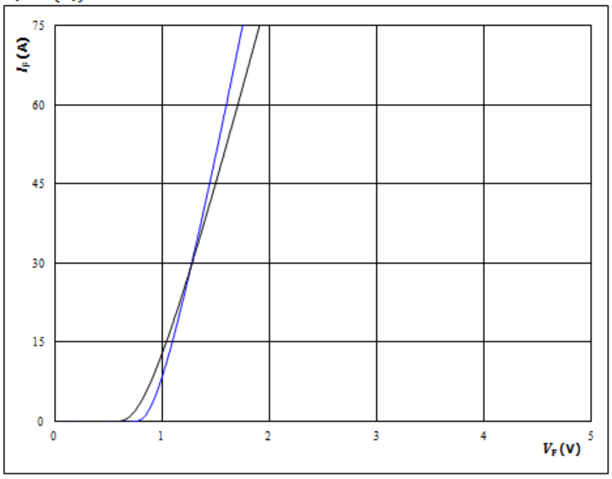
FWD thermal model values

R (K/W)	τ (s)
4,62E-02	8,95E+00
1,39E-01	1,10E+00
6,93E-01	1,96E-01
5,75E-01	6,44E-02
6,19E-01	9,95E-03
2,95E-01	1,01E-03

Rectifier Diode Characteristics

Typical forward characteristics	Rectifier Diode

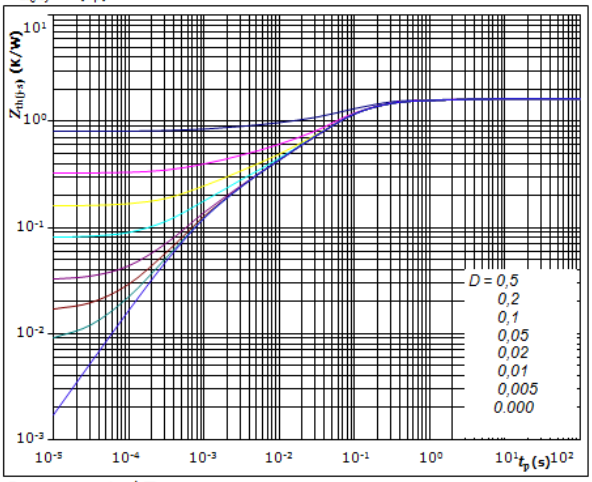
$I_F = f(V_F)$



t_p = 250 µs
T_j = 25, 125, 150 °C

Transient thermal impedance as a function of pulse width	Rectifier Diode

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



D = t_p / T
$R_{th(j\text{-}s)}$ = 1,61 K/W

Rectifier Diode thermal model values

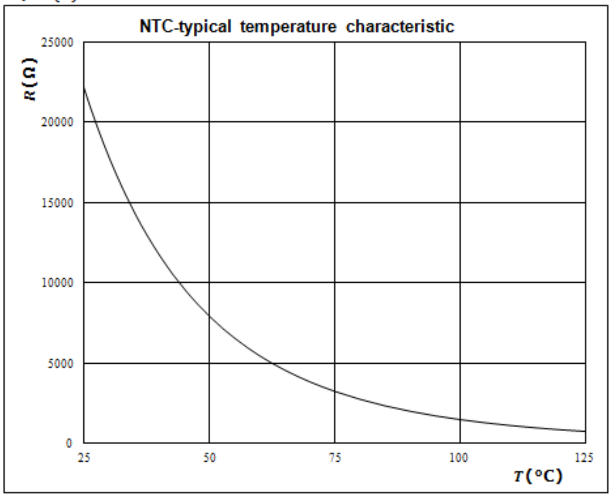
R (K/W)	τ (s)
6,72E-02	2,72E+00
1,48E-01	4,14E-01
8,68E-01	8,33E-02
2,53E-01	2,89E-02
1,69E-01	5,15E-03
1,06E-01	9,10E-04

Thermistor Characteristics

Thermistor typical temperature characteristic

Typical NTC characteristic as a function of temperature

$R_T = f(T)$

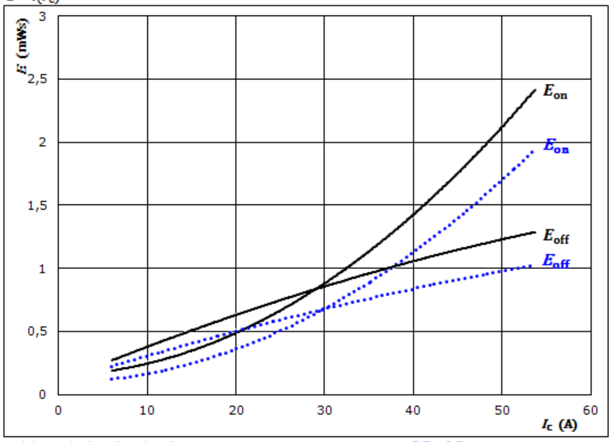


Inverter Switching Characteristics

Figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



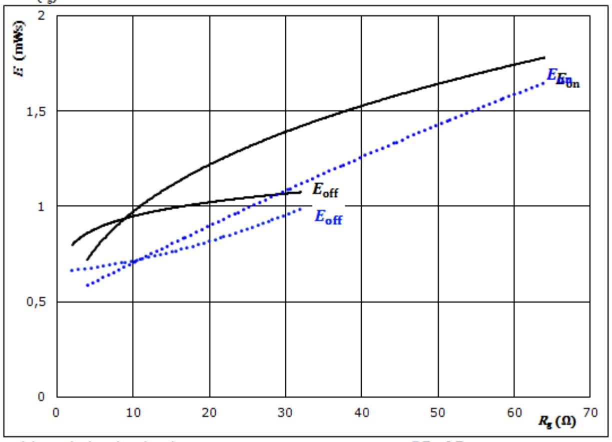
With an inductive load at

V_{CE} =	300	V	T_j:	25 °C	....
V_{GE} =	15/0	V		125 °C	———
R_{gon} =	8	Ω		150 °C	– – – –
R_{goff} =	4	Ω			

Figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(r_g)$



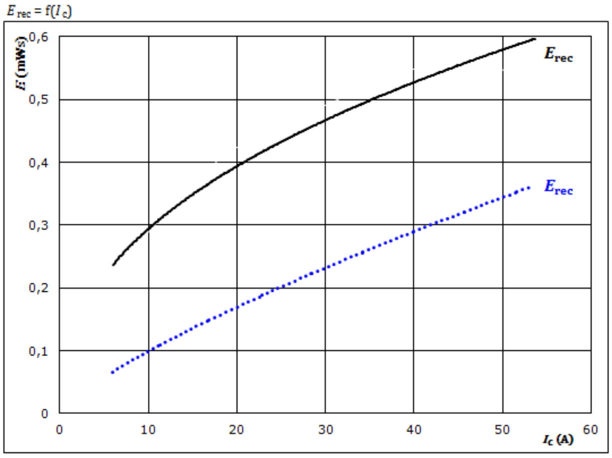
With an inductive load at

V_{CE} =	300	V	T_j:	25 °C	....
V_{GE} =	15/0	V		125 °C	———
I_C =	30	A		150 °C	– – – –

Figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



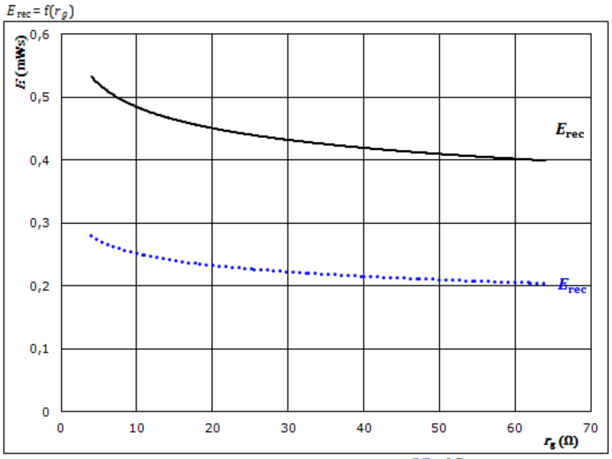
With an inductive load at

V_{CE} =	300	V	T_j:	25 °C	....
V_{GE} =	15/0	V		125 °C	———
R_{gon} =	8	Ω		150 °C	– – – –

Figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(r_g)$



With an inductive load at

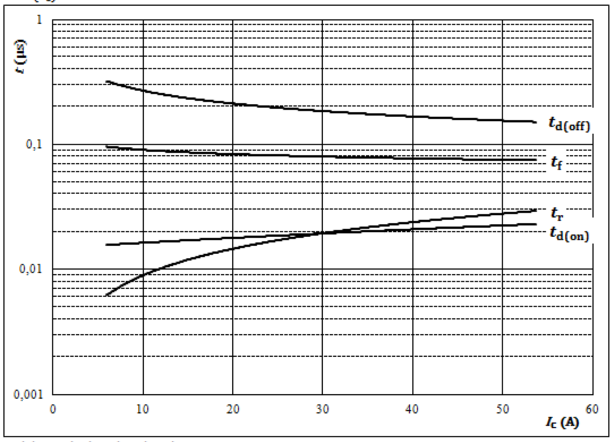
V_{CE} =	300	V	T_j:	25 °C	....
V_{GE} =	15/0	V		125 °C	———
I_C =	30	A		150 °C	– – – –

Inverter Switching Characteristics

Figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



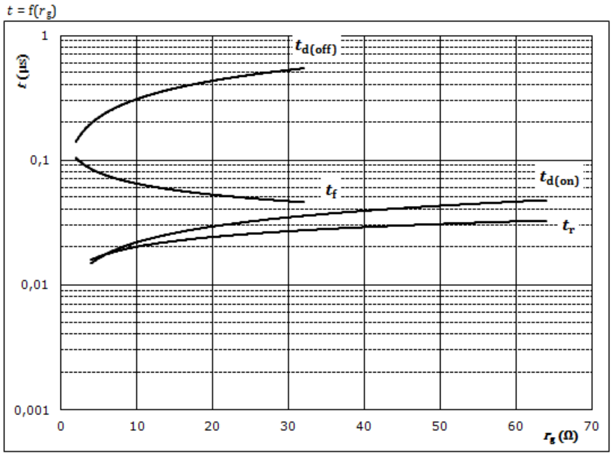
With an inductive load at

T_j =	125	°C
V_{CE} =	300	V
V_{GE} =	15/0	V
R_{gon} =	8	Ω
R_{goff} =	4	Ω

Figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(r_g)$



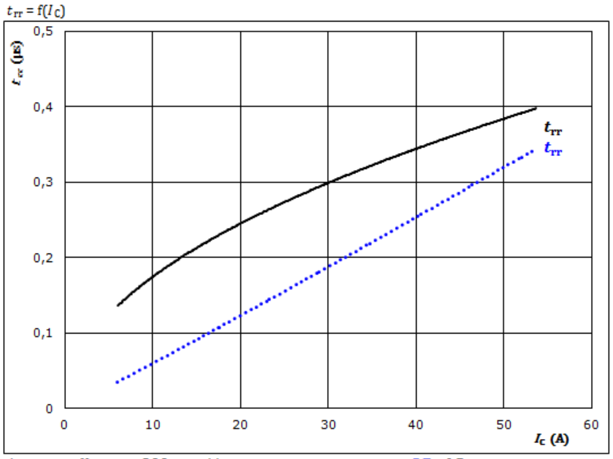
With an inductive load at

T_j =	125	°C
V_{CE} =	300	V
V_{GE} =	15/0	V
I_C =	30	A

Figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

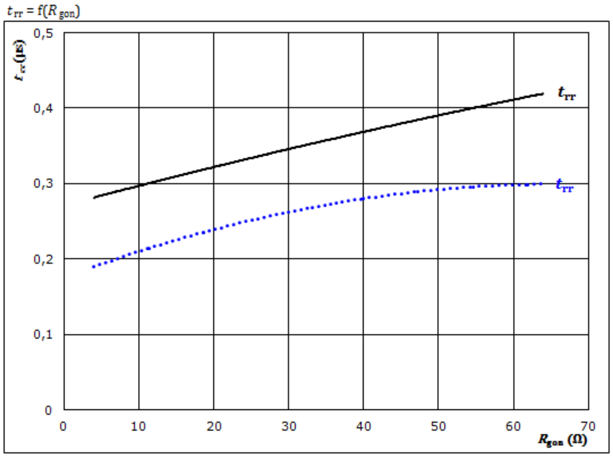


At						
V_{CE} =	300	V		25 °C	············
V_{GE} =	15/0	V	T_j:	125 °C	———
R_{gon} =	8	Ω		150 °C	– – – –

Figure 8. FWD

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

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



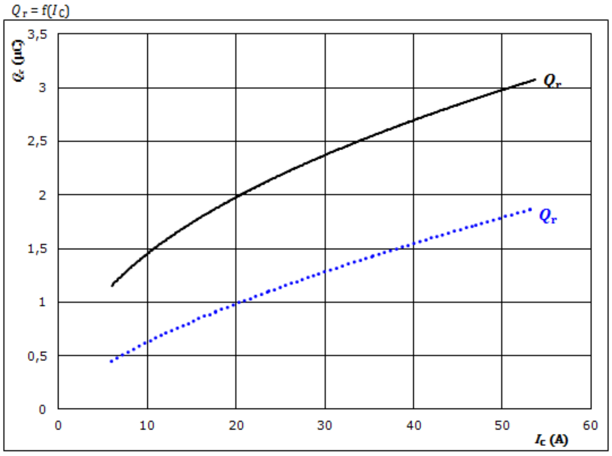
At						
V_{CE} =	300	V		25 °C	············
V_{GE} =	15/0	V	T_j:	125 °C	———
I_C =	30	A		150 °C	– – – –

Inverter Switching Characteristics

Figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

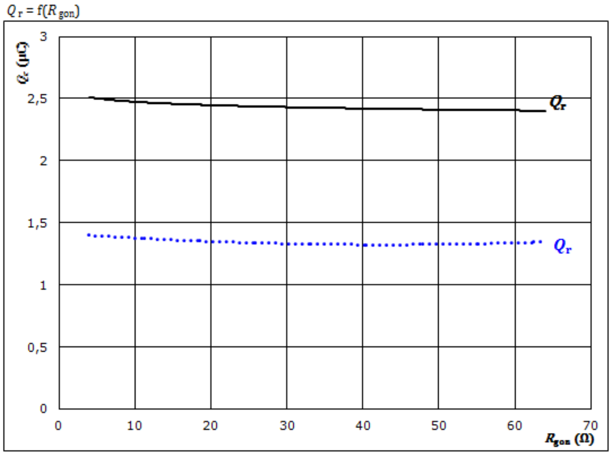


At						
At	V_{CE} =	300	V		25 °C	··············
	V_{GE} =	15/0	V	T_j:	125 °C	———
	R_{gon} =	8	Ω		150 °C	– – – –

