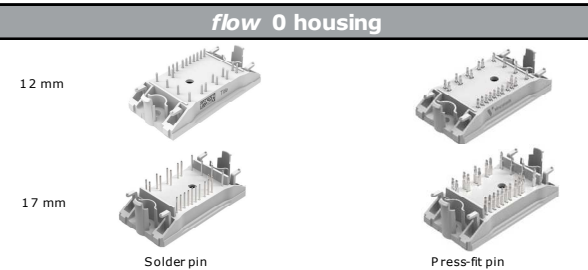
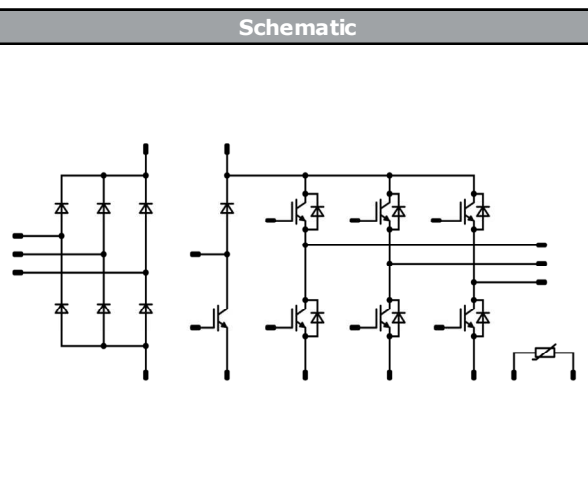




Vincotech

10-xZ12PMA015M7-P840A28x
10-x012PMA015M7-P840A29x
datasheet

flow PIM 0		1200 V / 15 A
Features • IGBT M7 with low V_{CEsat} and improved EMC behavior • Open emitter configuration • Compact and low inductive design • Builtin NTC		flow 0 housing  Solder pin Press-fit pin
Target applications • Industrial Drives		Schematic 
Types • 10-FZ12PMA015M7-P840A28 • 10-F012PMA015M7-P840A29 • 10-PZ12PMA015M7-P840A28Y • 10-P012PMA015M7-P840A29Y		

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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	25	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave $t_p = 10\text{ ms}$ $T_j = 150\text{ °C}$	200	A
Surge current capability	I^2t		200	A ² s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	44	W
Maximum Junction Temperature	T_{jmax}		150	°C



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 datasheet

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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	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

Inverter Diode				
Peak repetitive reverse voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	15	A
Repetitive peak forward current	I_{FRM}		30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	45	W
Maximum junction temperature	T_{jmax}		175	°C

Brake Switch				
Collector-emitter voltage	V_{CES}		1200	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	10	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	55	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	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	5	A
Repetitive peak forward current	I_{FRM}		10	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80\text{ °C}$	27	W
Maximum junction temperature	T_{jmax}		175	°C



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datasheet

Maximum Ratings

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

Parameter	Symbol	Condition	Value	Unit
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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			min. 12,7	mm
Clearance		Solder pin 12 mm housing / 17 mm housing	9,29 / 12,7	mm
		Press-fit pin 12 mm housing / 17 mm housing	9,48 / 12,7	
Comparative Tracking Index	CTI		> 200	

*100 % tested in production



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10-x012PMA015M7-P840A29x
 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				25	25 125		1,22 1,21	1,8	V
Reverse leakage current	I_r			1600		25 145			50 1100	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						1,59		K/W
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Inverter Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			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}		0	10		25		2900		pF
Output capacitance	C_{oes}							120		
Reverse transfer capacitance	C_{res}							34		
Gate charge	Q_g		15	600	15	25		110		nC

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						1,60		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{goff} = 32 \Omega$ $R_{gon} = 32 \Omega$	±15	600	15	25 150		176 174		ns
Rise time	t_r					25 150		43 48		
Turn-off delay time	$t_{d(off)}$					25 150		191 218		
Fall time	t_f					25 150		119 127		
Turn-on energy (per pulse)	E_{on}	$Q_{rFWD} = 1,5 \mu C$ $Q_{rFWD} = 2,6 \mu C$				25 150		1,548 2,008		mWs
Turn-off energy (per pulse)	E_{off}					25 150		0,925 1,322		



