30-F212PMA050M7-L888A79
30-P212PMA050M7-L888A79Y
datasheet

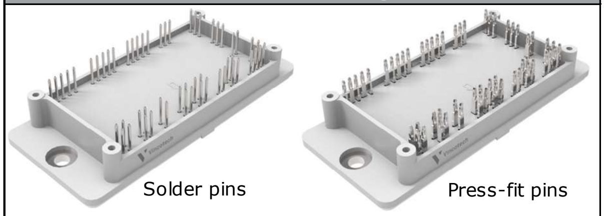
Vincotech

***flow* PIM 2** | **1200 V / 50 A**

Features

- IGBT M7 with low V_{CEsat} and improved EMC behavior
- Open emitter configuration
- Compact and low inductive design
- Built-in NTC

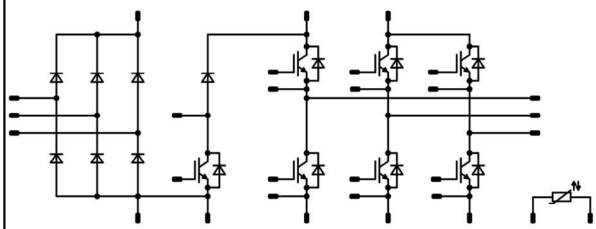
flow 2 housing



Target applications

- Industrial Drives

Schematic



Types

- 30-F212PMA050M7-L888A79
- 30-P212PMA050M7-L888A79Y

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Rectifier Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	71	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 8,3 ms	T_j = 150 °C	490	A
Surge current capability	I^2t			1200	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	106	W
Maximum junction temperature	T_{jmax}			150	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Inverter Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	70	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	162	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
Inverter Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	54	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		100	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	101	W
Maximum junction temperature	T_{jmax}			175	°C
Brake Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	50	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		70	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	132	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum junction temperature	T_{jmax}			175	°C
Brake Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	35	A
Repetitive peak forward current	I_{FRM}	T_j limited by T_{jmax}		50	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	70	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Brake Sw. Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	7	A
Repetitive peak forward current	I_{FRM}			10	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	34	W
Maximum junction temperature	T_{jmax}			175	°C

Module Properties

Thermal Properties

Parameter	Symbol	Condition		Value	Unit
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{jop}			-40…(T_{jmax} - 25)	°C

Isolation Properties

Parameter	Symbol	Condition		Value	Unit
Isolation voltage	V_{isol}	DC Test Voltage*	t_p = 2 s	6000	V
		AC Voltage	t_p = 1 min	2500	V
Creepage distance		Press-fit pins		min. 12,7	mm
		Solder pins			
Clearance		Press-fit pins		11,58	mm
		Solder pins		11,82	
Operation temperature under switching condition	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	
Rectifier Diode										
Static										
Forward voltage	V_F				50	25 125 150		1,14 1,08 1,07	1,7	V
Reverse leakage current	I_R			1600		25 150			50 1100	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,66		K/W

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Inverter Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,005	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 125 150		1,55 1,77 1,83	1,9	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			90	µA
Gate-emitter leakage current	I_{GES}		15	0		25			500	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}		0	10		25		10000		pF
Output capacitance	C_{oes}							350		
Reverse transfer capacitance	C_{res}							130		
Gate charge	Q_g		15	600	50	25		410		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,59		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 8 Ω R_{gon} = 8 Ω	±15	600	50	25 125 150		176 176 190		ns
Rise time	t_r					25 125 150		52 58 60		
Turn-off delay time	$t_{d(off)}$					25 125 150		206 229 241		
Fall time	t_f					25 125 150		92 125 122		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 4,9 µC Q_{rFWD} = 7,1 µC Q_{rFWD} = 8 µC				25 125 150		4,82 6,38 6,25		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		2,98 4,25 5,03		

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	
Inverter Diode										
Static										
Forward voltage	V_F				50	25 125 150		1,66 1,78 1,79	2,15	V
Reverse leakage current	I_R			1200		25 150			50	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,94		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 338 A/µs di/dt = 450 A/µs di/dt = 498 A/µs	±15	600	50	25 125 150		29 33 33		A
Reverse recovery time	t_{rr}					25 125 150		339 435 511		ns
Recovered charge	Q_r					25 125 150		4,93 7,08 8,04		µC
Reverse recovered energy	E_{rec}					25 125 150		1,79 2,59 3,33		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		195 128 114		A/µs

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	
Brake Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0035	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		35	25 125 150		1,48 1,64 1,68	1,85	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			80	µA
Gate-emitter leakage current	I_{GES}		20	0		25			500	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}		0	10		25		7900		pF
Output capacitance	C_{oes}							270		
Reverse transfer capacitance	C_{res}							97		
Gate charge	Q_g		15	600	35	25		260		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,72		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 16 Ω R_{gon} = 16 Ω	15/0	700	35	25 125 150		199 172 167		ns
Rise time	t_r					25 125 150		111 109 110		
Turn-off delay time	$t_{d(off)}$					25 125 150		438 485 497		
Fall time	t_f					25 125 150		65 100 107		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 2,8 µC Q_{rFWD} = 4,5 µC Q_{rFWD} = 5,1 µC				25 125 150		4,87 5,85 6,10		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		3,00 3,88 4,10		

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Brake Diode										
Static										
Forward voltage	V_F				25	25 125 150		1,63 1,70 1,69	2,1	V
Reverse leakage current	I_R			1200		25			35	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,36		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 310 A/µs di/dt = 311 A/µs di/dt = 260 A/µs	15/0	700	35	25 125 150		18 20 20		A
Reverse recovery time	t_{rr}					25 125 150		269 397 449		ns
Recovered charge	Q_r					25 125 150		2,81 4,53 5,09		µC
Reverse recovered energy	E_{rec}					25 125 150		1,12 1,92 2,21		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		132 80 77		A/µs
Brake Sw. Protection Diode										
Static										
Forward voltage	V_F				5	25 125 150		1,57 1,65 1,65	2,1	V
Reverse leakage current	I_R			1200		25			20	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,76		K/W

Characteristic Values

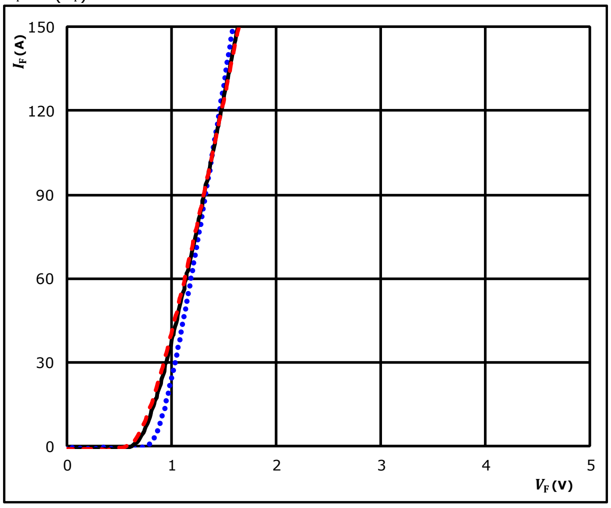
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P					25		5		mW
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	

Rectifier Diode Characteristics

figure 1. **Rectifer**

Typical forward characteristics

$I_F = f(V_F)$



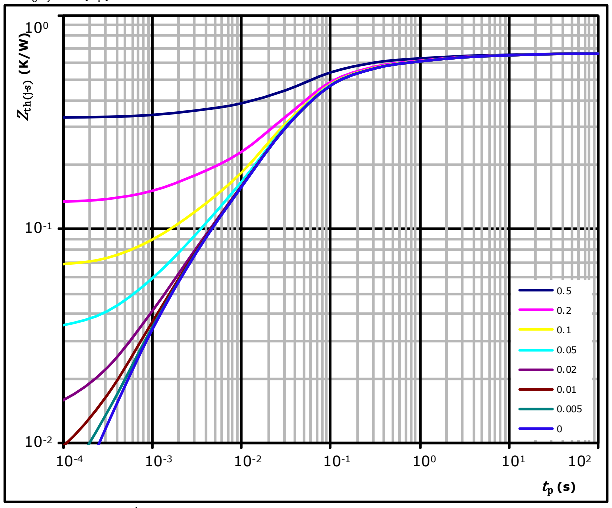
t_p = 250 µs

T_j: 25 °C · 125 °C · 150 °C

figure 2. **Rectifer**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

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

Rectifer thermal model values

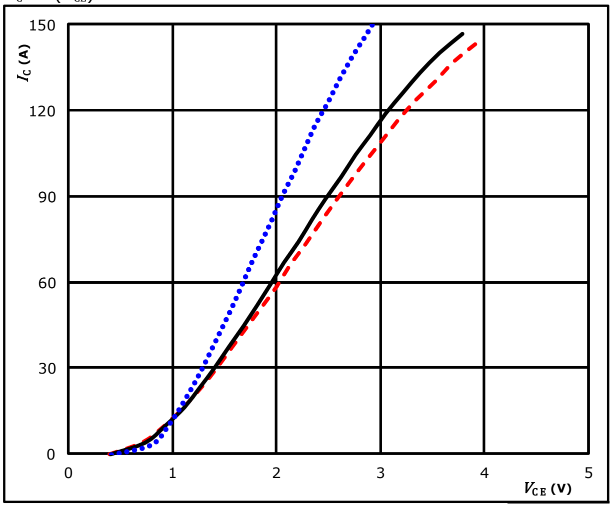
R (K/W)	τ (s)
2,64E-02	1,18E+01
6,63E-02	1,18E+00
1,36E-01	1,65E-01
3,29E-01	4,29E-02
6,63E-02	1,04E-02
3,95E-02	1,49E-03

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

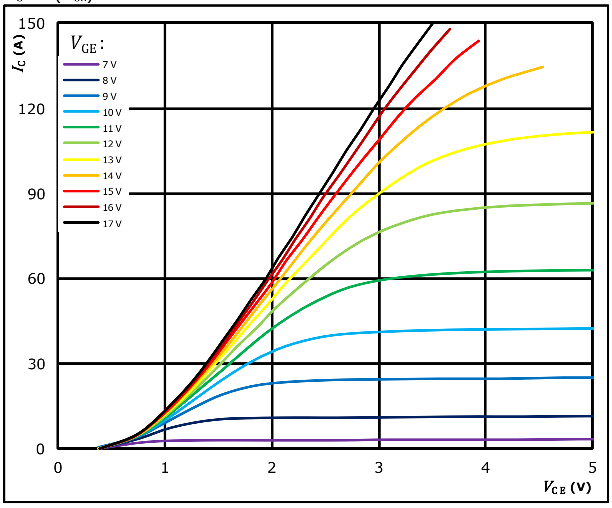


t_p =	250	µs		25 °C	dotted
V_{GE} =	15	V	T_j:	125 °C	solid
				150 °C	dashed

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



t_p = 250 µs

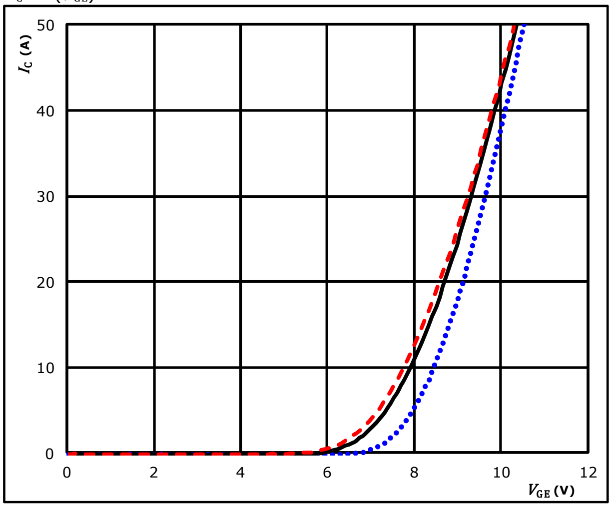
T_j = 150 °C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