Figure 10. **FWD**

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

$Q_r = f(R_{gon})$

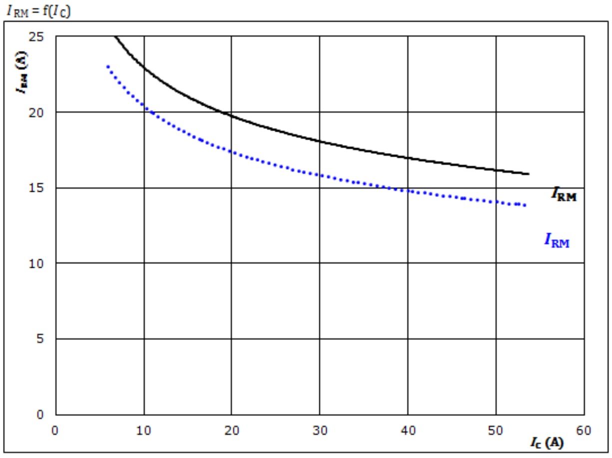


At	V_{CE}=	300	V		25 °C	··············
	V_{GE} =	15/0	V	T_j:	125 °C	———
	I_C=	30	A		150 °C	– – – –

Figure 11. **FWD**

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

$I_{RM} = f(I_C)$

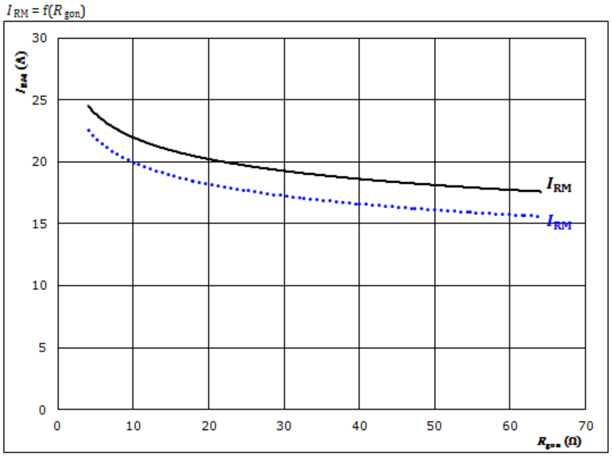


At	V_{CE}	300	V		25 °C	··············
	V_{GE} =	15/0	V	T_j:	125 °C	———
	R_{gon} =	8	Ω		150 °C	– – – –

Figure 12. **FWD**

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

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



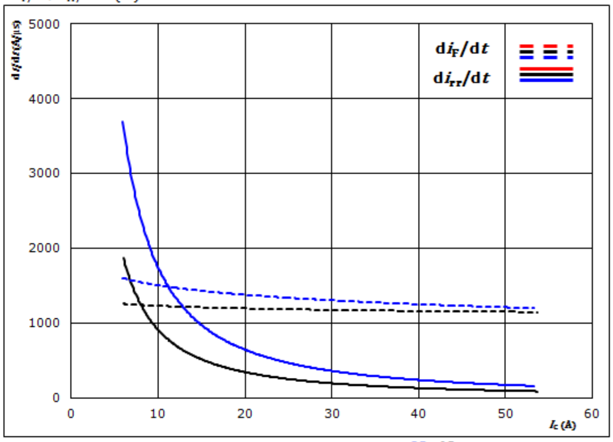
At	V_{CE} =	300	V		25 °C	··············
	V_{GE} =	15/0	V	T_j:	125 °C	———
	I_C=	30	A		150 °C	– – – –

Inverter Switching Characteristics

Figure 13. FWD

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

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



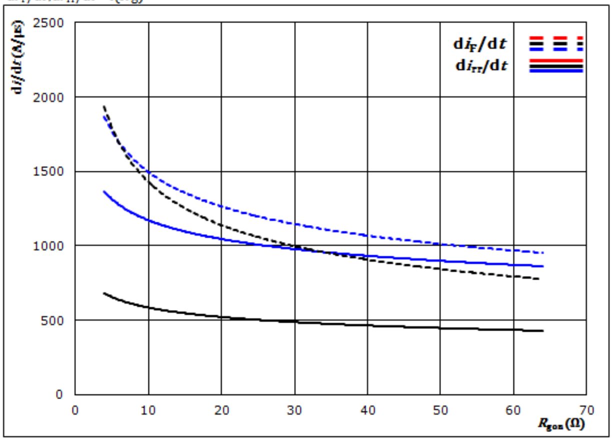
At

V_{CE} =	300	V		25	°C
V_{GE} =	15/0	V	T_j:	125	°C
R_{gon} =	8	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

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



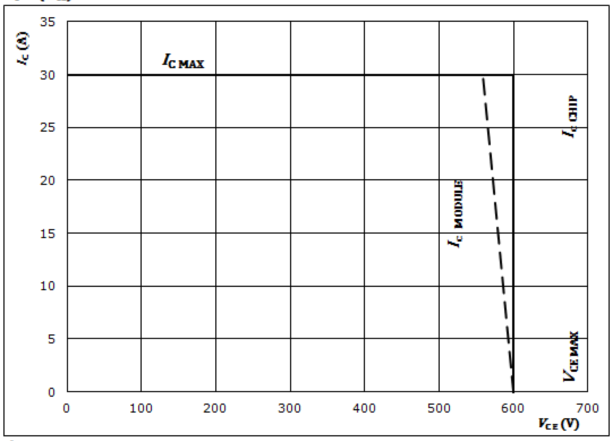
At

V_{CE} =	300	V
V_{GE} =	15/0	V
I_C =	30	A

Figure 15. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

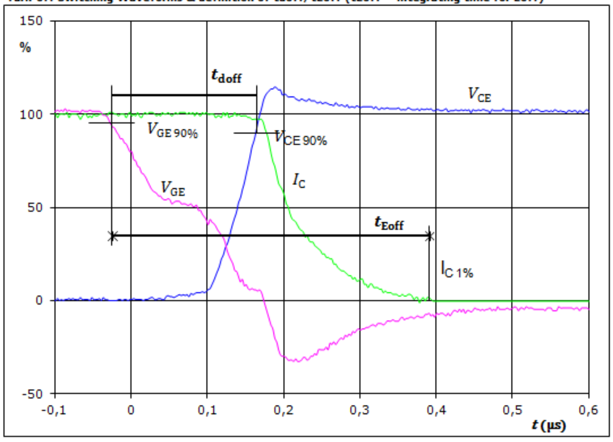
T_j =	175	°C
R_{gon} =	8	Ω
R_{goff} =	4	Ω

Inverter Switching Characteristics

General conditions		
T_j	=	125 °C
R_{gon}	=	8 Ω
R_{goff}	=	4 Ω

Figure 1. IGBT

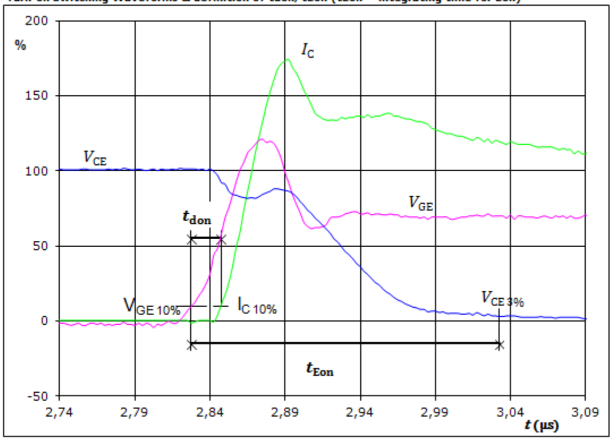
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	30	A
t_{doff} =	0,181	µs
t_{Eoff} =	0,416	µs

Figure 2. IGBT

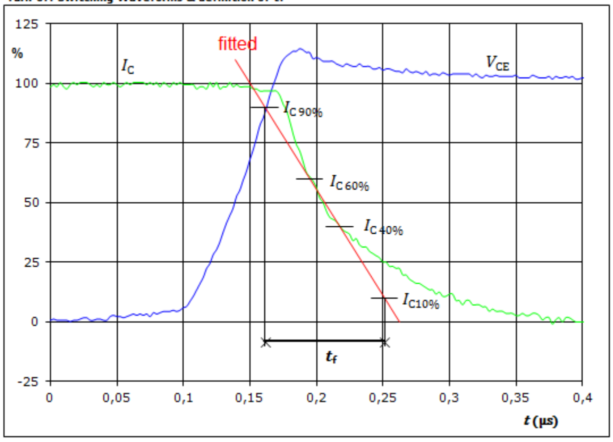
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	30	A
t_{don} =	0,019	µs
t_{Eon} =	0,205	µs

