Vincotech

10-FY12PMA050M7-P580A78
10-F112PMA050M7-P580A79
datasheet

flowPIM 1 **1200 V / 50 A**

Features

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

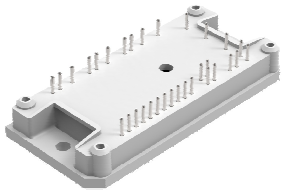
Target applications

- Industrial Drives

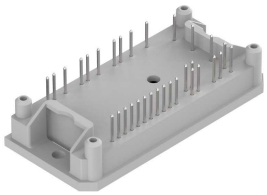
Types

- 10-FY12PMA050M7-P580A78
- 10-F112PMA050M7-P580A79

flow 1 housing

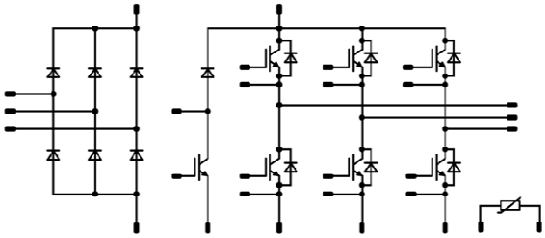


12 mm housing



17 mm housing

Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Brake Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C		35	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	107	W
Gate-emitter voltage	V_{GES}		±20	V
Maximum junction temperature	T_{jmax}		175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Brake Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F		25	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	62	W
Maximum junction temperature	T_{jmax}		175	°C
Inverter Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C		50	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	115	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	45	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	78	W
Maximum junction temperature	T_{jmax}		175	°C
Rectifier Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1600	V
Continuous (direct) forward current	I_F		45	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 10 ms T_j = 150 °C	350	A
Surge current capability	I^2t		610	A^2s
Total power dissipation	P_{tot}	T_j = T_{jmax} T_s = 80 °C	65	W
Maximum Junction Temperature	T_{jmax}		150	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Module Properties				
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation temperature under switching condition	T_{jop}		-40…(T_{jmax} - 25)	°C
Isolation Properties				
Isolation voltage	V_{isol}	DC Test Voltage* t_p = 2 s	6000	V
		AC Voltage t_p = 1 min	2500	V
Creepage distance			min. 12,7	mm
Clearance		12 mm / 17 mm housing	7,91 / min. 12,7	mm
Comparative Tracking Index	CTI		> 200	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
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)						0,89		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					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 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)						1,54		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

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	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,005	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}	10 MHz	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)						0,82		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 8 Ω R_{gon} = 8 Ω	±15	600	48	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		1,66 1,78	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)						1,22		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	48	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
Rectifier Diode										
Static										
Forward voltage	V_F				45	25 125 150		1,15 1,12 1,15	1,21	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)						1,08		K/W

Characteristic Values

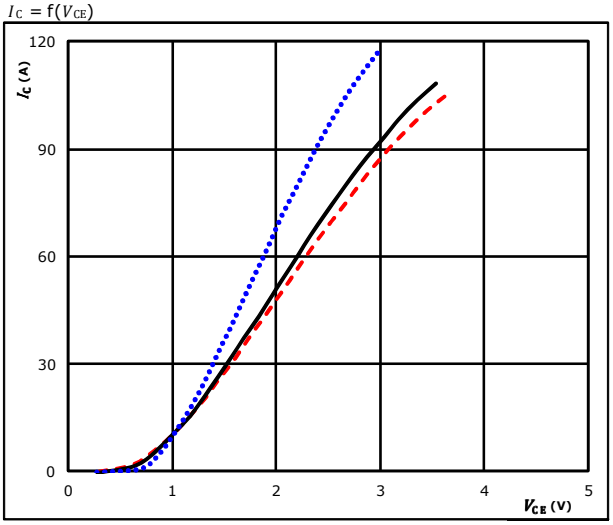
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P					25		5		mW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

Brake Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

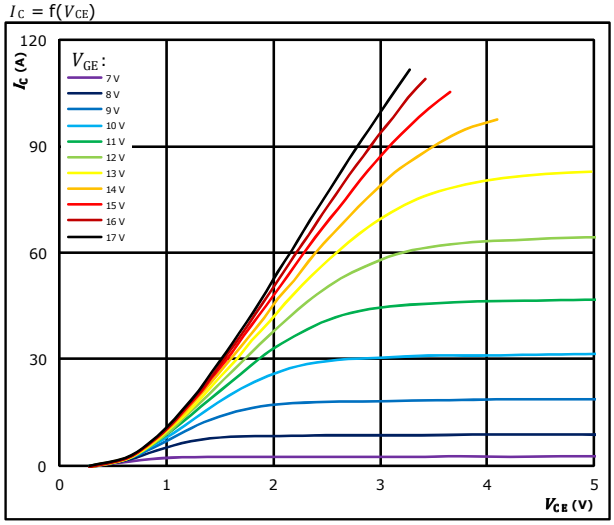


t_p =	250	µs		25 °C	
V_{GE} =	15	V	T_j:	125 °C	
				150 °C	

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

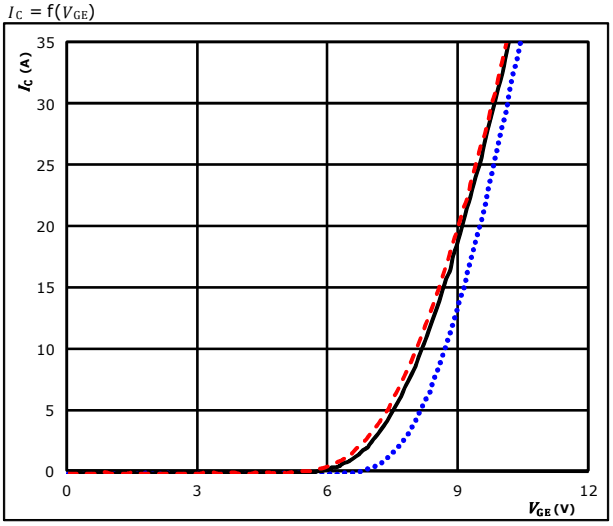


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{CE})$

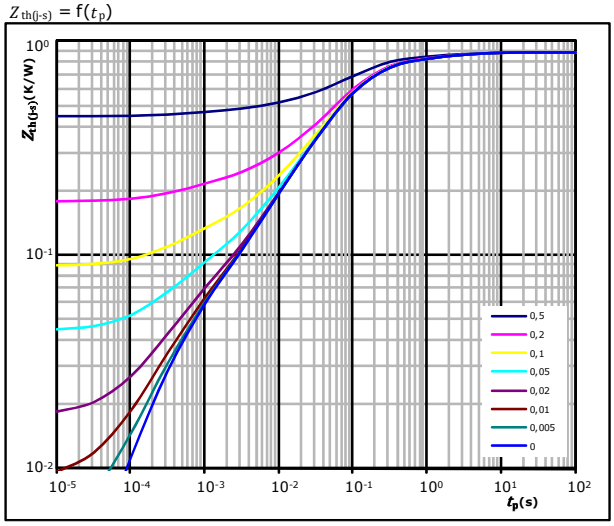


t_p =	100	µs		25 °C	
V_{CE} =	10	V	T_j:	125 °C	
				150 °C	

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,89	K/W

IGBT thermal model values

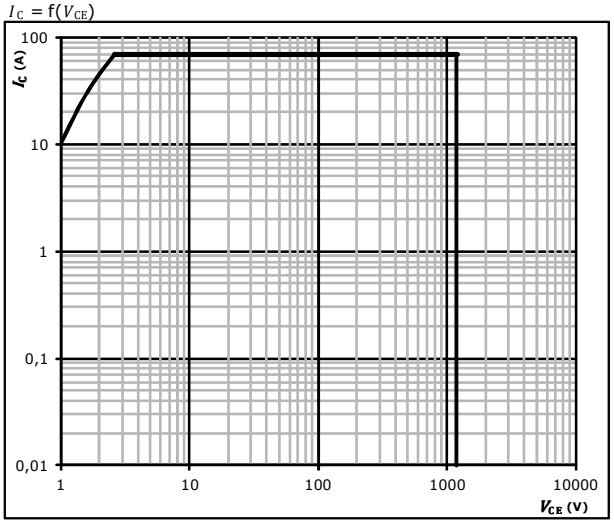
R (K/W)	τ (s)
4,56E-02	3,89E+00
8,84E-02	7,65E-01
3,30E-01	1,35E-01
2,86E-01	4,71E-02
8,94E-02	7,49E-03
3,24E-02	8,15E-04
1,67E-02	2,52E-04

Brake Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



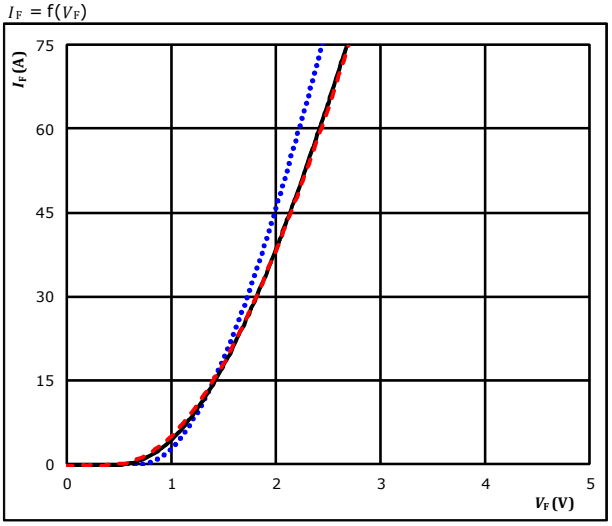
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Brake Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