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 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	

Inverter Diode

Static

Forward voltage	V_F				15	25 125		1,63 1,74	2,1	V
Reverse leakage current	I_R			1200		25			30	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						2,11		K/W
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Dynamic

Peak recovery current	I_{RRM}	$di/dt = 293 \text{ A/}\mu\text{s}$ $di/dt = 244 \text{ A/}\mu\text{s}$	± 15	600	15	25 150		11 12		A
Reverse recovery time	t_{rr}					25 150		265 423		ns
Recovered charge	Q_r					25 150		1,549 2,592		μC
Reverse recovered energy	E_{rec}					25 150		0,488 0,938		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		92 52		A/μs



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10-x012PMA015M7-P840A29x
 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	

Brake Switch

Static

Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE} = V_{CE}$			0,001	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}		15		10	25 125 150		1,66 1,90 1,96	2,15	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			35	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			2000		pF
Output capacitance	C_{oes}							86		
Reverse transfer capacitance	C_{res}							23		
Gate charge	Q_g		15	600	10	25		80		nC

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK (PSX)}$						1,72		K/W
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Dynamic

Turn-on delay time	$t_{d(on)}$	$R_{goff} = 64 \Omega$ $R_{gon} = 64 \Omega$	15/0	700	10	25 125 150		124 115 112		ns
Rise time	t_r					25 125 150		66 73 74		
Turn-off delay time	$t_{d(off)}$					25 125 150		353 386 395		
Fall time	t_f					25 125 150		94 113 118		
Turn-on energy (per pulse)	E_{on}					25 125 150		1,265 1,536 1,581		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,822 1,087 1,140		



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 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	

Brake Diode

Static

Forward voltage	V_F			5	25 125			1,57 1,65	2,1	V
Reverse leakage current	I_R			1200	25				20	μA

Thermal

Thermal resistance junction to sink	$R_{th(j-s)}$	$\lambda_{paste} = 3,4 \text{ W/mK}$ (PSX)						3,50		K/W
-------------------------------------	---------------	---	--	--	--	--	--	------	--	-----

Dynamic

Peak recovery current	I_{RRM}	$\frac{di}{dt} = 118 \text{ A/}\mu\text{s}$ $\frac{di}{dt} = 104 \text{ A/}\mu\text{s}$ $\frac{di}{dt} = 106 \text{ A/}\mu\text{s}$	15/0	700	10	25 125 150		5 5 5		A
Reverse recovery time	t_{rr}					25 125 150		291 419 463		ns
Recovered charge	Q_r					25 125 150		0,761 1,136 1,275		μC
Reverse recovered energy	E_{rec}					25 125 150		0,296 0,483 0,557		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		25 19 19		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. $\pm 1 \%$				25		3962		K
B-value	$B_{(25/100)}$	Tol. $\pm 1 \%$				25		4000		K
Vincotech NTC Reference									I	