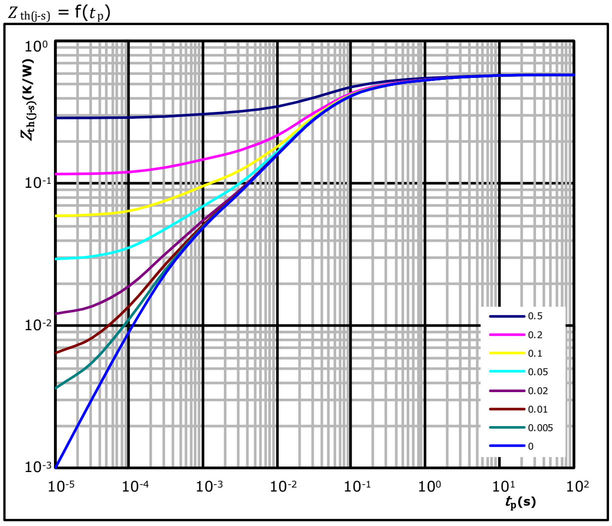


t_p =	100	µs		25 °C	dotted
V_{CE} =	10	V	T_j:	125 °C	solid
				150 °C	dashed

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j-s)}$ = 0,59 K/W

IGBT thermal model values

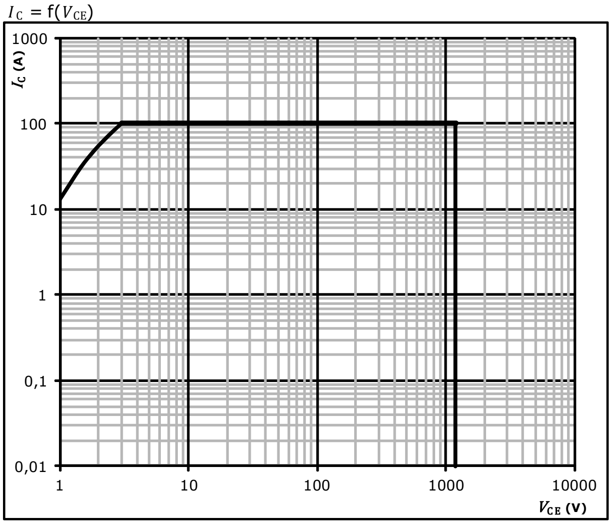
R (K/W)	τ (s)
3,16E-02	4,80E+00
5,30E-02	1,05E+00
1,21E-01	1,71E-01
2,39E-01	4,01E-02
9,09E-02	1,21E-02
2,38E-02	1,71E-03
2,73E-02	3,65E-04

Inverter Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



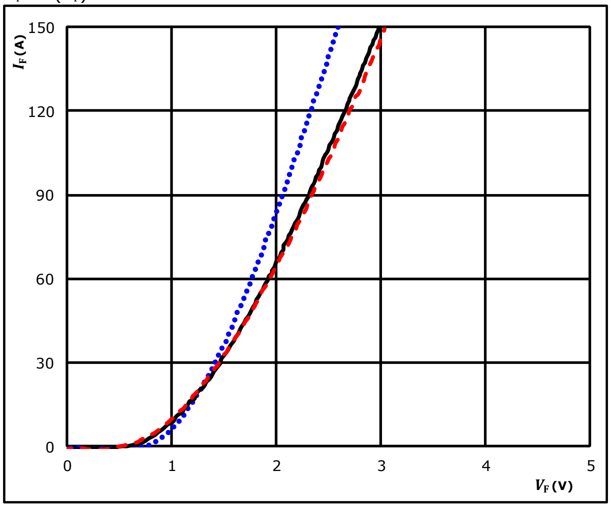
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Inverter Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



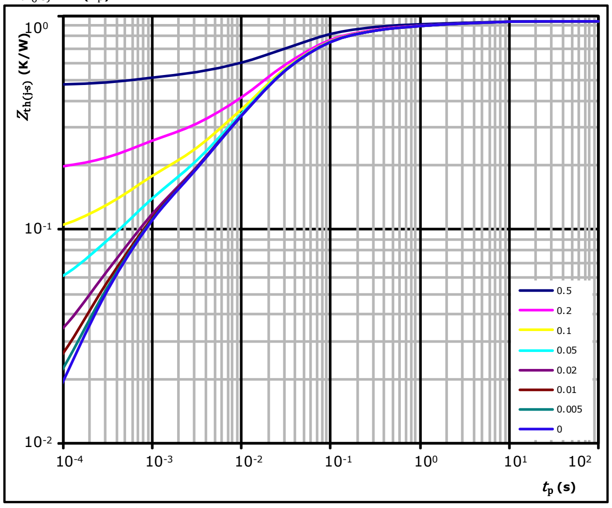
t_p = 250 µs

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

$R_{th(j\text{-}s)}$ = 0,94 K/W

FWD thermal model values

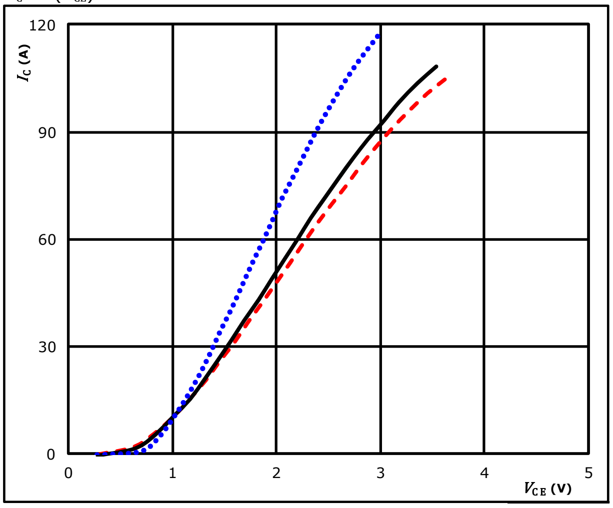
R (K/W)	τ (s)
5,03E-02	3,45E+00
8,14E-02	4,50E-01
2,71E-01	7,41E-02
3,67E-01	2,11E-02
9,51E-02	3,99E-03
7,76E-02	4,74E-04

Brake Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

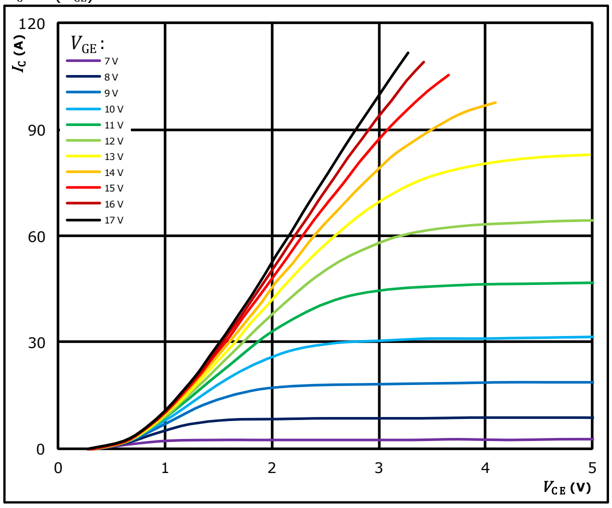


t_p =	250	µs		25	°C
V_{GE} =	15	V	T_j:	125	°C
				150	°C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



t_p = 250 µs

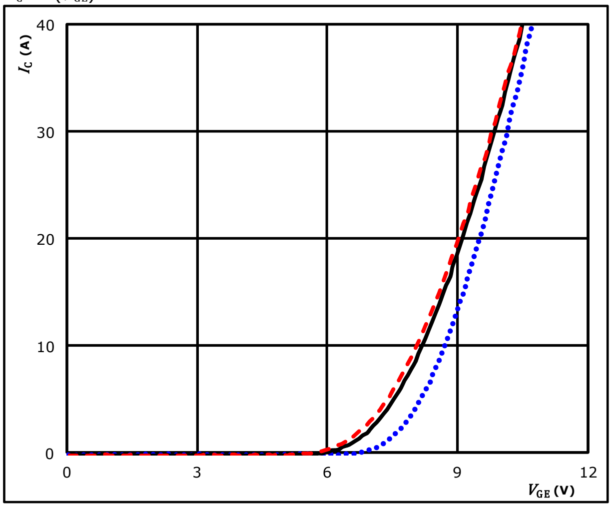
T_j = 150 °C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

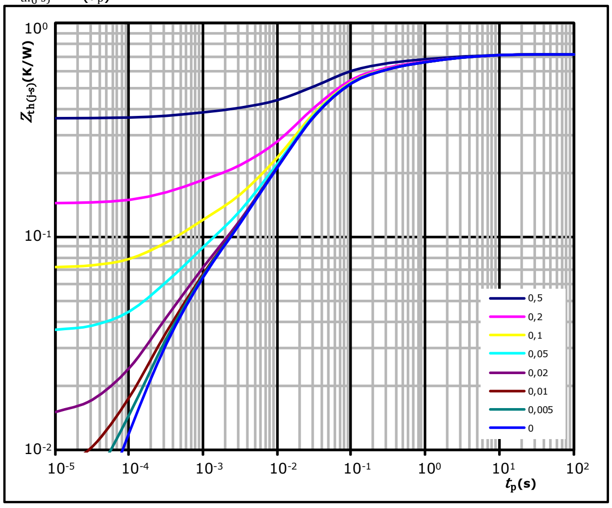


t_p =	100	µs		25	°C
V_{CE} =	10	V	T_j:	125	°C
				150	°C

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 0,72 K/W

IGBT thermal model values

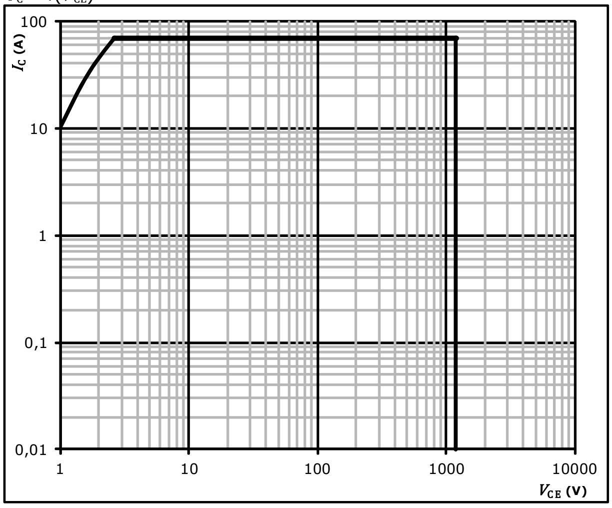
R (K/W)	τ (s)
3,93E-02	5,07E+00
7,23E-02	9,25E-01
1,28E-01	1,58E-01
3,10E-01	3,68E-02
1,08E-01	1,02E-02
3,17E-02	1,41E-03
3,18E-02	3,39E-04