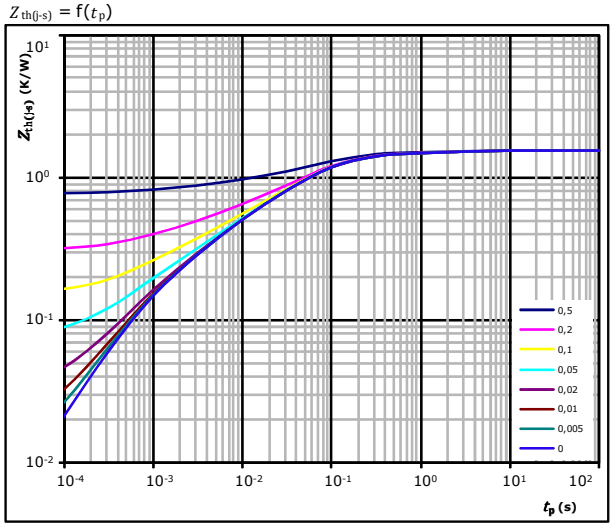
t_p = 250 µs

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

$R_{th(j-s)}$ = 1,54 K/W

FWD thermal model values

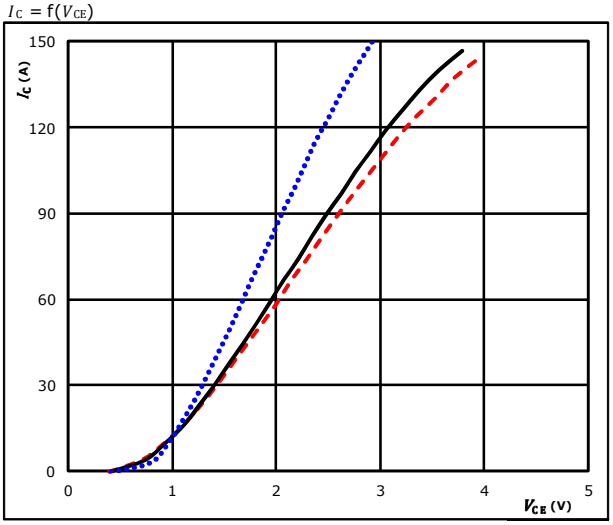
R (K/W)	τ (s)
4,69E-02	5,05E+00
1,06E-01	7,09E-01
5,57E-01	1,01E-01
4,68E-01	3,22E-02
2,35E-01	5,52E-03
8,77E-02	1,01E-03
4,01E-02	5,52E-04

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

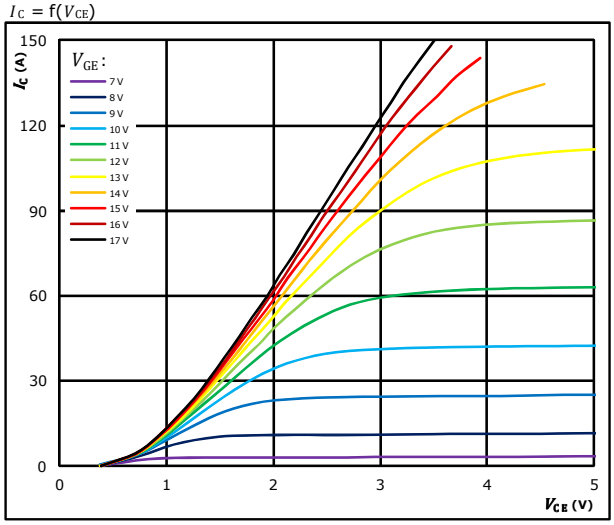


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

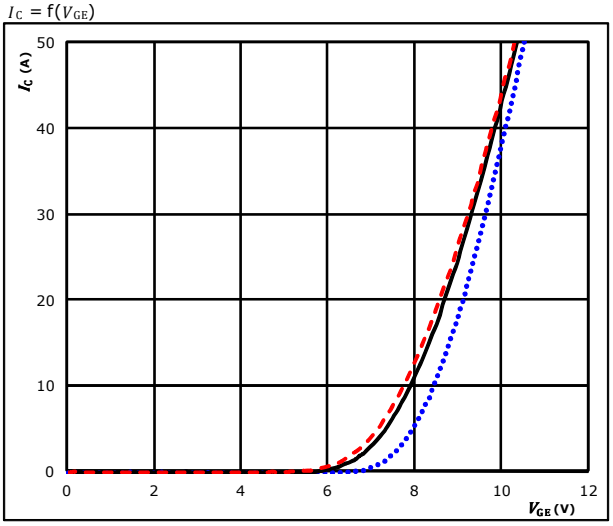


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

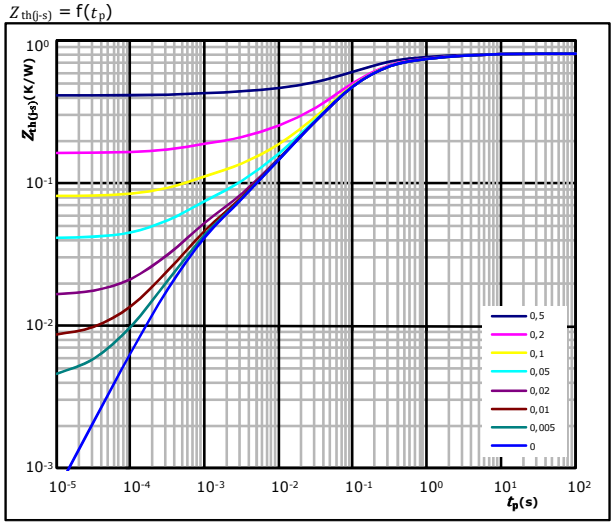


t_p =	100	µs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



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

IGBT thermal model values

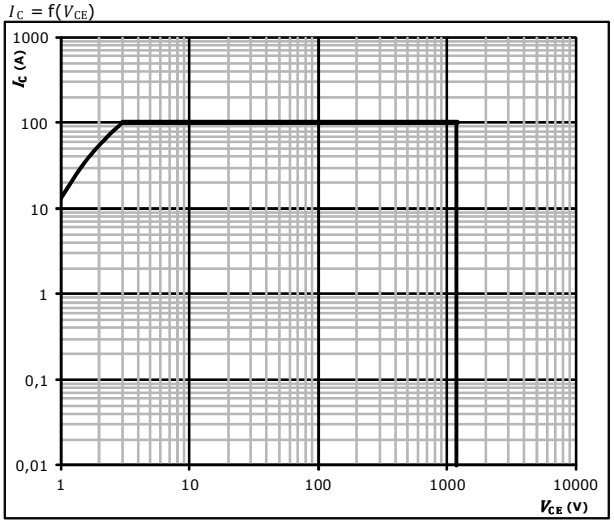
R (K/W)	τ (s)
4,05E-02	5,17E+00
8,54E-02	1,03E+00
3,18E-01	1,67E-01
2,80E-01	5,49E-02
6,47E-02	7,32E-03
3,43E-02	6,46E-04

Inverter Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



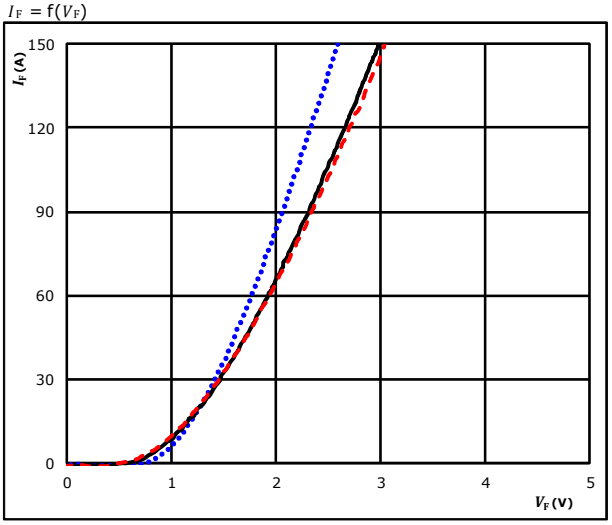
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Inverter Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



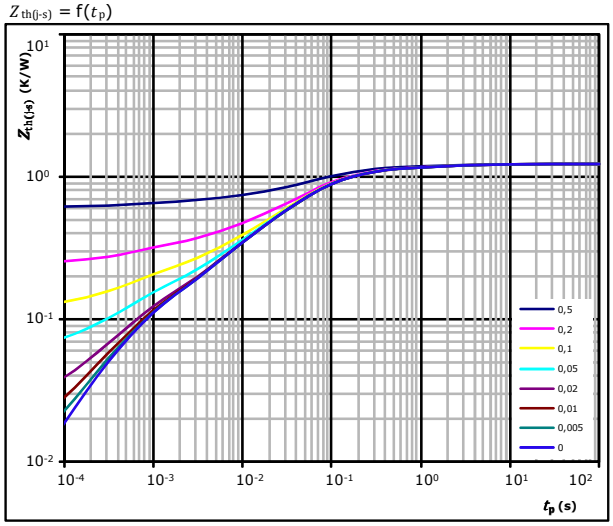
t_p = 250 µs

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

$R_{th(j-s)}$ = 1,22 K/W

FWD thermal model values

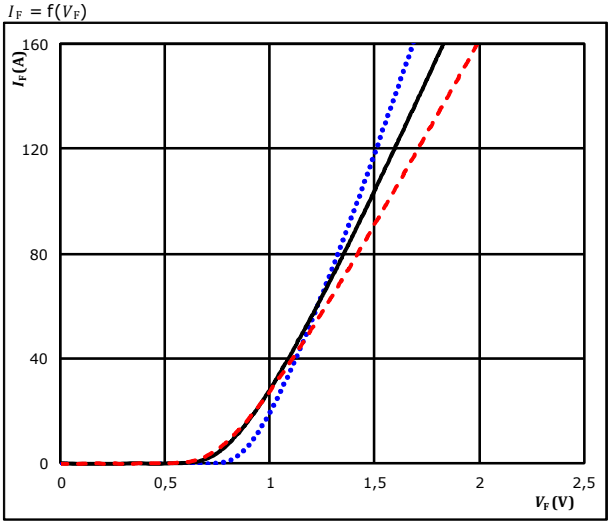
R (K/W)	τ (s)
3,84E-02	6,82E+00
9,89E-02	9,92E-01
3,93E-01	1,28E-01
4,67E-01	3,75E-02
1,41E-01	5,65E-03
8,52E-02	5,44E-04