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 datasheet

Rectifier Diode Characteristics

figure 1. FWD
 Typical forward characteristics

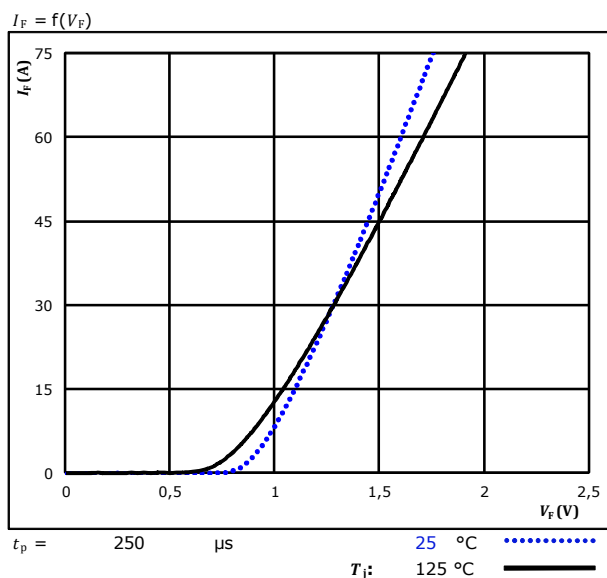
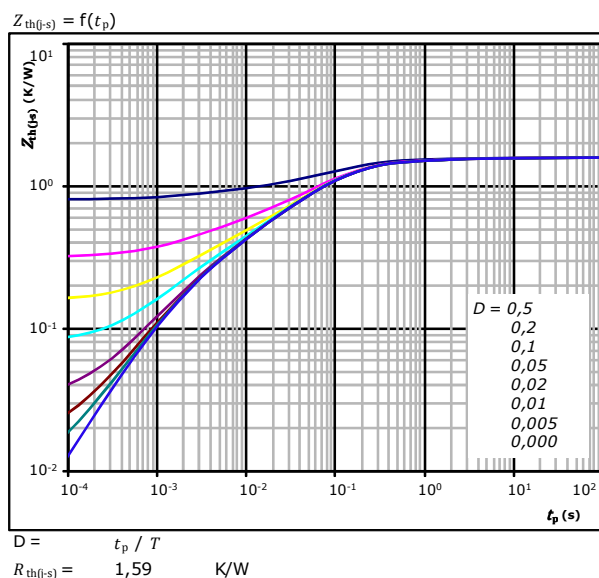


figure 2. FWD
 Transient thermal impedance as a function of pulse width



Diode thermal model values

$R \text{ (K/W)}$	$\tau \text{ (s)}$
3,44E-02	9,66E+00
1,12E-01	1,22E+00
5,81E-01	1,45E-01
4,89E-01	5,05E-02
2,38E-01	9,26E-03
1,22E-01	1,79E-03
1,22E-01	1,79E-03



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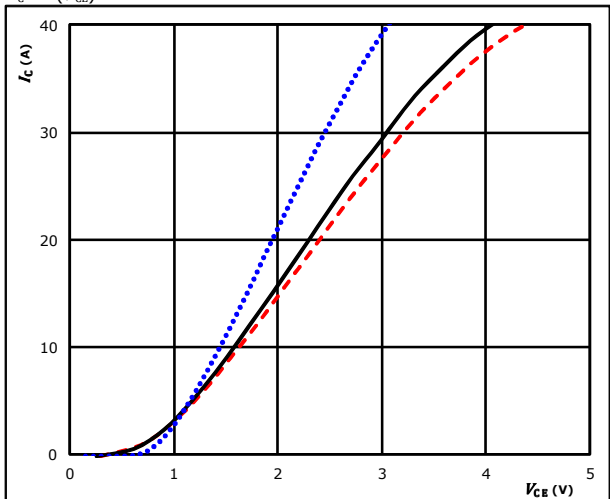
10-xZ12PMA015M7-P840A28x 10-x012PMA015M7-P840A29x datasheet

Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics

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

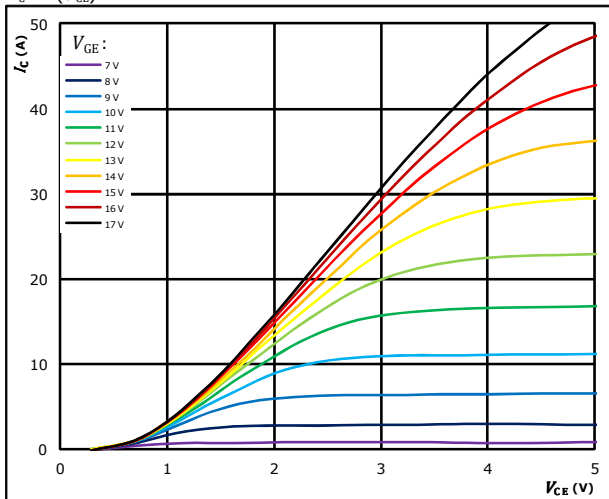


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j: 25 \text{ } ^\circ C$ (blue dotted line)
 $125 \text{ } ^\circ C$ (black solid line)
 $150 \text{ } ^\circ C$ (red dashed line)

