


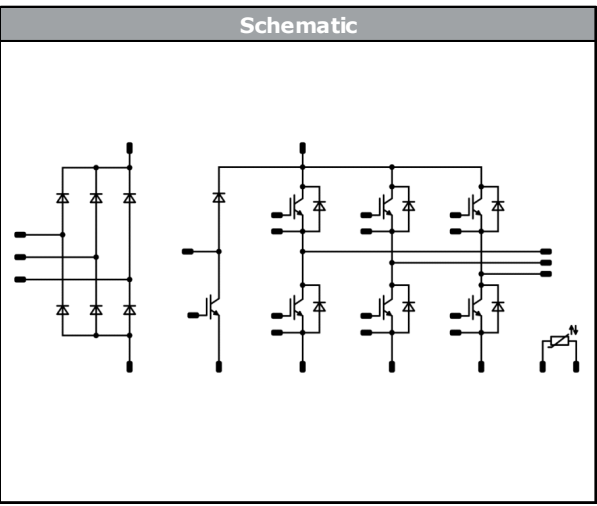




<i>flow PIM 1</i>	1200 V / 25 A
<div style="background-color: #eee; padding: 5px; margin-bottom: 10px;">Features</div> <ul style="list-style-type: none"> IGBT M7 with low V_{CEsat} and improved EMC behavior Open emitter configuration Compact and low inductive design Built-in NTC <div style="background-color: #eee; padding: 5px; margin-bottom: 10px;">Target applications</div> <ul style="list-style-type: none"> Industrial Drives <div style="background-color: #eee; padding: 5px;">Types</div> <ul style="list-style-type: none"> 10-FY12PMA025M7-P588A78 10-PY12PMA025M7-P588A78Y 10-F112PMA025M7-P588A79 	<div style="background-color: #eee; padding: 5px; margin-bottom: 10px;">flow 1 housing</div> <div style="display: flex; justify-content: space-around; text-align: center;"> <div>12 mm Solder </div> <div>12 mm Press-fit </div> <div>17 mm Solder pins </div> </div> <div style="background-color: #eee; padding: 5px; margin-top: 10px;">Schematic</div> 

Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Rectifier Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1600	V
Continuous (direct) forward current	I_F		35	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave $t_p = 10\text{ ms}$	270	A
Surge current capability	P_{t}		370	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	56	W
Maximum Junction Temperature	T_{jmax}	$T_s = 80\text{ °C}$	150	°C



Maximum Ratings

$T_j = 25\text{ °C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C		25	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	50	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	82	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		25	A
Repetitive peak forward current	I_{FRM}	T_j limited by T_{jmax}	50	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	62	W
Maximum junction temperature	T_{jmax}		175	°C

Brake Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C		15	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	60	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		10	A
Repetitive peak forward current	I_{FRM}	T_j limited by T_{jmax}	20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	50	W
Maximum junction temperature	T_{jmax}		175	°C



Maximum Ratings

$T_j = 25\text{ °C}$, 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* $t_p = 2\text{ s}$	6000	V
		AC Voltage $t_p = 1\text{ min}$	2500	V
Creepage distance		for 12 mm solder pins	min. 12,7	mm
		for 12 mm press-fit pins		
		for 17 mm solder pins		
Clearance		for 12 mm solder pins	7,91	mm
		for 12 mm press-fit pins	7,96	
		for 17 mm solder pins	min. 12,7	
Comparative Tracking Index	CTI		> 200	

*100 % tested in production



Vincotech

10-FY12PMA025M7-P588A78
10-PY12PMA025M7-P588A78Y
10-F112PMA025M7-P588A79
datasheet

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			35	25 125		1,17 1,13		V
Reverse leakage current	I_r		1600		25			50	μ A

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					1,25		K/W
-------------------------------------	---------------	---------------------------------------	--	--	--	--	------	--	-----



Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GS} [V]	V_{CE} [V]	V_{DS} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	

Inverter Switch

Static

Parameter	Symbol	Conditions	V_{GS} [V]	V_{CE} [V]	V_{DS} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 10\text{ V}$				0,0025	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CESat}		15			25	25 125 150		1,65 1,89 1,95	2,15	V
Collector-emitter cut-off current	I_{CES}		0	1200			25			70	μA
Gate-emitter leakage current	I_{GES}		20	0			25			500	nA
Input capacitance	C_{ies}								4800		pF
Output capacitance	C_{oes}		0	10		25			170		
Reverse transfer capacitance	C_{res}								57		
Gate charge	Q_g		15	600		25	25			180	nC

Thermal

Parameter	Symbol	Conditions	V_{GS} [V]	V_{CE} [V]	V_{DS} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4\text{ W/mK}$ (PSX)							1,16		K/W

Dynamic

Parameter	Symbol	Conditions	V_{GS} [V]	V_{CE} [V]	V_{DS} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$	$R_{goff} = 16\ \Omega$ $R_{gon} = 16\ \Omega$	±15	600		25	25		147		ns
								125	149		
								150	145		
Rise time	t_r							25	29		
								125	33		
								150	34		
Turn-off delay time	$t_{d(off)}$							25	171		
								125	191		
								150	196		
Fall time	t_f							25	95		
		125	110								
		150	115								
Turn-on energy (per pulse)	E_{on}	$Q_{tFWD} = 2,5\ \mu\text{C}$ $Q_{tFWD} = 3,9\ \mu\text{C}$ $Q_{tFWD} = 4,3\ \mu\text{C}$					25		2,06		mWs
			125	2,66							
			150	2,82							
Turn-off energy (per pulse)	E_{off}		25	1,67							
			125	2,18							
			150	2,29							



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				25 125 150		1,63 1,70 1,69	2,1	V
Reverse leakage current	I_R		1200		25			35	μ A

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4$ W/mK (PSX)					1,54		K/W
-------------------------------------	---------------	---------------------------------------	--	--	--	--	------	--	-----

Dynamic

Peak recovery current	I_{RRM}				25 125 150		21 23 23		A
Reverse recovery time	t_{rr}				25 125 150		254 367 404		ns
Recovered charge	Q_r	$di/dt = 645$ A/ μ s $di/dt = 673$ A/ μ s $di/dt = 633$ A/ μ s	± 15	600	25		2,54 3,88 4,28		μ C
Reverse recovered energy	E_{rec}				25 125 150		0,88 1,45 1,61		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$				25 125 150		217 134 132		A/ μ s



Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	

Brake Switch

Static

Parameter	Symbol	Conditions	V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = 10\text{ V}$				0,0015	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CESat}		15			15	25 125 150		1,70 1,95 2,01	2,15	V
Collector-emitter cut-off current	I_{CES}		0	1200			25			60	μA
Gate-emitter leakage current	I_{GES}		20	0			25			500	nA
Internal gate resistance	r_g								none		Ω
Input capacitance	C_{ies}								2900		pF
Output capacitance	C_{oes}		0	10		25			120		
Reverse transfer capacitance	C_{res}								34		
Gate charge	Q_g		15	600	15	25			1100		nC

Thermal

Parameter	Symbol	Conditions	V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4\text{ W/mK}$ (PSX)							1,60		K/W

Dynamic

Parameter	Symbol	Conditions	V_{GS} [V]	V_{GE} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$	$R_{goff} = 32\ \Omega$ $R_{gon} = 32\ \Omega$					25 125 150		293 257 246		ns
Rise time	t_r						25 125 150		185 200 203		
Turn-off delay time	$t_{d(off)}$		15/0	700	15		25 125 150		398 442 450		
Fall time	t_f						25 125 150		66 88 92		
Turn-on energy (per pulse)	E_{on}		$Q_{fFWD} = 1,1\ \mu\text{C}$ $Q_{fFWD} = 1,9\ \mu\text{C}$ $Q_{fFWD} = 2,1\ \mu\text{C}$					25 125 150		2,95 3,57 3,74	
Turn-off energy (per pulse)	E_{off}						25 125 150		1,33 1,71 1,81		



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			10	25 125 150		1,61 1,69 1,69	2,1		V
Reverse leakage current	I_R		1200		25			25		μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)					1,91			K/W
-------------------------------------	---------------	---	--	--	--	--	------	--	--	-----

Dynamic

Peak recovery current	I_{RRM}				25 125 150		6 7 7			A
Reverse recovery time	t_{rr}				25 125 150		295 485 544			ns
Recovered charge	Q_r	$di/dt = 69 \text{ A}/\mu\text{s}$ $di/dt = 69 \text{ A}/\mu\text{s}$ $di/dt = 67 \text{ A}/\mu\text{s}$	15/0	700	15	25 125 150	1,140 1,882 2,120			μC
Reverse recovered energy	E_{rec}				25 125 150		0,422 0,781 0,895			mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$				25 125 150		44 29 25			A/μs

Thermistor

Rated resistance	R				25		22			kΩ
Deviation of R_{100}	$\Delta_{R/R}$	$R_{100} = 1484 \Omega$			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		

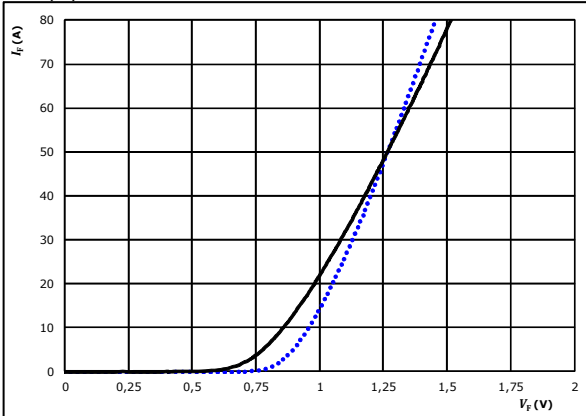


Rectifier Diode Characteristics

figure 1. Rectifier Diode

Typical forward characteristics

$$I_F = f(V_F)$$

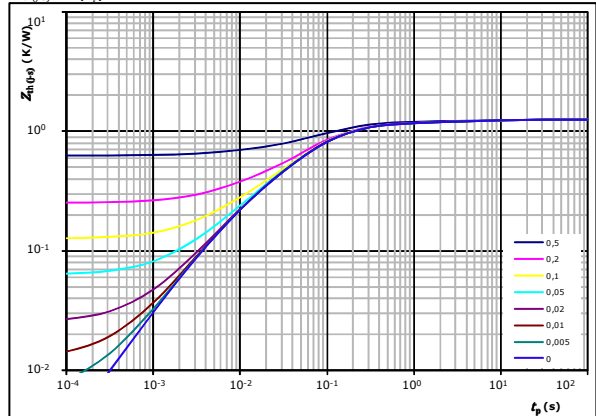


$t_p = 250 \mu s$
 $T_j: 25 \text{ } ^\circ\text{C}$ (dotted blue line)
 $125 \text{ } ^\circ\text{C}$ (solid black line)

figure 2. Rectifier Diode

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$
 $R_{th(j-s)} = 1,25 \text{ K/W}$