Brake Switch Characteristics

figure 5.	IGBT

Safe operating area

$I_C = f(V_{CE})$



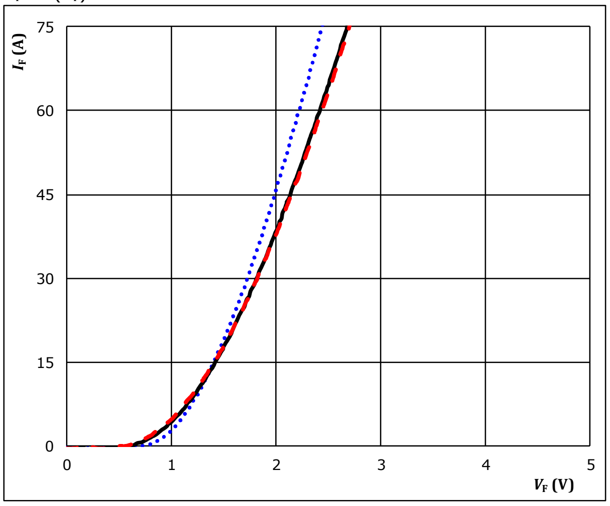
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Brake Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



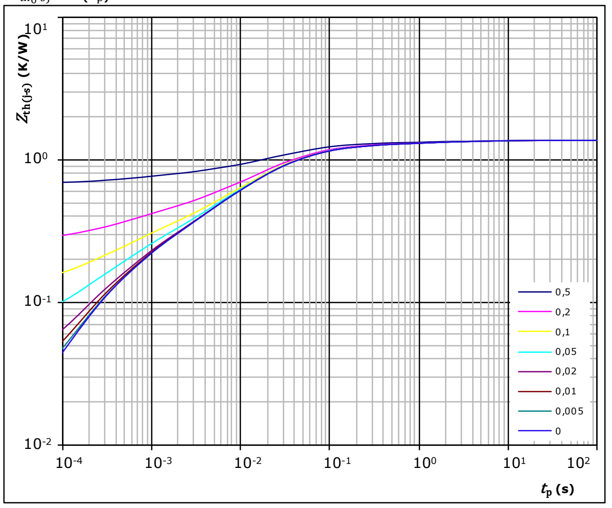
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,36 K/W

FWD thermal model values

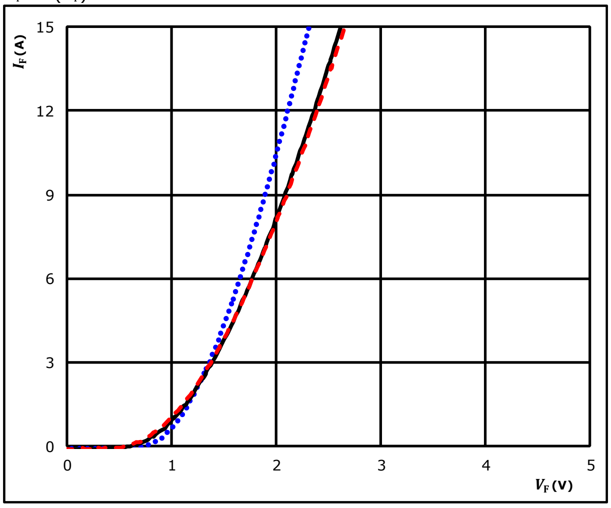
R (K/W)	τ (s)
4,30E-02	6,93E+00
7,33E-02	1,01E+00
1,84E-01	1,33E-01
5,52E-01	2,95E-02
2,85E-01	7,43E-03
1,16E-01	1,34E-03
1,06E-01	3,07E-04

Brake Sw. Protection Diode Characteristics

figure 1. FWD

Typical forward characteristics

$I_F = f(V_F)$

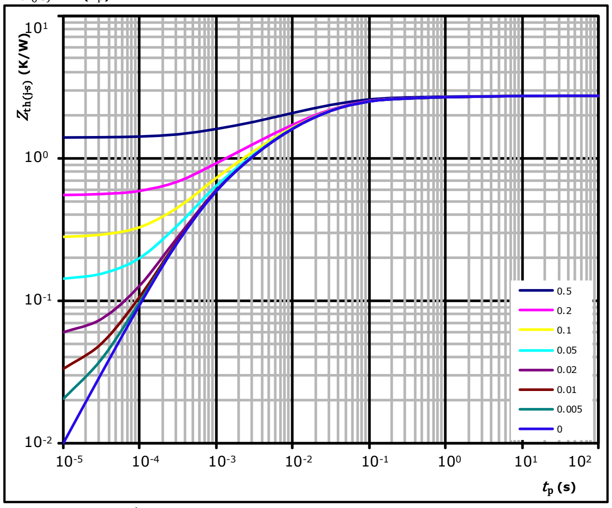


t_p =	250 µs	T_j:	25 °C
			125 °C
			150 °C

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j\text{-}s)}$ = 2,76 K/W

FWD thermal model values

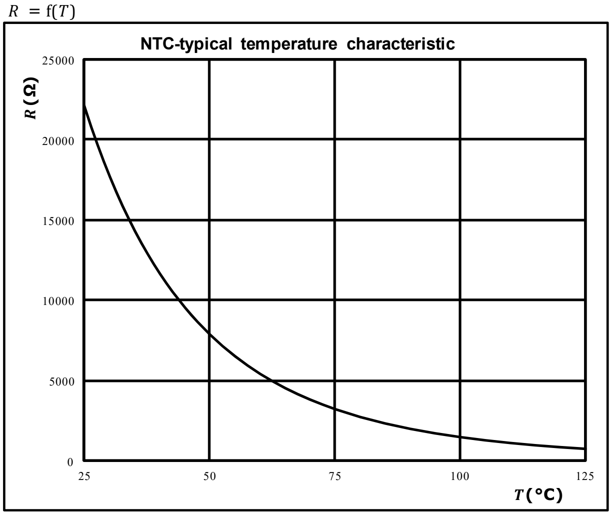
R (K/W)	τ (s)
6,58E-02	4,81E+00
1,43E-01	3,47E-01
6,08E-01	4,61E-02
8,65E-01	1,40E-02
7,08E-01	2,91E-03
3,69E-01	5,42E-04

Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic as a function of temperature

$R = f(T)$

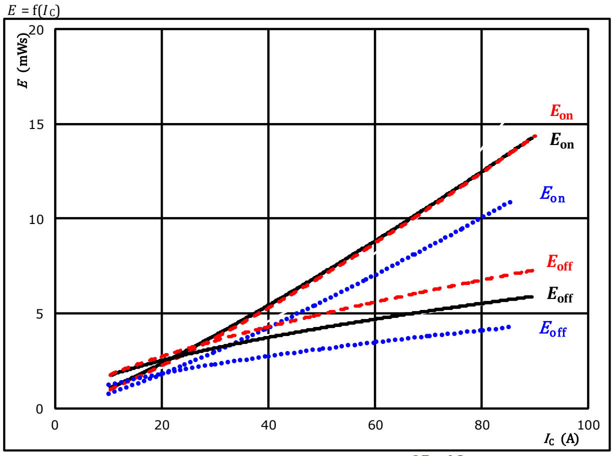


Inverter Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



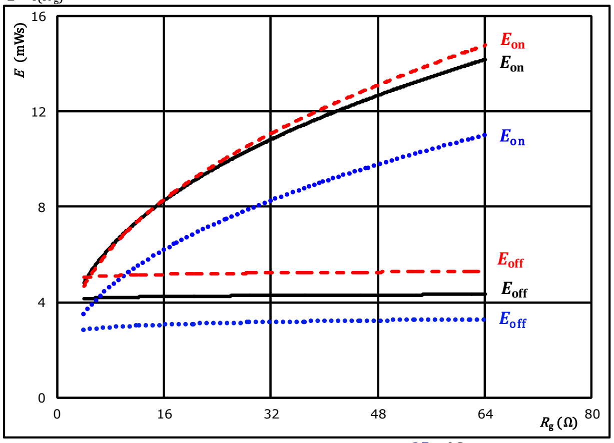
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C / 125 °C / 150 °C
V_{GE} =	±15	V		
R_{gon} =	8	Ω		
R_{goff} =	8	Ω		

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



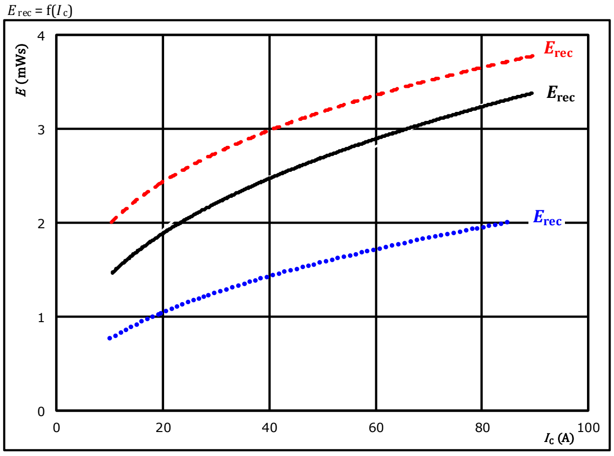
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C / 125 °C / 150 °C
V_{GE} =	±15	V		
I_C =	50	A		

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_c)$



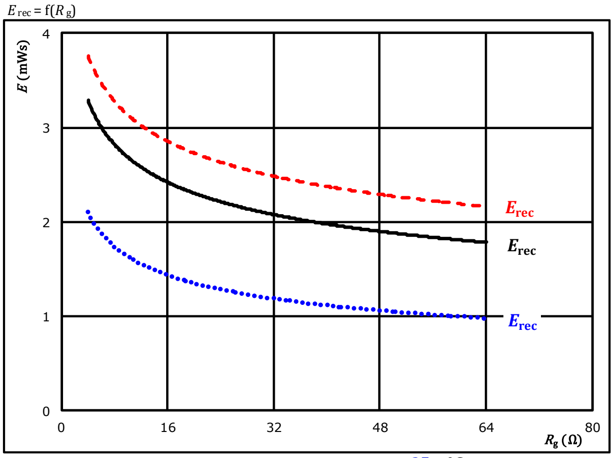
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C / 125 °C / 150 °C
V_{GE} =	±15	V		
R_{gon} =	8	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