figure 2. IGBT

Typical output characteristics

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

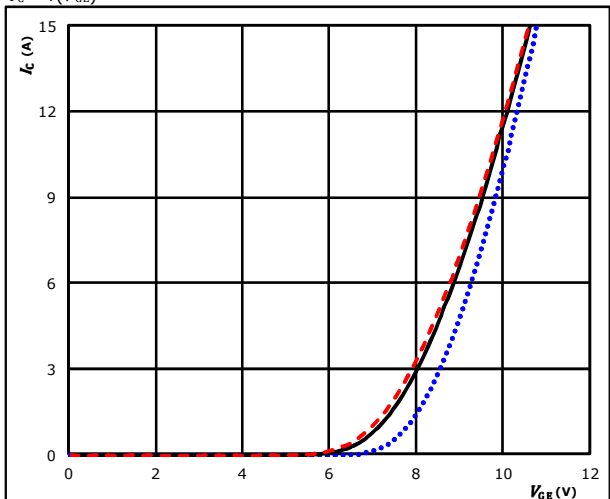


$t_p = 250 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

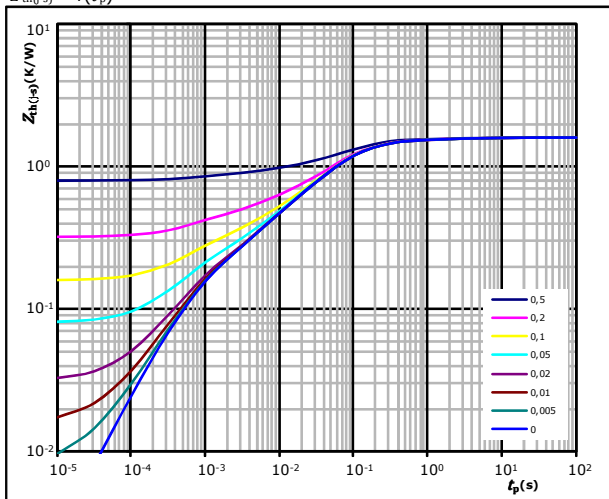


$t_p = 100 \mu s$
 $V_{CE} = 10 V$
 $T_j: 25 \text{ } ^\circ C$ (blue dotted line)
 $125 \text{ } ^\circ C$ (black solid line)
 $150 \text{ } ^\circ C$ (red dashed line)

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



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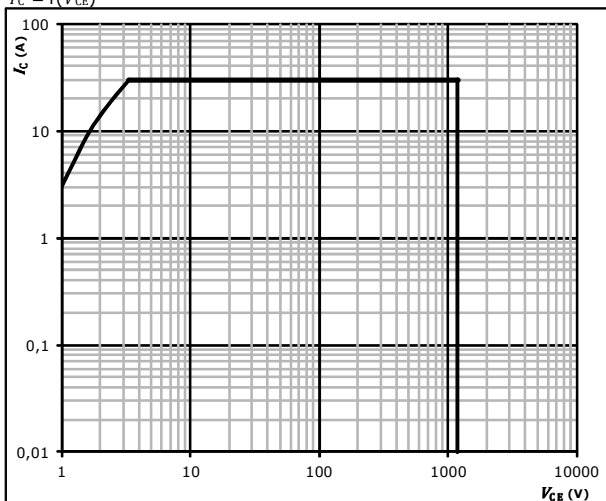
10-xZ12PMA015M7-P840A28x
10-x012PMA015M7-P840A29x
datasheet

Inverter Switch Characteristics

figure 5. IGBT

Safe operating area

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



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



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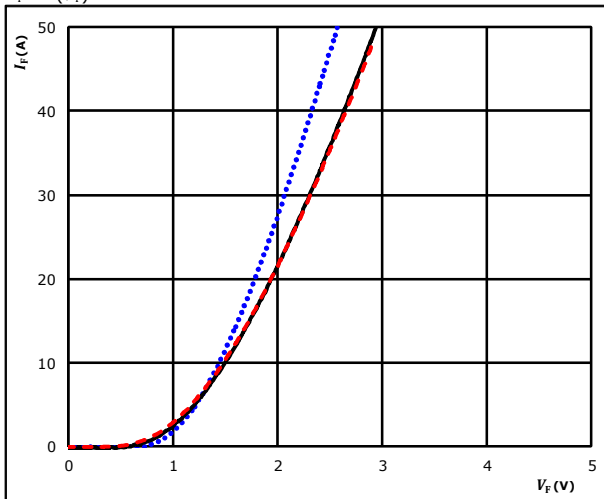
10-xZ12PMA015M7-P840A28x
10-x012PMA015M7-P840A29x
 datasheet

