30-F212PMA075M7-L889A79
30-P212PMA075M7-L889A79Y
datasheet

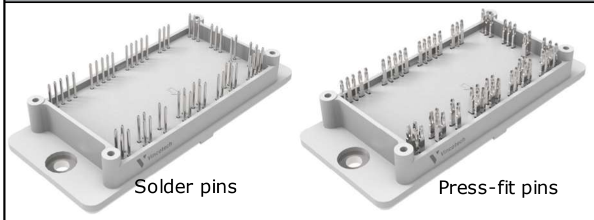
Vincotech

***flow* PIM 2** | **1200 V / 75 A**

Features

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

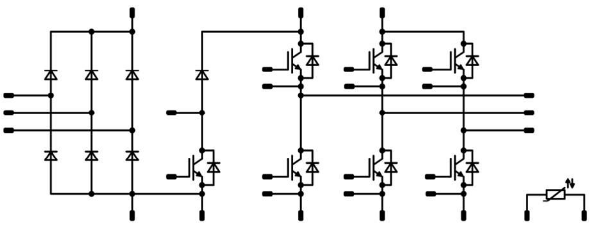
flow 2 housing



Target applications

- Industrial Drives

Schematic



Types

- 30-F212PMA075M7-L889A79
- 30-P212PMA075M7-L889A79Y

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	106	A
Surge (non-repetitive) forward current	I_{FSM}	t_p = 10 ms, sin 180°	T_j = 150 °C	890	A
Surge current capability	I^2t			3960	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	156	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	93	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		150	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	190	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	89	A
Repetitive peak forward current	I_{FRM}	T_j limited by T_{jmax}		200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	165	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	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
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			min. 12,7	mm
Clearance		Solder Pins	11,82	mm
		Press-fit Pins	11,58	mm
Comparative Tracking Index	CTI		> 200	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Rectifier Diode										
Static										
Forward voltage	V_F				75	25 125 150		1,10 1,04 1,05	1,8	V
Reverse leakage current	I_r			1600		25 145			50 1100	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,45		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	
Inverter Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,0075	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		75	25 125 150		1,55 1,70 1,75	1,90	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			100	µA
Gate-emitter leakage current	I_{GES}		20	0		25			500	nA
Internal gate resistance	r_g							4		Ω
Input capacitance	C_{ies}		0	10		25		16000		pF
Output capacitance	C_{oes}							480		
Reverse transfer capacitance	C_{res}							190		
Gate charge	Q_g		15	600	75	25		570		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,50		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 4 Ω R_{gon} = 4 Ω	±15	600	75	25 125 150		259 267 269		ns
Rise time	t_r					25 125 150		40 50 51		
Turn-off delay time	$t_{d(off)}$					25 125 150		227 259 266		
Fall time	t_f					25 125 150		87 106 111		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 8 µC Q_{rFWD} = 12,6 µC Q_{rFWD} = 14,2 µC				25 125 150		6,83 9,29 9,94		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		5,17 6,89 7,30		

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				100	25 125 150		1,82 1,96 1,97	2,1	V
Reverse leakage current	I_R			1200		25			40	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j\text{-}s)}$	λ_{paste} = 3,4 W/mK (PSX)						0,58		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 1913 A/µs di/dt = 1557 A/µs di/dt = 1447 A/µs	±15	600	75	25 125 150		63 64 66		A
Reverse recovery time	t_{rr}					25 125 150		297 458 502		ns
Recovered charge	Q_r					25 125 150		8,02 12,63 14,17		µC
Reverse recovered energy	E_{rec}					25 125 150		2,75 4,59 5,24		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		592 340 314		A/µs

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Brake 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	15/0	700	50	25 125 150		116 105 105		ns
Rise time	t_r					25 125 150		58 64 66		
Turn-off delay time	$t_{d(off)}$					25 125 150		330 369 374		
Fall time	t_f					25 125 150		85 117 124		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 3,8 µC Q_{rFWD} = 5,6 µC Q_{rFWD} = 6,2 µC				25 125 150		4,49 5,50 5,80		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		4,94 5,48 5,76		

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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 = 1050 A/µs di/dt = 710 A/µs di/dt = 806 A/µs	15/0	700	50	25 125 150		30 32 33		A
Reverse recovery time	t_{rr}					25 125 150		263 376 411		ns
Recovered charge	Q_r					25 125 150		3,82 5,59 6,19		µC
Reverse recovered energy	E_{rec}					25 125 150		1,70 2,62 2,95		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		272 192 183		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

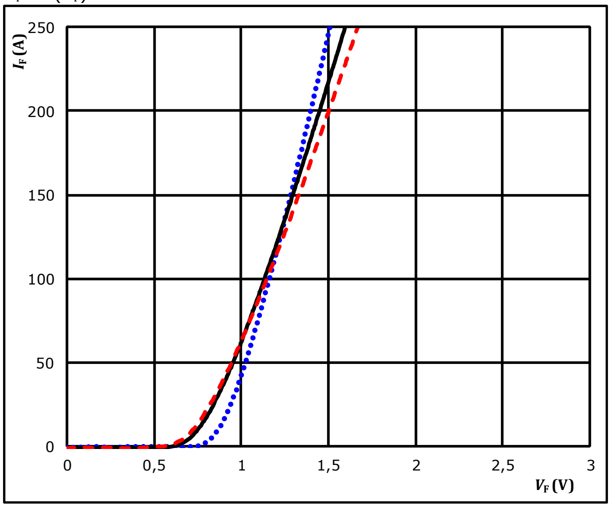
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_{F} [V]	I_{C} [A] I_{D} [A] I_{F} [A]	T_{j} [°C]	Min	Typ	Max	
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P					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.	Rectifier Diode

Typical forward characteristics

$I_F = f(V_F)$



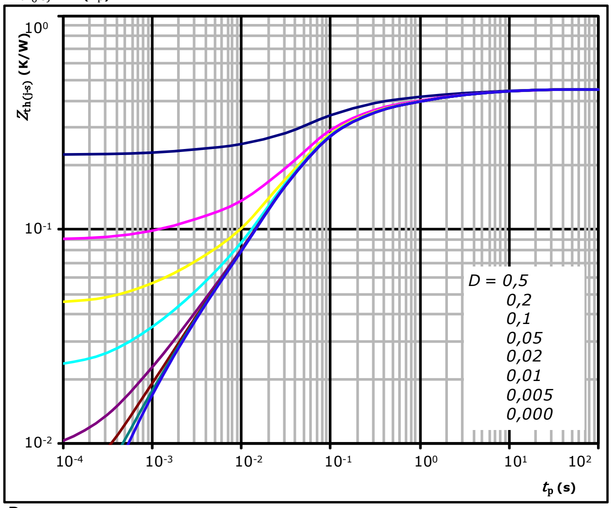
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2.	Rectifier Diode

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 0,45 K/W

Diode thermal model values

R (K/W)	τ (s)
3,06E-02	7,38E+00
5,87E-02	1,30E+00
1,21E-01	1,90E-01
2,00E-01	4,49E-02
2,12E-02	9,83E-03
1,85E-02	1,38E-03

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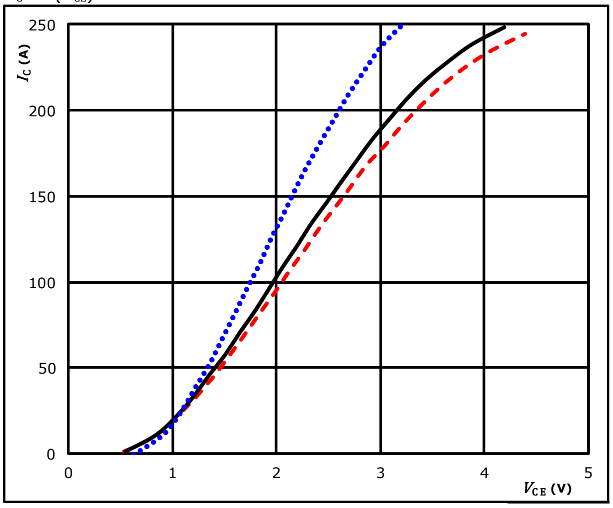
Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

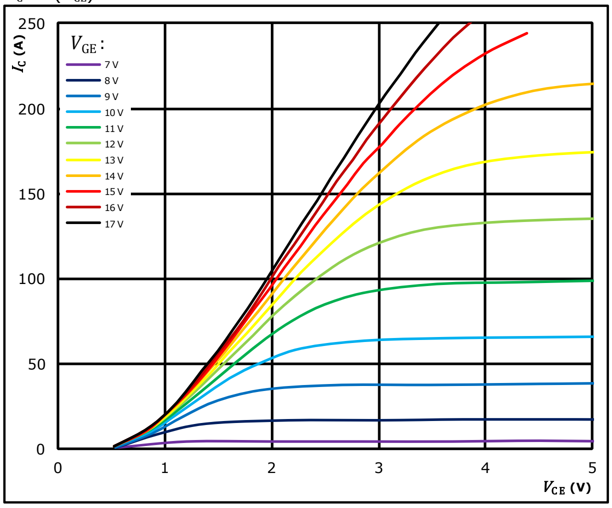


t_p =	250	μs		25 °C	············
V_{GE} =	15	V	T_j:	125 °C	———
				150 °C	– – –

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



t_p = 250 μs

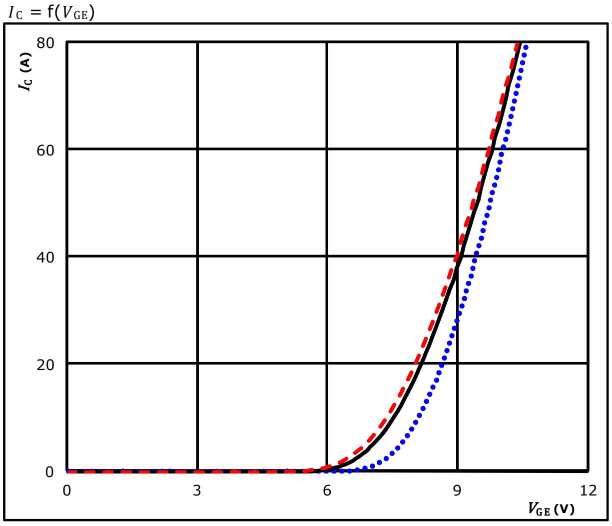
T_j = 150 °C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