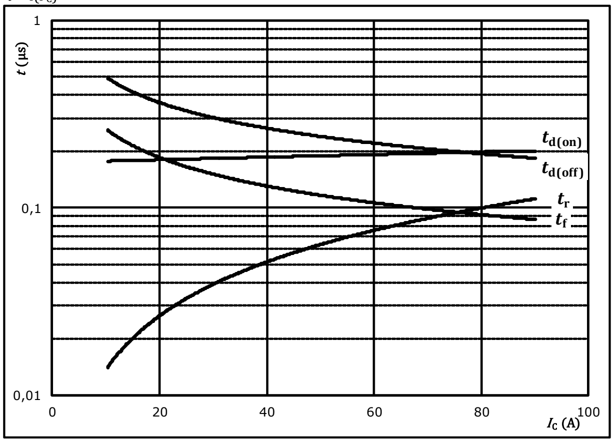
V_{CE} =	600	V	T_j:	25 °C / 125 °C / 150 °C
V_{GE} =	±15	V		
I_C =	50	A		

Inverter Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



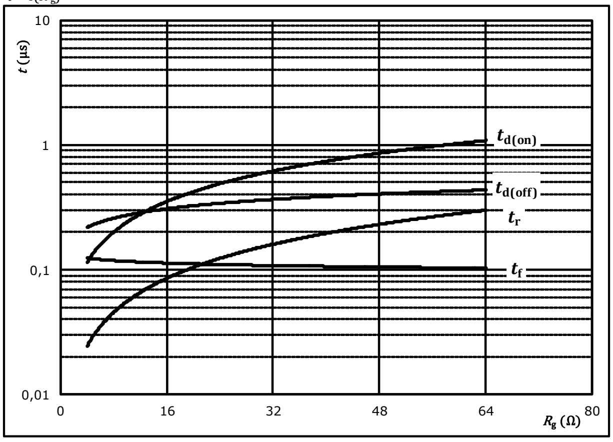
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



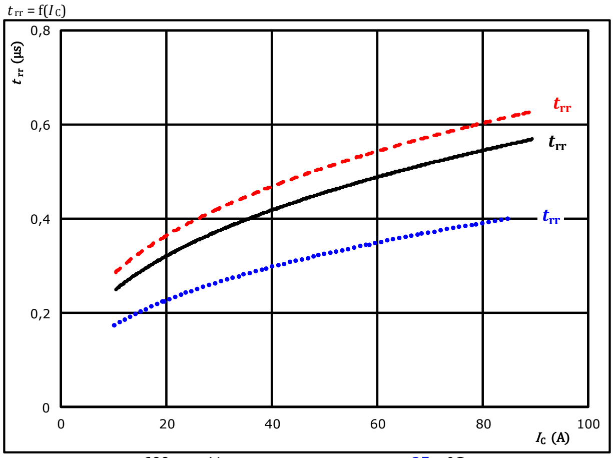
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	50	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

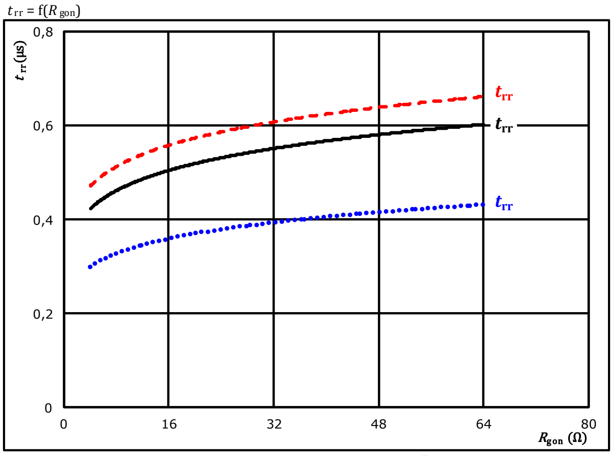


At						
V_{CE} =	600	V		25	°C	blue dotted
V_{GE} =	±15	V	T_j:	125	°C	black solid
R_{gon} =	8	Ω		150	°C	red dashed

figure 8. **FWD**

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

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



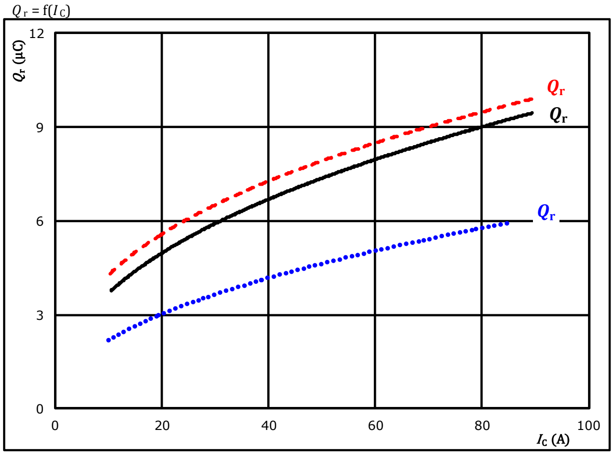
At						
V_{CE} =	600	V		25	°C	blue dotted
V_{GE} =	±15	V	T_j:	125	°C	black solid
I_C =	50	A		150	°C	red dashed

Inverter Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

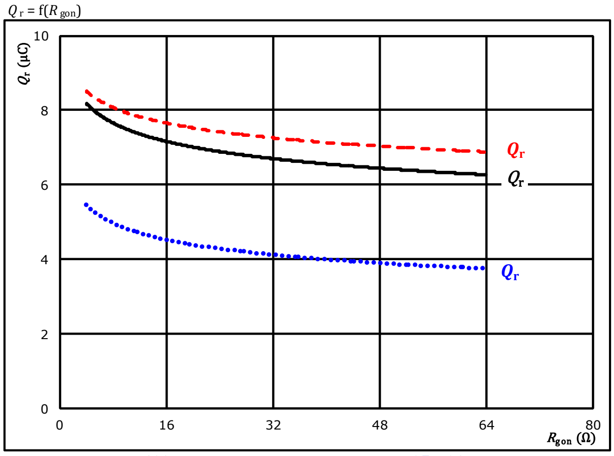


At					
V_{CE} =	600	V		25 °C	············
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	8	Ω		150 °C	– – –

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

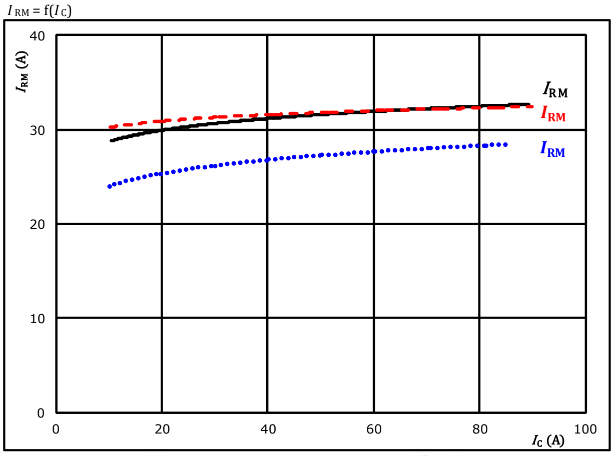


At					
V_{CE} =	600	V		25 °C	············
V_{GE} =	±15	V	T_j:	125 °C	———
I_C =	50	A		150 °C	– – –

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

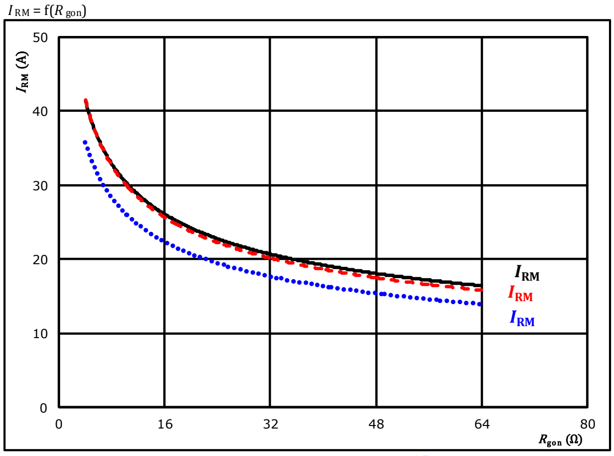


At					
V_{CE} =	600	V		25 °C	············
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	8	Ω		150 °C	– – –

figure 12. **FWD**

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

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



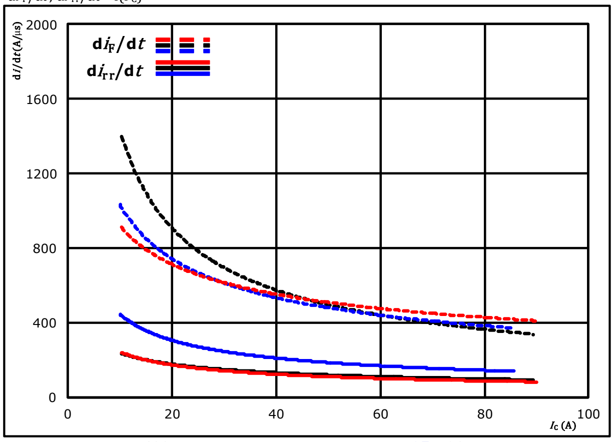
At					
V_{CE} =	600	V		25 °C	············
V_{GE} =	±15	V	T_j:	125 °C	———
I_C =	50	A		150 °C	– – –

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

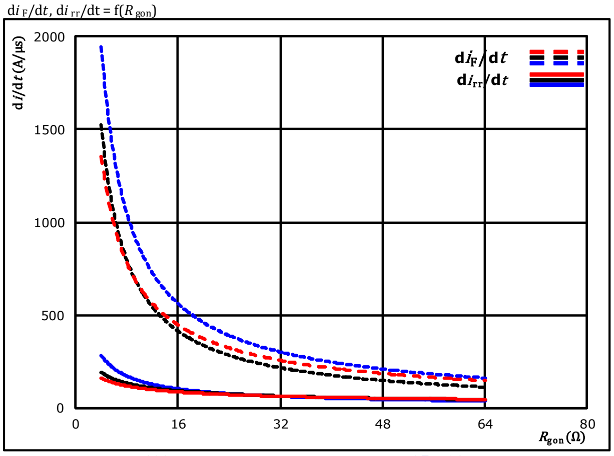


At						
V_{CE}:	600	V	T_j:	25	°C	•••••••••••••
V_{GE} =	±15	V		125	°C	———
R_{gon} =	8	Ω		150	°C	– – – –