Figure 3. IGBT

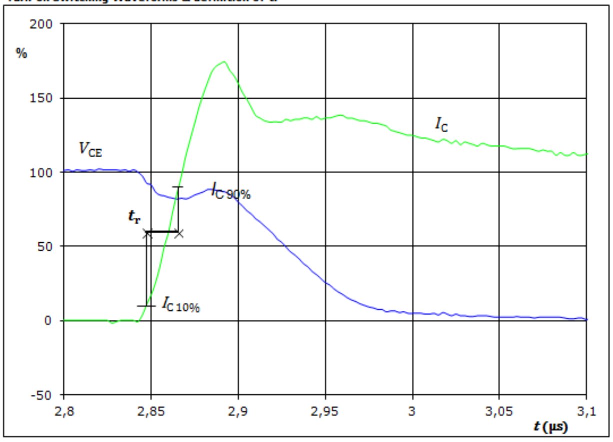
Turn-off Switching Waveforms & definition of tf



$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	30	A
t_f =	0,085	µs

Figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

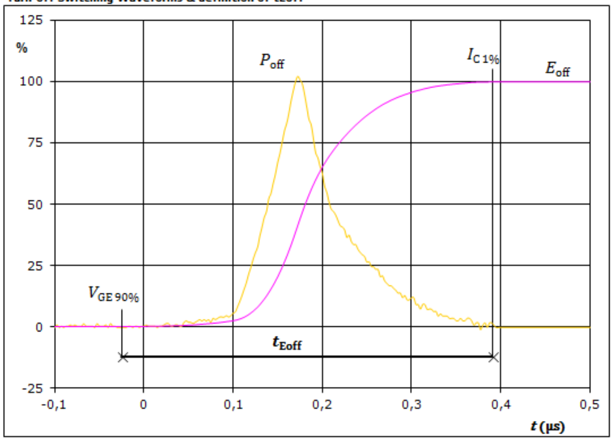


$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	30	A
t_r =	0,019	µs

Inverter Switching Characteristics

Figure 5. **IGBT**

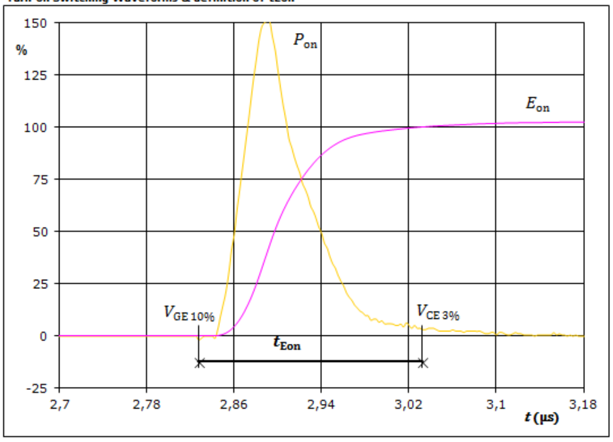
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	8,98	kW
E_{off} (100%) =	0,85	mJ
t_{Eoff} =	0,42	µs

Figure 6. **IGBT**

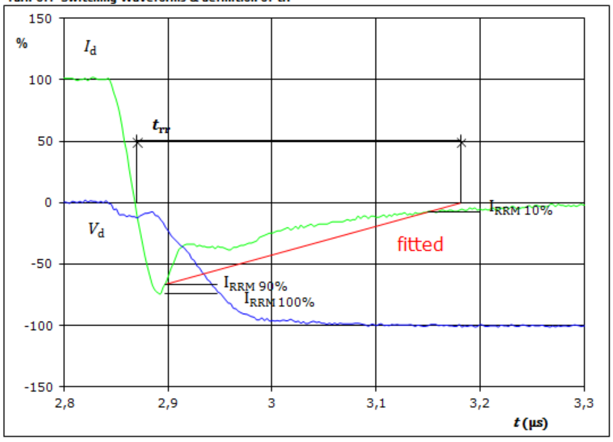
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	8,98	kW
E_{on} (100%) =	0,88	mJ
t_{Eon} =	0,21	µs

Figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

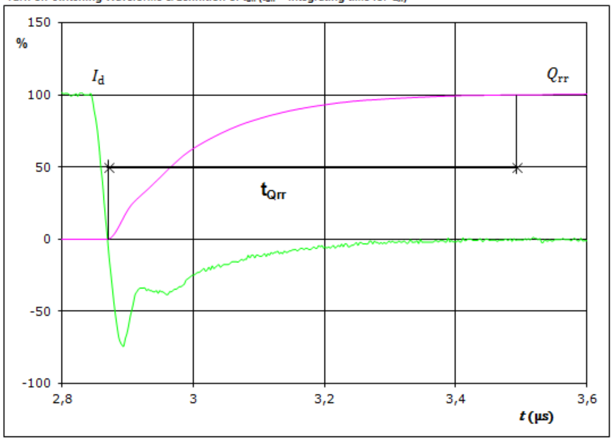


V_d (100%) =	300	V
I_d (100%) =	30	A
I_{RRM} (100%) =	22	A
t_{rr} =	0,291	µs

Inverter Switching Characteristics

Figure 8.	**FWD**

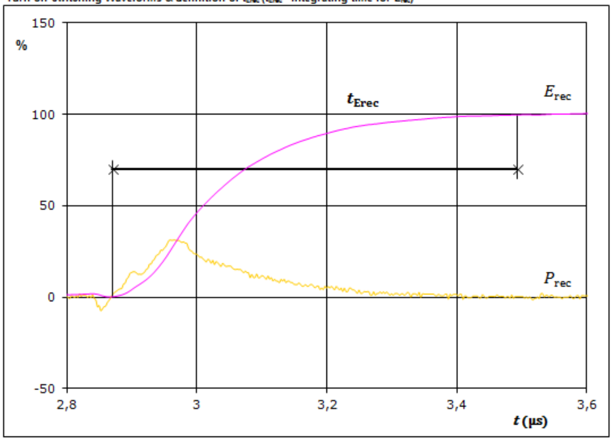
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	30	A
Q_{rr} (100%) =	2,45	µC
t_{Qrr} =	0,62	µs

Figure 9.	**FWD**

Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec}= integrating time for E_{rec})



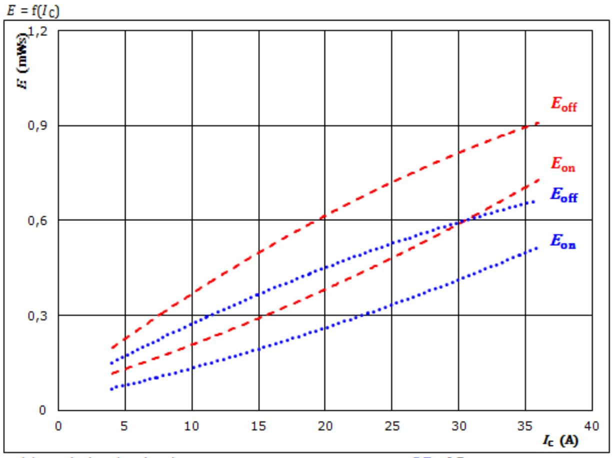
P_{rec} (100%) =	8,98	kW
E_{rec} (100%) =	0,49	mJ
t_{Erec} =	0,62	µs

Brake Switching Characteristics

Figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



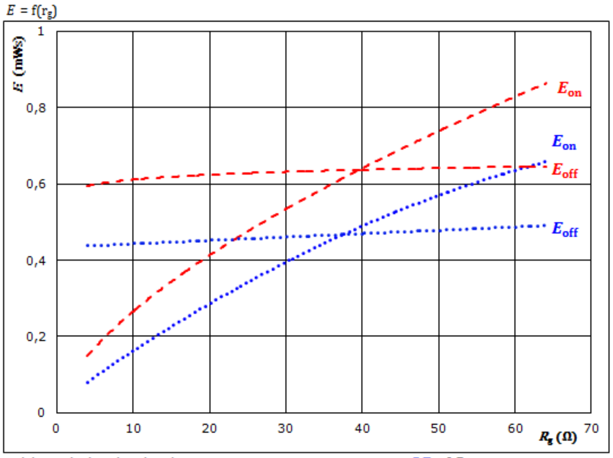
With an inductive load at

V_{CE} =	300	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	16	Ω		150 °C
R_{goff} =	16	Ω		

Figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(r_g)$



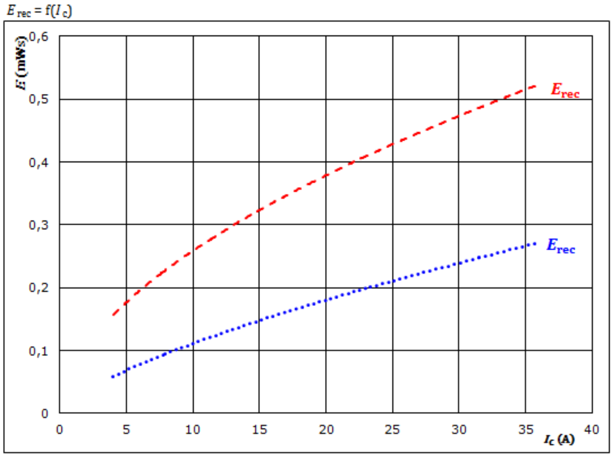
With an inductive load at

V_{CE} =	300	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	20	A		150 °C

Figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



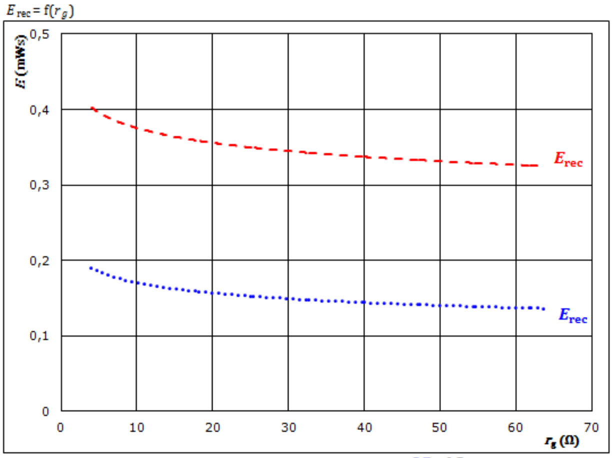
With an inductive load at

V_{CE} =	300	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
R_{gon} =	16	Ω		150 °C

Figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(r_g)$



With an inductive load at

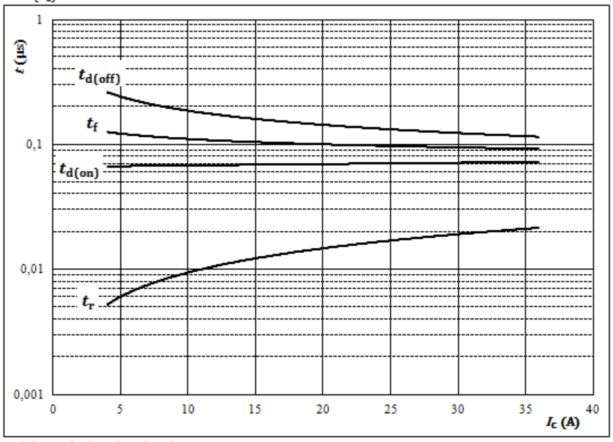
V_{CE} =	300	V	T_j:	25 °C
V_{GE} =	±15	V		125 °C
I_C =	20	A		150 °C

Brake Switching Characteristics

Figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



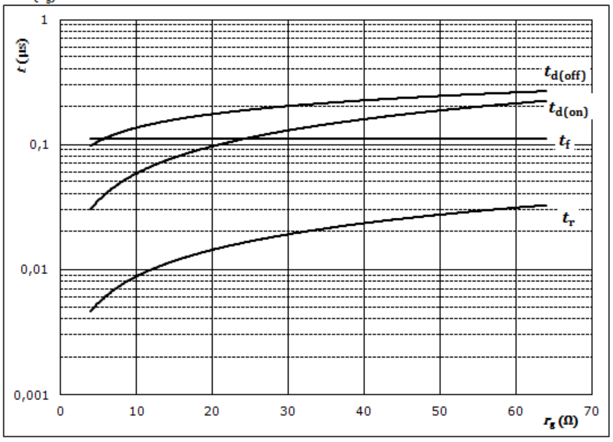
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

Figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(r_g)$



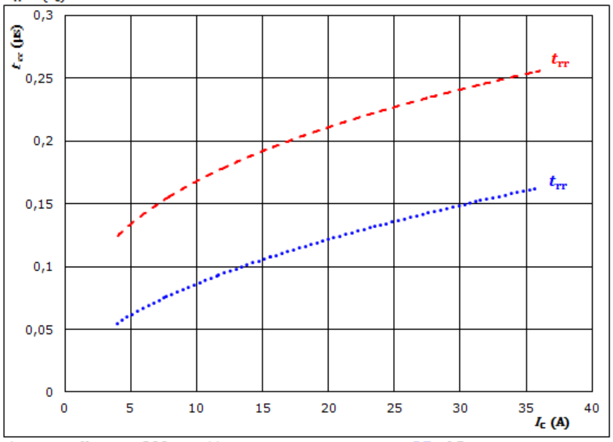
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	20	A

Figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

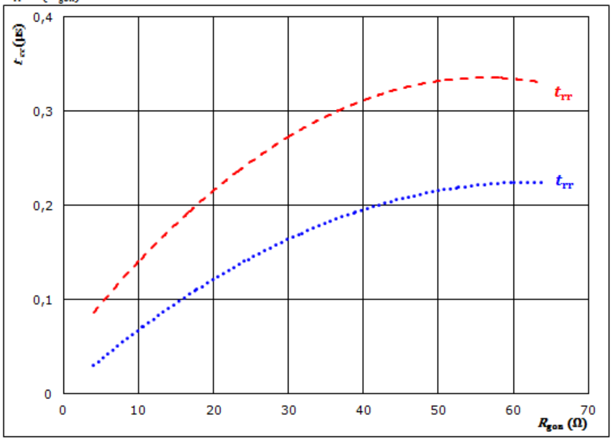


At						
V_{CE} =	300	V		25 °C	········
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	16	Ω		150 °C	– – –

Figure 8. FWD

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

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



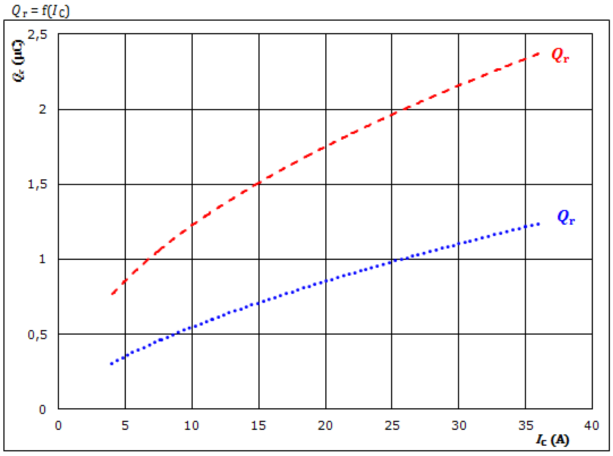
At					
V_{CE} =	300	V		25 °C	········
V_{GE} =	±15	V	T_j:	125 °C	———
I_C =	20	A		150 °C	– – –