Rectifier Diode Characteristics

figure 1. **Rectifier Diode**

Typical forward characteristics

$I_F = f(V_F)$



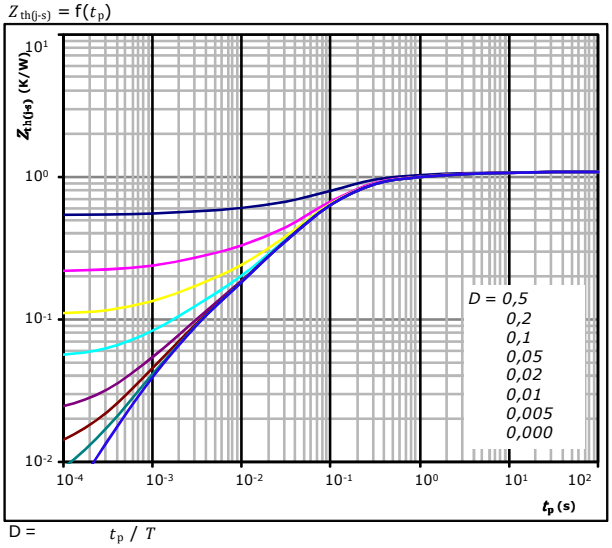
t_p = 250 µs

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

$R_{th(j-s)}$ = 1,08 K/W

Diode thermal model values

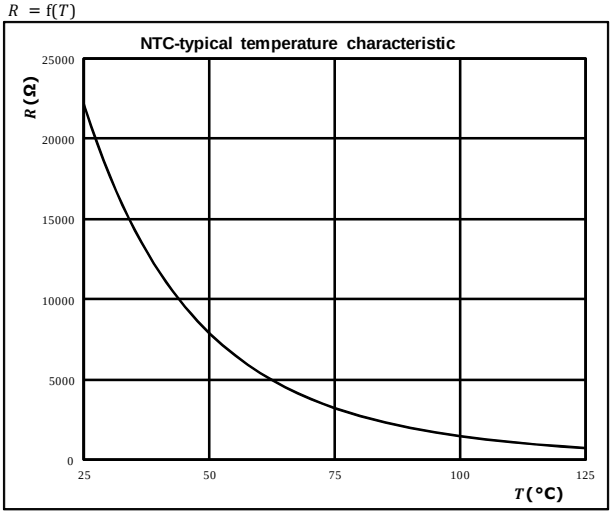
R (K/W)	τ (s)
4,60E-02	9,93E+00
1,23E-01	1,00E+00
4,58E-01	1,51E-01
3,31E-01	5,61E-02
7,76E-02	9,34E-03
4,64E-02	1,55E-03

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

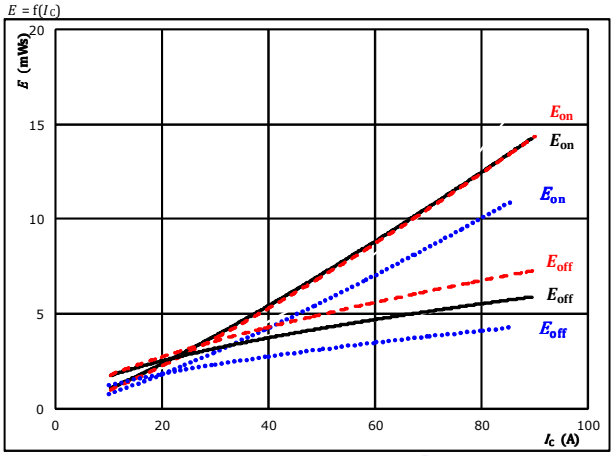


Inverter Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



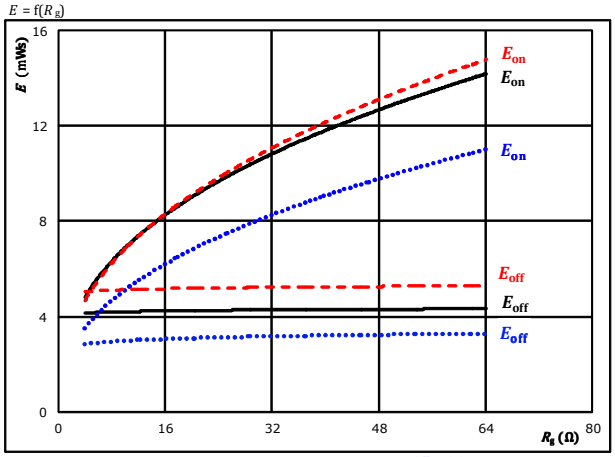
With an inductive load at

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

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



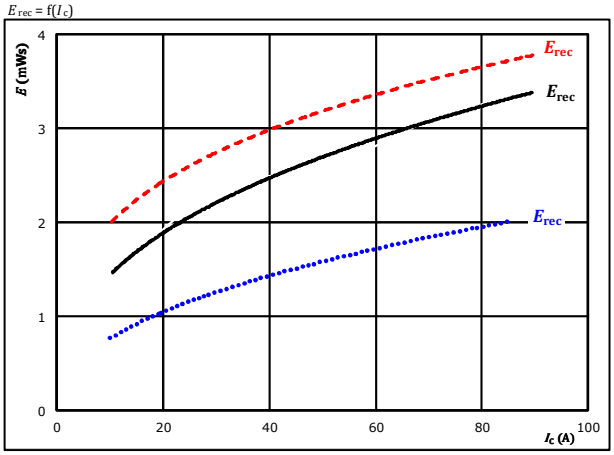
With an inductive load at

V_{CE} =	600	V	T_J:	25 °C	
V_{GE} =	±15	V		125 °C	
I_C =	48	A		150 °C	

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



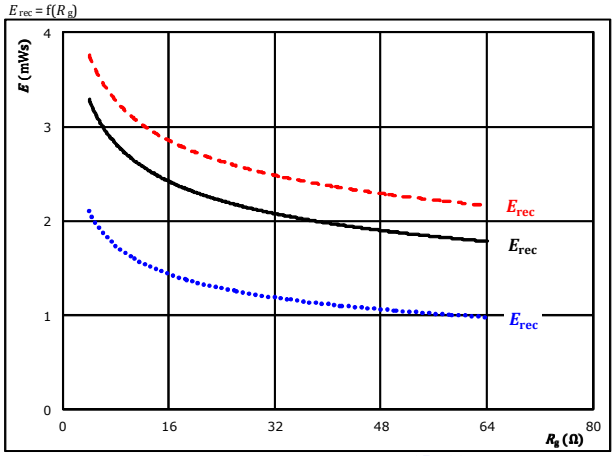
With an inductive load at

V_{CE} =	600	V	T_J:	25 °C	
V_{GE} =	±15	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

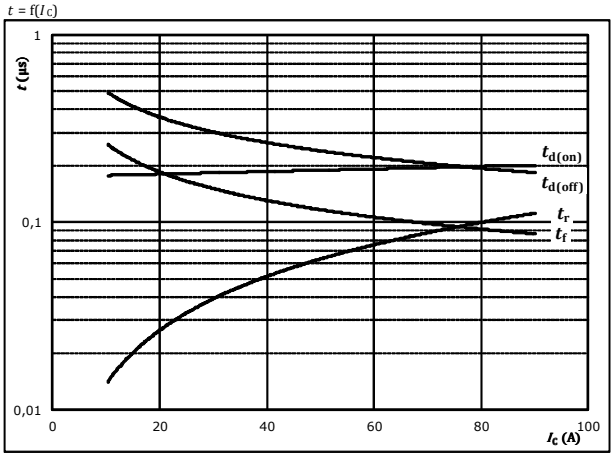
V_{CE} =	600	V	T_J:	25 °C	
V_{GE} =	±15	V		125 °C	
I_C =	48	A		150 °C	

Inverter Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



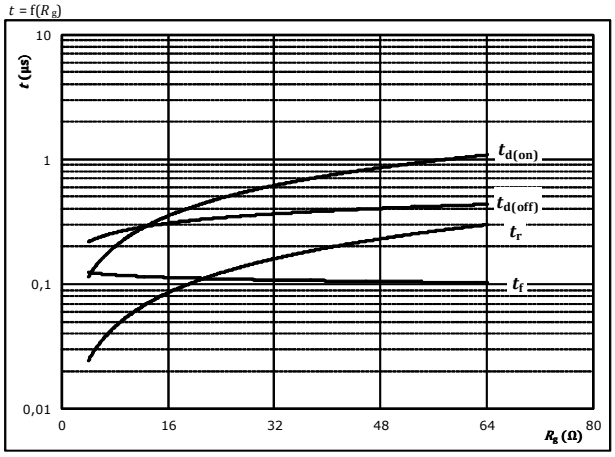
With an inductive load at

T_j =	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

$t = f(R_g)$



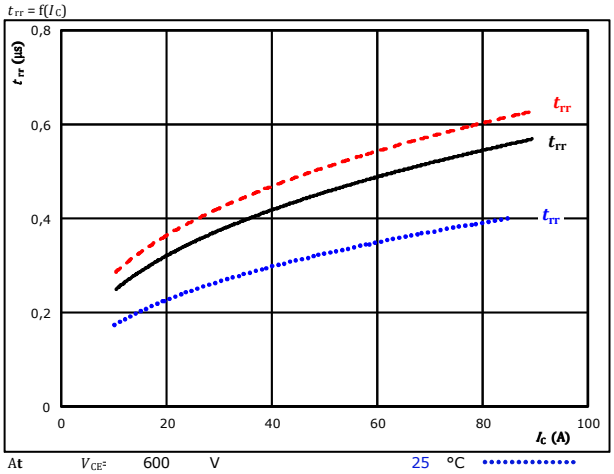
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	48	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