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

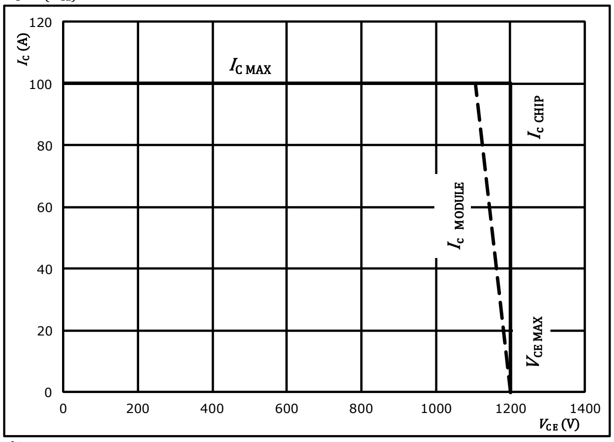


At						
V_{CE} =	600	V	T_j:	25	°C	•••••••••••••
V_{GE} =	±15	V		125	°C	———
I_C=	50	A		150	°C	– – – –

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



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

Vincotech

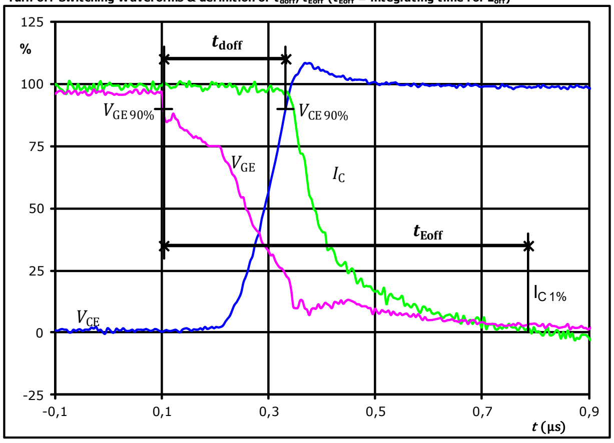
Inverter Switching Definitions

General conditions

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

figure 1. **IGBT**

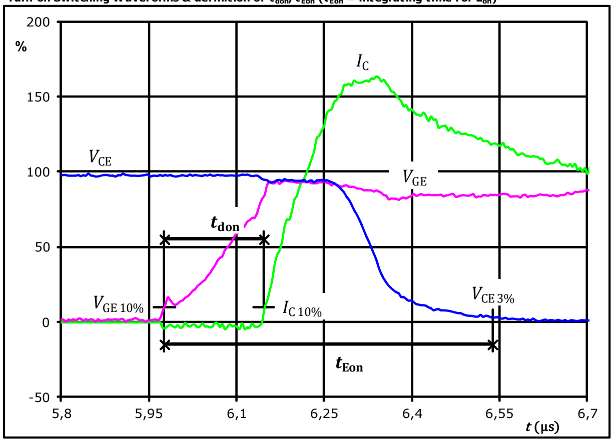
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	50	A
t_{doff} =	0,229	µs
t_{Eoff} =	0,683	µs

figure 2. **IGBT**

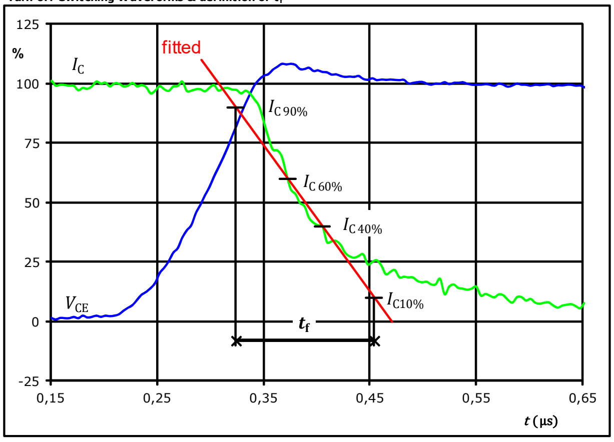
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	50	A
t_{don} =	0,176	µs
t_{Eon} =	0,561	µs

figure 3. **IGBT**

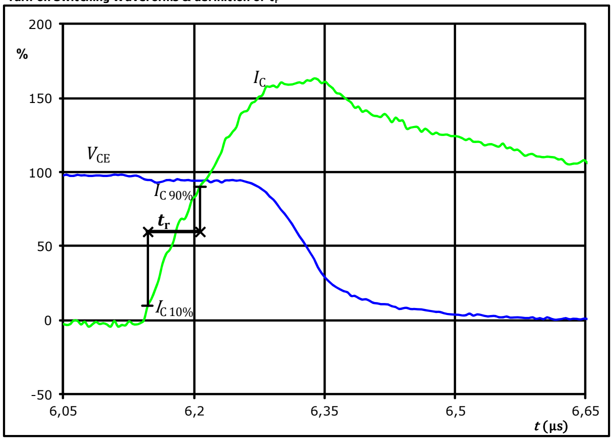
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	50	A
t_f =	0,125	µs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

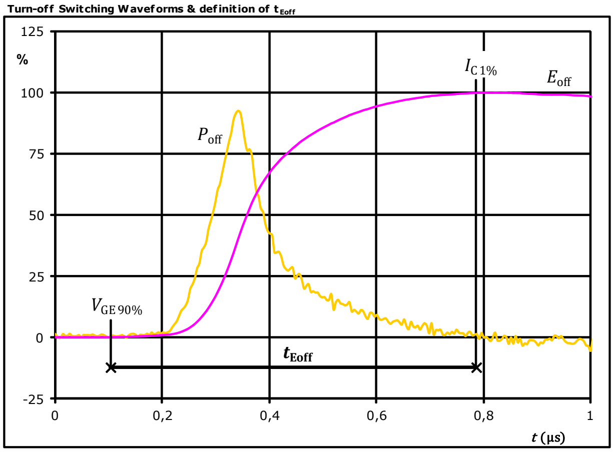


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	50	A
t_r =	0,058	µs

Inverter Switching Characteristics

figure 5. **IGBT**

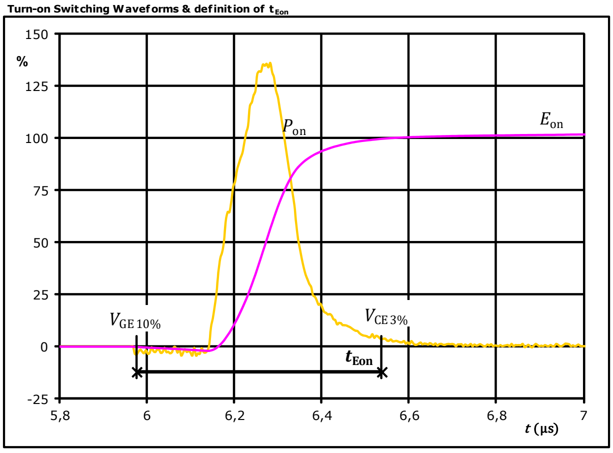
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	30	kW
E_{off} (100%) =	4,25	mJ
t_{Eoff} =	0,68	µs

figure 6. **IGBT**

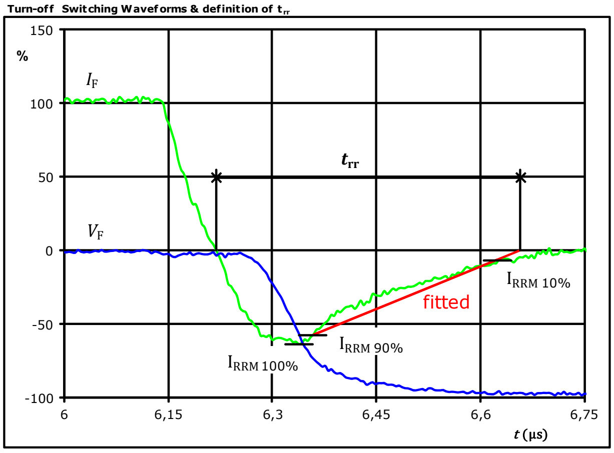
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	30	kW
E_{on} (100%) =	6,38	mJ
t_{Eon} =	0,56	µs

figure 7. **FWD**

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

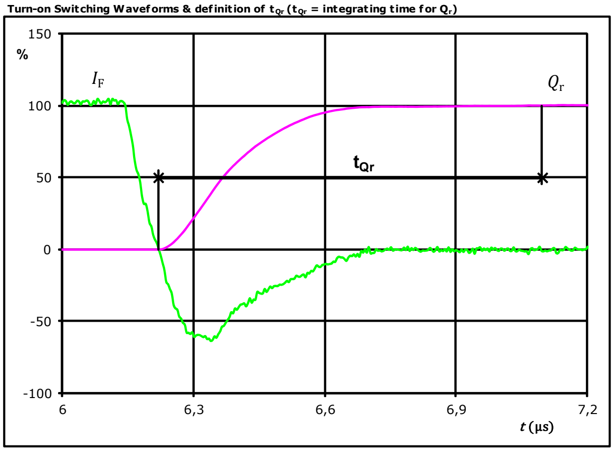


V_F (100%) =	600	V
I_F (100%) =	50	A
I_{RRM} (100%) =	-33	A
t_{rr} =	0,435	µs

Inverter Switching Characteristics

figure 8. **FWD**

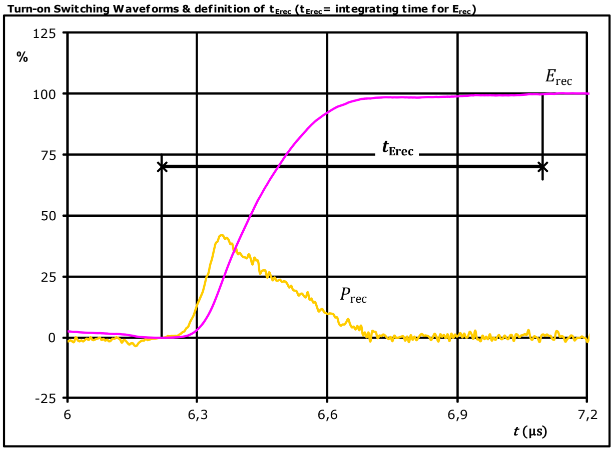
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	50	A
Q_r (100%) =	7,08	µC
t_{Qr} =	0,88	µs

figure 9. **FWD**

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



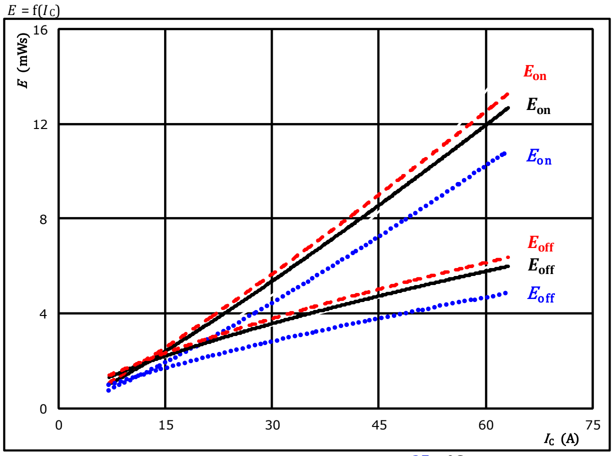
P_{rec} (100%) =	30,00	kW
E_{rec} (100%) =	2,59	mJ
t_{Erec} =	0,88	µs