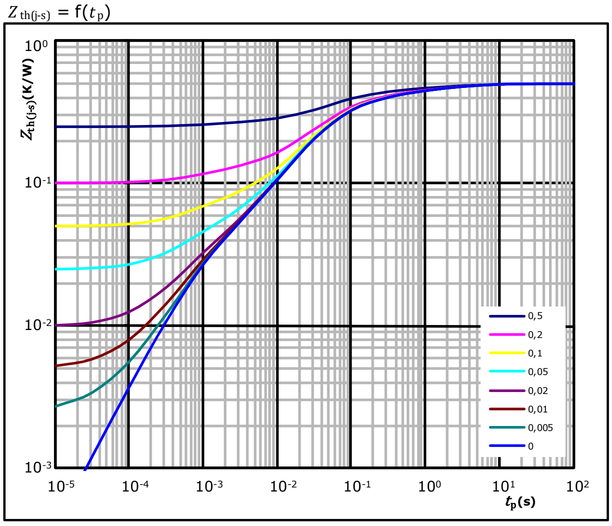


t_p =	100	μs		25 °C	············
V_{CE} =	10	V	T_j:	125 °C	———
				150 °C	– – –

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j-s)}$ = 0,50 K/W

IGBT thermal model values

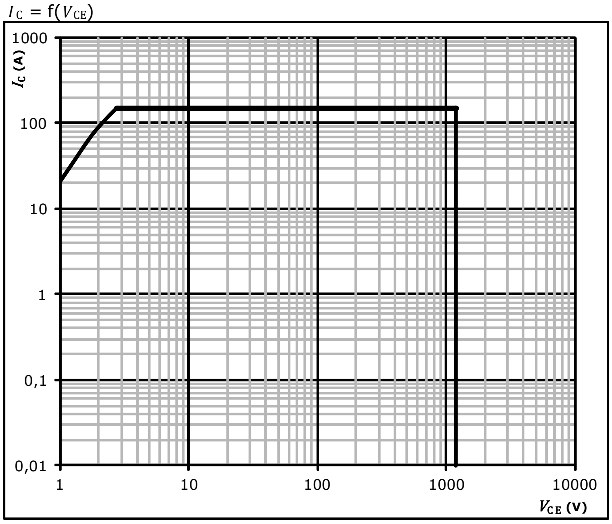
R (K/W)	τ (s)
3,92E-02	4,73E+00
6,01E-02	9,48E-01
1,18E-01	1,70E-01
2,25E-01	3,80E-02
3,32E-02	9,18E-03
2,48E-02	8,63E-04

Inverter Switch Characteristics

figure 5.	IGBT

Safe operating area

$I_C = f(V_{CE})$



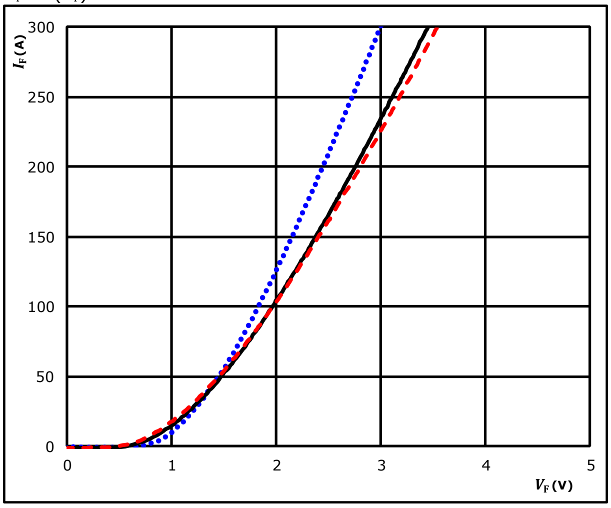
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Inverter Diode Characteristics

figure 1. FWD

Typical forward characteristics

$I_F = f(V_F)$

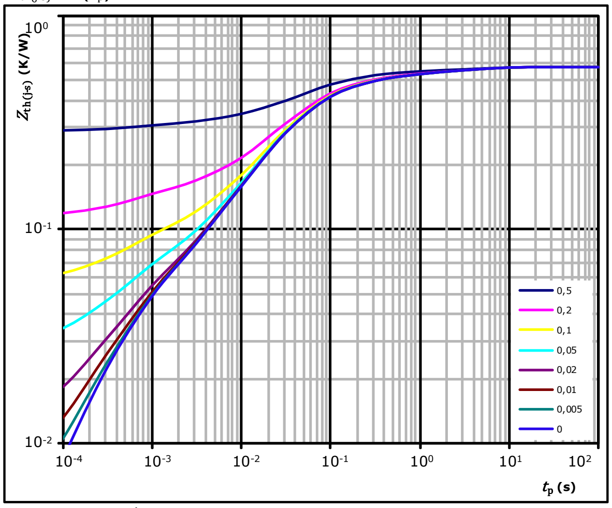


t_p =	250	μs	T_j:	25 °C
				125 °C
				150 °C

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



D = t_p / T

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

FWD thermal model values

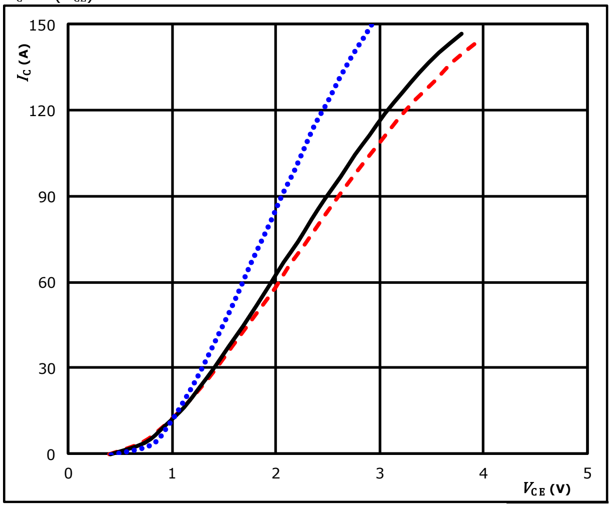
R (K/W)	τ (s)
4,89E-02	3,41E+00
7,07E-02	4,06E-01
2,02E-01	7,46E-02
1,90E-01	2,27E-02
3,24E-02	3,47E-03
3,35E-02	4,78E-04

Brake Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

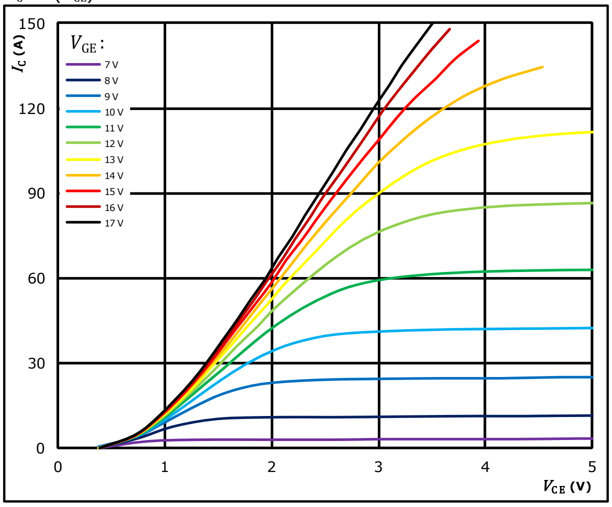


t_p =	250	μs		25 °C	•••••••••
V_{GE} =	15	V	T_j:	125 °C	———
				150 °C	– – – –

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



t_p = 250 μs

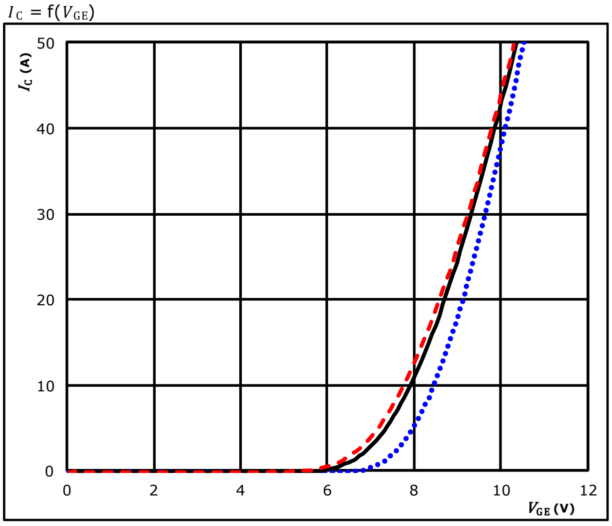
T_j = 150 °C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

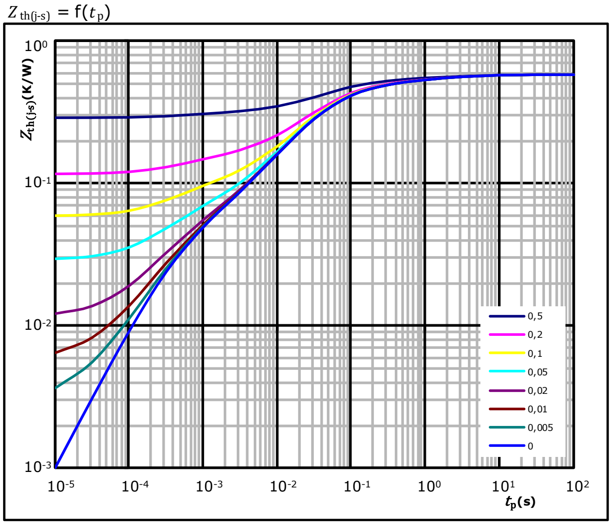


t_p =	100	μs		25 °C	•••••••••
V_{CE} =	10	V	T_j:	125 °C	———
				150 °C	– – – –

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

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

IGBT thermal model values

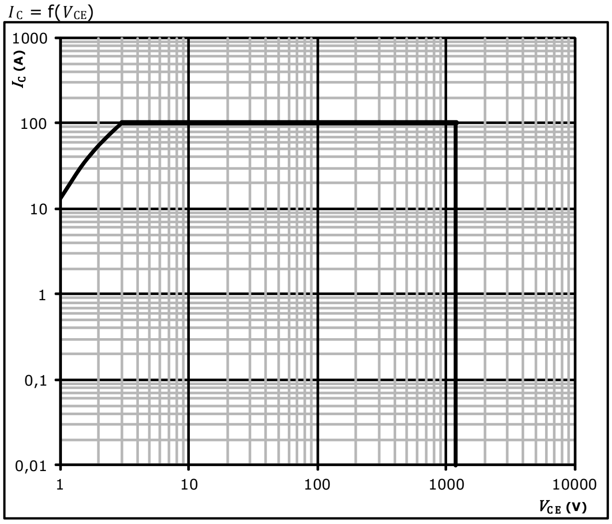
R (K/W)	τ (s)
3,16E-02	4,80E+00
5,30E-02	1,05E+00
1,21E-01	1,71E-01
2,39E-01	4,01E-02
9,09E-02	1,21E-02
2,38E-02	1,71E-03
2,73E-02	3,65E-04