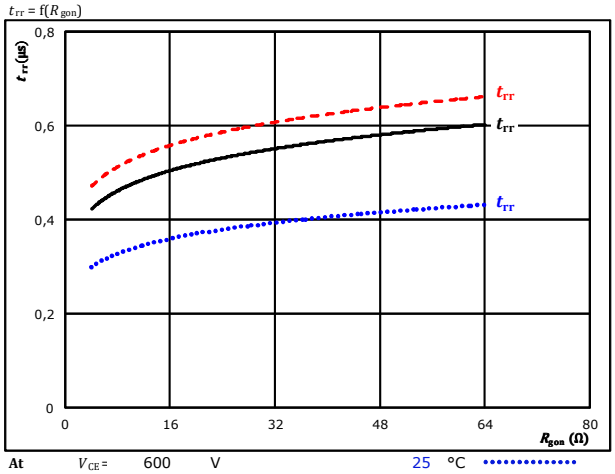


At					
V_{CE} =	600	V	T_j:	25 °C	
V_{GE} =	±15	V		125 °C	
R_{gon} =	8	Ω		150 °C	

figure 8. **FWD**

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

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



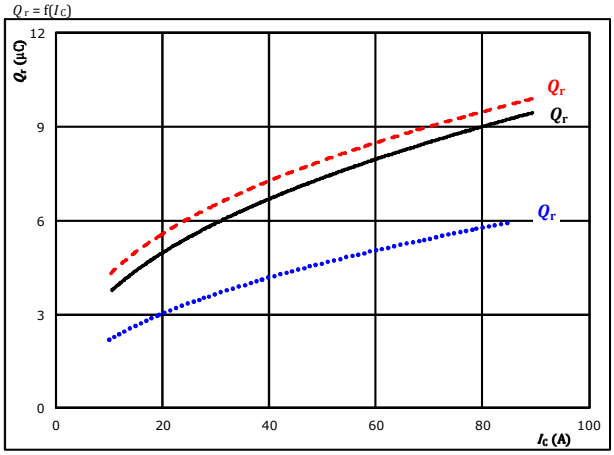
At					
V_{CE} =	600	V	T_j:	25 °C	
V_{GE} =	±15	V		125 °C	
I_C =	48	A		150 °C	

Inverter Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

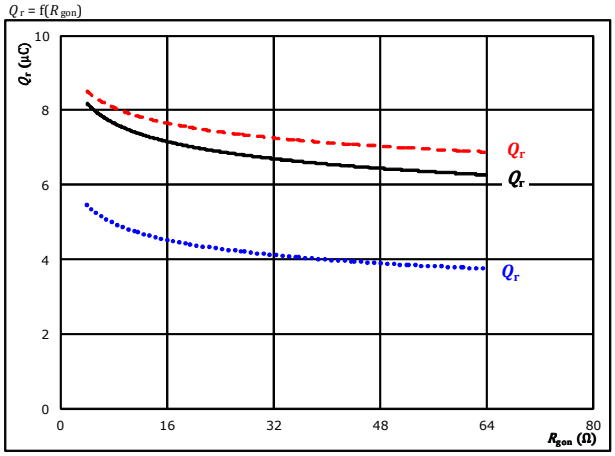


At						
	V_{CE} =	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	R_{gon} =	8	Ω		150 °C	

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

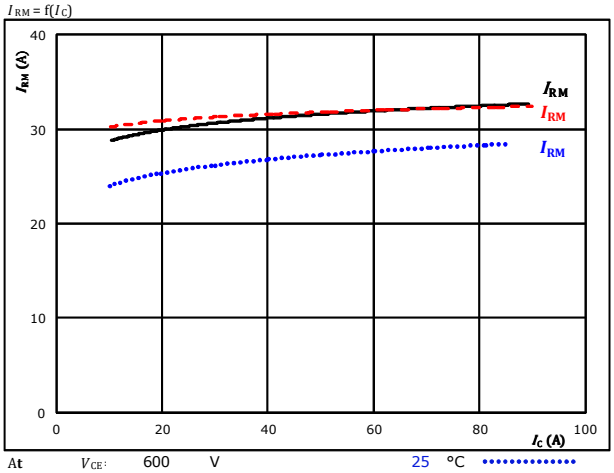


At						
	V_{CE}=	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	I_C=	48	A		150 °C	

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

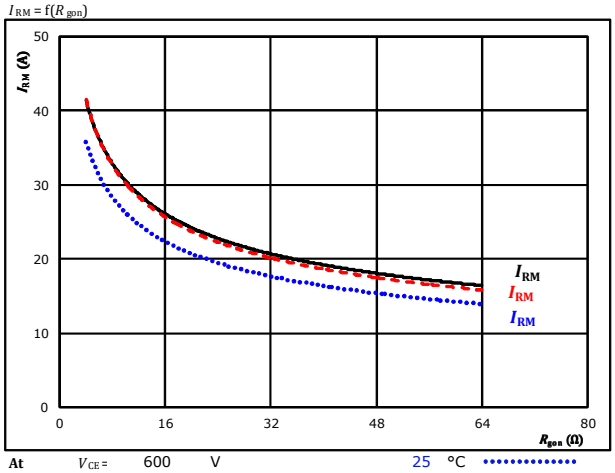


At						
	V_{CE}:	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	R_{gon} =	8	Ω		150 °C	

figure 12. **FWD**

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

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



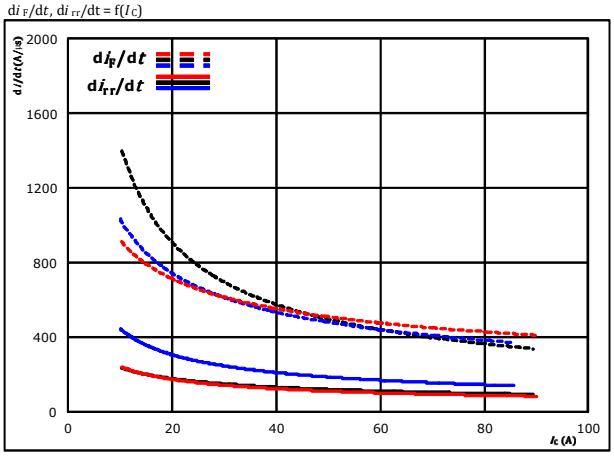
At						
	V_{CE} =	600	V		25 °C	
	V_{GE} =	±15	V	T_j:	125 °C	
	I_C =	48	A		150 °C	

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

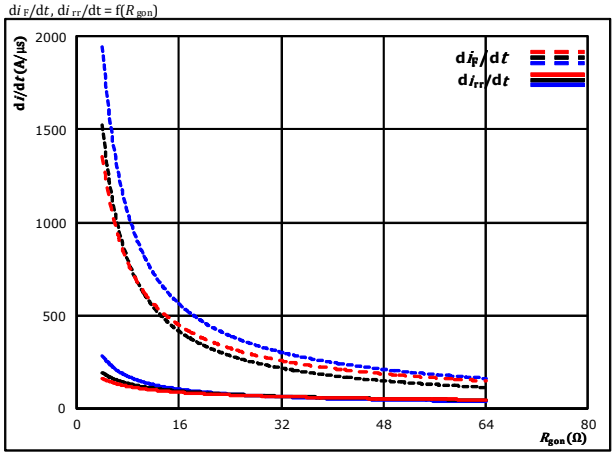


At						
V_{CE} =	600	V	T_j:	25 °C	•••••••••••••••
V_{GE} =	±15	V		125 °C	———
R_{gon} =	8	Ω		150 °C	– – – –

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

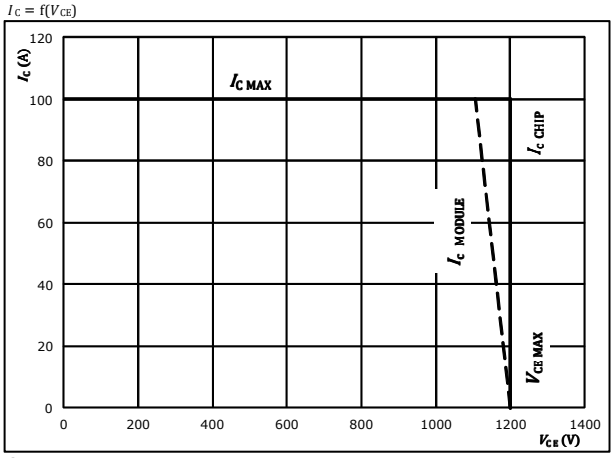


At						
V_{CE} =	600	V	T_j:	25 °C	•••••••••••••••
V_{GE} =	±15	V		125 °C	———
I_C =	48	A		150 °C	– – – –

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

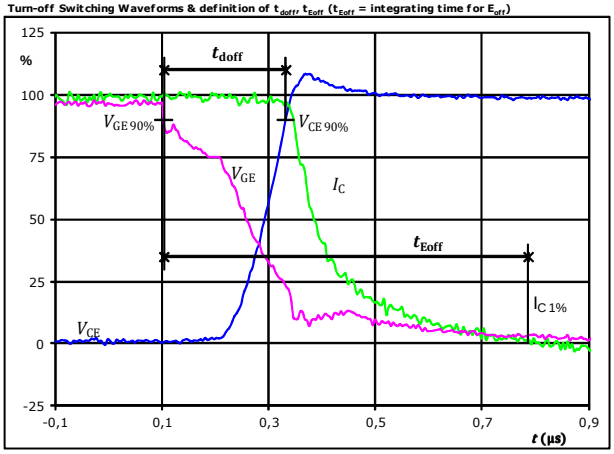
Inverter Switching Definitions

General conditions

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

figure 1. IGBT

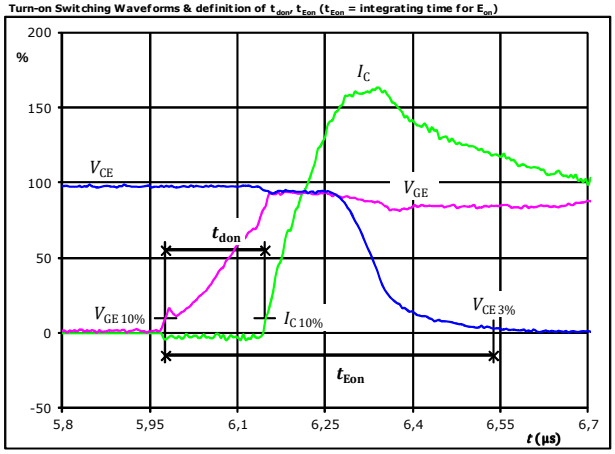
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	51	A
t_{doff} =	0,229	µs
t_{Eoff} =	0,683	µs