Brake Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



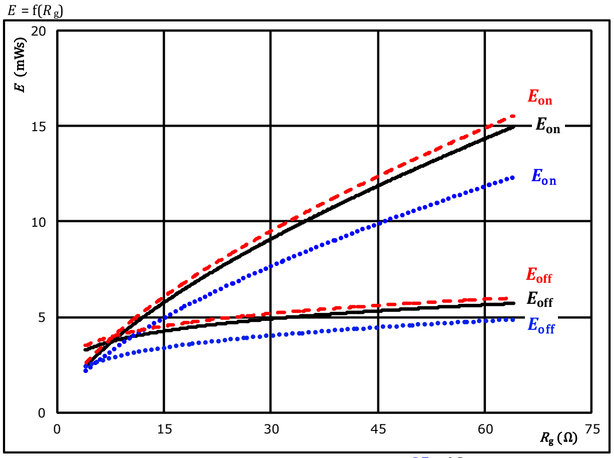
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C (dotted)
V_{GE} =	15/0	V		125 °C (solid)
R_{gon} =	16	Ω		150 °C (dashed)
R_{goff} =	16	Ω		

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



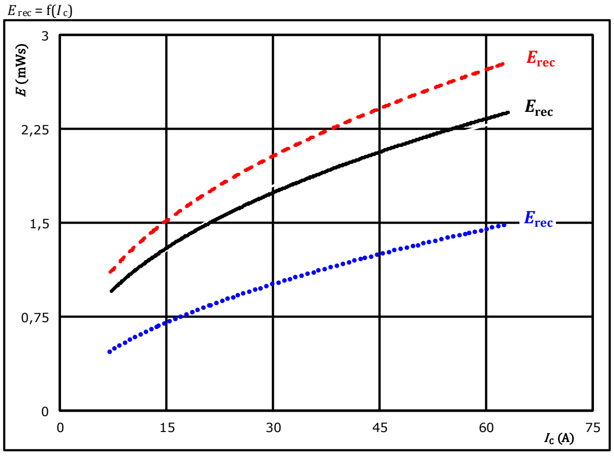
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C (dotted)
V_{GE} =	15/0	V		125 °C (solid)
I_C =	35	A		150 °C (dashed)

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



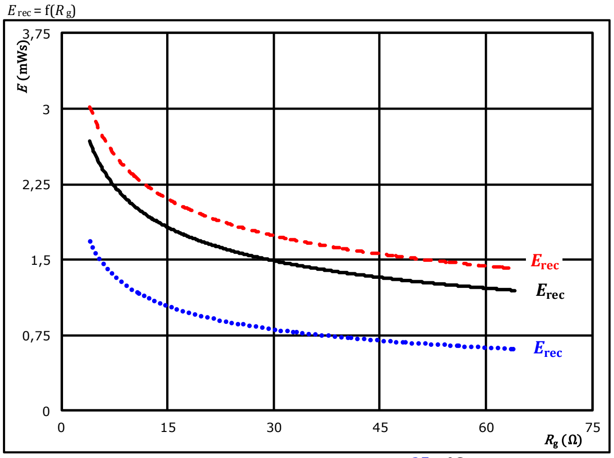
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C (dotted)
V_{GE} =	15/0	V		125 °C (solid)
R_{gon} =	16	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

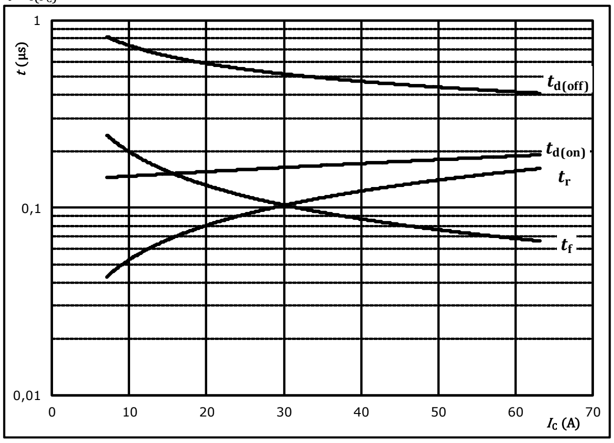
V_{CE} =	700	V	T_j:	25 °C (dotted)
V_{GE} =	15/0	V		125 °C (solid)
I_C =	35	A		150 °C (dashed)

Brake Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



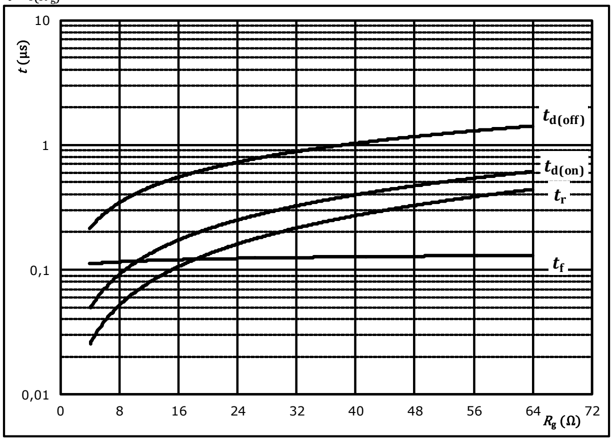
With an inductive load at

T_j =	150	°C
V_{CE} =	700	V
V_{GE} =	15/0	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



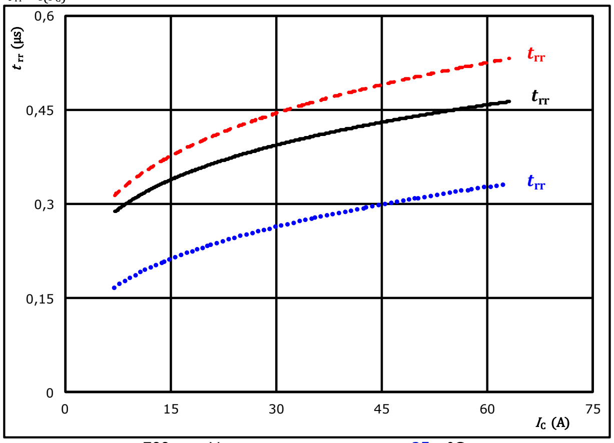
With an inductive load at

T_j =	150	°C
V_{CE} =	700	V
V_{GE} =	15/0	V
I_C =	35	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

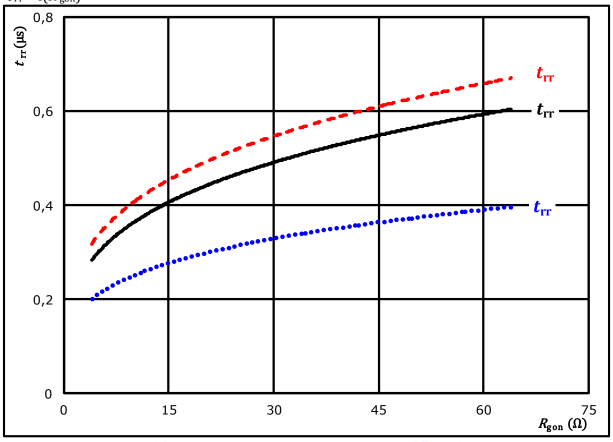


At						
V_{CE} =	700	V		25	°C	•••••••••••••
V_{GE} =	15/0	V	T_j:	125	°C	———
R_{gon} =	16	Ω		150	°C	– – – –

figure 8. **FWD**

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

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



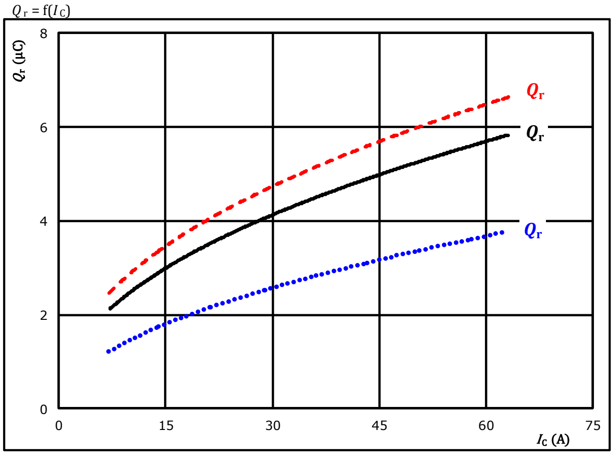
At						
V_{CE} =	700	V		25	°C	•••••••••••••
V_{GE} =	15/0	V	T_j:	125	°C	———
I_C =	35	A		150	°C	– – – –

Brake Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

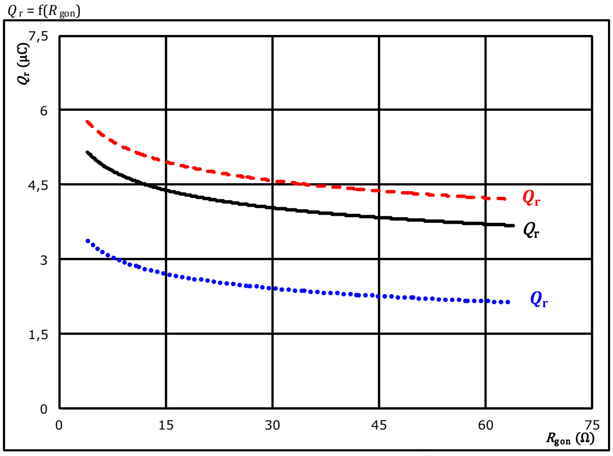


At					
V_{CE} =	700	V		25 °C	············
V_{GE} =	15/0	V	T_j:	125 °C	———
R_{gon} =	16	Ω		150 °C	– – –