Brake Switch Characteristics

figure 5.	IGBT

Safe operating area

$I_C = f(V_{CE})$



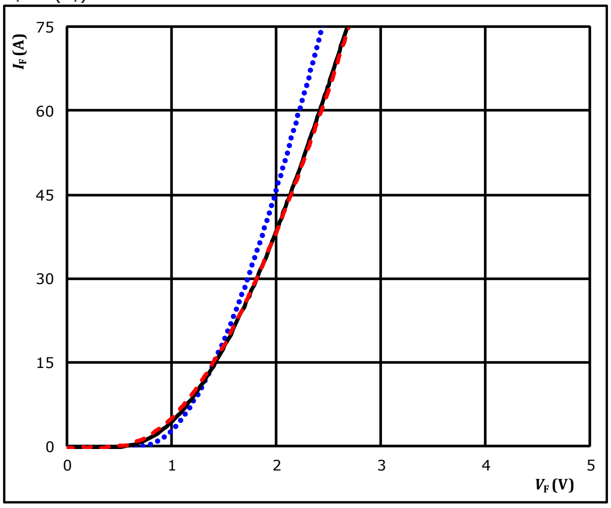
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Brake Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



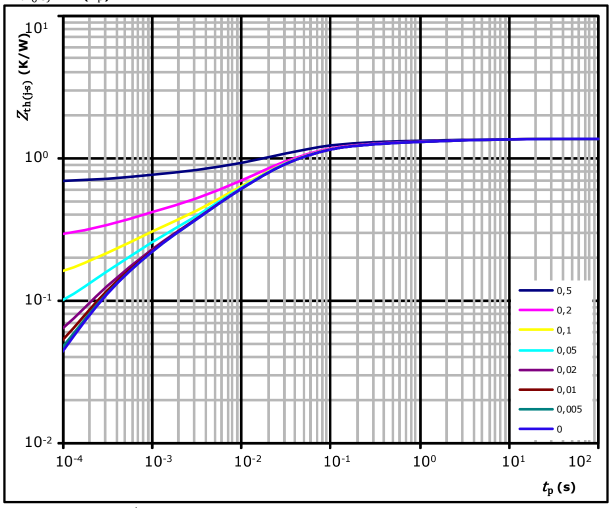
t_p = 250 µs

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

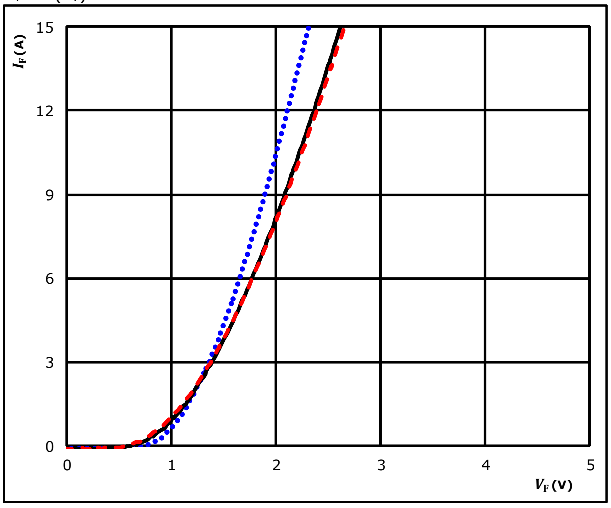
R (K/W)	τ (s)
4,30E-02	6,93E+00
7,33E-02	1,01E+00
1,84E-01	1,33E-01
5,52E-01	2,95E-02
2,85E-01	7,43E-03
1,16E-01	1,34E-03
1,06E-01	3,07E-04

Brake Sw. Protection Diode Characteristics

figure 1. **Prot. Diode**

Typical forward characteristics

I_F = f(V_F)



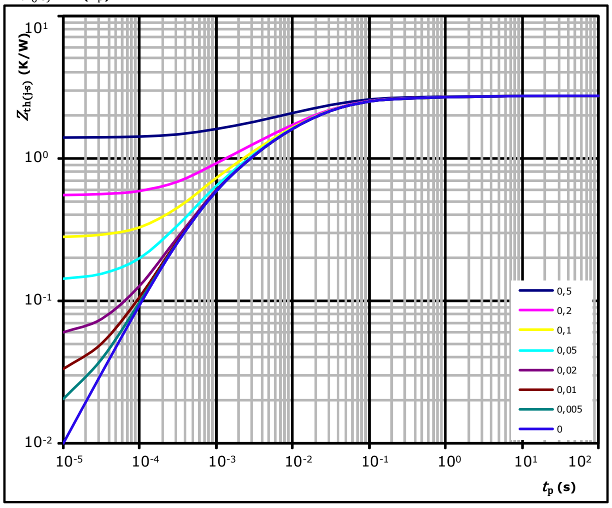
t_p = 250 µs

T_j: 25 °C; 125 °C; 150 °C

figure 2. **Prot. Diode**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

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

Prot. Diode thermal model values

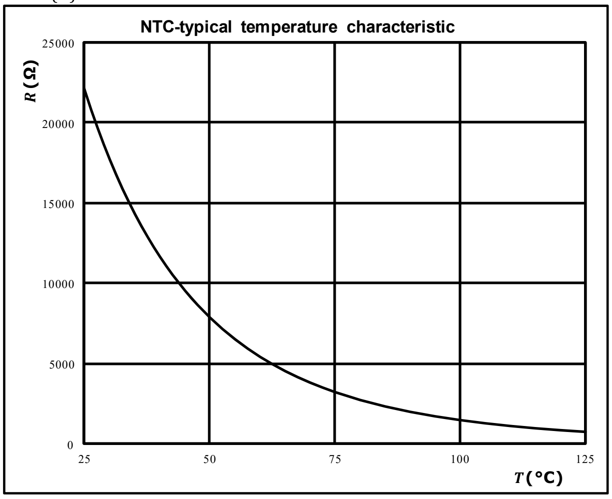
R (K/W)	τ (s)
6,58E-02	4,81E+00
1,43E-01	3,47E-01
6,08E-01	4,61E-02
8,65E-01	1,40E-02
7,08E-01	2,91E-03
3,69E-01	5,42E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

R = f(T)

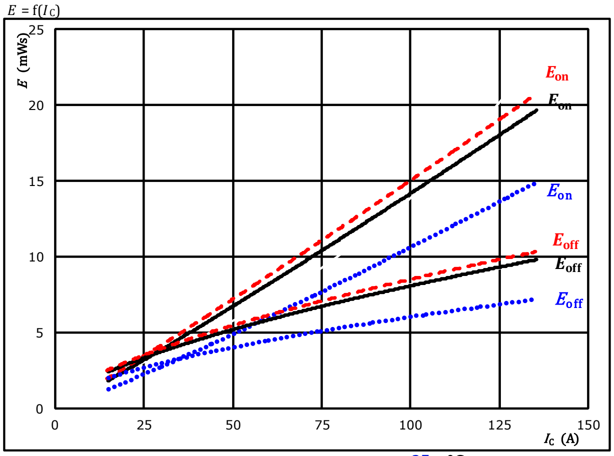


Inverter Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



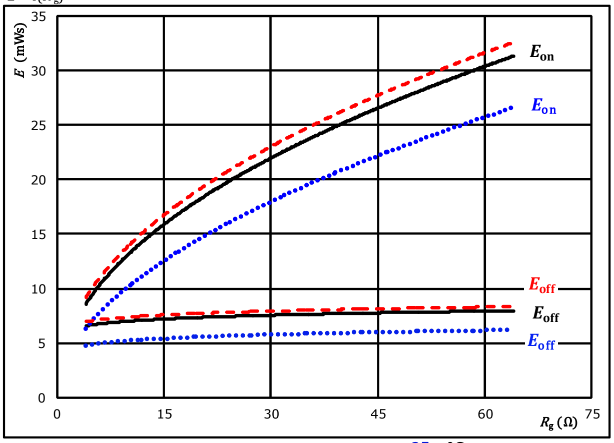
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	4	Ω		150 °C	dashed
R_{goff} =	4	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



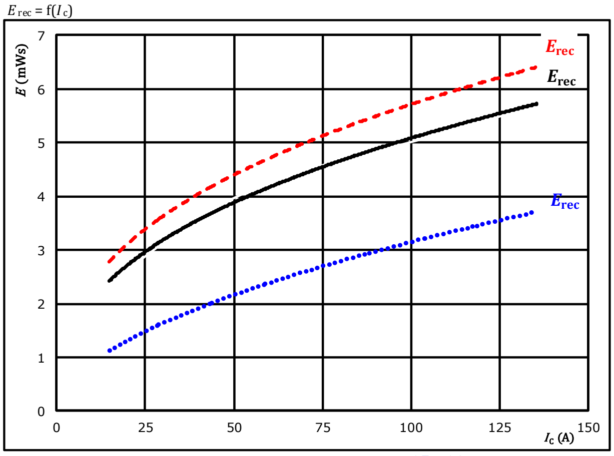
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	75	A		150 °C	dashed

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



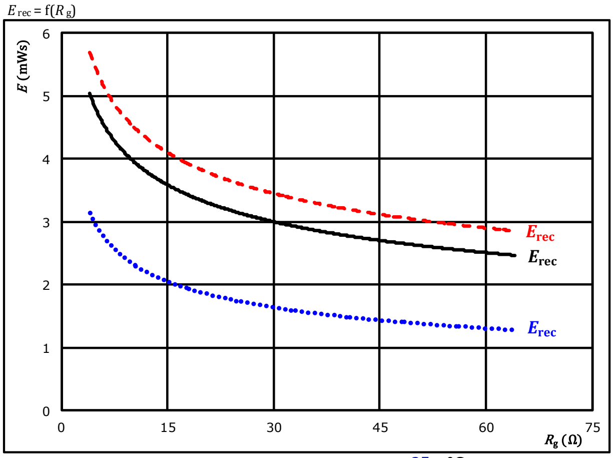
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
R_{gon} =	4	Ω		150 °C	dashed

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

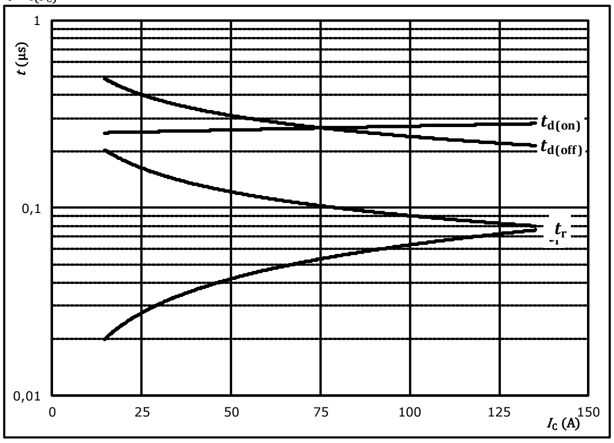
V_{CE} =	600	V	T_j:	25 °C	dotted
V_{GE} =	±15	V		125 °C	solid
I_C =	75	A		150 °C	dashed