figure 2. IGBT

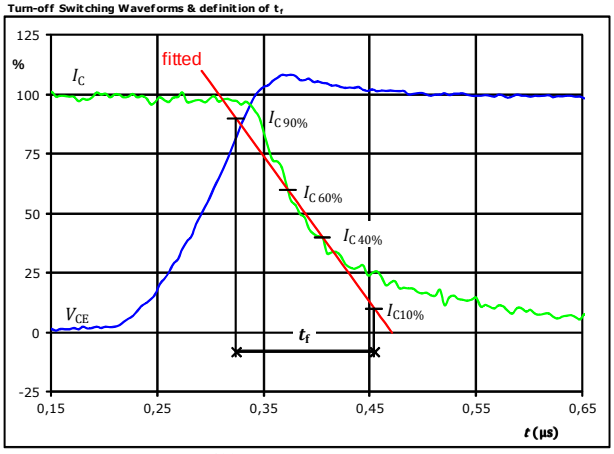
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	51	A
t_{don} =	0,176	µs
t_{Eon} =	0,561	µs

figure 3. IGBT

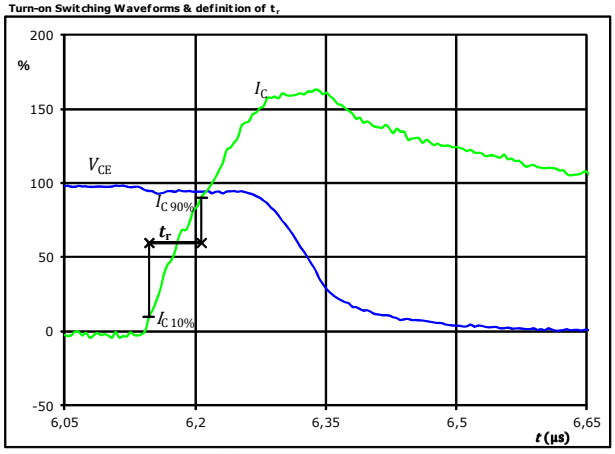
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	51	A
t_f =	0,125	µs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

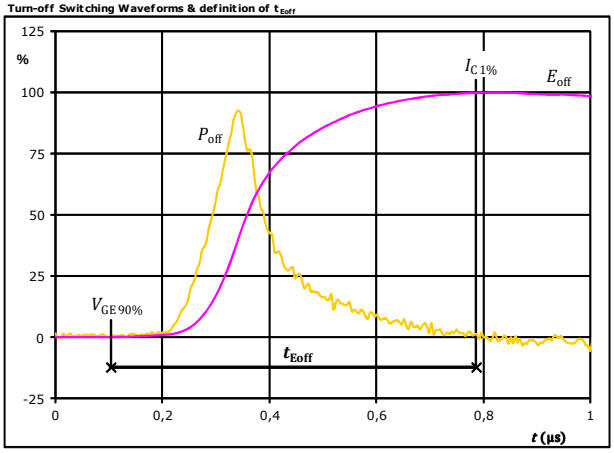


$V_C(100\%)$ =	600	V
$I_C(100\%)$ =	51	A
t_r =	0,058	µs

Inverter Switching Characteristics

figure 5. **IGBT**

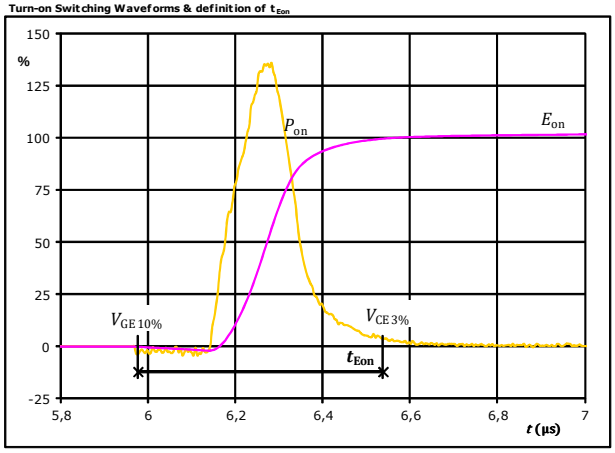
Turn-off Switching Waveforms & definition of t_{Eoff}



$P_{off}(100\%)$ =	30,49	kW
$E_{off}(100\%)$ =	4,25	mJ
t_{Eoff} =	0,68	µs

figure 6. **IGBT**

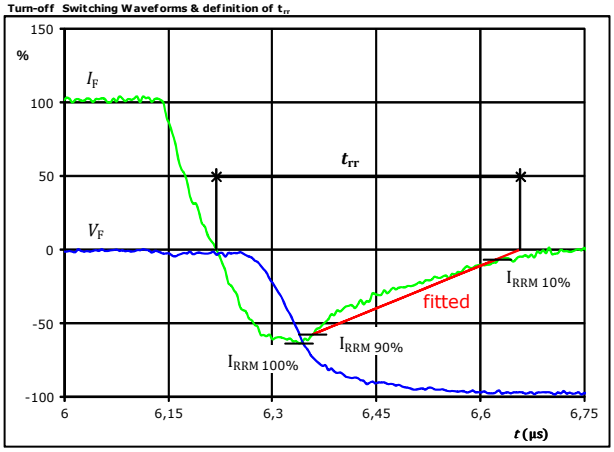
Turn-on Switching Waveforms & definition of t_{Eon}



$P_{on}(100\%)$ =	30,49	kW
$E_{on}(100\%)$ =	6,38	mJ
t_{Eon} =	0,56	µs

figure 7. **FWD**

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

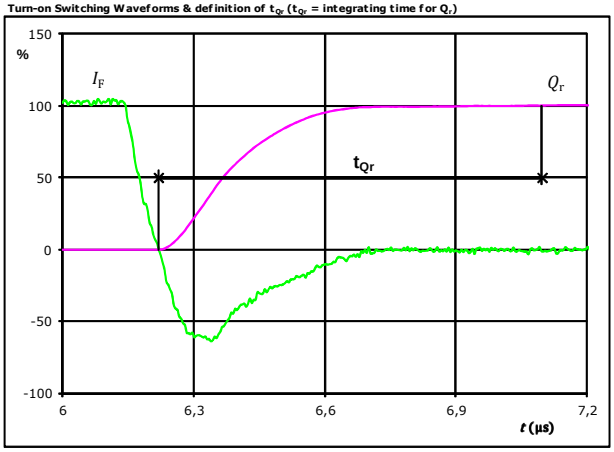


$V_F(100\%)$ =	600	V
$I_F(100\%)$ =	51	A
$I_{RRM}(100\%)$ =	-33	A
t_{rr} =	0,435	µs

Inverter Switching Characteristics

figure 8. **FWD**

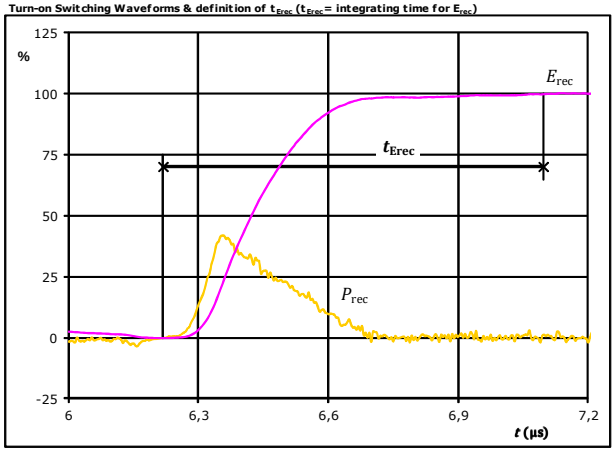
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



I_F (100%) =	51	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})



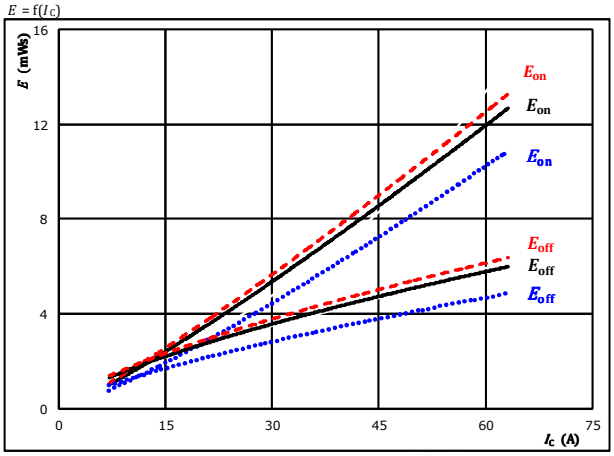
P_{rec} (100%) =	30,49	kW
E_{rec} (100%) =	2,59	mJ
t_{Erec} =	0,88	µs

Brake Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



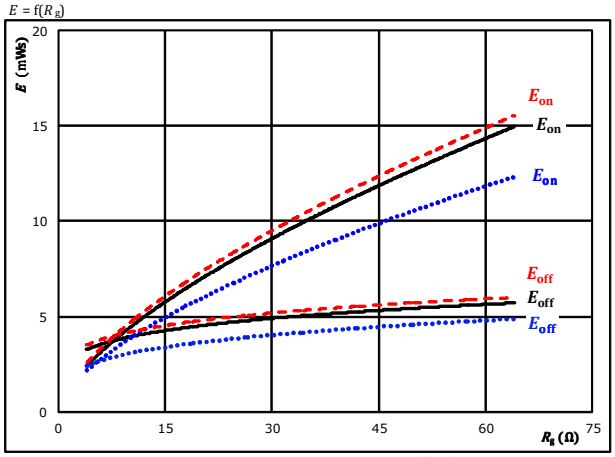
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	15/0	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