Brake Switching Characteristics

Figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

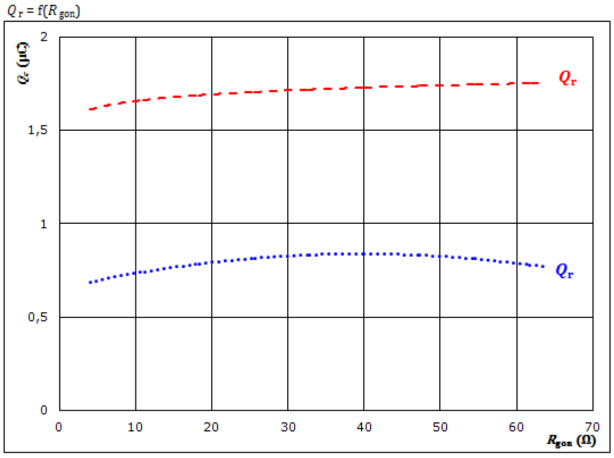


At						
	V_{CE} =	300	V		25 °C	············
	V_{GE} =	±15	V	T_j:	125 °C	———
	R_{gon} =	16	Ω		150 °C	– – – –

Figure 10. **FWD**

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

$Q_r = f(R_{gon})$

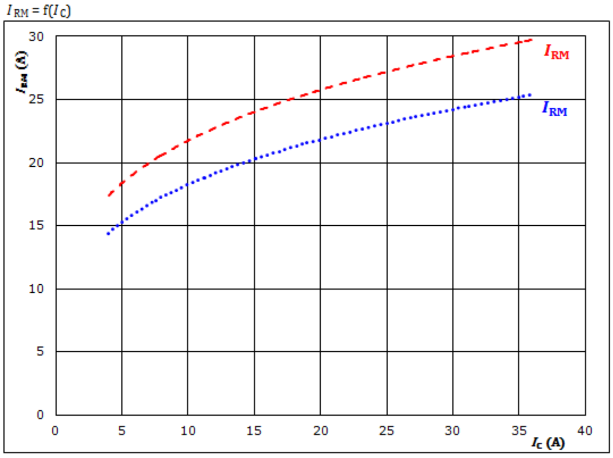


At						
	V_{CE}=	300	V		25 °C	············
	V_{GE} =	±15	V	T_j:	125 °C	———
	I_C=	20	A		150 °C	– – – –

Figure 11. **FWD**

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

$I_{RM} = f(I_C)$

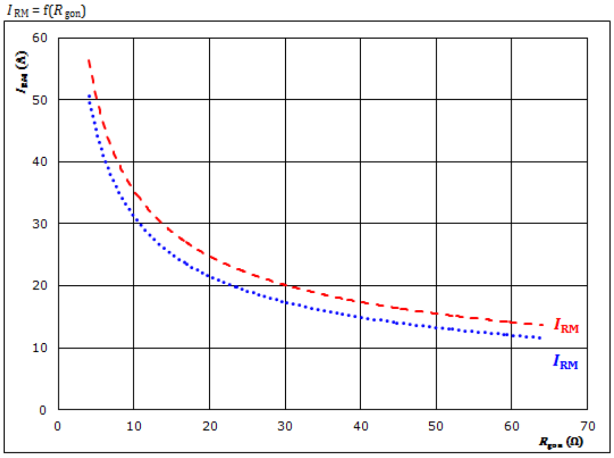


At						
	V_{CE}	300	V		25 °C	············
	V_{GE} =	±15	V	T_j:	125 °C	———
	R_{gon} =	16	Ω		150 °C	– – – –

Figure 12. **FWD**

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

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



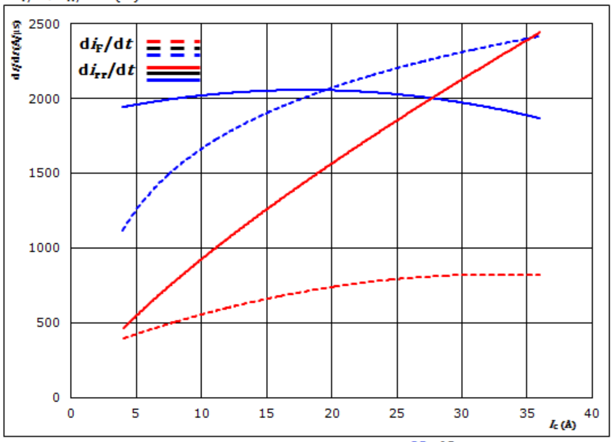
At						
	V_{CE} =	300	V		25 °C	············
	V_{GE} =	±15	V	T_j:	125 °C	———
	I_C=	20	A		150 °C	– – – –

Brake Switching Characteristics

Figure 13. **FWD**

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

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

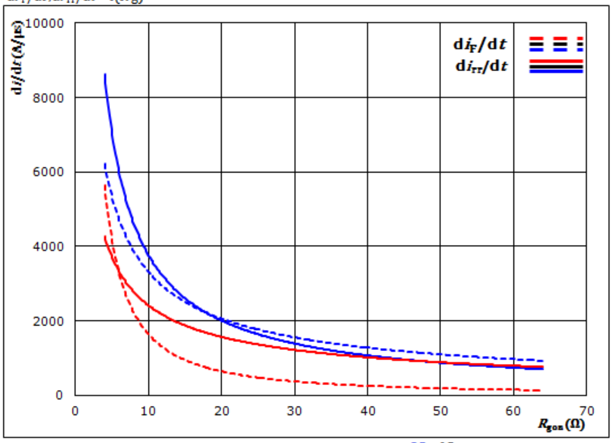


At						
V_{CE}	300	V		25	°C	············
V_{GE} =	±15	V	T_j:	125	°C	———
R_{gon} =	16	Ω		150	°C	– – – –

Figure 14. **FWD**

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

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

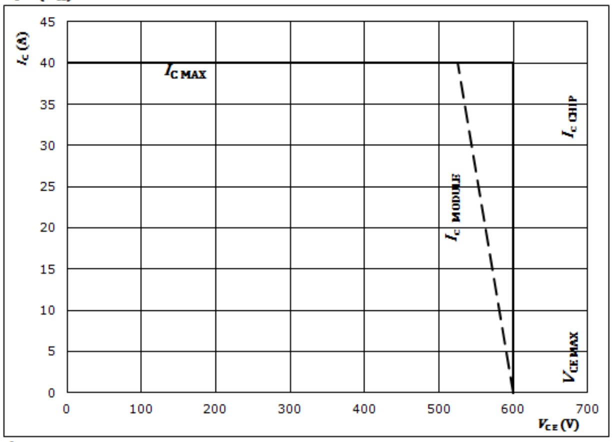


At						
V_{CE} =	300	V		25	°C	············
V_{GE} =	±15	V	T_j:	125	°C	———
I_C=	20	A		150	°C	– – – –

Figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	175	°C
R_{gon} =	16	Ω
R_{goff} =	16	Ω

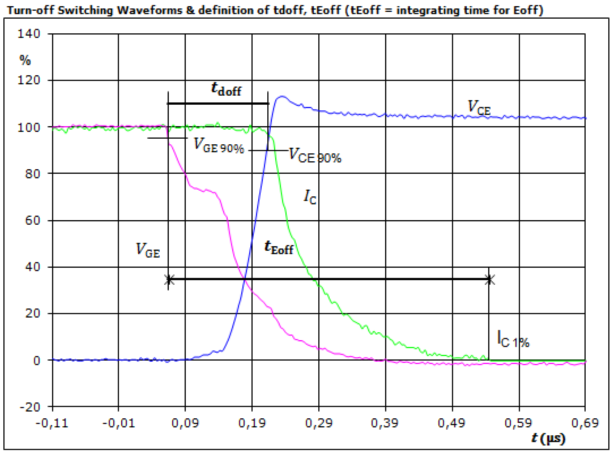
Brake Switching Characteristics

General conditions

T_j	=	150 °C
R_{gon}	=	16 Ω
R_{goff}	=	16 Ω

Figure 1. IGBT

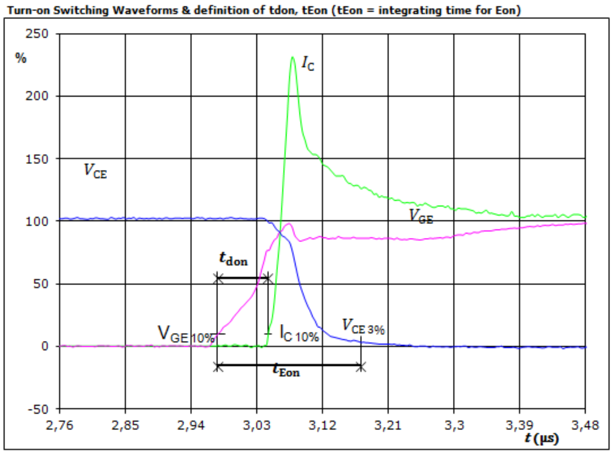
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	20	A
t_{doff} =	0,143	µs
t_{Eoff} =	0,482	µs