Diode thermal model values

R (K/W)	τ (s)
8,00E-02	5,22E+00
1,56E-01	4,18E-01
6,95E-01	8,82E-02
2,23E-01	3,07E-02
9,97E-02	5,99E-03

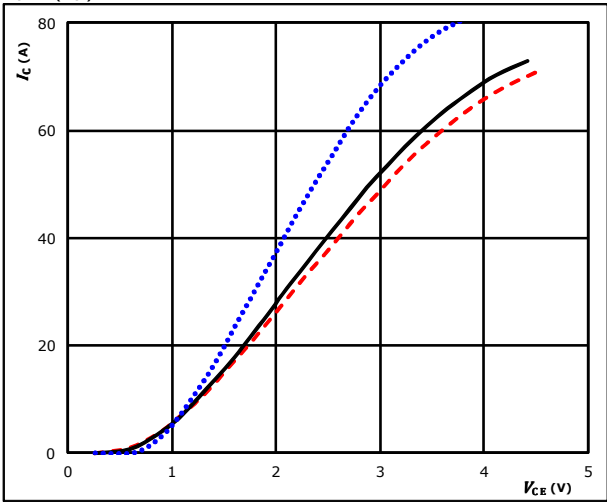


Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

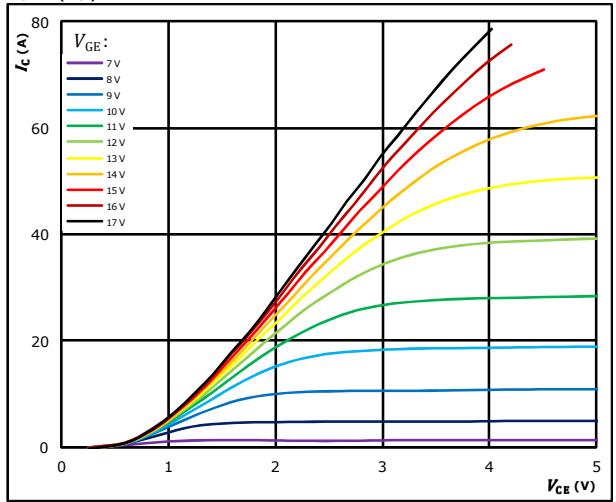


$t_p = 250 \mu s$ $T_j: 25 \text{ }^\circ C$
 $V_{GE} = 15 \text{ V}$ $T_j: 125 \text{ }^\circ C$ ———
 $T_j: 150 \text{ }^\circ C$ - - - -

figure 2. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

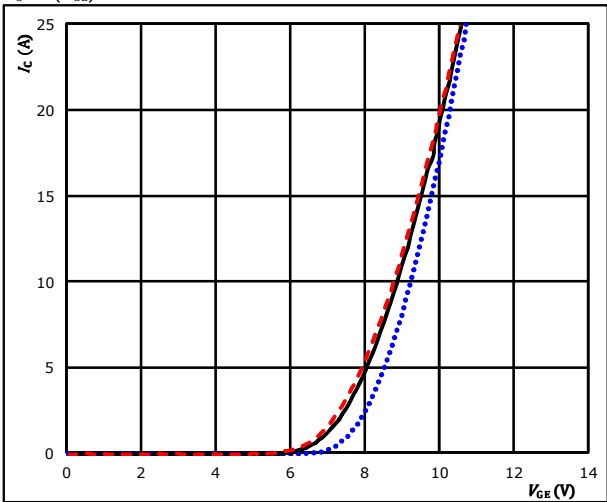


$t_p = 250 \mu s$ $T_j = 125 \text{ }^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

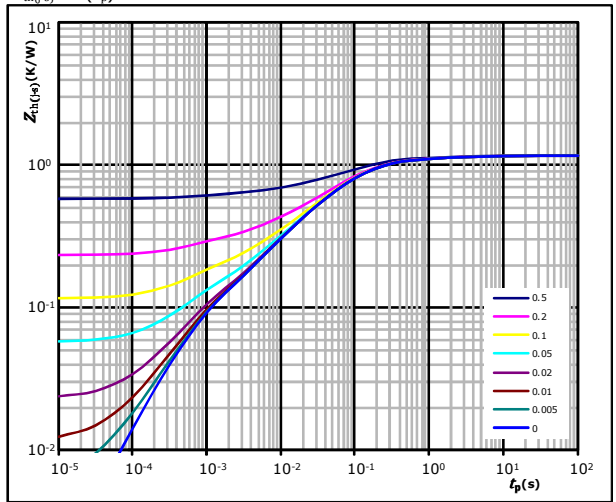


$t_p = 100 \mu s$ $T_j: 25 \text{ }^\circ C$
 $V_{CE} = 10 \text{ V}$ $T_j: 125 \text{ }^\circ C$ ———
 $T_j: 150 \text{ }^\circ C$ - - - -

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



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

IGBT thermal model values

R (K/W)	τ (s)
5,33E-02	3,54E+00
1,07E-01	5,75E-01
5,05E-01	1,04E-01
2,68E-01	3,30E-02
1,51E-01	7,35E-03
7,80E-02	6,52E-04

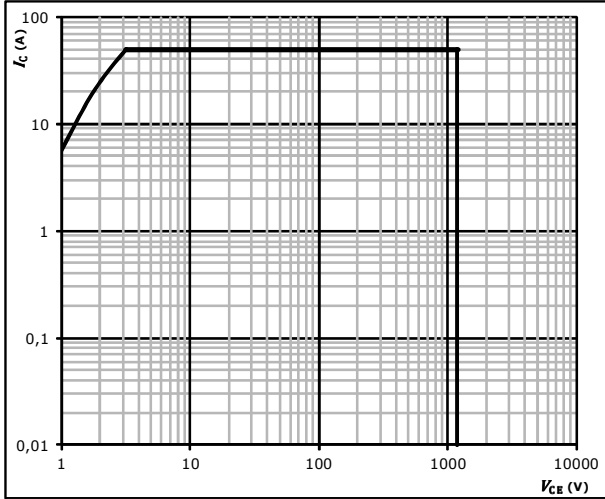


Inverter Switch Characteristics

figure 5. IGBT

Safe operating area

$$I_C = f(V_{CE})$$



$D =$ single pulse
 $T_s = 80$ °C
 $V_{GE} = \pm 15$ V
 $T_j = T_{jmax}$

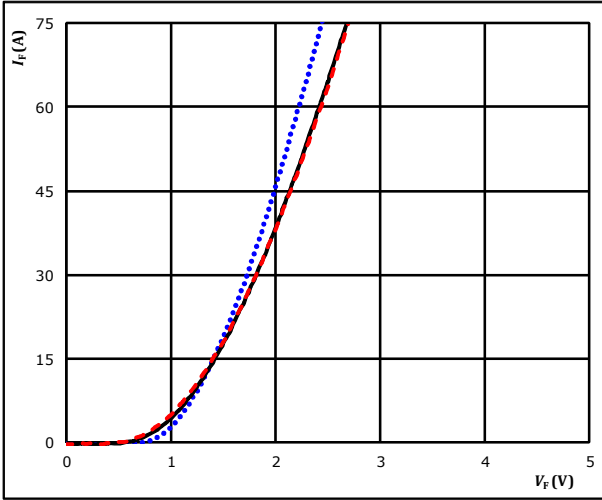


Inverter Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$$I_F = f(V_F)$$



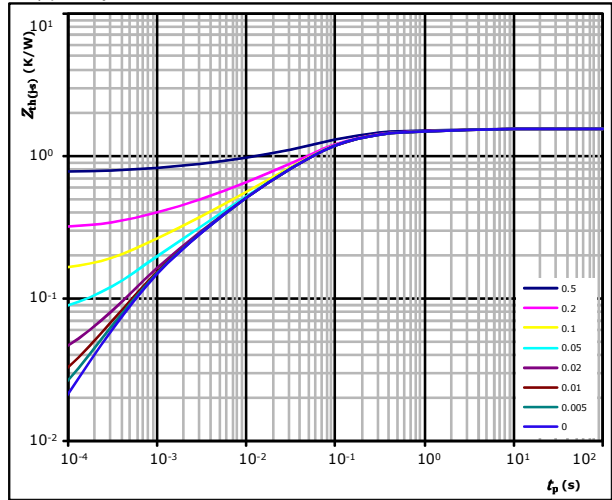
$t_p = 250 \mu s$

T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

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

FWD thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
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

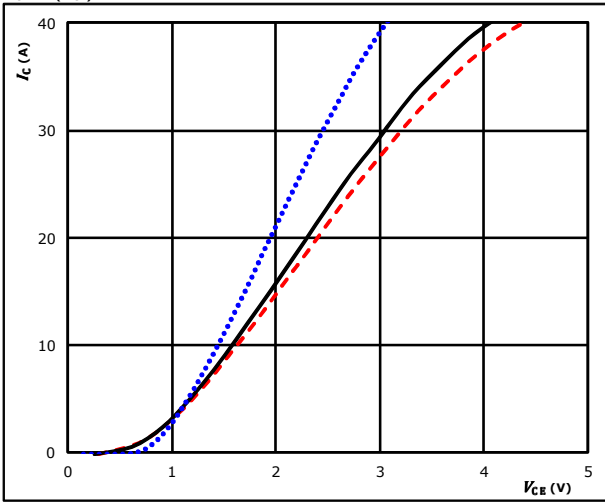


Brake Switch Characteristics

figure 1. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

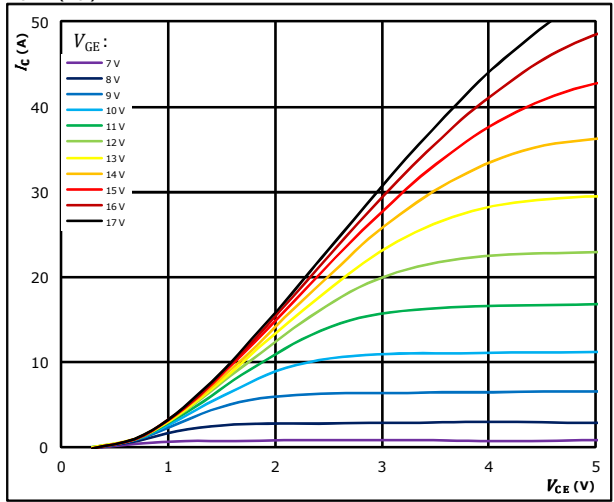


$t_p = 250 \mu s$ $T_j: 25 \text{ }^\circ C$
 $V_{GE} = 15 V$ $T_j: 125 \text{ }^\circ C$ ———
 $T_j: 150 \text{ }^\circ C$ - - - - -