$E = f(R_g)$



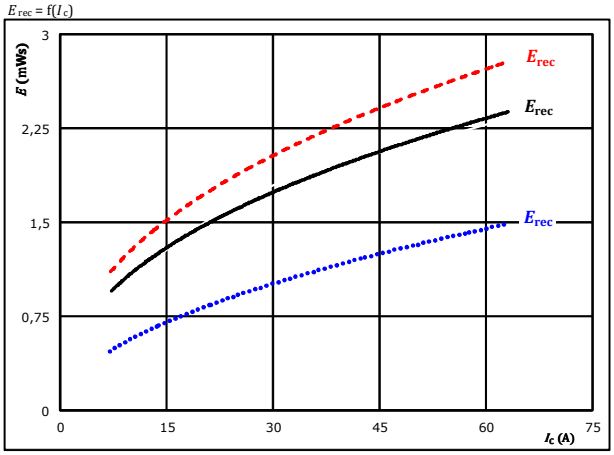
With an inductive load at

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

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



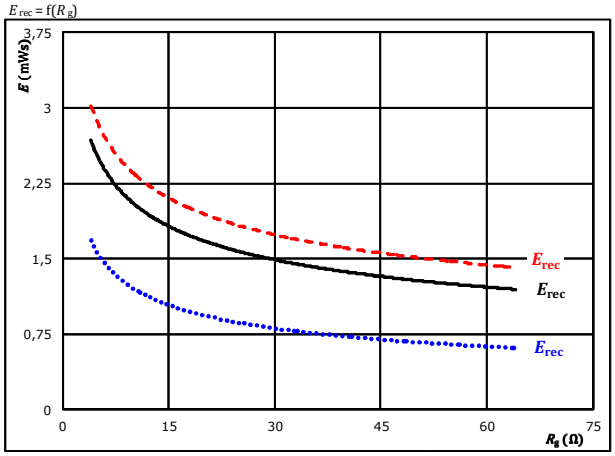
With an inductive load at

V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	15/0	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

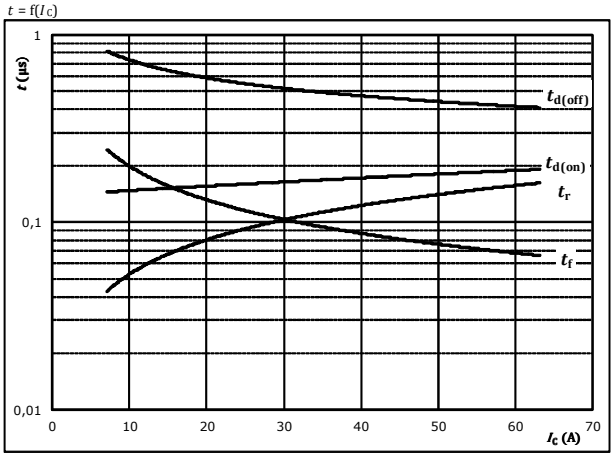
V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	15/0	V		125 °C
I_C =	35	A		150 °C

Brake Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



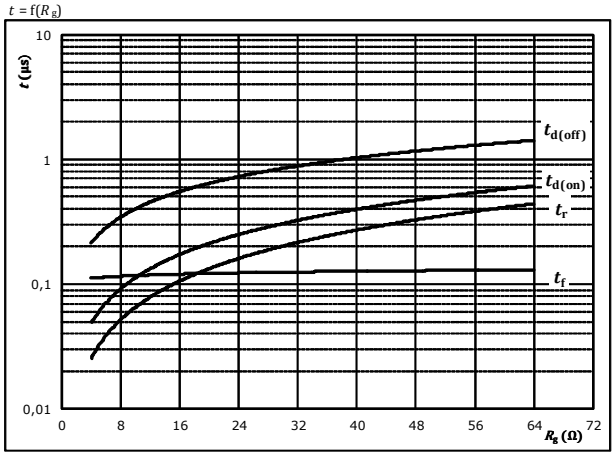
With an inductive load at

T_j =	150	°C
V_{CE} =	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

$t = f(R_g)$



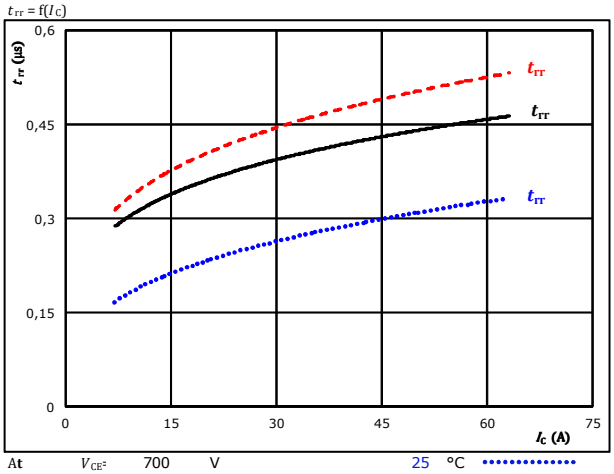
With an inductive load at

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

$t_{rr} = f(I_C)$

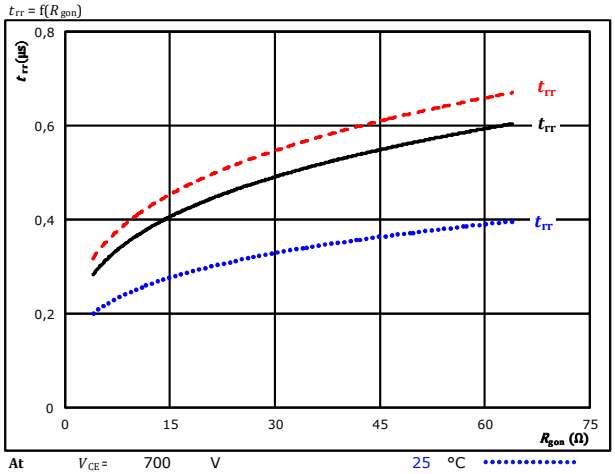


At					
	V_{CE} =	700	V		25 °C
	V_{GE} =	15/0	V	T_j:	125 °C
	R_{gon} =	16	Ω		150 °C

figure 8. **FWD**

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

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



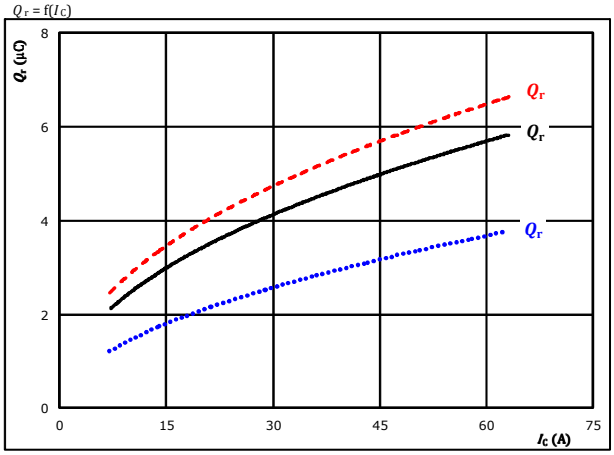
At					
	V_{CE} =	700	V		25 °C
	V_{GE} =	15/0	V	T_j:	125 °C
	I_C =	35	A		150 °C

Brake Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

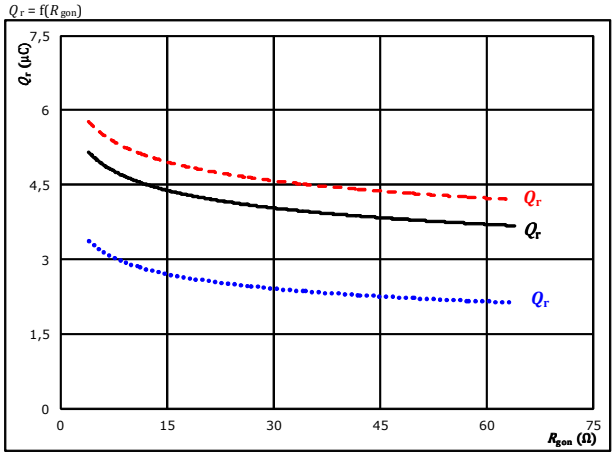


At						
	V_{CE} =	700	V		25 °C	
	V_{GE} =	15/0	V	T_j:	125 °C	
	R_{gon} =	16	Ω		150 °C	