Figure 2. IGBT

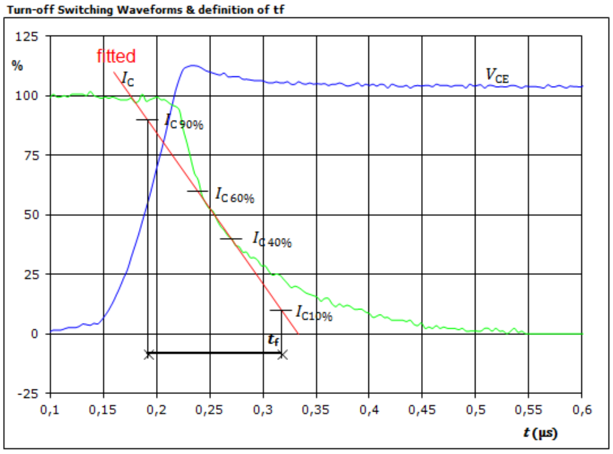
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	300	V
I_C (100%) =	20	A
t_{don} =	0,070	µs
t_{Eon} =	0,196	µs

Figure 3. IGBT

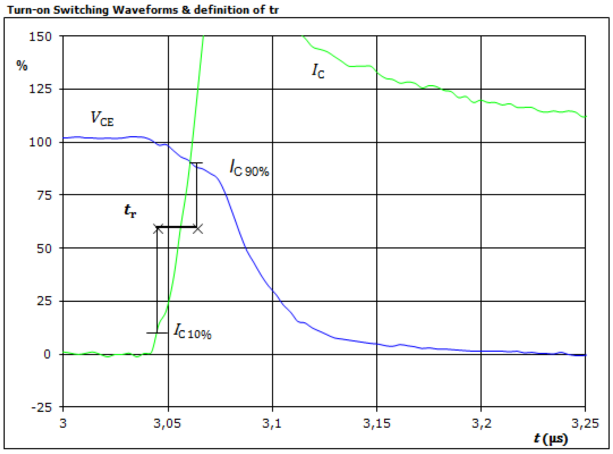
Turn-off Switching Waveforms & definition of tf



V_C (100%) =	300	V
I_C (100%) =	20	A
t_f =	0,110	µs

Figure 4. IGBT

Turn-on Switching Waveforms & definition of tr

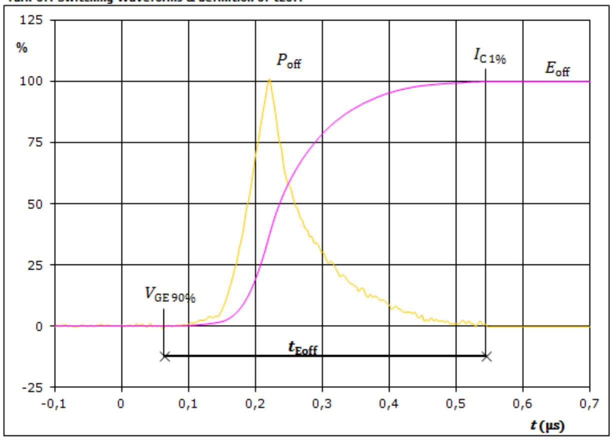


V_C (100%) =	300	V
I_C (100%) =	20	A
t_r =	0,016	µs

Brake Switching Characteristics

Figure 5. IGBT

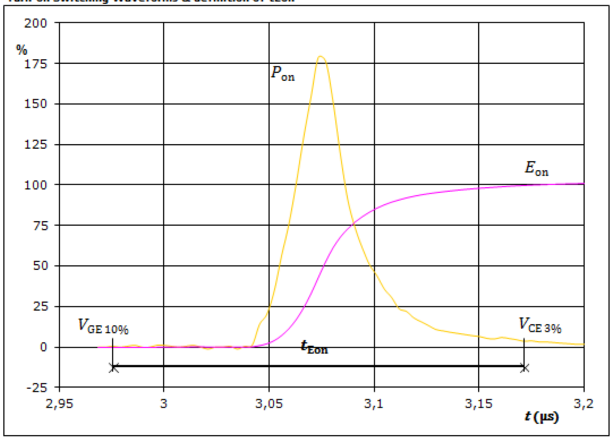
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	5,98	kW
E_{off} (100%) =	0,61	mJ
t_{Eoff} =	0,48	µs

Figure 6. IGBT

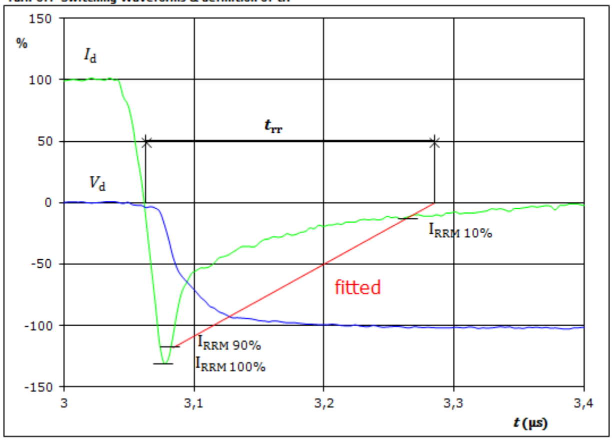
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	5,98	kW
E_{on} (100%) =	0,38	mJ
t_{Eon} =	0,20	µs

Figure 7. FWD

Turn-off Switching Waveforms & definition of trr

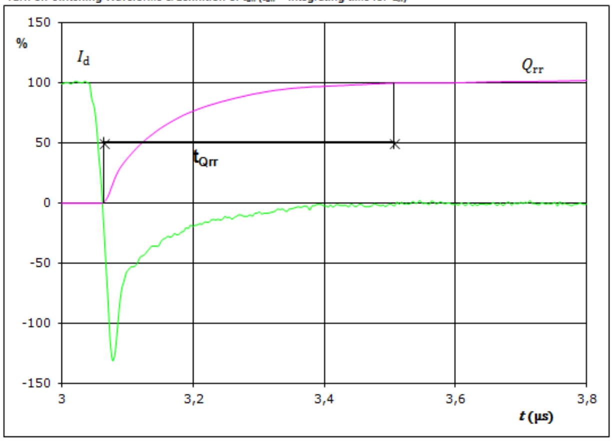


V_d (100%) =	300	V
I_d (100%) =	20	A
I_{RRM} (100%) =	-26	A
t_{rr} =	0,204	µs

Brake Switching Characteristics

Figure 8. **FWD**

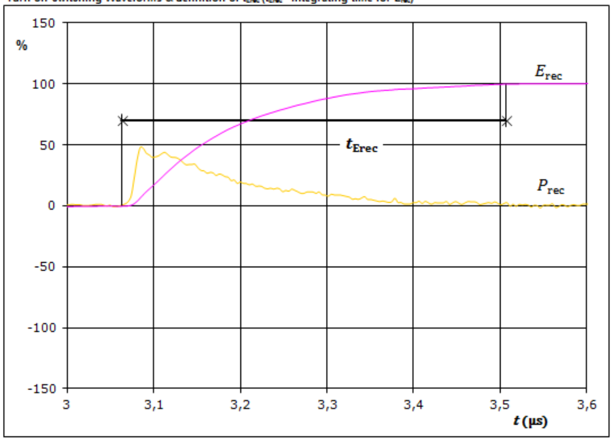
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	20	A
Q_{rr} (100%) =	1,71	µC
t_{Qrr} =	0,44	µs