figure 2. IGBT

Typical output characteristics

$$I_C = f(V_{CE})$$

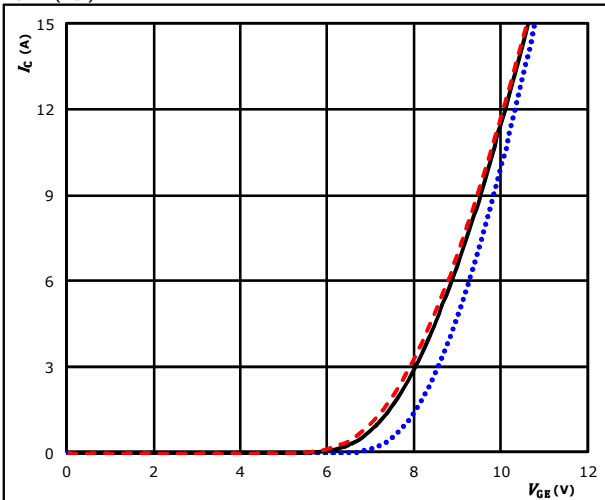


$t_p = 250 \mu s$
 $T_j = 150 \text{ }^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

$$I_C = f(V_{GE})$$

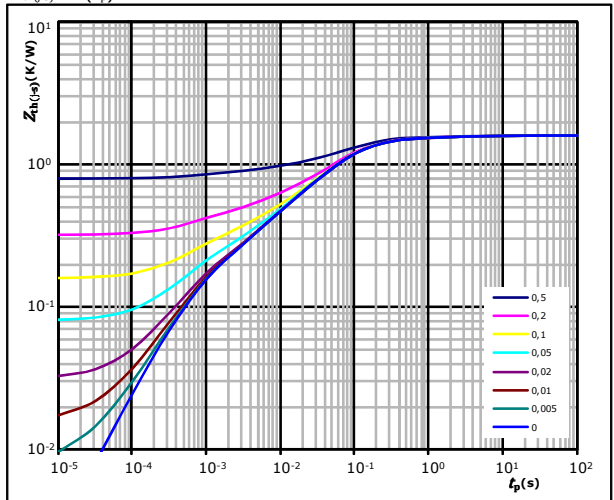


$t_p = 100 \mu s$ $T_j: 25 \text{ }^\circ C$
 $V_{CE} = 10 V$ $T_j: 125 \text{ }^\circ C$ ———
 $T_j: 150 \text{ }^\circ C$ - - - - -

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$
 $R_{th(j-s)} = 1,60 \text{ K/W}$
 IGBT thermal model values

R (K/W)	τ (s)
4,90E-02	4,40E+00
1,40E-01	5,34E-01
8,04E-01	8,02E-02
2,98E-01	2,57E-02
1,69E-01	5,09E-03
1,35E-01	6,41E-04

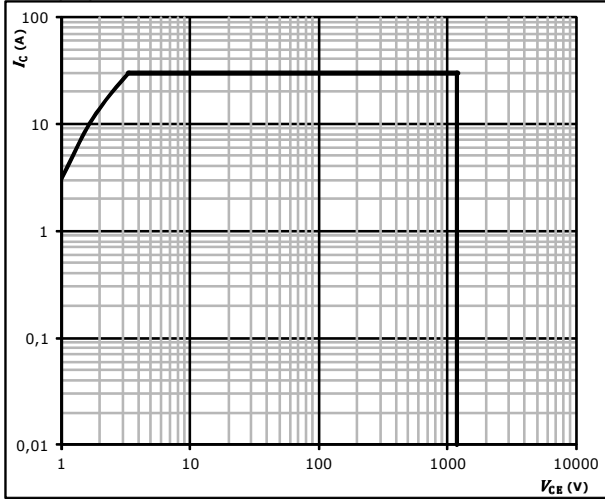


Brake Switch Characteristics

figure 5. IGBT

Safe operating area

$I_C = f(V_{CE})$



- $D =$ single pulse
- $T_s = 80$ °C
- $V_{GE} = \pm 15$ V
- $T_j = T_{jmax}$

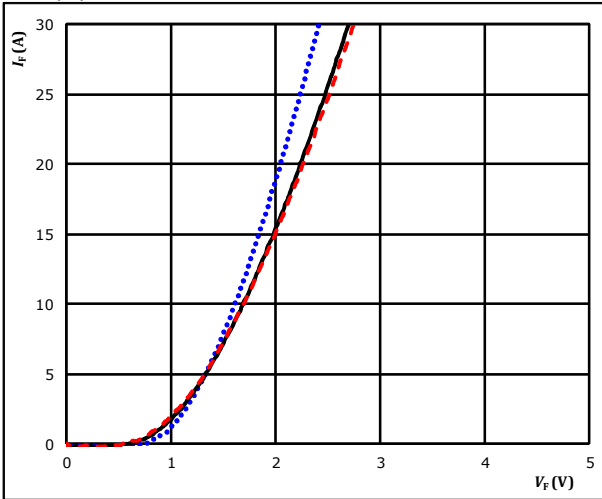


Brake Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

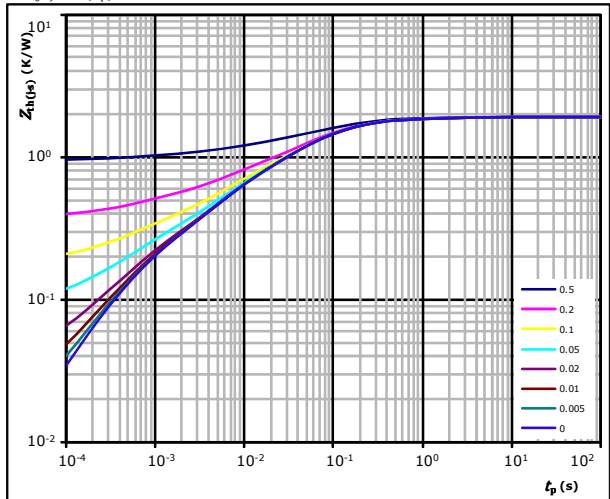


$t_p = 250 \mu\text{s}$
 T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



$$D = \frac{t_p}{T}$$

$$R_{th(j-s)} = 1,91 \text{ K/W}$$

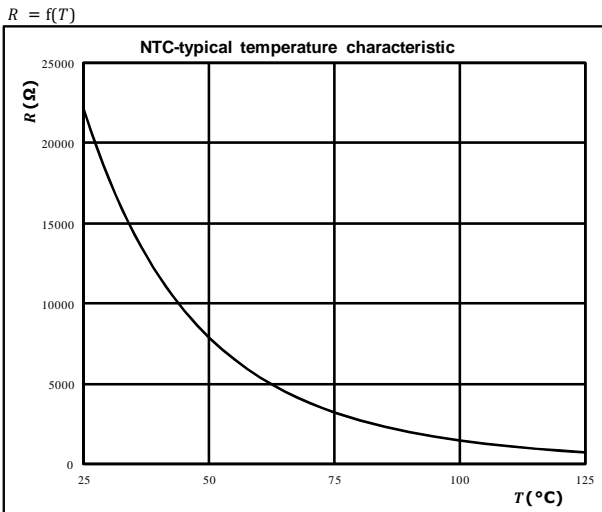
FWD thermal model values

R (K/W)	τ (s)
9,38E-02	2,25E+00
3,43E-01	2,12E-01
8,53E-01	5,82E-02
3,59E-01	9,80E-03
1,37E-01	2,88E-03
1,26E-01	4,78E-04



Thermistor Characteristics

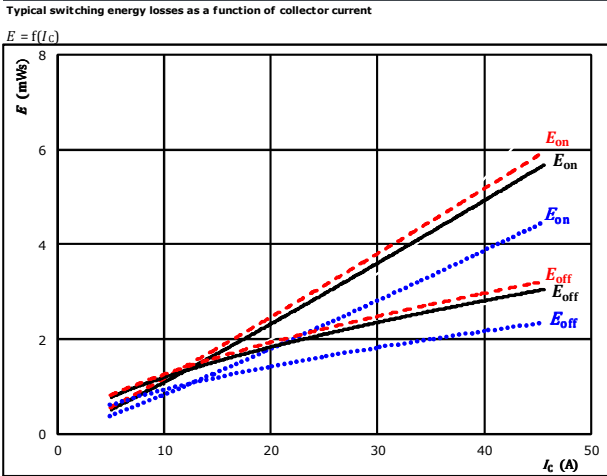
figure 1. Thermistor
Typical NTC characteristic as a function of temperature





Inverter Switching Characteristics

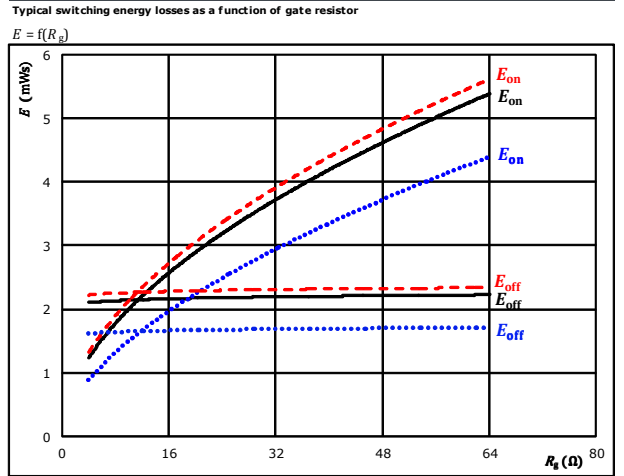
figure 1. IGBT



With an inductive load at
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 16 \text{ } \Omega$
 $R_{goff} = 16 \text{ } \Omega$

T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

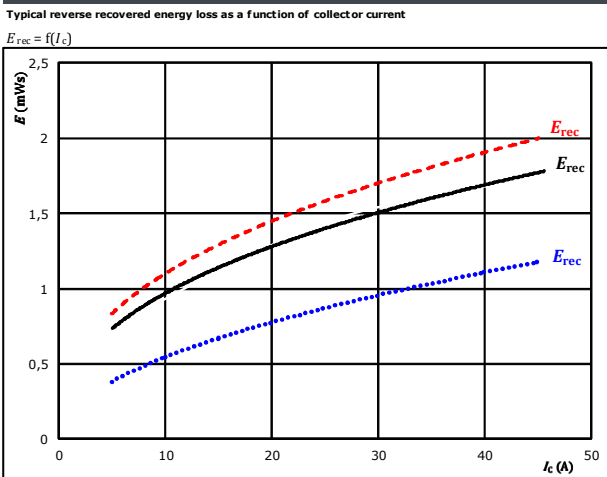
figure 2. IGBT



With an inductive load at
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 25 \text{ A}$

T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

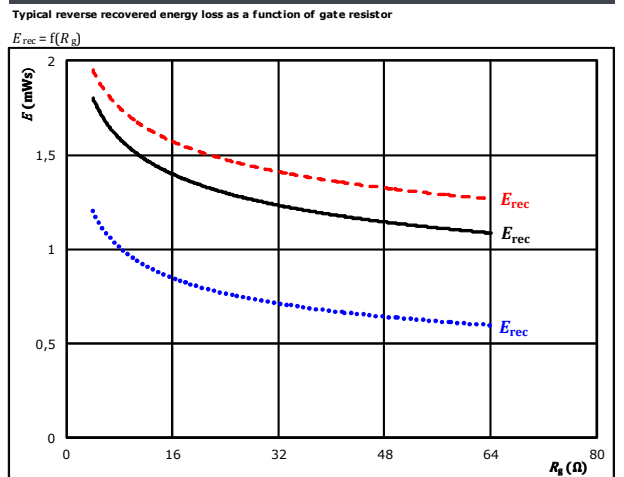
figure 3. FWD



With an inductive load at
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{gon} = 16 \text{ } \Omega$