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

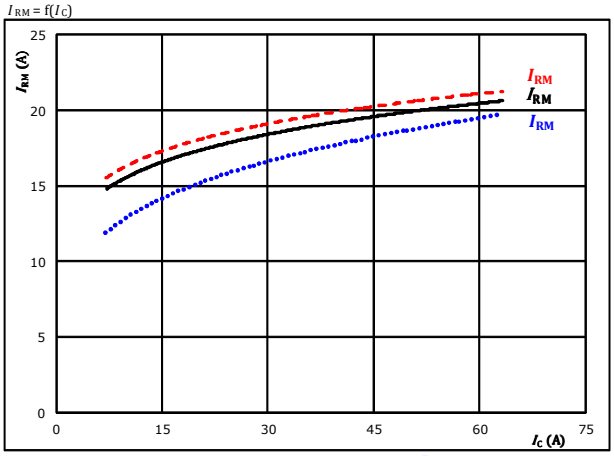


At						
	V_{CE}=	700	V		25 °C	
	V_{GE} =	15/0	V	T_j:	125 °C	
	I_C=	35	A		150 °C	

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

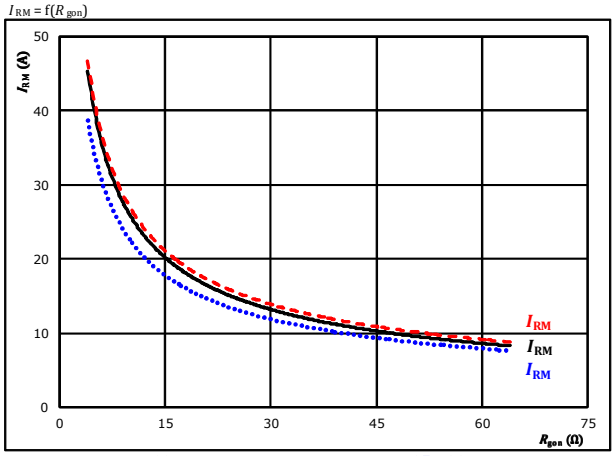


At						
	V_{CE}:	700	V		25 °C	
	V_{GE} =	15/0	V	T_j:	125 °C	
	R_{gon} =	16	Ω		150 °C	

figure 12. **FWD**

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

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



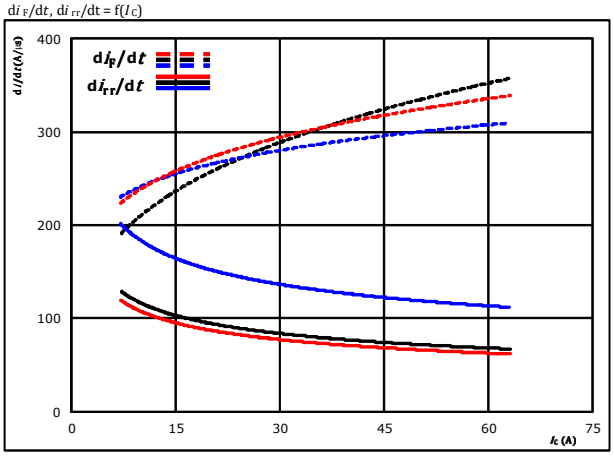
At						
	V_{CE} =	700	V		25 °C	
	V_{GE} =	15/0	V	T_j:	125 °C	
	I_C =	35	A		150 °C	

Brake Switching Characteristics

figure 13. **FWD**

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

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

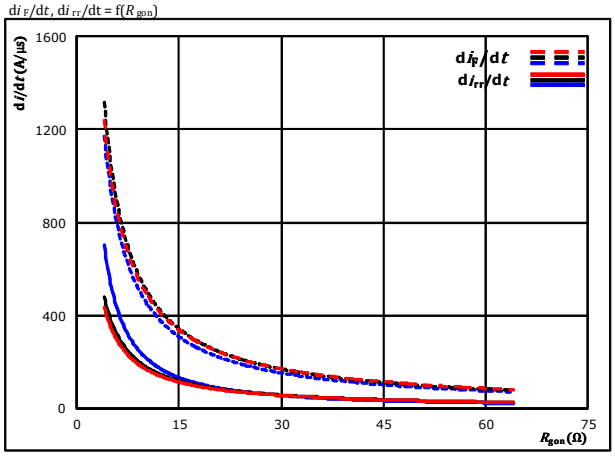


At					
V_{CE} =	700	V	T_j:	25 °C	
V_{GE} =	15/0	V		125 °C	
R_{gon} =	16	Ω		150 °C	

figure 14. **FWD**

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

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

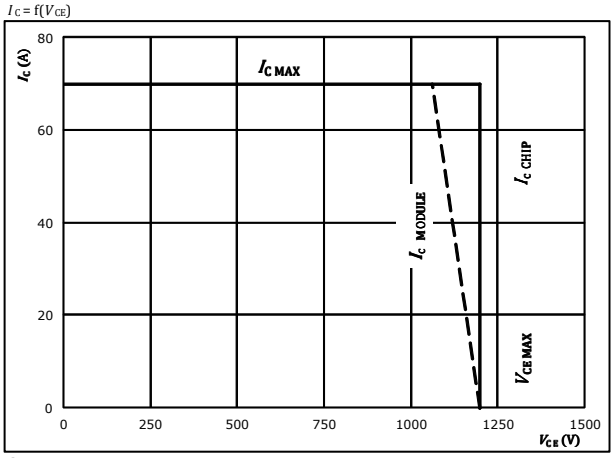


At					
V_{CE} =	700	V	T_j:	25 °C	
V_{GE} =	15/0	V		125 °C	
I_C =	35	A		150 °C	

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

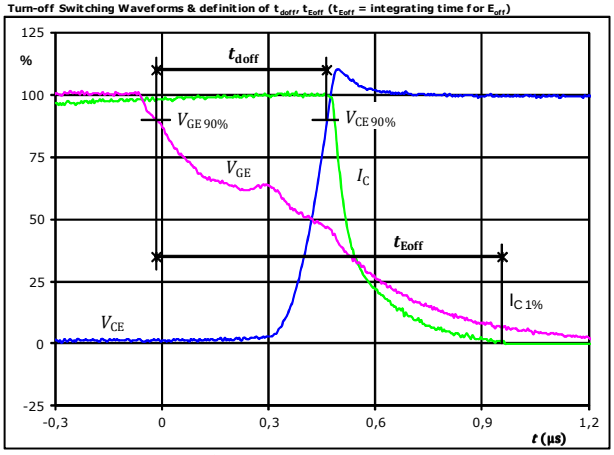
Brake Switching Definitions

General conditions

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

figure 1. **IGBT**

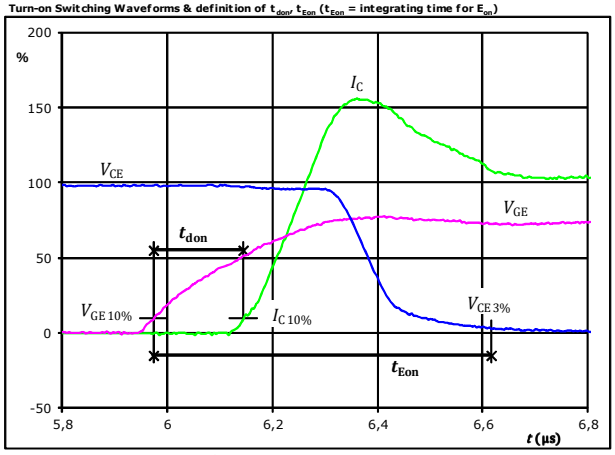
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	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**

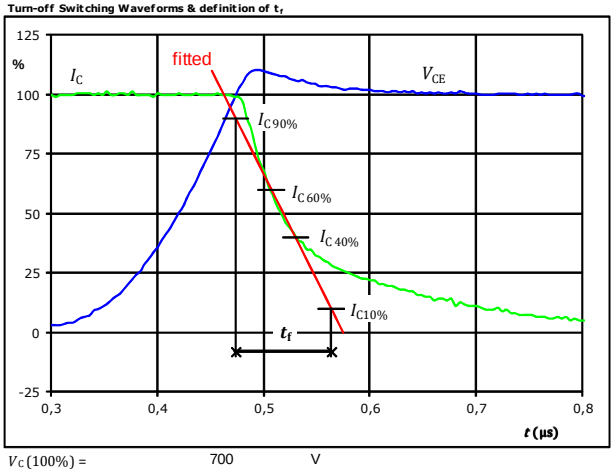
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	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**

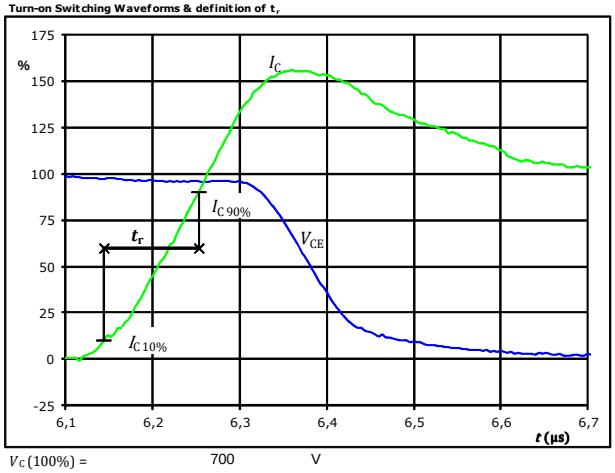
Turn-off Switching Waveforms & definition of t_f



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

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r

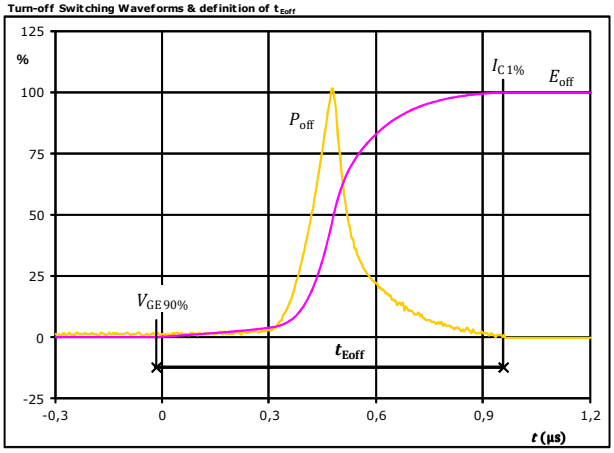


$V_C(100\%)$ =	700	V
$I_C(100\%)$ =	35	A
t_r =	0,109	µs

Brake Switching Characteristics

figure 5. **IGBT**

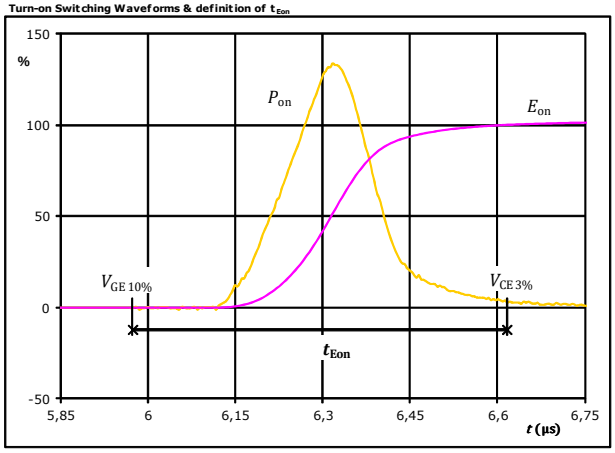
Turn-off Switching Waveforms & definition of t_{Eoff}