Figure 9. **FWD**

Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec}= integrating time for E_{rec})



P_{rec} (100%) =	5,98	kW
E_{rec} (100%) =	0,37	mJ
t_{Erec} =	0,44	µs

V23990-P635-A-PM
datasheet

Vincotech

Ordering Code & Marking

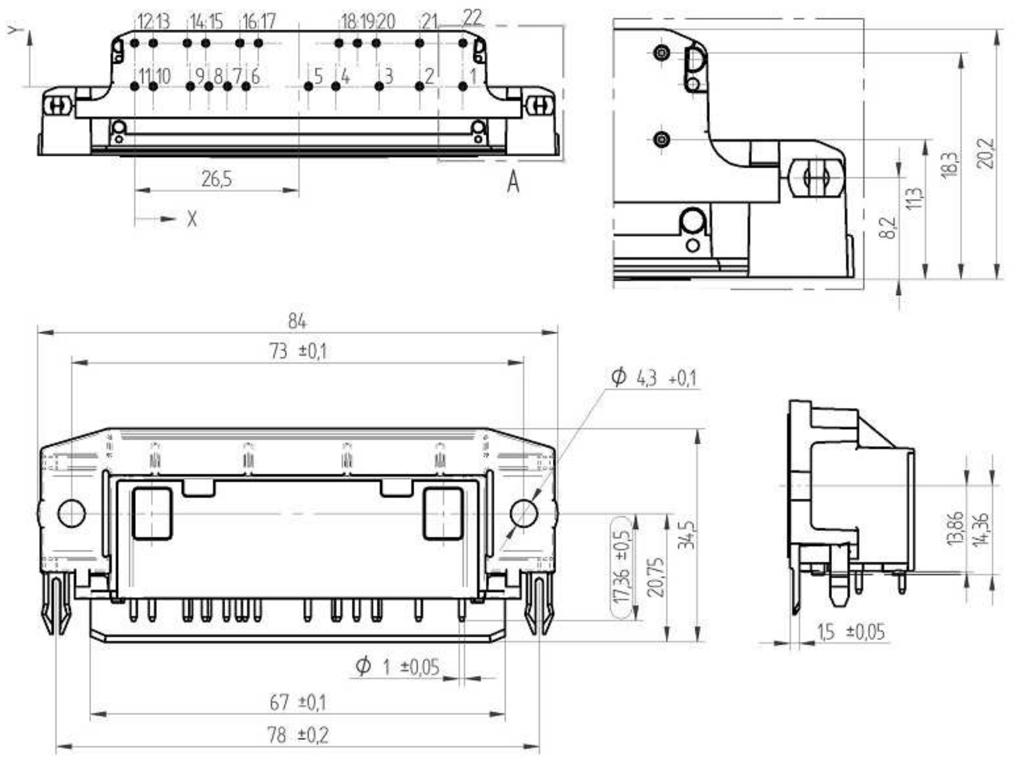
Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste with solder pins	V23990-P635-A-PM	P635-A	P635-A

Text	**Vinco**	**Date code**	**Name&Ver**	**UL**	**Lot**	**Serial**
	Vinco	WWYY	NNNNNNNVV	UL	LLLLL	SSSS
Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

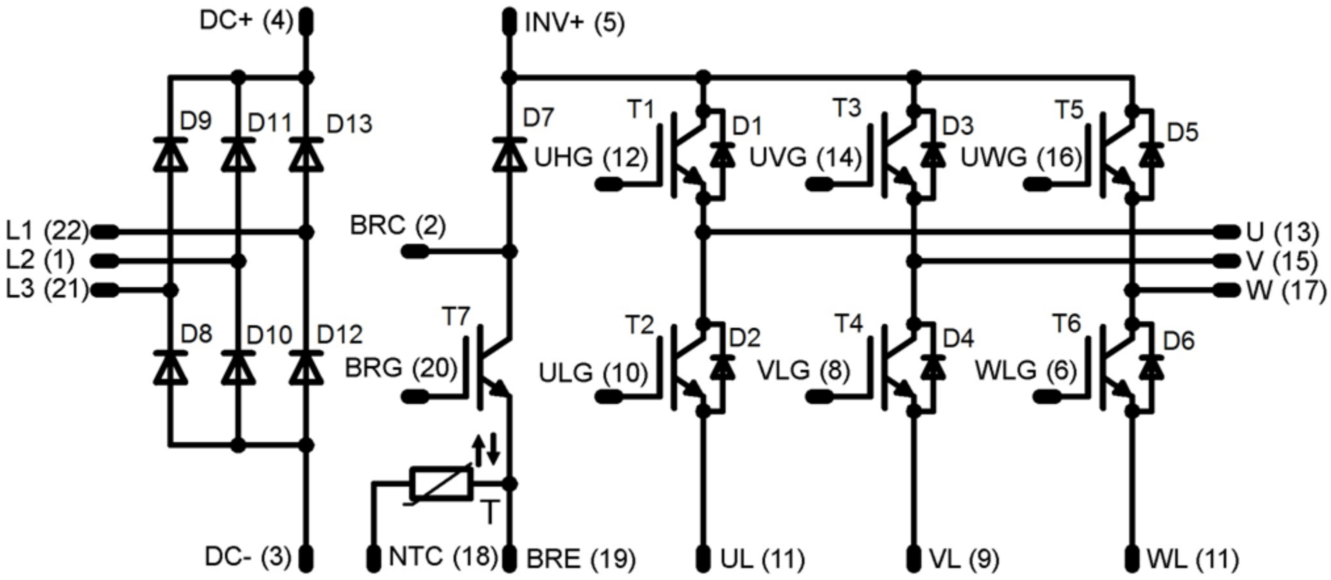
Outline

Pin table [mm]

Pin	X	Y	Function
1	53	0	L2
2	46	0	BrC
3	39,5	0	DC-
4	32,5	0	DC+
5	28,1	0	Inv+
6	18	0	WLG
7	15	0	WL
8	12	0	VLG
9	9	0	VL
10	3	0	ULG
11	0	0	UL
12	0	7	UHG
13	3	7	U
14	8,5	7	VHG
15	11,5	7	V
16	17	7	WHG
17	20	7	W
18	33	7	NTC
19	36	7	BrE
20	39	7	BrG
21	46	7	L3
22	53	7	L1



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T1,T2,T3,T4,T5,T6	IGBT	600V	30A	Inverter Switch	
D1,D2,D3,D4,D5,D6	FWD	600V	30A	Inverter Diode	
T7	IGBT	600V	20A	Brake Switch	
D7	FWD	600V	20A	Brake Diode	
D8,D9,D10, D11,D12,D13	Rectifier	1600V	25A	Rectifier Diode	
T	NTC	-	-	Thermistor	

Packaging instruction					
Standard packaging quantity (SPQ)	80	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* 90 1 packages see vincotech.com website.

Document No.:	Date:	Modification:	Pages
V23990-P635A-D2-14	17 Mar. 2015		

DISCLAIMER

The information given in this datasheet describes the type of component and does not represent assured characteristics. For tested values please contact Vincotech.Vincotech reserves the right to make changes without further notice to any products herein to improve reliability, function or design. Vincotech does not assume any liability arising out of the application or use of any product or circuit described herein; neither does it convey any license under its patent rights, nor the rights of others.

LIFE SUPPORT POLICY

Vincotech products are not authorised for use as critical components in life support devices or systems without the express written approval of Vincotech.

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.

2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.