Inverter Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

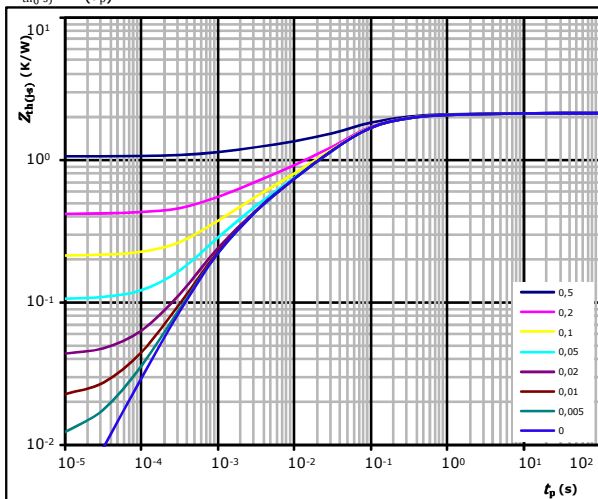


$t_p =$ 250 μ s
 T_j : 25 °C
 125 °C ———
 150 °C - - - -

figure 2. FWD

Transient thermal impedance as a function of pulse width

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



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

$$R_{th(j-s)} = 2,11 \text{ K/W}$$

FWD thermal model values

R (K/W)	τ (s)
8,99E-02	2,33E+00
4,04E-01	1,91E-01
1,05E+00	4,49E-02
3,39E-01	6,08E-03
2,29E-01	1,02E-03



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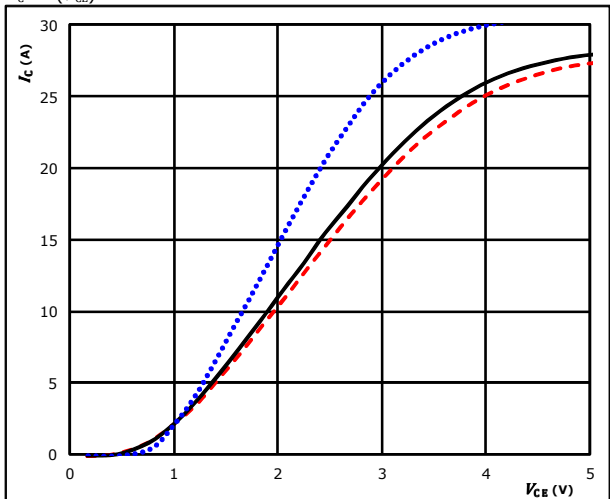
10-xZ12PMA015M7-P840A28x 10-x012PMA015M7-P840A29x datasheet

Brake Switch Characteristics

figure 1. IGBT

Typical transfer characteristics

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

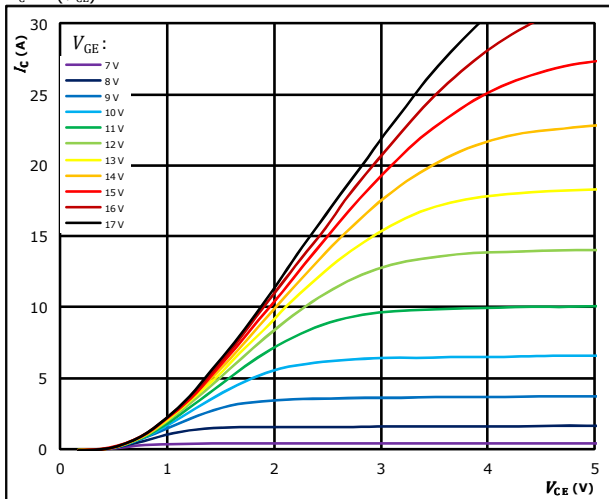


$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $T_j: 25 \text{ } ^\circ C$ (dotted blue)
 $125 \text{ } ^\circ C$ (solid black)
 $150 \text{ } ^\circ C$ (dashed red)