Inverter Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



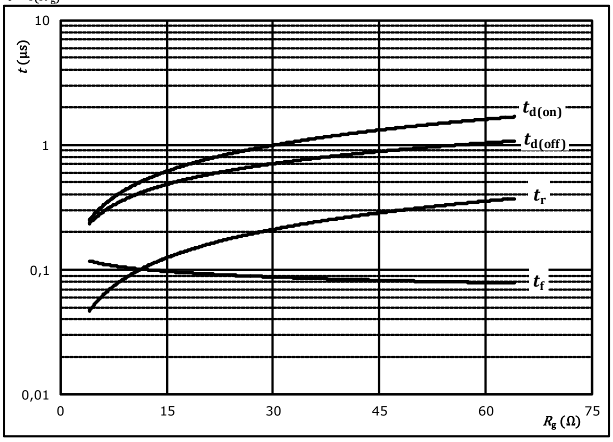
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	4	Ω
R_{goff} =	4	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



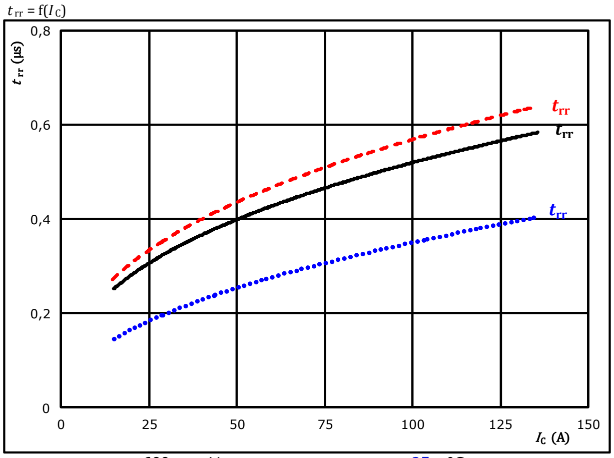
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	75	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

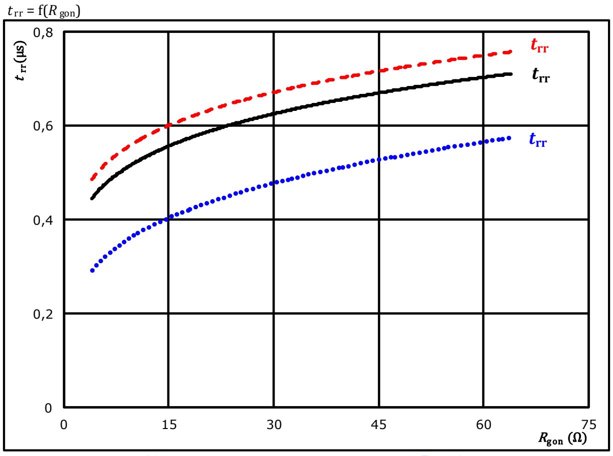


At					
V_{CE}=	600	V		25 °C	•••••••••••
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	4	Ω		150 °C	– – –

figure 8. **FWD**

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

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



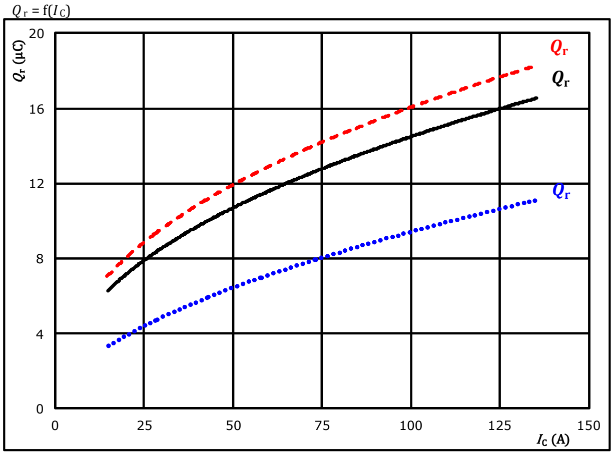
At					
V_{CE} =	600	V		25 °C	•••••••••••
V_{GE} =	±15	V	T_j:	125 °C	———
I_C =	75	A		150 °C	– – –

Inverter Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

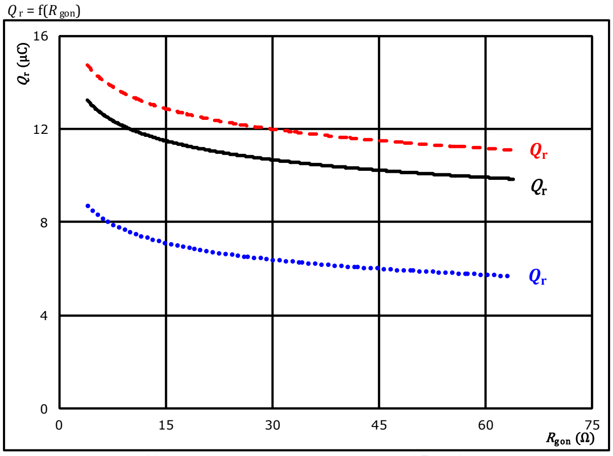


At				
V_{CE} =	600	V	T_j: 25 °C	dotted (blue)
V_{GE} =	±15	V	125 °C	solid (black)
R_{gon} =	4	Ω	150 °C	dashed (red)

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

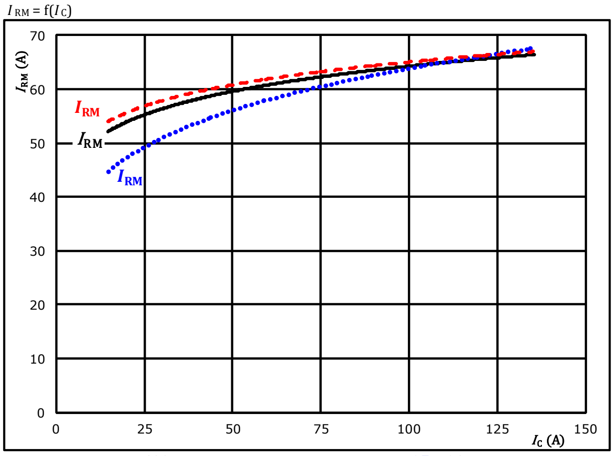


At				
V_{CE}=	600	V	T_j: 25 °C	dotted (blue)
V_{GE} =	±15	V	125 °C	solid (black)
I_C=	75	A	150 °C	dashed (red)

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

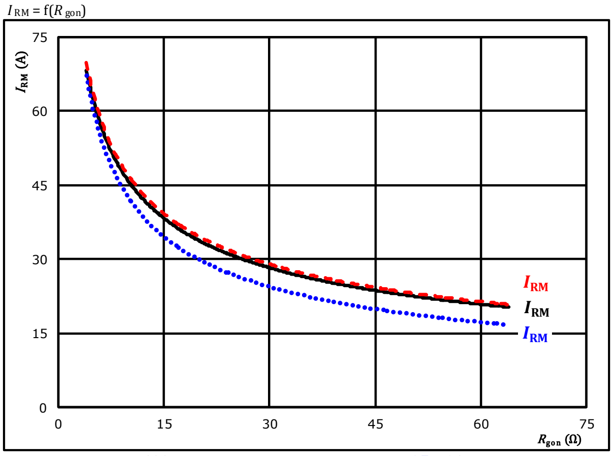


At				
V_{CE}:	600	V	T_j: 25 °C	dotted (blue)
V_{GE} =	±15	V	125 °C	solid (black)
R_{gon} =	4	Ω	150 °C	dashed (red)

figure 12. **FWD**

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

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



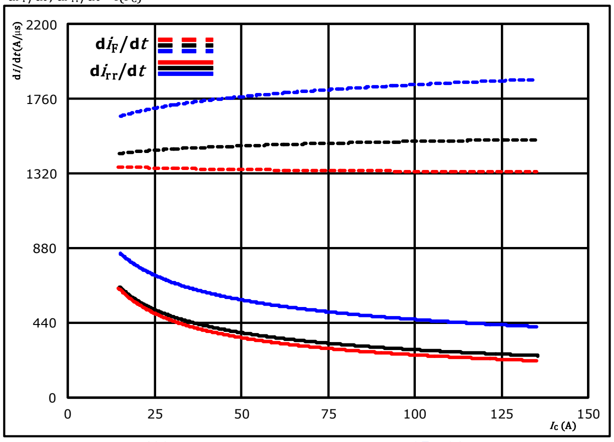
At				
V_{CE} =	600	V	T_j: 25 °C	dotted (blue)
V_{GE} =	±15	V	125 °C	solid (black)
I_C =	75	A	150 °C	dashed (red)

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

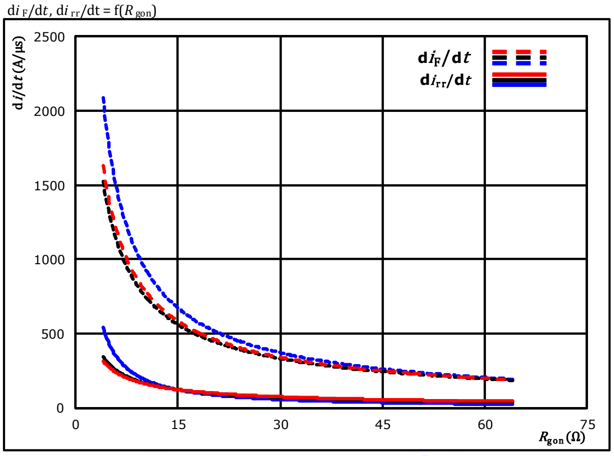


At						
V_{CE} =	600	V		25	°C	···········
V_{GE} =	±15	V	T_j:	125	°C	———
R_{gon} =	4	Ω		150	°C	– – –