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

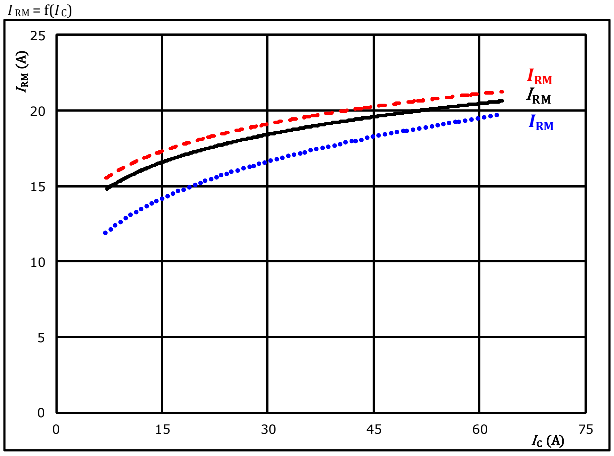


At					
V_{CE}=	700	V		25 °C	············
V_{GE} =	15/0	V	T_j:	125 °C	———
I_C=	35	A		150 °C	– – –

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

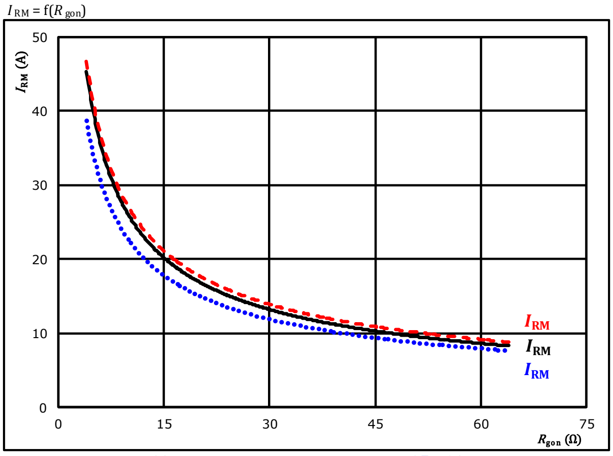


At					
V_{CE}:	700	V		25 °C	············
V_{GE} =	15/0	V	T_j:	125 °C	———
R_{gon} =	16	Ω		150 °C	– – –

figure 12. **FWD**

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

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



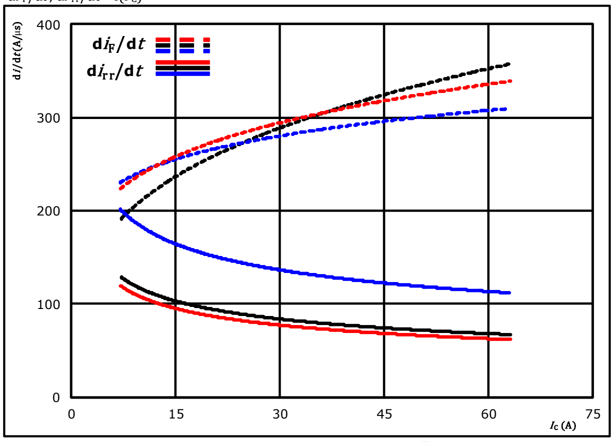
At					
V_{CE} =	700	V		25 °C	············
V_{GE} =	15/0	V	T_j:	125 °C	———
I_C =	35	A		150 °C	– – –

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

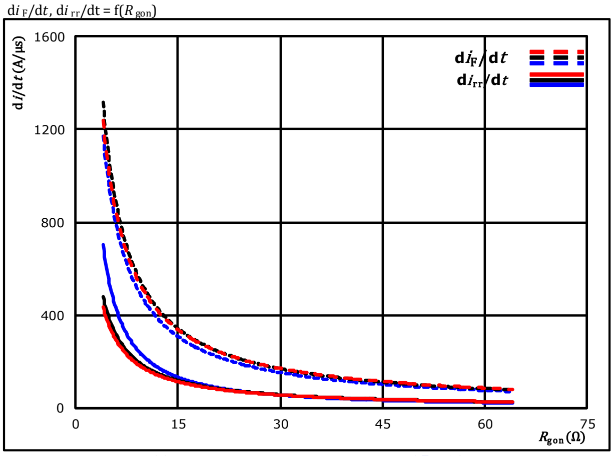


At					
V_{CE} =	700	V	T_j:	25 °C	•••••••••
V_{GE} =	15/0	V		125 °C	———
R_{gon} =	16	Ω		150 °C	– – –

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

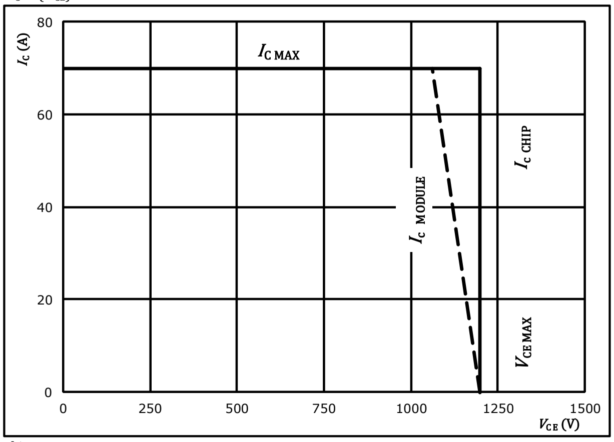


At					
V_{CE} =	700	V	T_j:	25 °C	•••••••••
V_{GE} =	15/0	V		125 °C	———
I_C=	35	A		150 °C	– – –

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

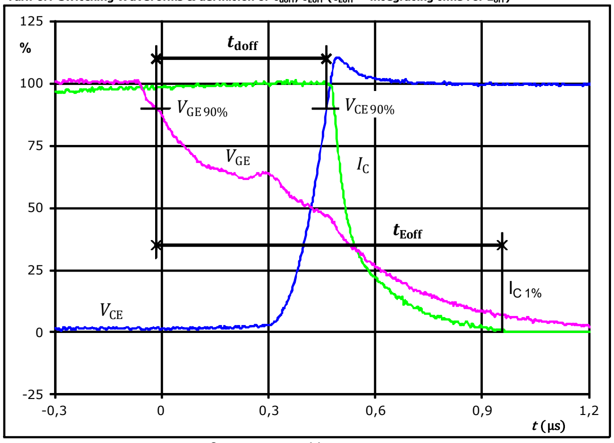
Brake Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	16 Ω
R_{goff}	=	16 Ω

figure 1. **IGBT**

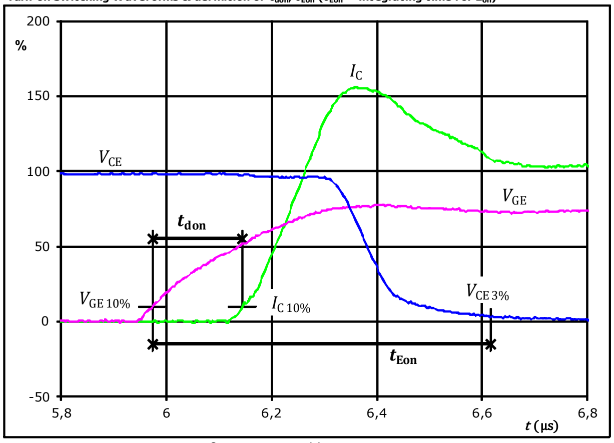
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	35	A
t_{doff} =	0,485	µs
t_{Eoff} =	0,973	µs

figure 2. **IGBT**

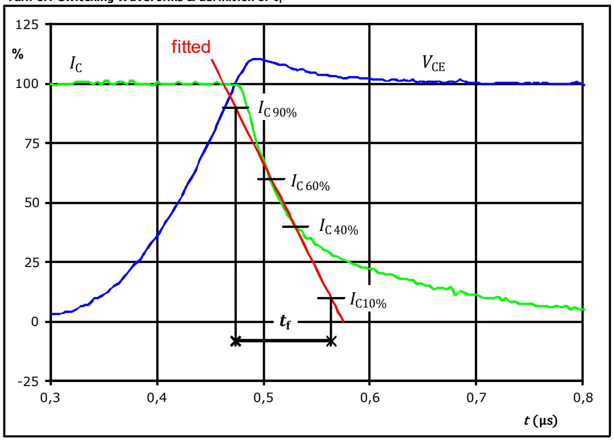
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	35	A
t_{don} =	0,172	µs
t_{Eon} =	0,642	µs

figure 3. **IGBT**

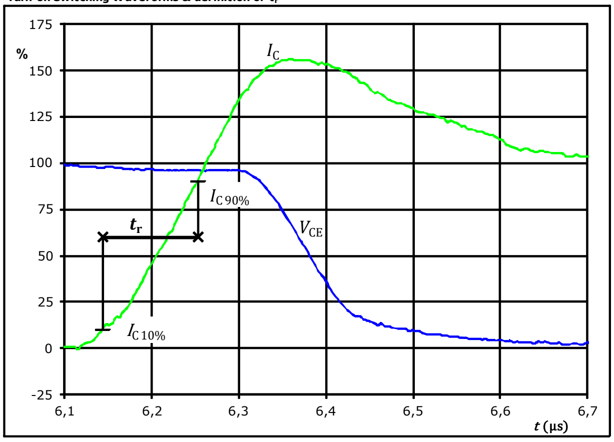
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	35	A
t_f =	0,100	µs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

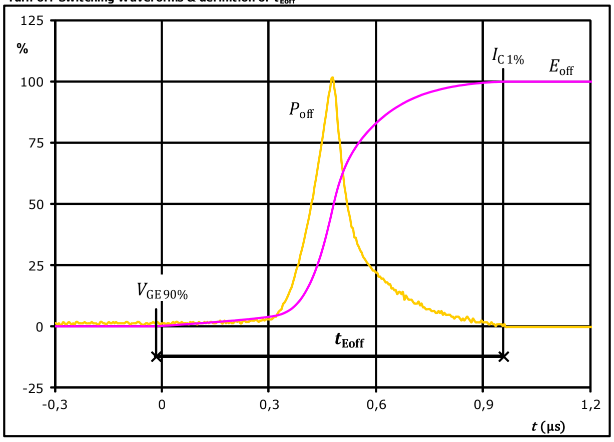


$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	35	A
t_r =	0,109	µs

Brake Switching Characteristics

figure 5. **IGBT**

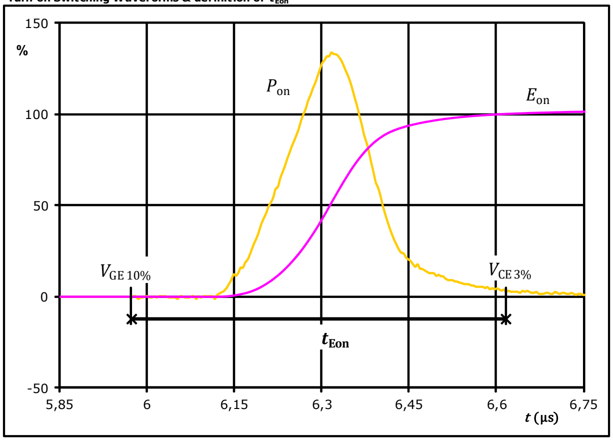
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	24,56	kW
E_{off} (100%) =	3,88	mJ
t_{Eoff} =	0,97	μs

figure 6. **IGBT**

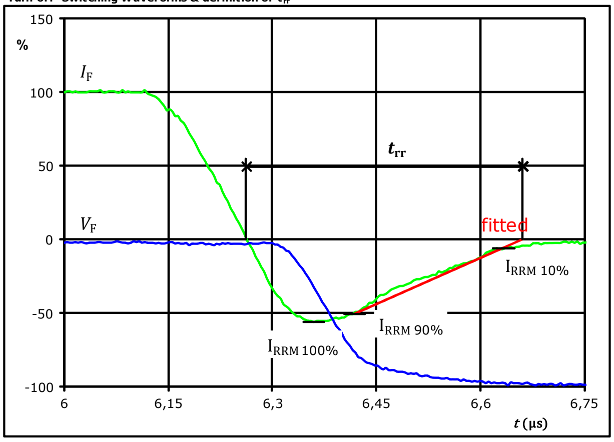
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	24,56	kW
E_{on} (100%) =	5,85	mJ
t_{Eon} =	0,64	μs