T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

figure 4. FWD



With an inductive load at
 $V_{CE} = 600 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_c = 25 \text{ A}$

T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

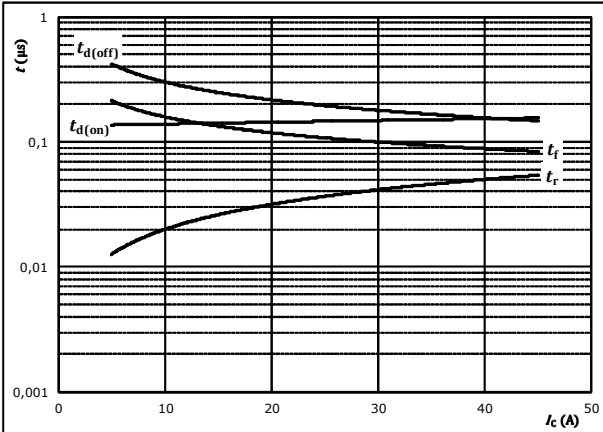


Inverter Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_c)$$



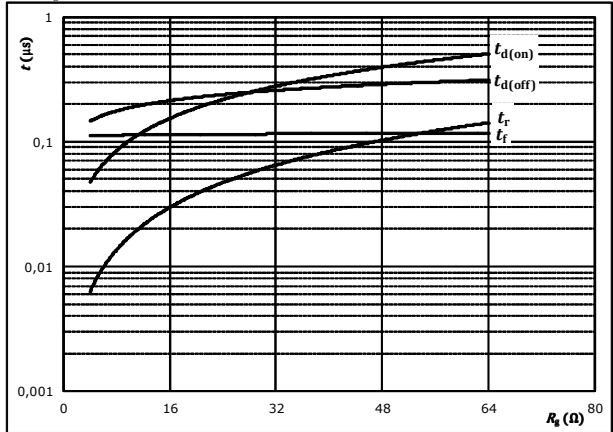
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{g(on)} =$	16	Ω
$R_{g(off)} =$	16	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



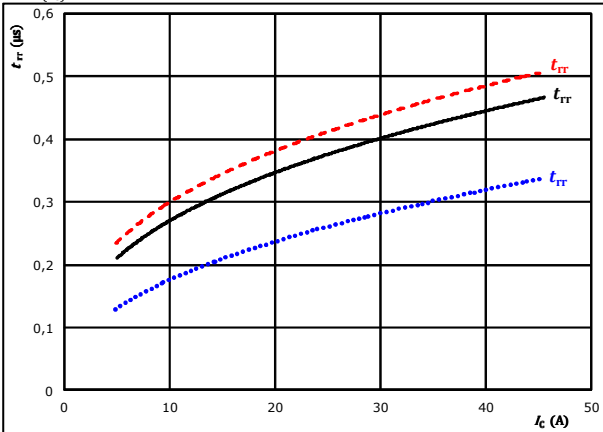
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$I_c =$	25	A

figure 7. FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_c)$$

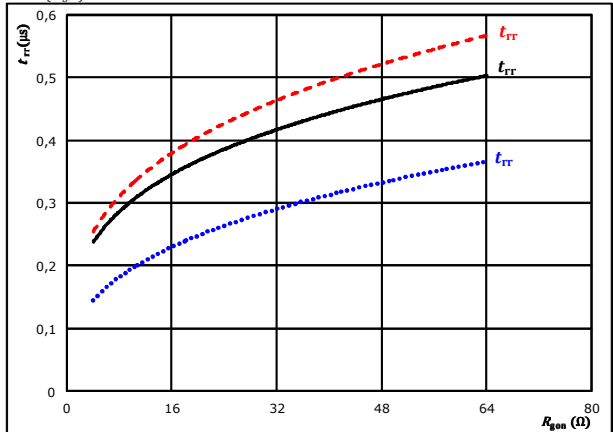


At	$V_{CE} =$	600	V	$T_j:$	25 °C
	$V_{GE} =$	±15	V		125 °C	————
	$R_{g(on)} =$	16	Ω		150 °C	-----

figure 8. FWD

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

$$t_{rr} = f(R_{g(on)})$$



At	$V_{CE} =$	600	V	$T_j:$	25 °C
	$V_{GE} =$	±15	V		125 °C	————
	$I_c =$	25	A		150 °C	-----

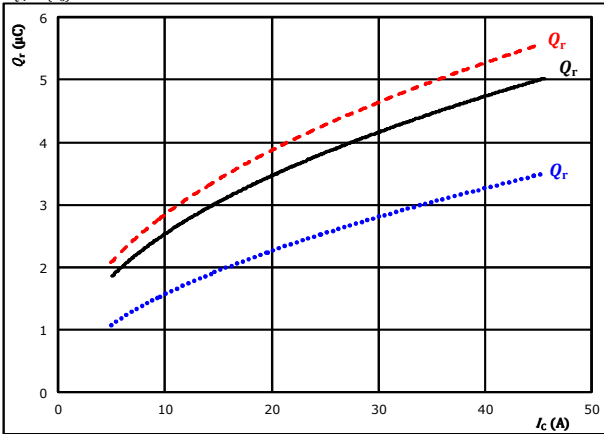


Inverter Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

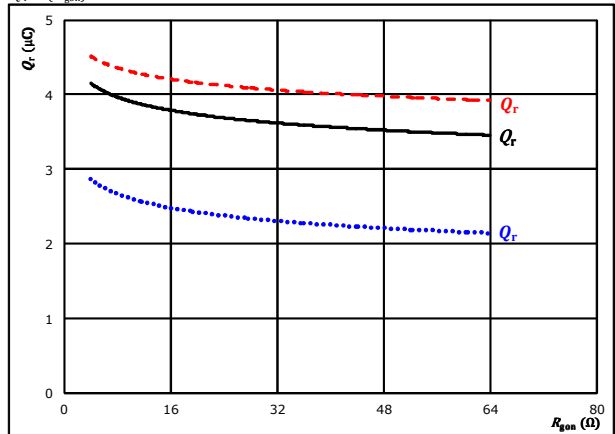


At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $R_{gdn} = 16$ Ω $T_j = 150$ °C - - - -

figure 10. FWD

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

$$Q_r = f(R_{gdn})$$

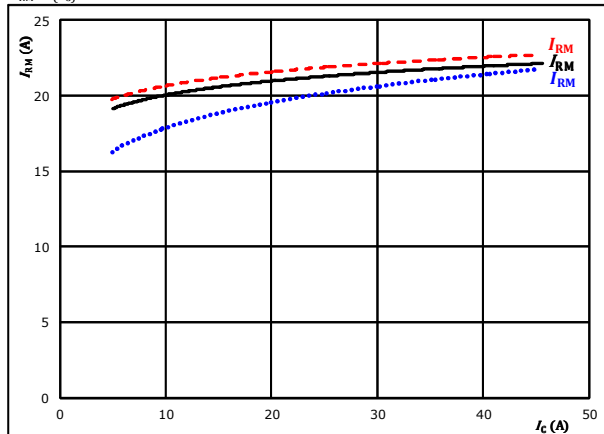


At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $I_c = 25$ A $T_j = 150$ °C - - - -

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

$$I_{RM} = f(I_c)$$

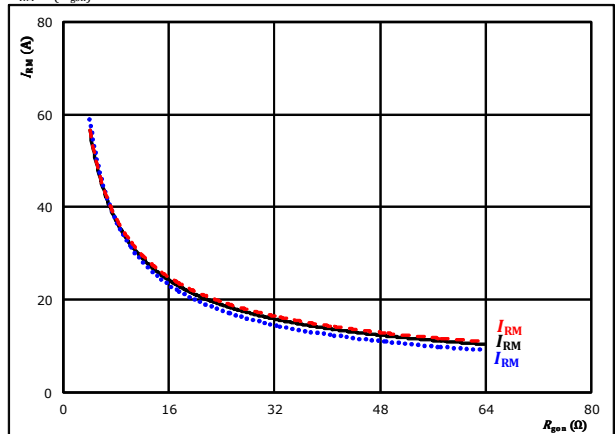


At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $R_{gdn} = 16$ Ω $T_j = 150$ °C - - - -

figure 12. FWD

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

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



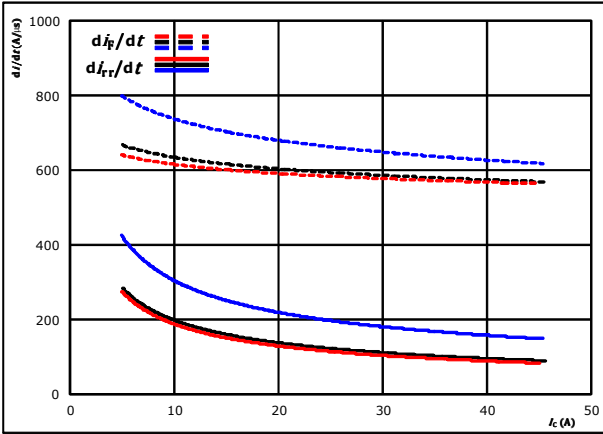
At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $I_c = 25$ A $T_j = 150$ °C - - - -



Inverter Switching Characteristics

figure 13. FWD

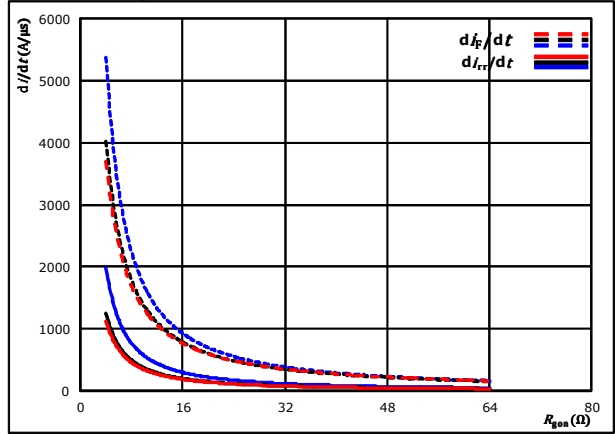
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $R_{g(on)} = 16$ Ω $T_j = 150$ °C - - - - -

figure 14. FWD

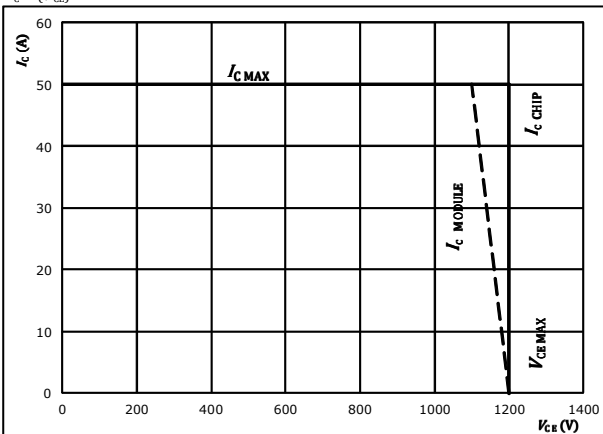
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{g(on)})$