figure 14. FWD

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

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

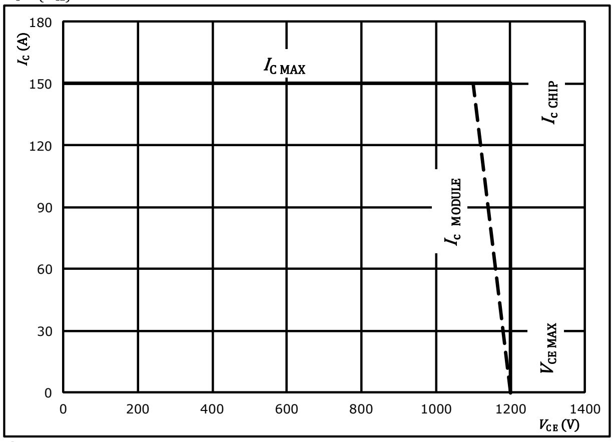


At						
V_{CE} =	600	V		25	°C	···········
V_{GE} =	±15	V	T_j:	125	°C	———
I_C=	75	A		150	°C	– – –

figure 15. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

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

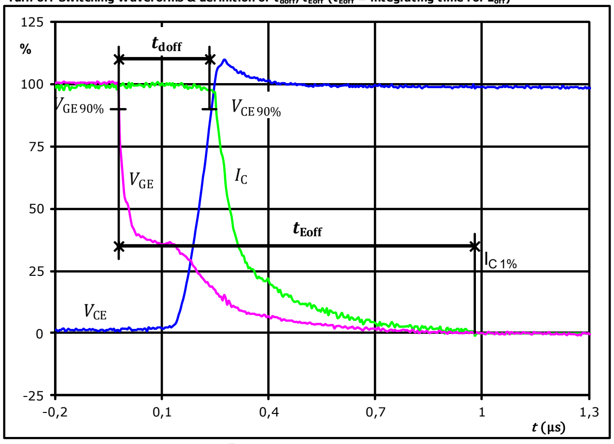
Inverter Switching Definitions

General conditions

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

figure 1. **IGBT**

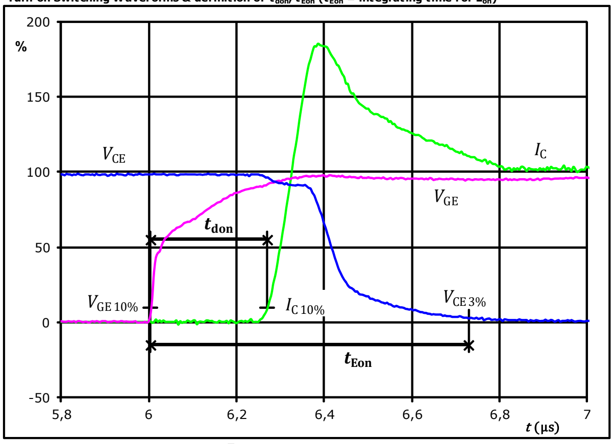
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	75	A
t_{doff} =	0,259	µs
t_{Eoff} =	1,000	µs

figure 2. **IGBT**

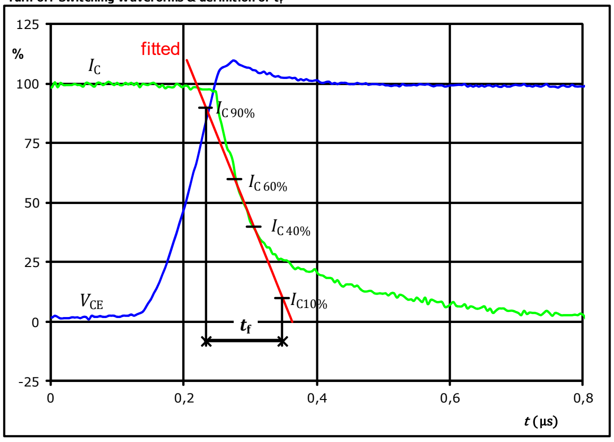
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	75	A
t_{don} =	0,267	µs
t_{Eon} =	0,725	µs

figure 3. **IGBT**

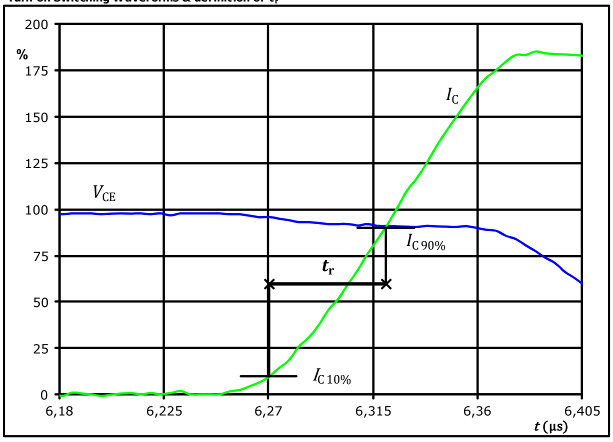
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	75	A
t_f =	0,106	µs

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

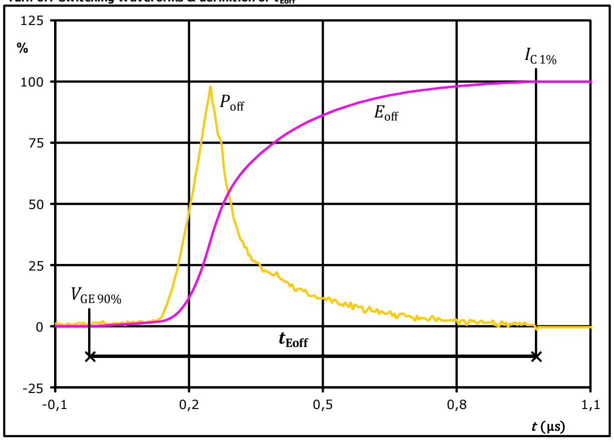


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	75	A
t_r =	0,050	µs

Inverter Switching Characteristics

figure 5. **IGBT**

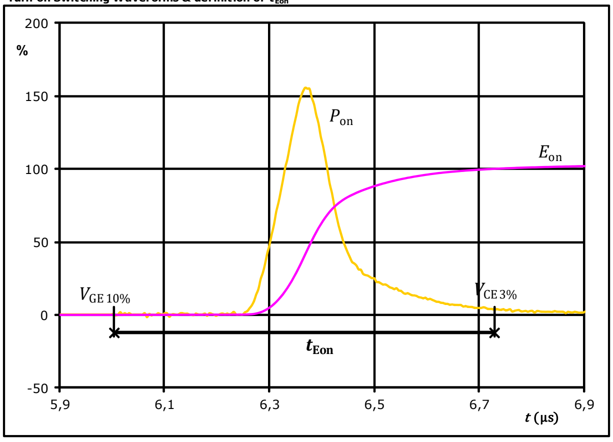
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	45,05	kW
E_{off} (100%) =	6,89	mJ
t_{Eoff} =	1,00	µs

figure 6. **IGBT**

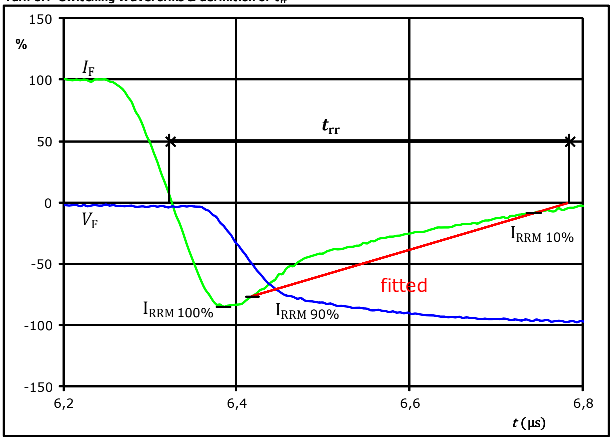
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	45,05	kW
E_{on} (100%) =	9,29	mJ
t_{Eon} =	0,73	µs

figure 7. **FWD**

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

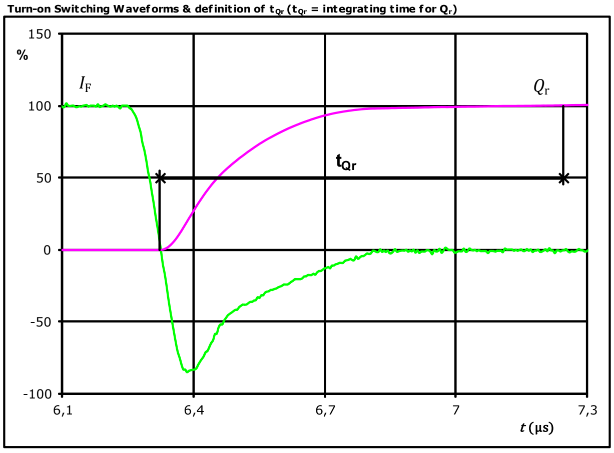


V_F (100%) =	600	V
I_F (100%) =	75	A
I_{RRM} (100%) =	-64	A
t_{rr} =	0,458	µs

Inverter Switching Characteristics

figure 8. **FWD**

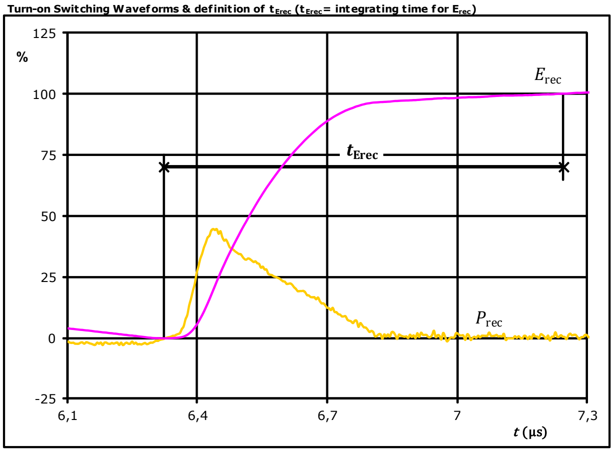
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	75	A
Q_r (100%) =	12,63	µC
t_{Qr} =	0,92	µs

figure 9. **FWD**

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



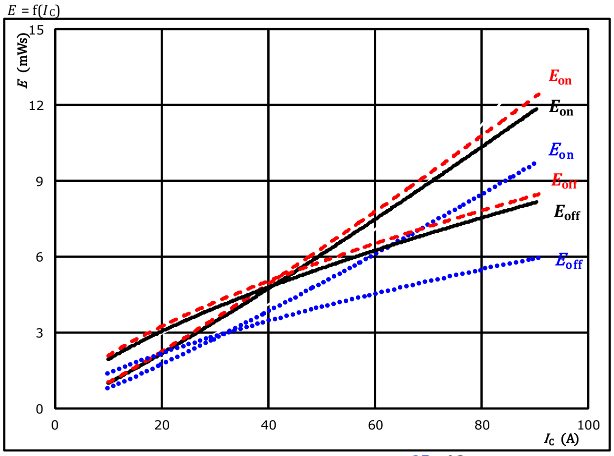
P_{rec} (100%) =	45,05	kW
E_{rec} (100%) =	4,59	mJ
t_{Erec} =	0,92	µs