figure 7. **FWD**

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

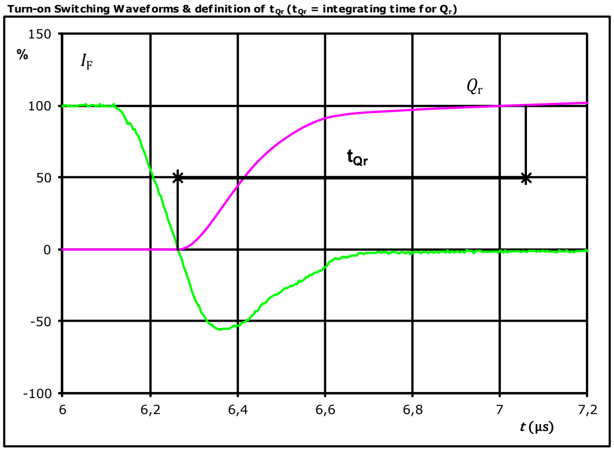


V_F (100%) =	700	V
I_F (100%) =	35	A
I_{RRM} (100%) =	-20	A
t_{rr} =	0,397	μs

Brake Switching Characteristics

figure 8. **FWD**

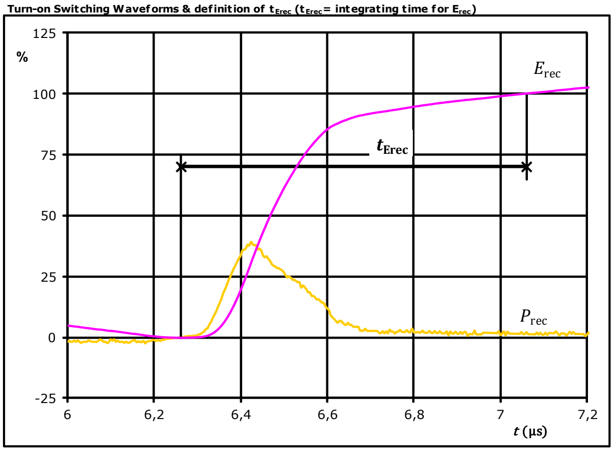
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F(100%) =	35	A
Q_r(100%) =	4,53	µC
t_{Qr} =	0,80	µs

figure 9. **FWD**

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

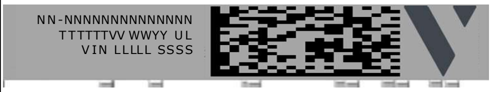


P_{rec}(100%) =	24,56	kW
E_{rec}(100%) =	1,92	mJ
t_{Erec} =	0,80	µs

Vincotech

Ordering Code & Marking

Version	Ordering Code
without thermal paste 17 mm housing with solder pins	30-F212PMA050M7-L888A79
with thermal paste 17 mm housing with solder pins	30-F212PMA050M7-L888A79-/3/
without thermal paste 17 mm housing with press-fit pins	30-P212PMA050M7-L888A79Y
with thermal paste 17 mm housing with press-fit pins	30-P212PMA050M7-L888A79Y-/3/



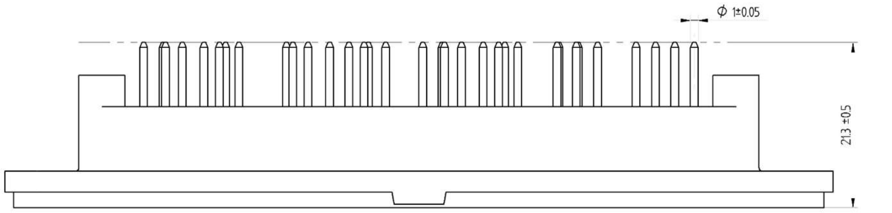
Text	Name		Date code	UL & VIN	Lot	Serial
	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

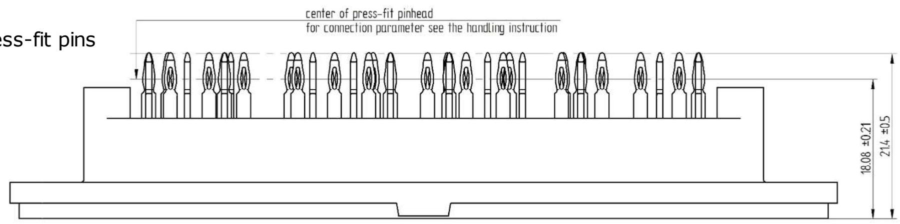
Pin table

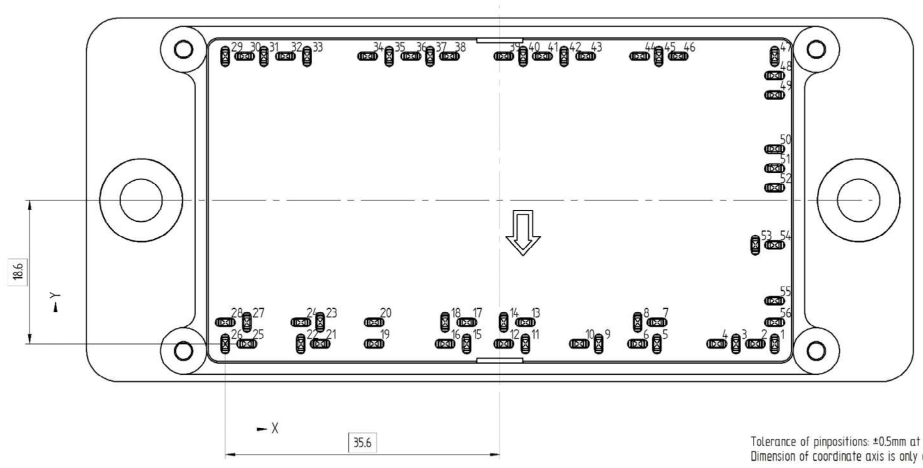
Pin	X	Y	Function	Pin	X	Y	Function
1	71,2	0	DC-Rect	52	71,2	20,2	ACIn3
2	68,7	0	DC-Rect	53	71,2	12,8	Br
3	66,2	0	DC-Rect	54	68,7	12,8	Br
4	63,7	0	DC-Rect	55	71,2	5,6	G27
5	55,95	0	DC+Rect	56	71,2	2,8	DC-Br
6	53,45	0	DC+Rect	52	71,2	20,2	ACIn3
7	55,95	2,8	DC+Rect	53	71,2	12,8	Br
8	53,45	2,8	DC+Rect	54	68,7	12,8	Br
9	48,4	0	DC+Inv1	55	71,2	5,6	G27
10	45,9	0	DC+Inv1	56	71,2	2,8	DC-Br
11	38,9	0	S11				
12	36,1	0	DC-1				
13	38,9	2,8	G11				
14	36,1	2,8	DC-1				
15	31,3	0	DC-2				
16	28,5	0	S13				
17	31,3	2,8	DC-2				
18	28,5	2,8	G13				
19	19,3	0	Therm2				
20	19,3	2,8	Therm1				
21	12,3	0	DC+Inv2				
22	9,8	0	DC+Inv2				
23	12,3	2,8	DC+Inv2				
24	9,8	2,8	DC+Inv2				
25	2,8	0	S15				
26	0	0	DC-3				
27	2,8	2,8	G15				
28	0	2,8	DC-3				
29	0	37,2	Ph3				
30	2,5	37,2	Ph3				
31	5	37,2	Ph3				
32	7,8	37,2	S16				
33	10,6	37,2	G16				
34	18,45	37,2	G14				
35	21,25	37,2	S14				
36	24,05	37,2	Ph2				
37	26,55	37,2	Ph2				
38	29,05	37,2	Ph2				
39	36,1	37,2	Ph1				
40	38,6	37,2	Ph1				
41	41,1	37,2	Ph1				
42	43,9	37,2	S12				
43	46,7	37,2	G12				
44	53,7	37,2	ACIn1				
45	56,2	37,2	ACIn1				
46	58,7	37,2	ACIn1				
47	71,2	37,2	ACIn2				
48	71,2	34,7	ACIn2				
49	71,2	32,2	ACIn2				
50	71,2	25,2	ACIn3				
51	71,2	22,7	ACIn3				

Solder pins



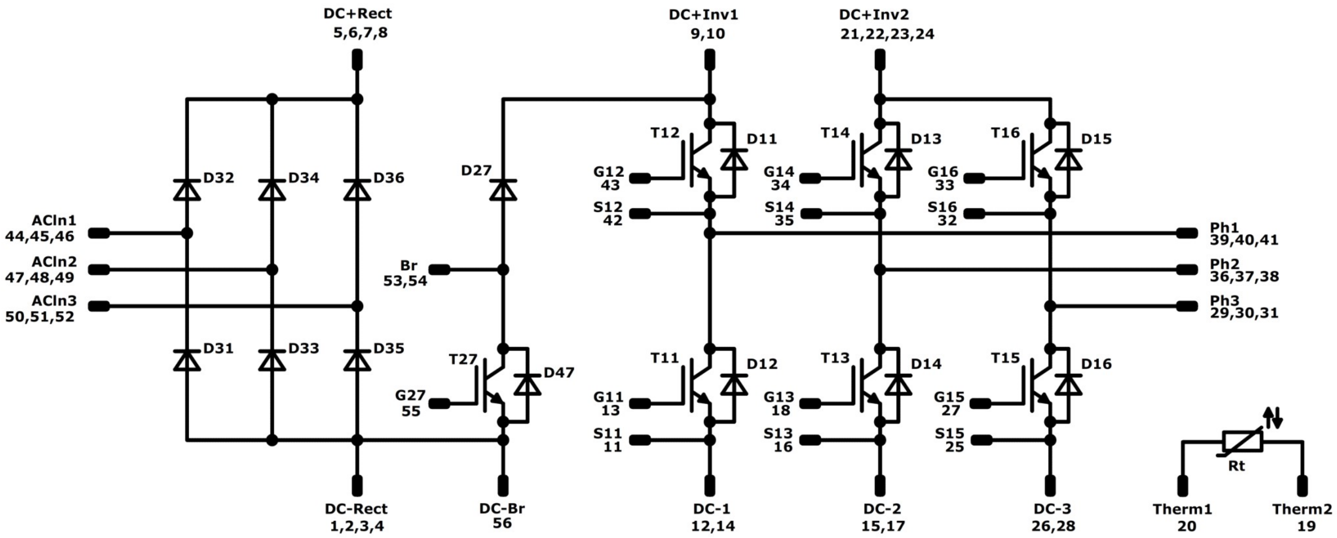
Press-fit pins





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
D31, D32, D33, D34, D35, D36	Rectifier	1200 V	50 A	Rectifier Diode	
T11, T12, T13, T14, T15, T16	IGBT	1200 V	50 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	50 A	Inverter Diode	
T27	IGBT	1200 V	35 A	Brake Switch	
D27	FWD	1200 V	25 A	Brake Diode	
D47	Diode	1200 V	5 A	Brake Sw. Protection Diode	
Rt	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-x212PMA050M7-L888A79x-D4-14	08 Mar. 2019	Correction of I_c/I_f values	1,2,3