figure 2. IGBT

Typical output characteristics

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

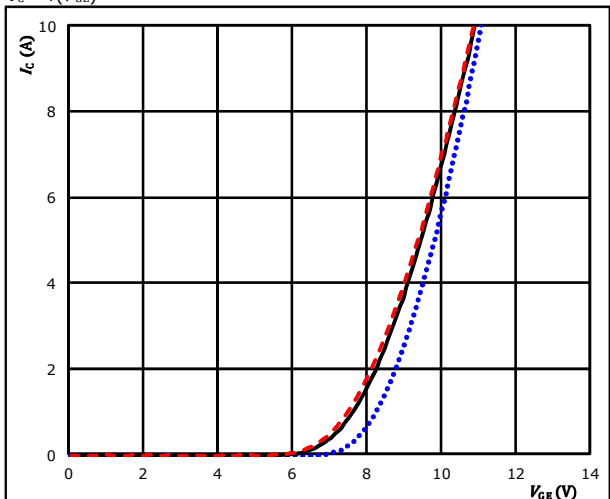


$t_p = 250 \mu s$
 $T_j = 150 \text{ } ^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

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

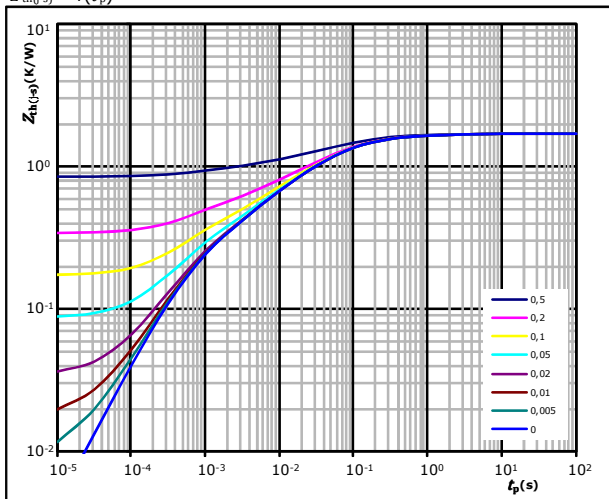


$t_p = 100 \mu s$
 $V_{CE} = 10 V$
 $T_j: 25 \text{ } ^\circ C$ (dotted blue)
 $125 \text{ } ^\circ C$ (solid black)
 $150 \text{ } ^\circ C$ (dashed red)

figure 4. IGBT

Transient thermal impedance as function of pulse duration

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



$D = t_p / T$
 $R_{th(j-s)} = 1,72 \text{ K/W}$
IGBT thermal model values

R (K/W)	τ (s)
8,08E-02	2,32E+00
2,21E-01	2,45E-01
6,51E-01	6,03E-02
3,93E-01	1,33E-02
1,95E-01	3,15E-03
1,82E-01	5,45E-04



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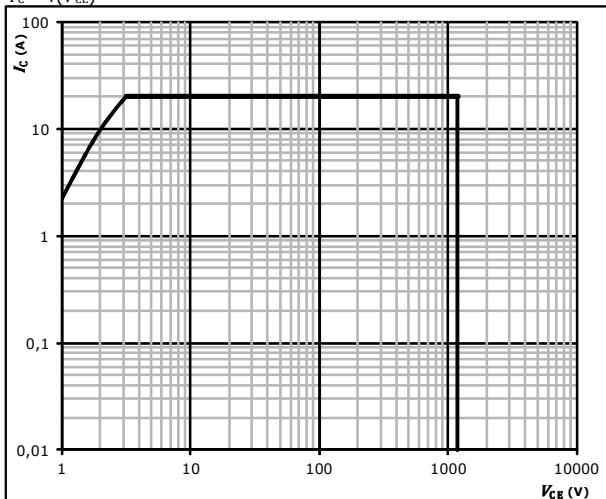
10-xZ12PMA015M7-P840A28x
10-x012PMA015M7-P840A29x
datasheet