Brake Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



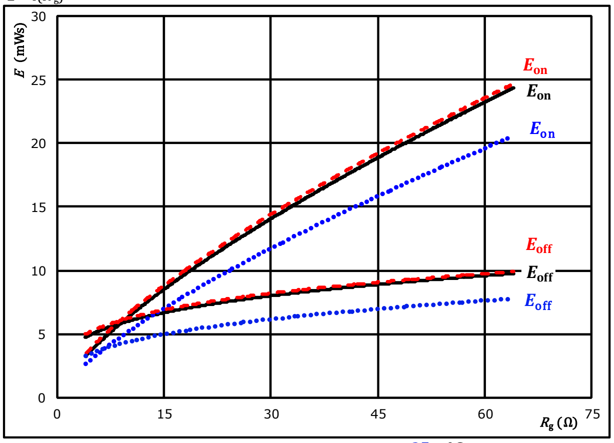
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C	dotted (blue)
V_{GE} =	15/0	V		125 °C	solid (black)
R_{gon} =	8	Ω		150 °C	dashed (red)
R_{goff} =	8	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



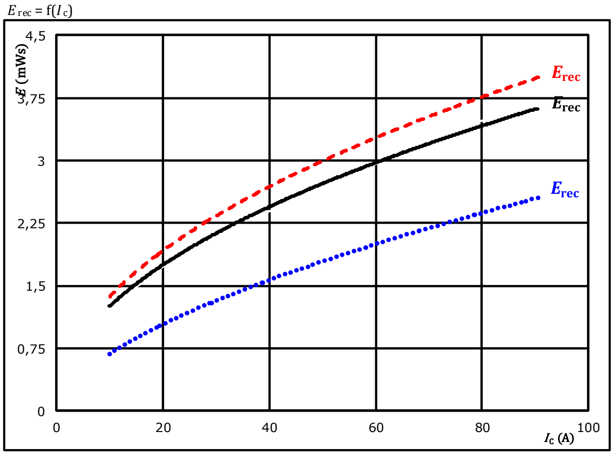
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C	dotted (blue)
V_{GE} =	15/0	V		125 °C	solid (black)
I_C =	50	A		150 °C	dashed (red)

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



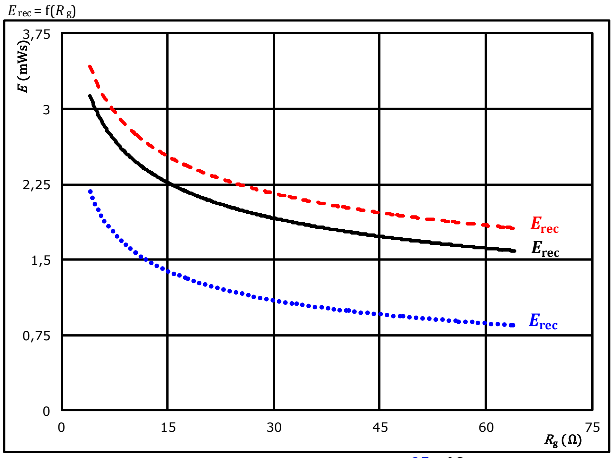
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C	dotted (blue)
V_{GE} =	15/0	V		125 °C	solid (black)
R_{gon} =	8	Ω		150 °C	dashed (red)

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

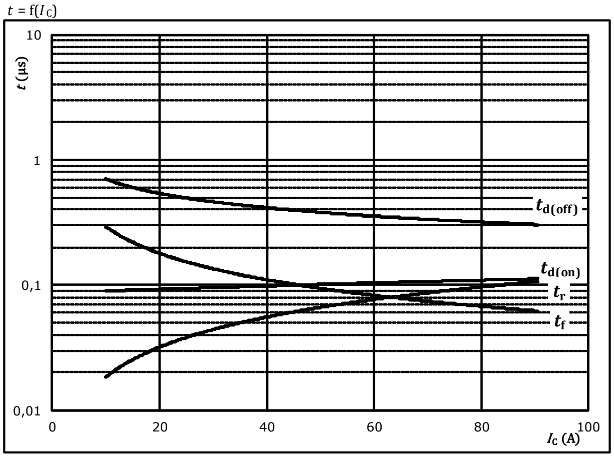
V_{CE} =	700	V	T_j:	25 °C	dotted (blue)
V_{GE} =	15/0	V		125 °C	solid (black)
I_C =	50	A		150 °C	dashed (red)

Brake Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$t = f(I_C)$



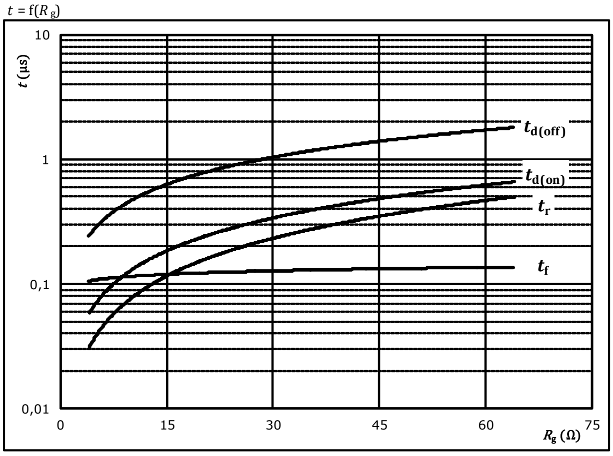
With an inductive load at

T_j =	150	°C
V_{CE} =	700	V
V_{GE} =	15/0	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$t = f(R_g)$



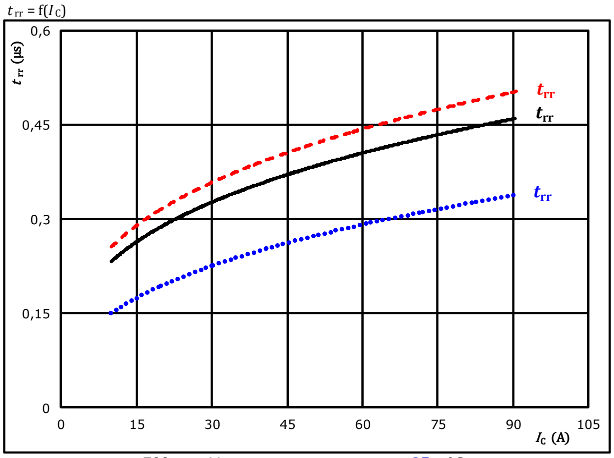
With an inductive load at

T_j =	150	°C
V_{CE} =	700	V
V_{GE} =	15/0	V
I_C =	50	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

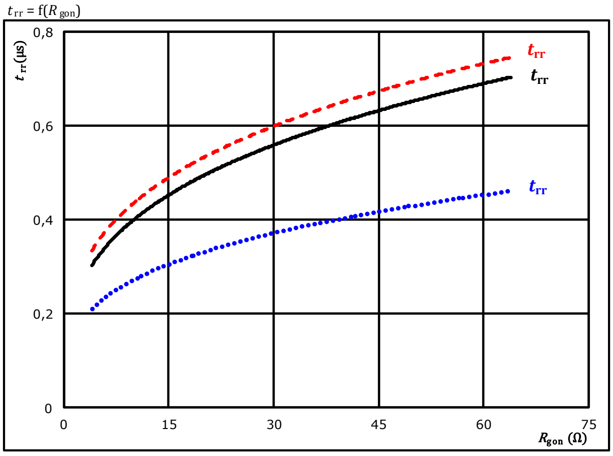


At						
V_{CE} =	700	V		25	°C	dotted blue
V_{GE} =	15/0	V	T_j:	125	°C	solid black
R_{gon} =	8	Ω		150	°C	dashed red

figure 8. FWD

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

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



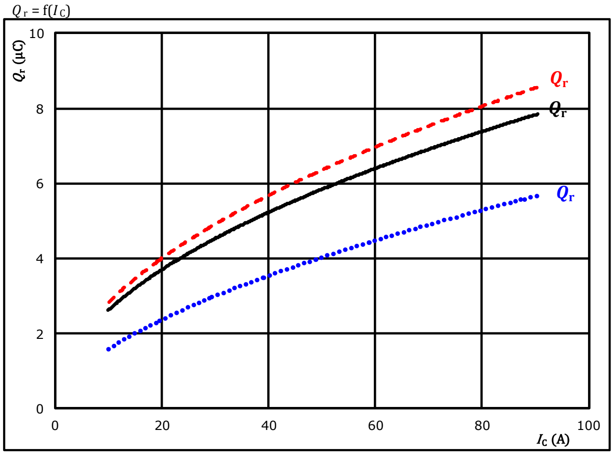
At						
V_{CE} =	700	V		25	°C	dotted blue
V_{GE} =	15/0	V	T_j:	125	°C	solid black
I_C =	50	A		150	°C	dashed red

Brake Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

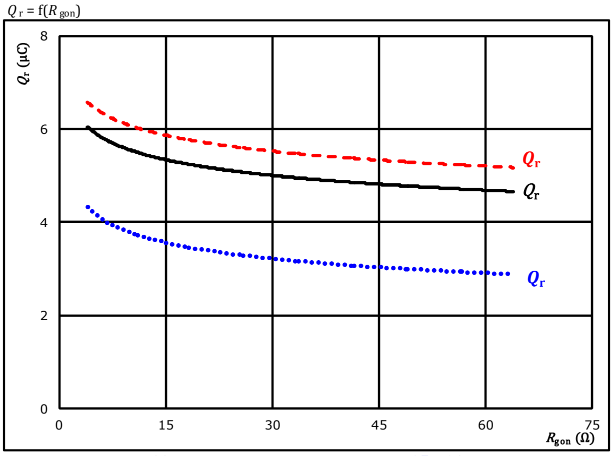


At				Tj:		
	V_{CE} =	700	V		25	°C (dotted)
	V_{GE} =	15/0	V		125	°C (solid)
	R_{gon} =	8	Ω		150	°C (dashed)

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

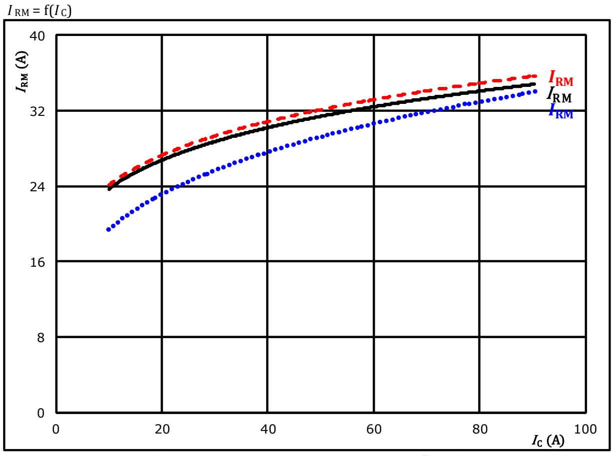


At				Tj:		
	V_{CE}=	700	V		25	°C (dotted)
	V_{GE} =	15/0	V		125	°C (solid)
	I_C=	50	A		150	°C (dashed)