At $V_{CE} = 600$ V $T_j = 25$ °C
 $V_{GE} = \pm 15$ V $T_j = 125$ °C ———
 $I_c = 25$ A $T_j = 150$ °C - - - - -

figure 15. IGBT

Reverse bias safe operating area
 $I_c = f(V_{CE})$



At $T_j = 175$ °C
 $R_{g(on)} = 16$ Ω
 $R_{g(off)} = 16$ Ω



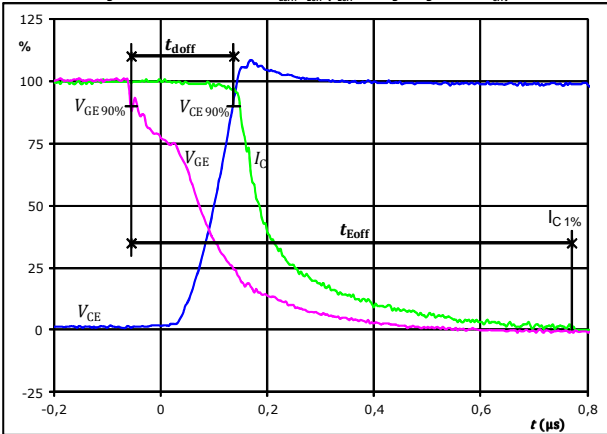
Inverter Switching Definitions

General conditions

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

figure 1. IGBT

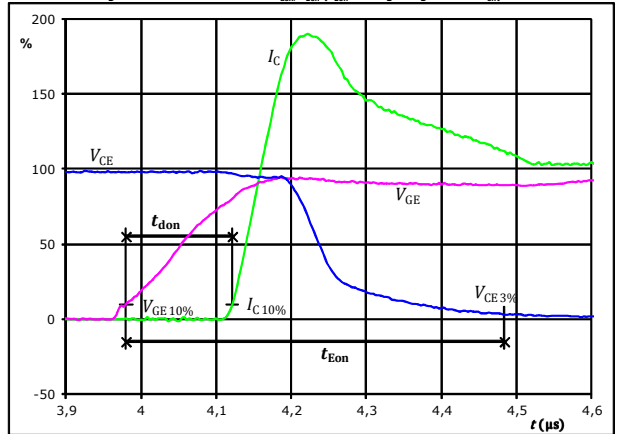
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	25	A
$t_{doff} =$	0,191	μs
$t_{Eoff} =$	0,826	μs

figure 2. IGBT

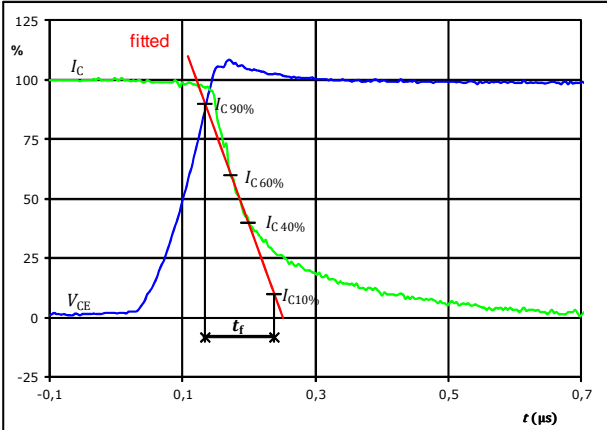
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	600	V
$I_C(100\%) =$	25	A
$t_{don} =$	0,149	μs
$t_{Eon} =$	0,504	μs

figure 3. IGBT

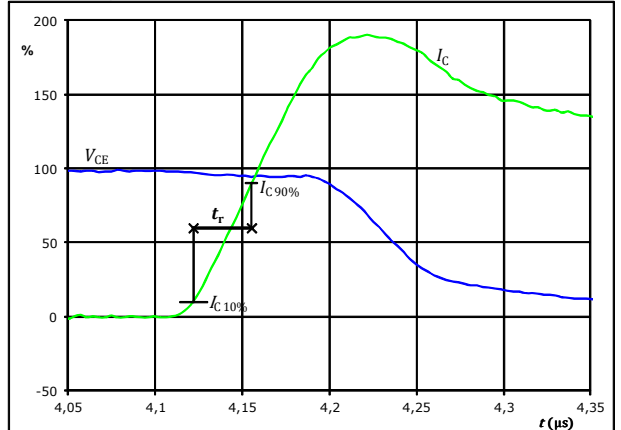
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%) =$	600	V
$I_C(100\%) =$	25	A
$t_f =$	0,110	μs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r



$V_C(100\%) =$	600	V
$I_C(100\%) =$	25	A
$t_r =$	0,033	μs

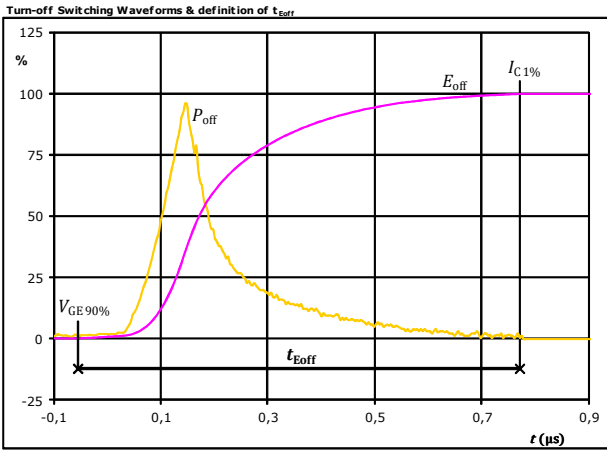


Vincotech

10-FY12PMA025M7-P588A78
10-PY12PMA025M7-P588A78Y
10-F112PMA025M7-P588A79
 datasheet

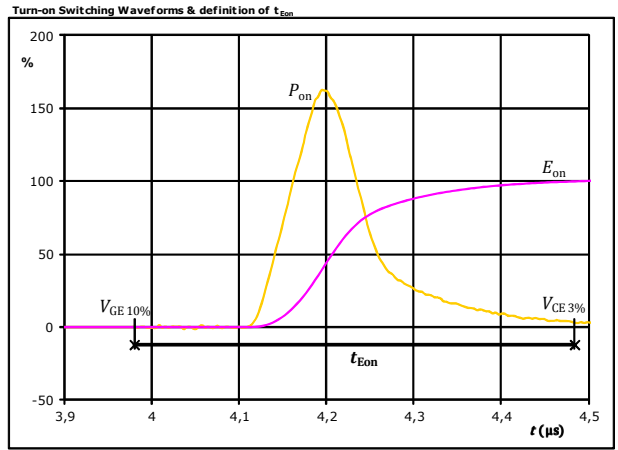
Inverter Switching Characteristics

figure 5. IGBT



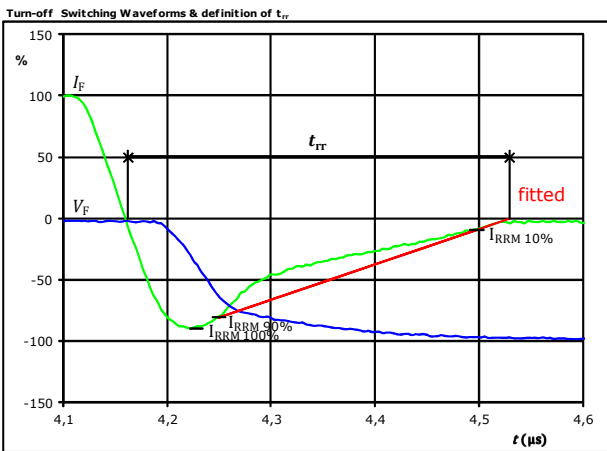
$P_{off}(100\%) =$	15,13	kW
$E_{off}(100\%) =$	2,18	mJ
$t_{Eoff} =$	0,83	µs

figure 6. IGBT



$P_{on}(100\%) =$	15,13	kW
$E_{on}(100\%) =$	2,66	mJ
$t_{Eon} =$	0,50	µs

figure 7. FWD

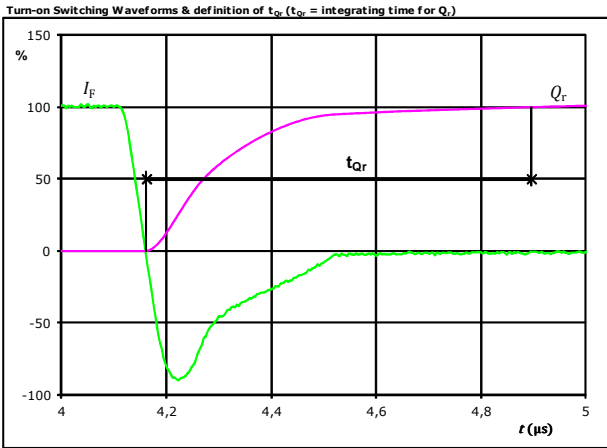


$V_F(100\%) =$	600	V
$I_F(100\%) =$	25	A
$I_{RRM}(100\%) =$	-23	A
$t_{rr} =$	0,367	µs



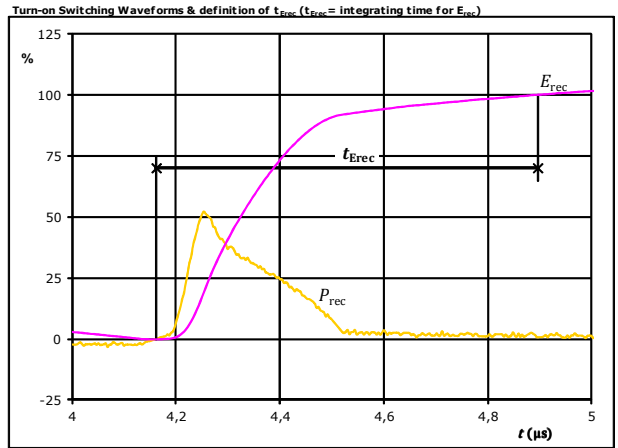
Inverter Switching Characteristics

figure 8. FWD



I_F (100%) =	25	A
Q_r (100%) =	3,88	μC
t_{Qr} =	0,73	μs

figure 9. FWD



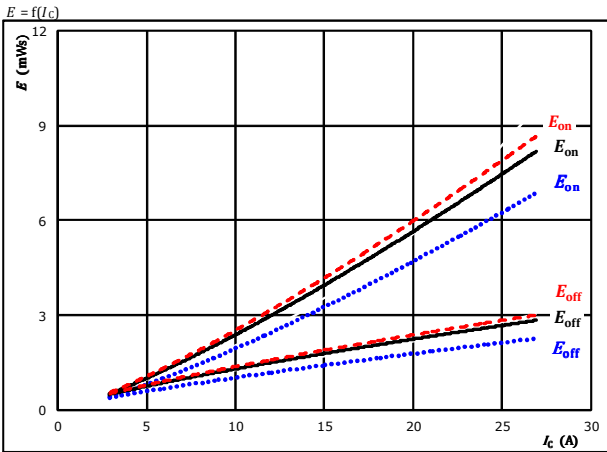
P_{rec} (100%) =	15,13	kW
E_{rec} (100%) =	1,45	mJ
t_{Erec} =	0,73	μs