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

figure 6. **IGBT**

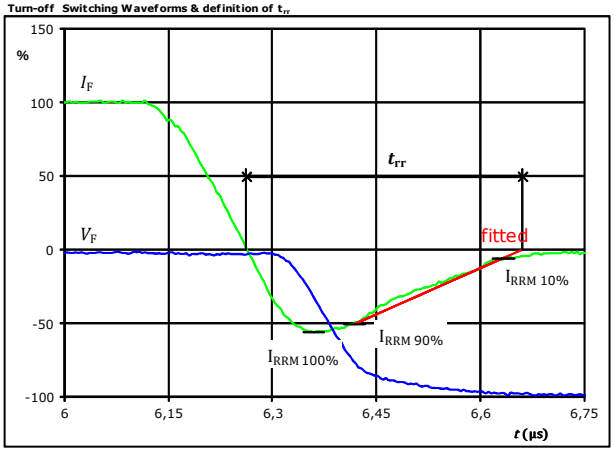
Turn-on Switching Waveforms & definition of t_{Eon}



$P_{on}(100\%)$ =	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}

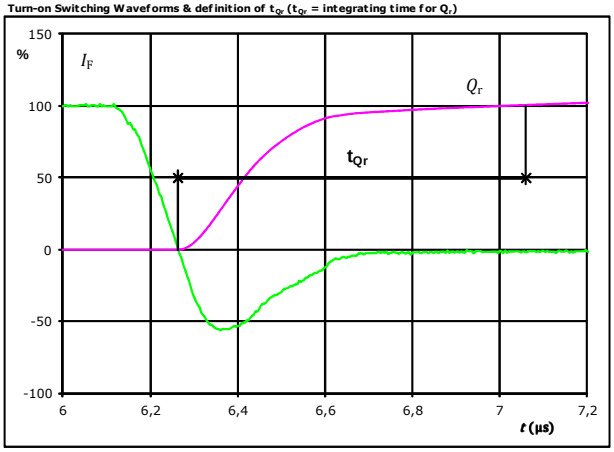


$V_F(100\%)$ =	700	V
$I_F(100\%)$ =	35	A
$I_{RRM}(100\%)$ =	-20	A
t_{rr} =	0,397	µs

Brake Switching Characteristics

figure 8. **FWD**

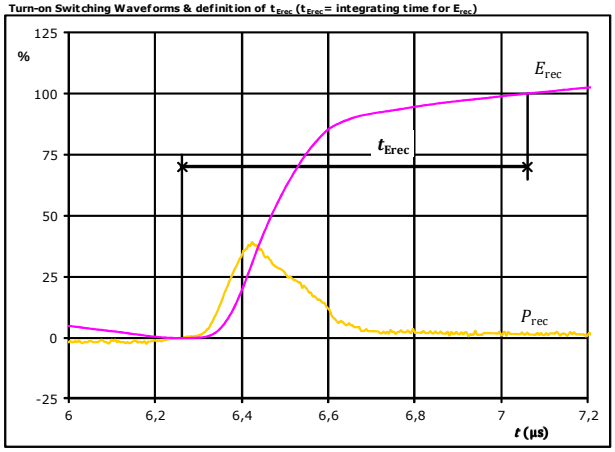
Turn-on Switching Waveforms & definition of t_{Qr} (t_{Qr} = integrating time for Q_r)



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

Ordering Code & Marking

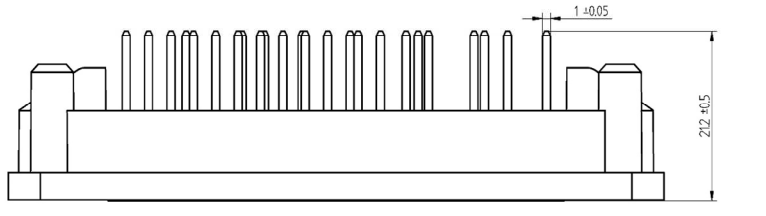
Version	Ordering Code
without thermal paste 12 mm housing with solder pins	10-FY12PMA050M7-P580A78
with thermal paste 12 mm housing with solder pins	10-FY12PMA050M7-P580A78-/3/
without thermal paste 17 mm housing with solder pins	10-F112PMA050M7-P580A79
with thermal paste 17 mm housing with solder pins	10-F112PMA050M7-P580A79-/3/

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

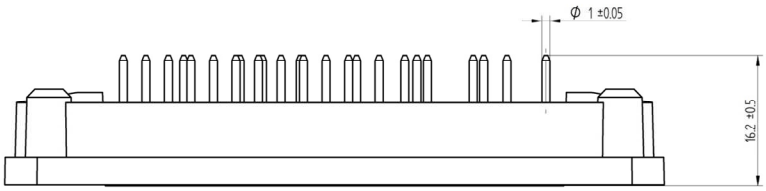
Outline

Pin table

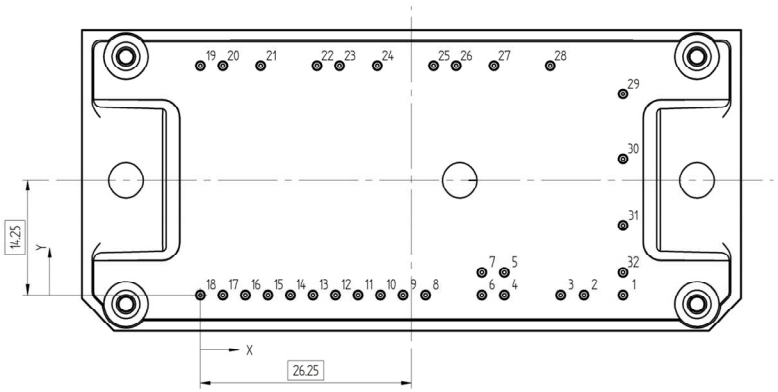
Pin	X	Y	Function
1	52,55	0	G27
2	47,7	0	DC-Rect
3	44,8	0	DC-Rect
4	37,8	0	DC+Rect
5	37,8	2,8	DC+Rect
6	35	0	DC+Inv
7	35	2,8	DC+Inv
8	28	0	Therm1
9	25,2	0	Therm2
10	22,4	0	DC-3
11	19,6	0	G15
12	16,8	0	S15
13	14	0	DC-2
14	11,2	0	G13
15	8,4	0	S13
16	5,6	0	DC-1
17	2,8	0	G11
18	0	0	S11
19	0	28,5	Ph1
20	2,8	28,5	G12
21	7,5	28,5	S12
22	14,5	28,5	Ph2
23	17,3	28,5	G14
24	22	28,5	S14
25	29	28,5	Ph3
26	31,8	28,5	G16
27	36,5	28,5	S16
28	43,5	28,5	ACIn1
29	52,55	25	ACIn2
30	52,55	16,9	ACIn3
31	52,55	8,6	Br
32	52,55	2,8	DC-Br



P580F79

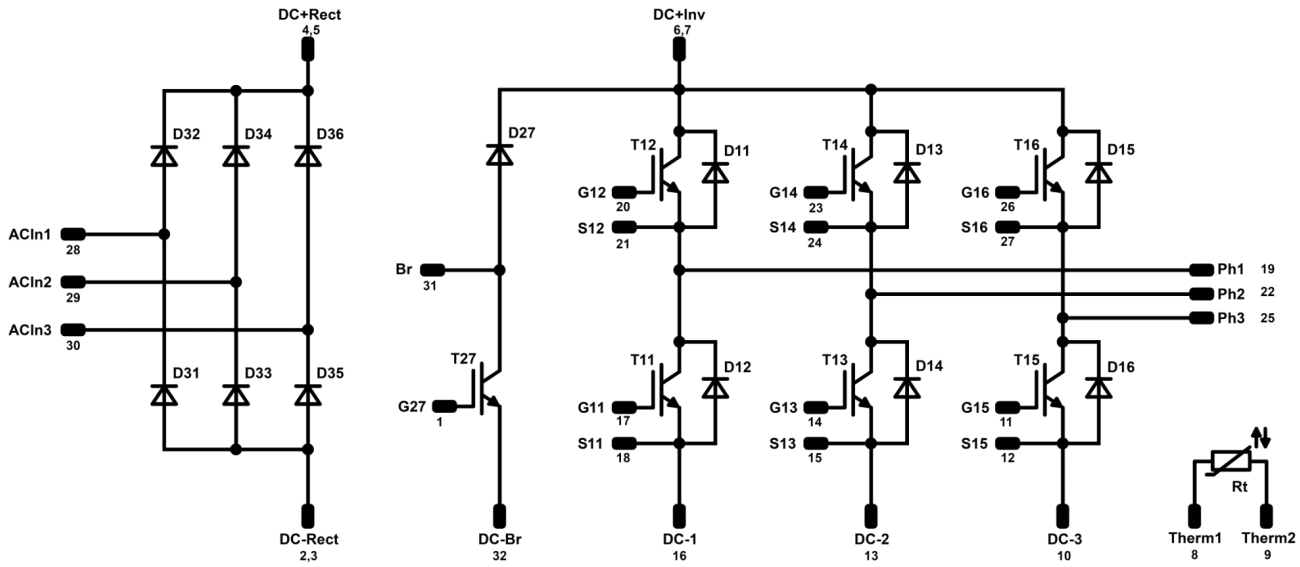


P580F78



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
T27	IGBT	1200 V	35 A	Brake Switch	
D27	FWD	1200 V	25 A	Brake 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	
D31, D32, D33, D34, D35, D36	Rectifier Diode	1600 V	45 A	Rectifier	
Rt	NTC			Thermistor	

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

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

Package data
Package data for *flow* 1 packages see vincotech.com website.

UL recognition and file number
This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-Fx12PMA050M7-P580A7x-D2-14	13 May. 2019	Added 17mm variant and thermal paste options	1,3,31