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

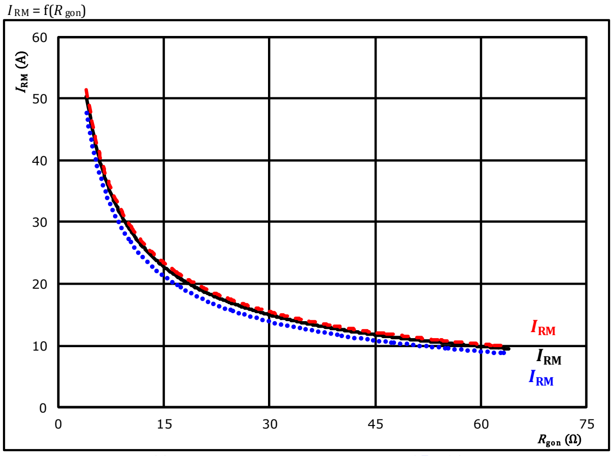


At				Tj:		
	V_{CE}:	700	V		25	°C (dotted)
	V_{GE} =	15/0	V		125	°C (solid)
	R_{gon} =	8	Ω		150	°C (dashed)

figure 12. **FWD**

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

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



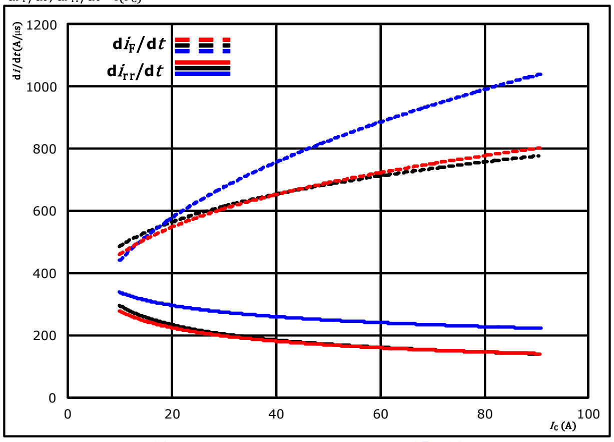
At				Tj:		
	V_{CE} =	700	V		25	°C (dotted)
	V_{GE} =	15/0	V		125	°C (solid)
	I_C =	50	A		150	°C (dashed)

Brake Switching Characteristics

figure 13. **FWD**

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

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

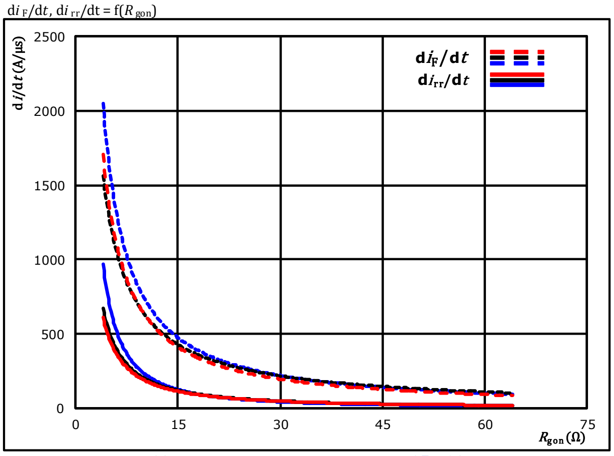


At					
V_{CE} =	700	V	T_j:	25 °C	
V_{GE} =	15/0	V		125 °C	
R_{gon} =	8	Ω		150 °C	

figure 14. **FWD**

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

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

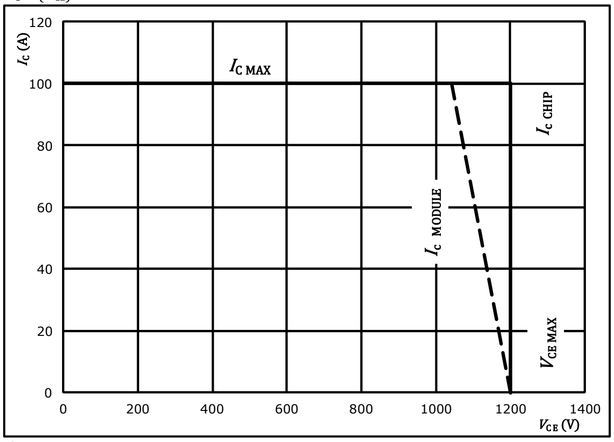


At					
V_{CE} =	700	V	T_j:	25 °C	
V_{GE} =	15/0	V		125 °C	
I_C =	50	A		150 °C	

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

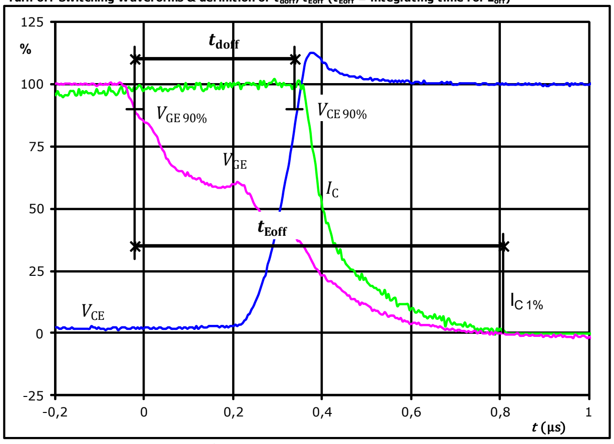
Vincotech

Brake Switching Definitions

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

figure 1. IGBT

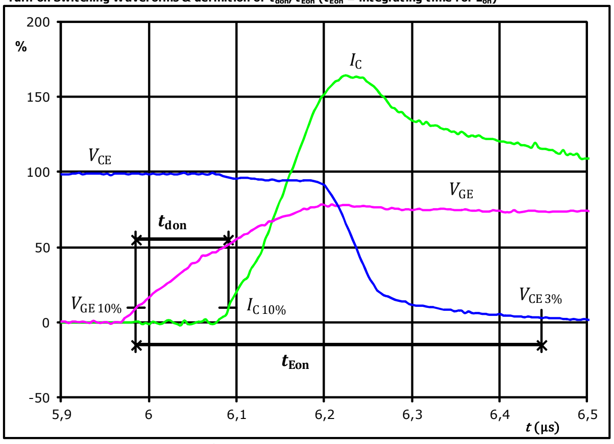
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	50	A
t_{doff} =	0,369	µs
t_{Eoff} =	0,829	µs

figure 2. IGBT

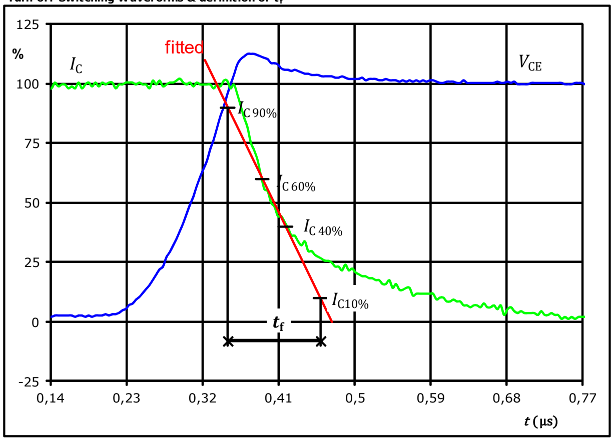
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	50	A
t_{don} =	0,105	µs
t_{Eon} =	0,462	µs

figure 3. IGBT

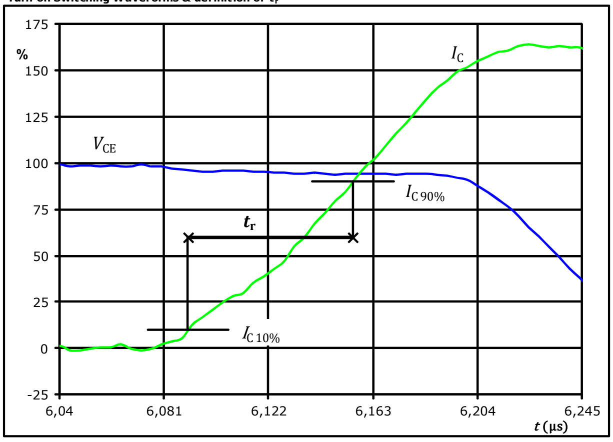
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	50	A
t_f =	0,117	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

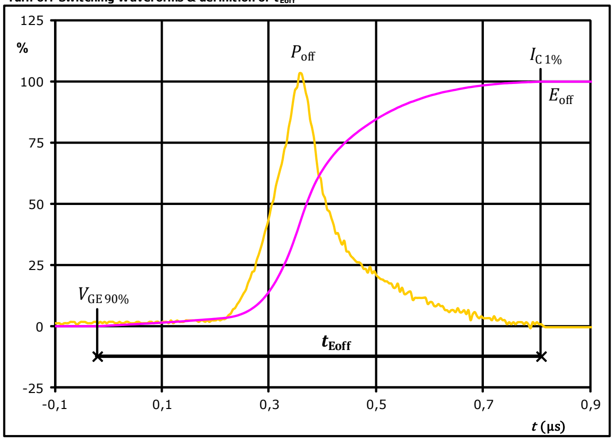


$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	50	A
t_r =	0,064	µs

Brake Switching Characteristics

figure 5. **IGBT**

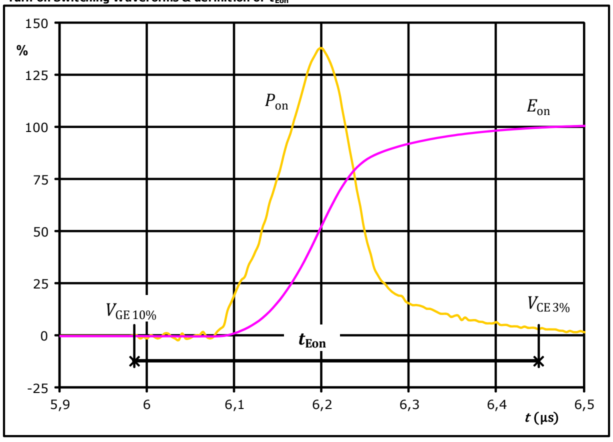
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	35,10	kW
E_{off} (100%) =	5,48	mJ
t_{Eoff} =	0,83	µs