Brake Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current

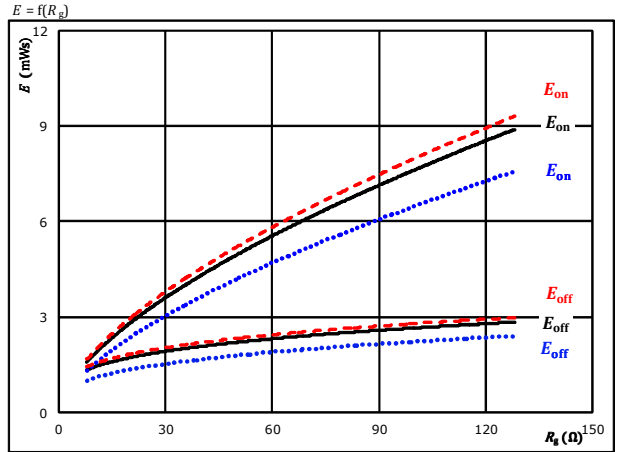


With an inductive load at
 $V_{CE} = 700$ V
 $V_{GE} = 15/0$ V
 $R_{gon} = 32$ Ω
 $R_{goff} = 32$ Ω

T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

figure 2. IGBT

Typical switching energy losses as a function of gate resistor

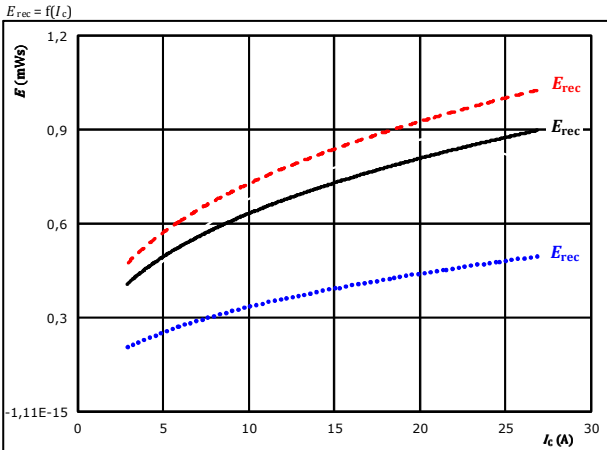


With an inductive load at
 $V_{CE} = 700$ V
 $V_{GE} = 15/0$ V
 $I_c = 15$ A

T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

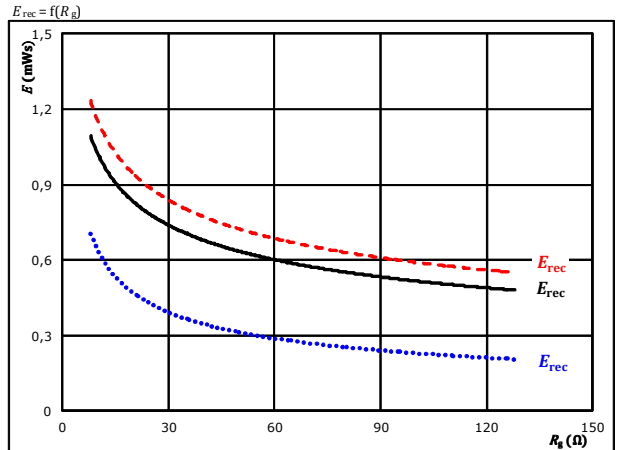


With an inductive load at
 $V_{CE} = 700$ V
 $V_{GE} = 15/0$ V
 $R_{gon} = 32$ Ω

T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at
 $V_{CE} = 700$ V
 $V_{GE} = 15/0$ V
 $I_c = 15$ A

T_j : 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)



Brake Switching Characteristics

figure 5. IGBT
 Typical switching times as a function of collector current

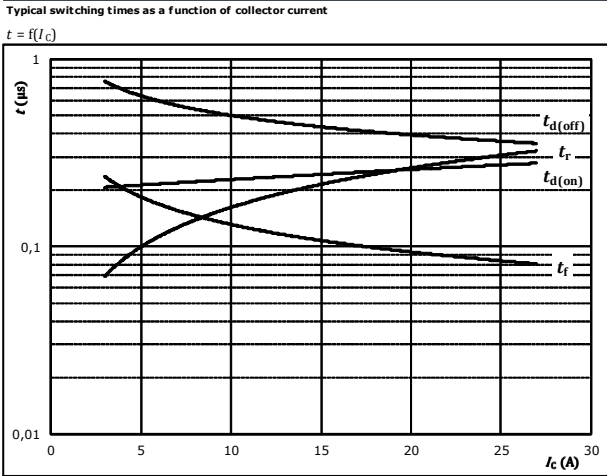


figure 6. IGBT
 Typical switching times as a function of gate resistor

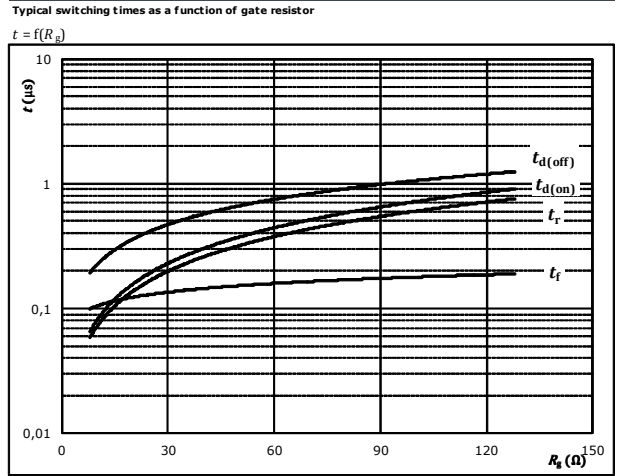


figure 7. FWD
 Typical reverse recovery time as a function of collector current

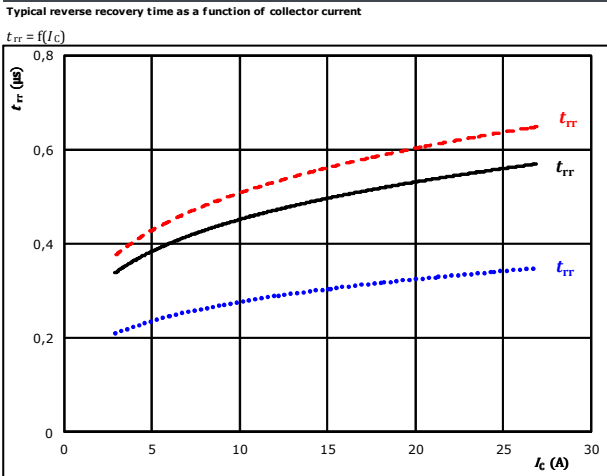
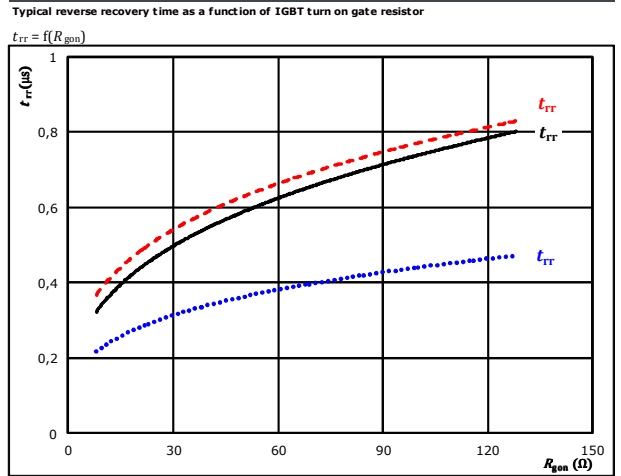


figure 8. FWD
 Typical reverse recovery time as a function of IGBT turn on gate resistor



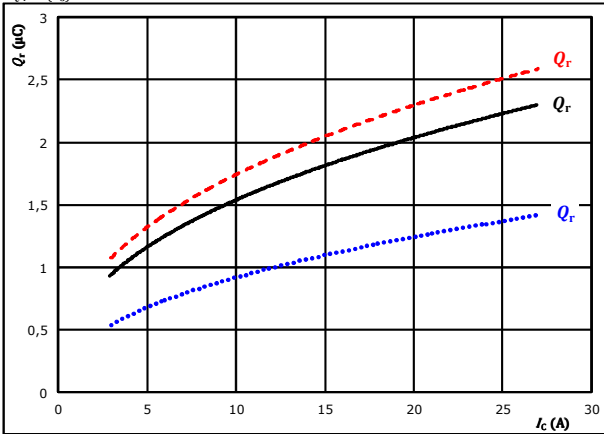


Brake Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_c)$$

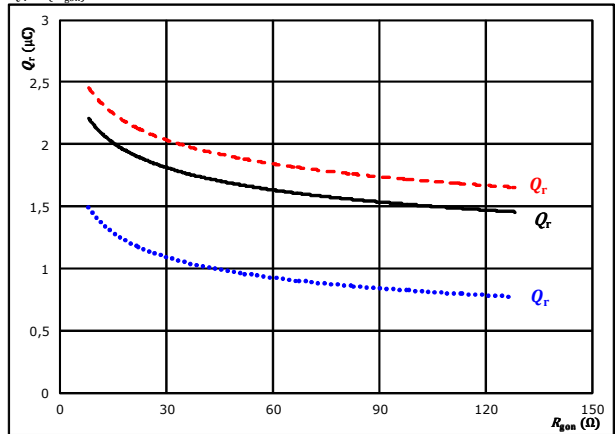


At $V_{CE} = 700$ V $T_j = 25$ °C
 $V_{GE} = 15/0$ V $T_j = 125$ °C ———
 $R_{gpn} = 32$ Ω $T_j = 150$ °C - - - -

figure 10. FWD

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

$$Q_r = f(R_{gpn})$$

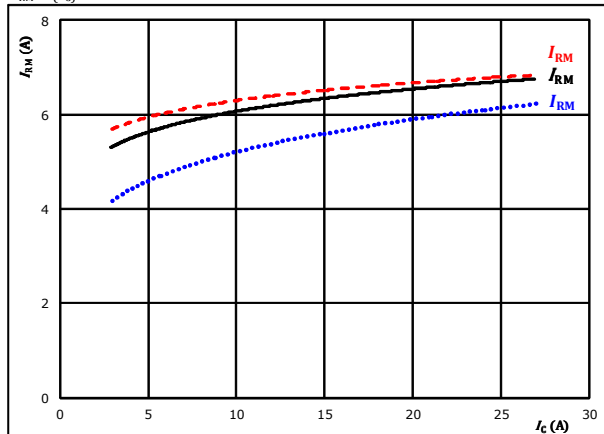


At $V_{CE} = 700$ V $T_j = 25$ °C
 $V_{GE} = 15/0$ V $T_j = 125$ °C ———
 $I_c = 15$ A $T_j = 150$ °C - - - -

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

$$I_{RM} = f(I_c)$$

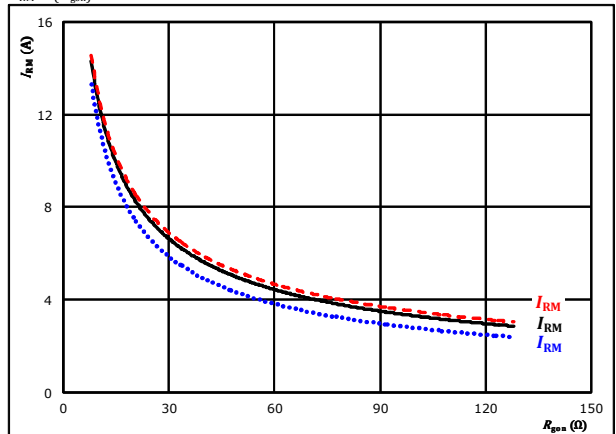


At $V_{CE} = 700$ V $T_j = 25$ °C
 $V_{GE} = 15/0$ V $T_j = 125$ °C ———
 $R_{gpn} = 32$ Ω $T_j = 150$ °C - - - -

figure 12. FWD

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

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



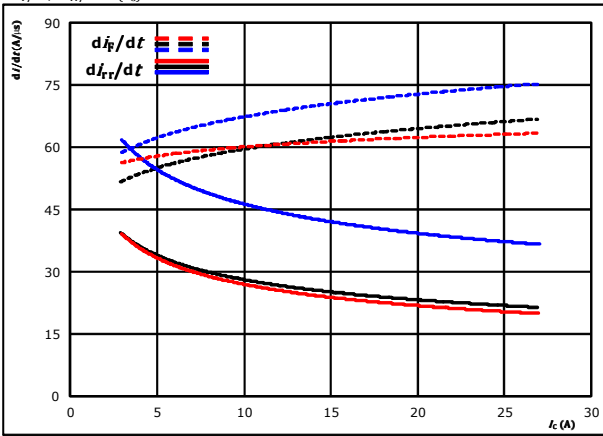
At $V_{CE} = 700$ V $T_j = 25$ °C
 $V_{GE} = 15/0$ V $T_j = 125$ °C ———
 $I_c = 15$ A $T_j = 150$ °C - - - -



Brake Switching Characteristics

figure 13. FWD

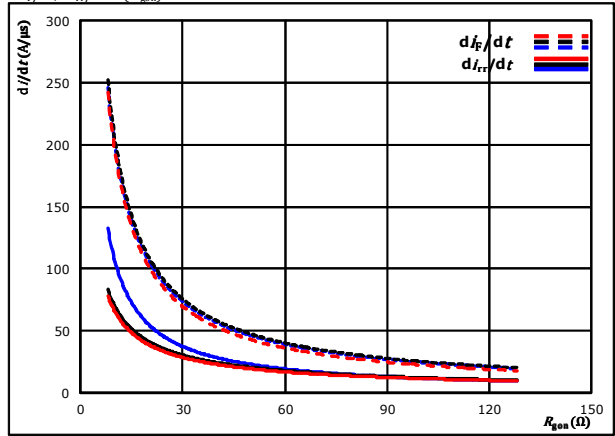
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_f/dt, di_{rr}/dt = f(I_c)$



At $V_{CE} = 700$ V $T_j = 25$ °C
 $V_{GE} = 15/0$ V $T_j = 125$ °C ———
 $R_{g0n} = 32$ Ω $T_j = 150$ °C - - - - -

figure 14. FWD

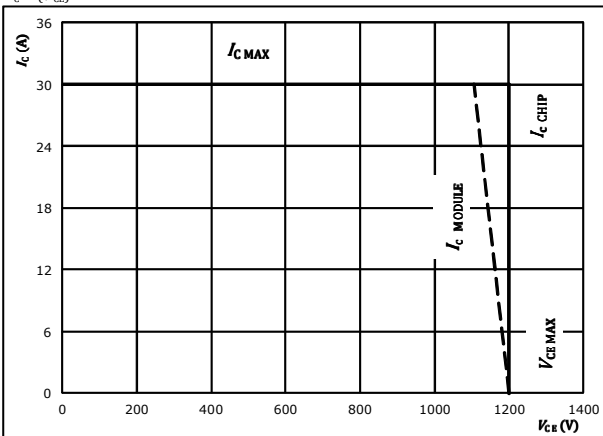
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_f/dt, di_{rr}/dt = f(R_{g0n})$



At $V_{CE} = 700$ V $T_j = 25$ °C
 $V_{GE} = 15/0$ V $T_j = 125$ °C ———
 $I_c = 15$ A $T_j = 150$ °C - - - - -

figure 15. IGBT

Reverse bias safe operating area
 $I_c = f(V_{CE})$



At $T_j = 175$ °C
 $R_{g0n} = 32$ Ω
 $R_{g0ff} = 32$ Ω



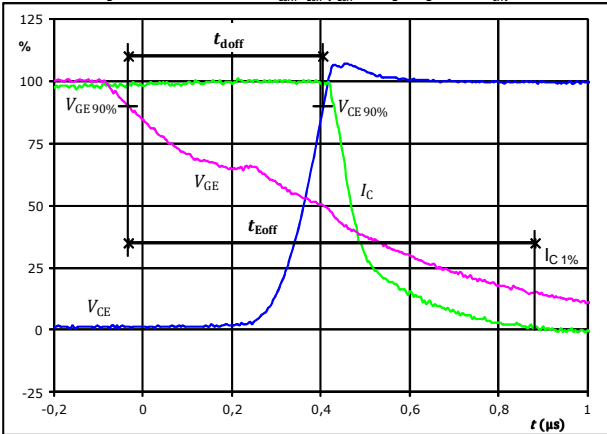
Brake Switching Definitions

General conditions

T_j	=	125 °C
R_{gon}	=	32 Ω
R_{goff}	=	32 Ω

figure 1. IGBT

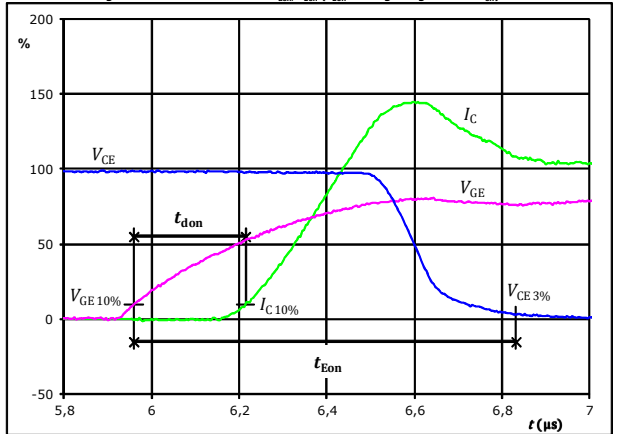
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%) =$	0	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	700	V
$I_C(100\%) =$	15	A
$t_{doff} =$	0,442	μs
$t_{Eoff} =$	0,915	μs

figure 2. IGBT

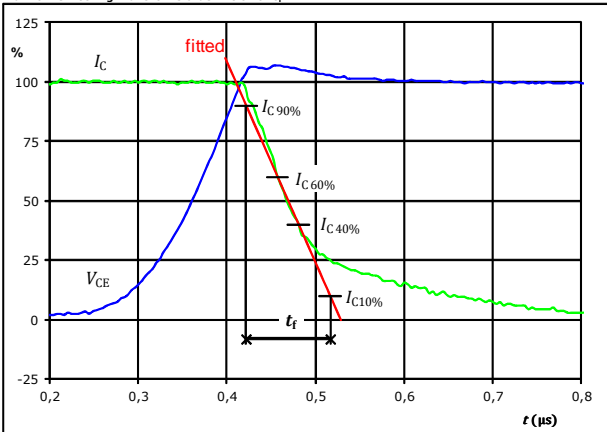
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%) =$	0	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	700	V
$I_C(100\%) =$	15	A
$t_{don} =$	0,257	μs
$t_{Eon} =$	0,872	μs

figure 3. IGBT

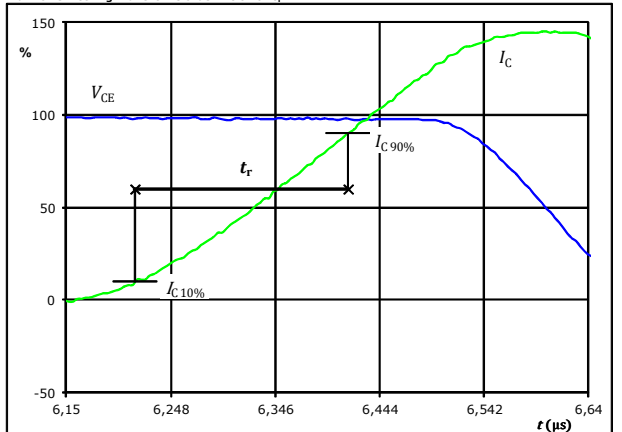
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%) =$	700	V
$I_C(100\%) =$	15	A
$t_f =$	0,088	μs