figure 6. **IGBT**

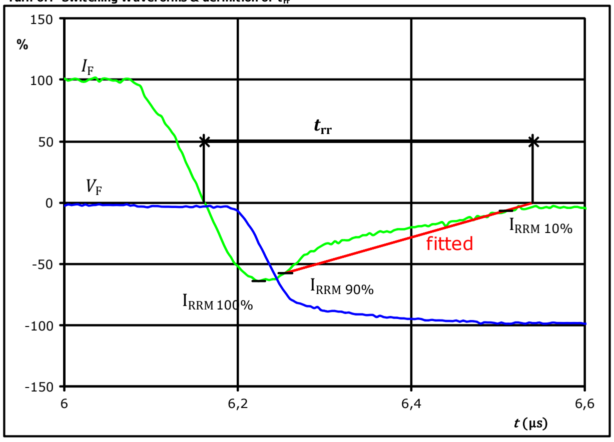
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	35,10	kW
E_{on} (100%) =	5,50	mJ
t_{Eon} =	0,46	µs

figure 7. **FWD**

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

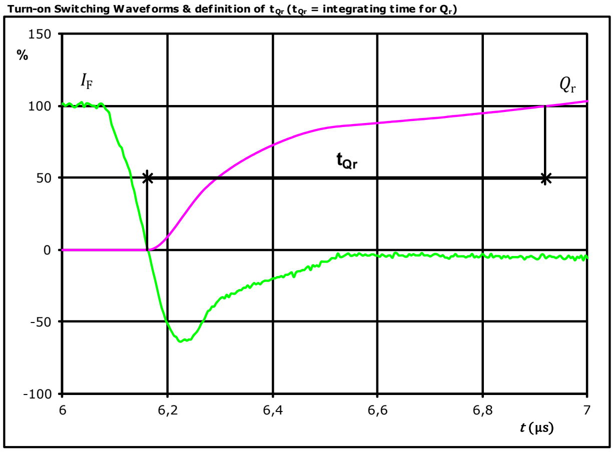


V_F (100%) =	700	V
I_F (100%) =	50	A
I_{RRM} (100%) =	-32	A
t_{rr} =	0,375	µs

Brake Switching Characteristics

figure 8. **FWD**

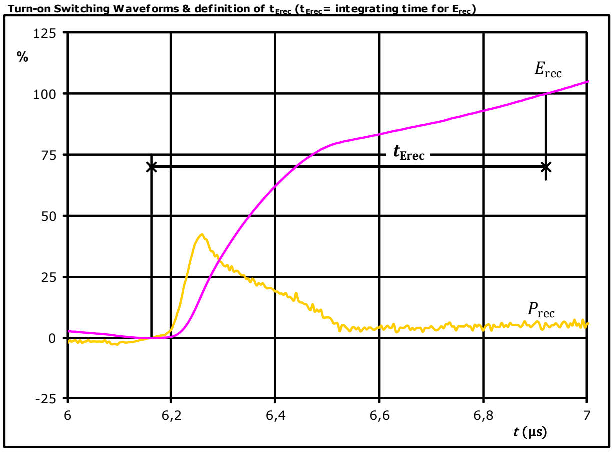
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	50	A
Q_r (100%) =	5,59	µC
t_{Qr} =	0,76	µs

figure 9. **FWD**

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



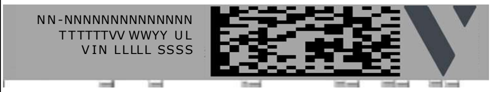
P_{rec} (100%) =	35,10	kW
E_{rec} (100%) =	2,62	mJ
t_{Erec} =	0,76	µs

Vincotech

30-F212PMA075M7-L889A79
30-P212PMA075M7-L889A79Y
datasheet

Ordering Code & Marking

Version	Ordering Code
without thermal paste 17 mm housing with solder pins	30-F212PMA075M7-L889A79
with thermal paste 17 mm housing with solder pins	30-F212PMA075M7-L889A79-/3/
without thermal paste 17 mm housing with press-fit pins	30-P212PMA075M7-L889A79Y
with thermal paste 17 mm housing with press-fit pins	30-P212PMA075M7-L889A79Y-/3/



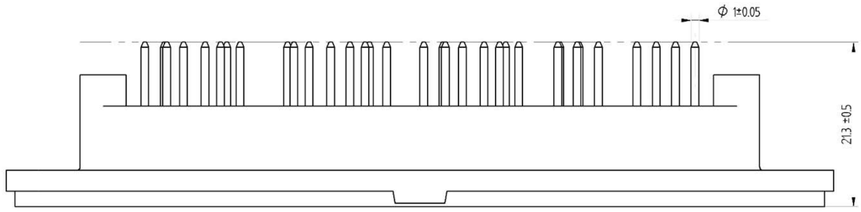
Text	Name		Date code	UL & VIN	Lot	Serial
	NN-NNNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTVV	LLLLL	SSSS	WWYY		

Outline

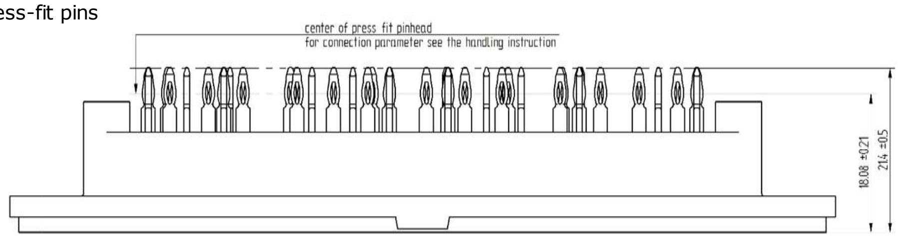
Pin table

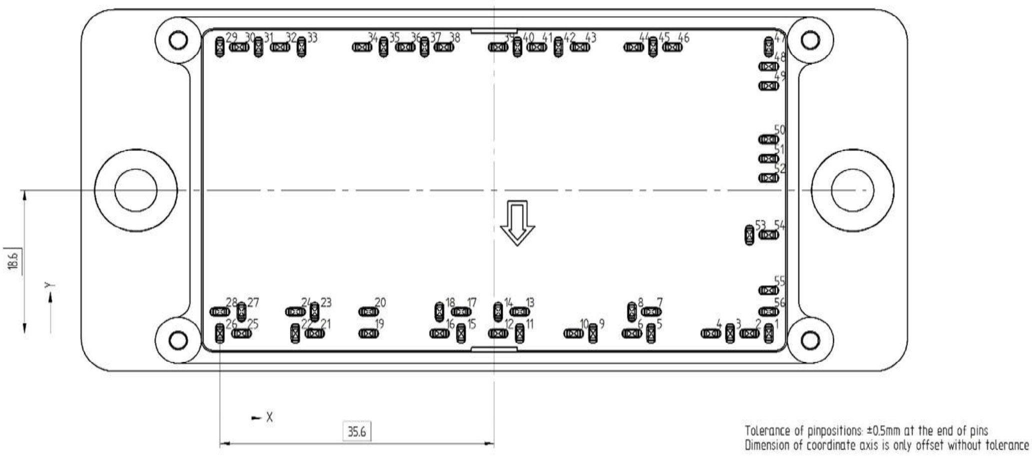
Pin	X	Y	Function	Pin	X	Y	Function
1	71,2	0	DC-Rect	52	71,2	20,2	ACIn3
2	68,7	0	DC-Rect	53	71,2	12,8	Br
3	66,2	0	DC-Rect	54	68,7	12,8	Br
4	63,7	0	DC-Rect	55	71,2	5,6	G27
5	55,95	0	DC+Rect	56	71,2	2,8	DC-Br
6	53,45	0	DC+Rect	52	71,2	20,2	ACIn3
7	55,95	2,8	DC+Rect	53	71,2	12,8	Br
8	53,45	2,8	DC+Rect	54	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

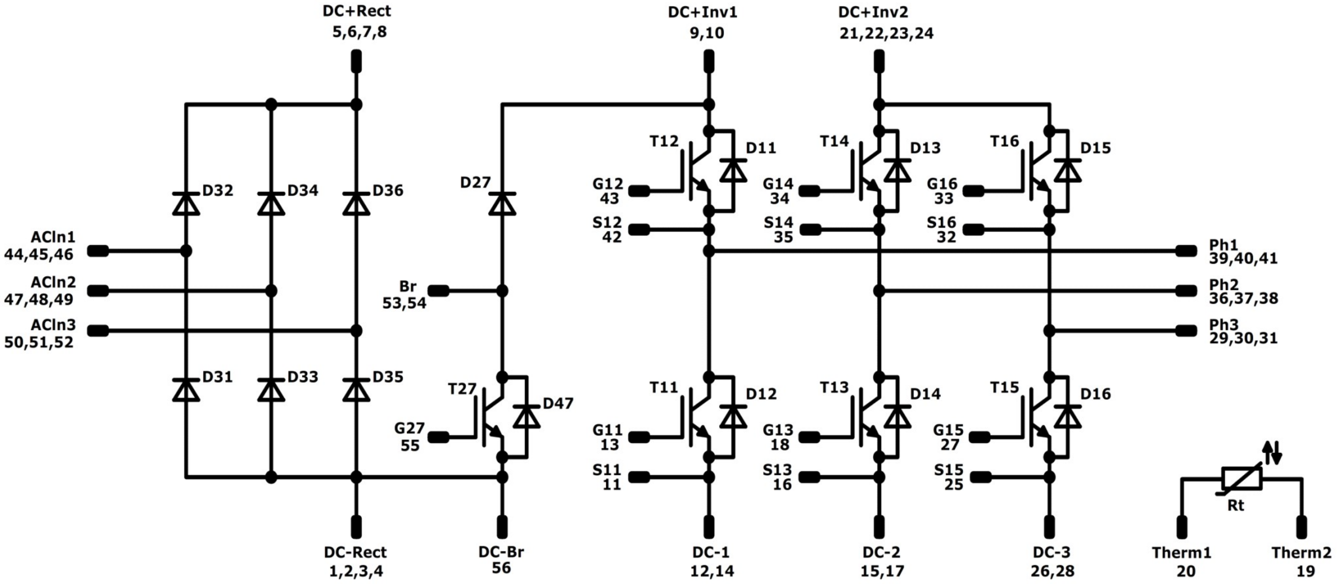


Press-fit pins





Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
D31, D32, D33, D34, D35, D36	Rectifier	1600 V	75 A	Rectifier Diode	
T11, T12, T13, T14, T15, T16	IGBT	1200 V	75 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	100 A	Inverter Diode	
T27	IGBT	1200 V	50 A	Brake Switch	
D27	FWD	1200 V	25 A	Brake Diode	
D47	FWD	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-x212PMA075M7-L889A79x-D4-14	08 Mar. 2019	Correction of I_c/I_f values	1,2,3