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

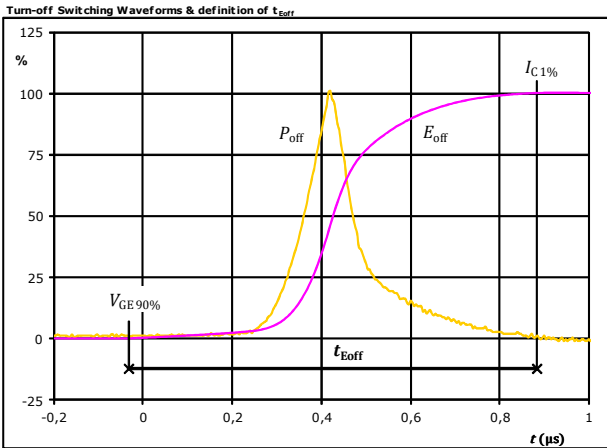


$V_C(100\%) =$	700	V
$I_C(100\%) =$	15	A
$t_r =$	0,200	μs



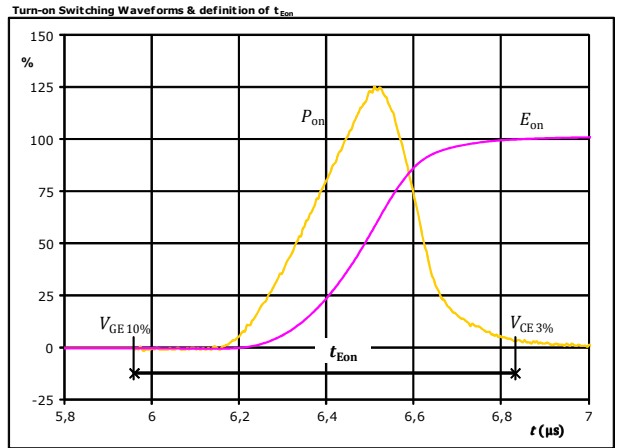
Brake Switching Characteristics

figure 5. IGBT



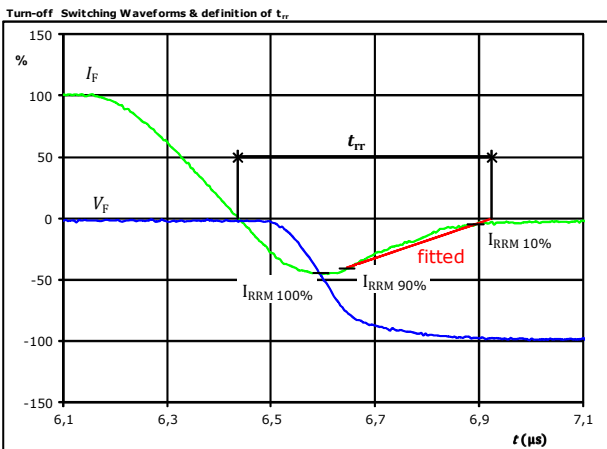
$P_{off}(100\%) = 10,55$ kW
 $E_{off}(100\%) = 1,71$ mJ
 $t_{Eoff} = 0,92$ µs

figure 6. IGBT



$P_{on}(100\%) = 10,55$ kW
 $E_{on}(100\%) = 3,57$ mJ
 $t_{Eon} = 0,87$ µs

figure 7. FWD



$V_F(100\%) = 700$ V
 $I_F(100\%) = 15$ A
 $I_{RRM}(100\%) = -7$ A
 $t_{rr} = 0,485$ µs

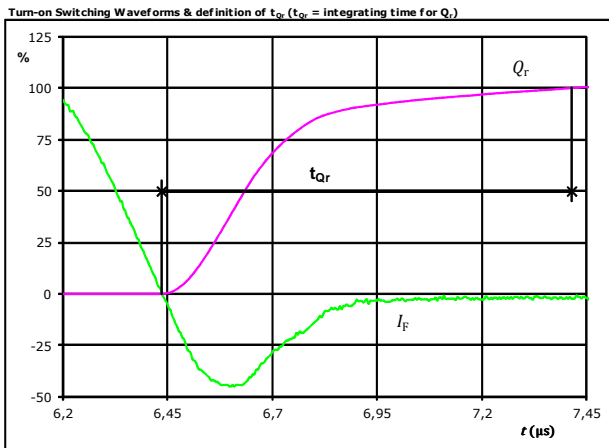


Vincotech

10-FY12PMA025M7-P588A78
10-PY12PMA025M7-P588A78Y
10-F112PMA025M7-P588A79
 datasheet

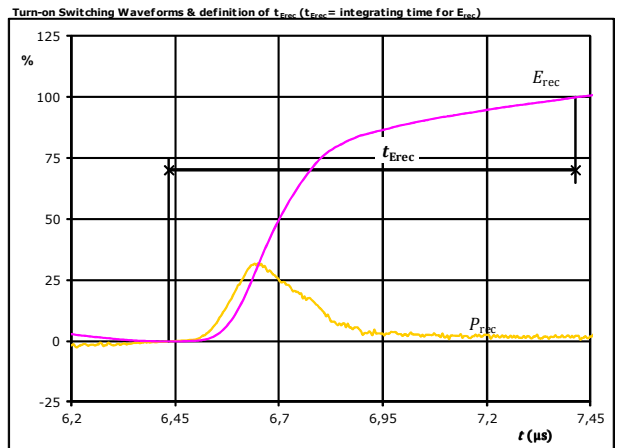
Brake Switching Characteristics

figure 8. FWD



I_F (100%) =	15	A
Q_r (100%) =	1,88	μC
t_{Qr} =	0,98	μs

figure 9. FWD



P_{rec} (100%) =	10,55	kW
E_{rec} (100%) =	0,78	mJ
t_{Erec} =	0,98	μs



Vincotech

10-FY12PMA025M7-P588A78
10-PY12PMA025M7-P588A78Y
10-F112PMA025M7-P588A79
 datasheet

Ordering Code & Marking							
Version			Ordering Code				
without thermal paste 12 mm housing with solder pins			10-FY12PMA025M7-P588A78				
with thermal paste 12 mm housing with press-fit pins			10-PY12PMA025M7-P588A78Y-/3/				
without thermal paste 17 mm housing with solder pins			10-F112PMA025M7-P588A79				
NN-NNNNNNNNNNNN TTTTIVVWWYY UL VIN LLLLL SSSS		Text	Name	Date code	UL & VIN	Lot	Serial
			NN-NNNNNNNNNNNN-TTTTIVV	WWYY	UL VIN	LLLLL	SSSS
		Datamatrix	Type&Ver	Lot number	Serial	Date code	
			TTTTIVV	LLLLL	SSSS	WWYY	

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

Outline

P588A79
 Dimensions: Pin pitch 1 ±0.05, Housing height 21.2 ±0.5

P588A78Y
 Dimensions: Pin pitch 1 ±0.05, Housing height 12.93 ±0.1, Total height 16.2 ±0.5. Note: center of press-fit pinhead for connection parameter see the handling instruction

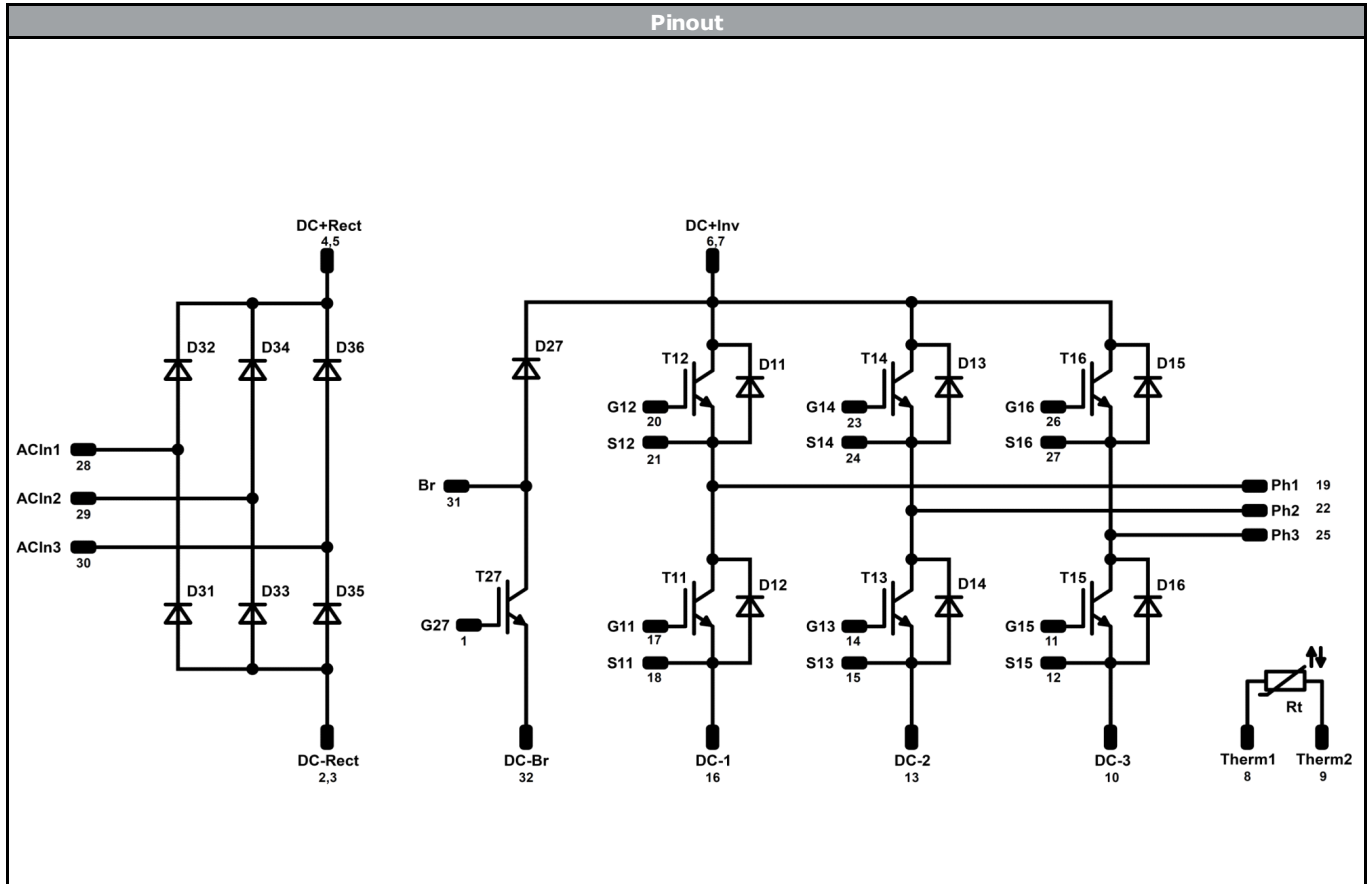
P588A78
 Dimensions: Pin diameter Ø 1 ±0.05, Housing height 16.2 ±0.5

Tolerance of pinpositions: ±0.5mm at the end of pins
 Dimension of coordinate axis is only offset without tolerance



Vincotech

10-FY12PMA025M7-P588A78
10-PY12PMA025M7-P588A78Y
10-F112PMA025M7-P588A79
 datasheet




Identification					
ID	Component	Voltage	Current	Function	Comment
D31, D32, D33, D34, D35, D36	Rectifier	1600 V	35 A	Rectifier Diode	
T11, T12, T13, T14, T15, T16	IGBT	1200 V	25 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	25 A	Inverter Diode	
T27	IGBT	1200 V	15 A	Brake Switch	
D27	FWD	1200 V	10 A	Brake Diode	
Rt	NTC			Thermistor	



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

Handling instruction
Handling instructions for <i>flow</i> 1 packages see vincotech.com website.

Package data
Package data for <i>flow</i> 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-xY12PMA025M7-P588A7xx-D2-14	14 Feb. 2018		

DISCLAIMER

The information, specifications, procedures, methods and recommendations herein (together "information") are presented by Vincotech to reader in good faith, are believed to be accurate and reliable, but may well be incomplete and/or not applicable to all conditions or situations that may exist or occur. Vincotech reserves the right to make any changes without further notice to any products to improve reliability, function or design. No representation, guarantee or warranty is made to reader as to the accuracy, reliability or completeness of said information or that the application or use of any of the same will avoid hazards, accidents, losses, damages or injury of any kind to persons or property or that the same will not infringe third parties rights or give desired results. It is reader's sole responsibility to test and determine the suitability of the information and the product for reader's intended use.

LIFE SUPPORT POLICY

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

As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, or (c) whose failure to perform when properly used in accordance with instructions for use provided in labelling can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.