Brake Switch Characteristics

figure 5. IGBT

Safe operating area

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



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



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 datasheet

Brake Diode Characteristics

figure 1. FWD

Typical forward characteristics

$$I_F = f(V_F)$$

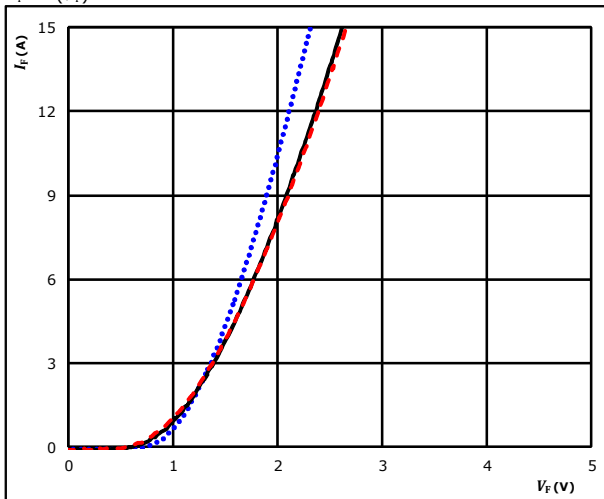
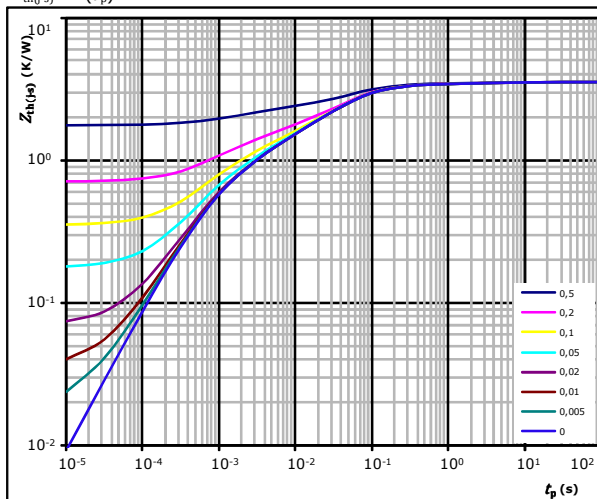


figure 2. FWD

Transient thermal impedance as a function of pulse width

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



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

$$R_{th(j-s)} = 3,50 \text{ K/W}$$

FWD thermal model values

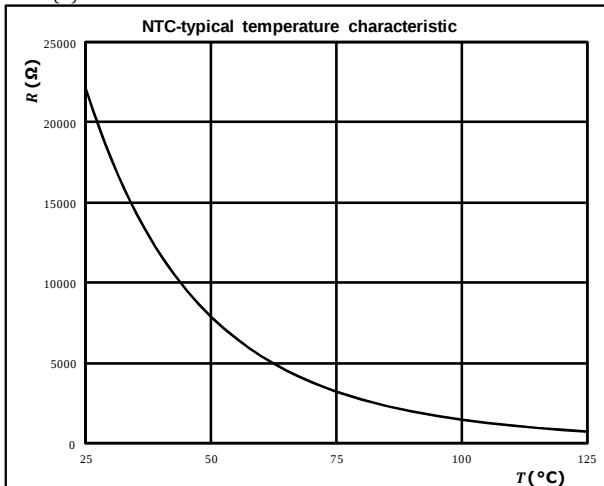
R (K/W)	τ (s)
8,03E-02	7,23E+00
2,34E-01	4,70E-01
1,33E+00	6,36E-02
7,92E-01	2,24E-02
5,71E-01	3,34E-03
4,85E-01	7,05E-04

Thermistor Characteristics

figure 1. Thermistor

Typical NTC characteristic
 as a function of temperature

$$R = f(T)$$





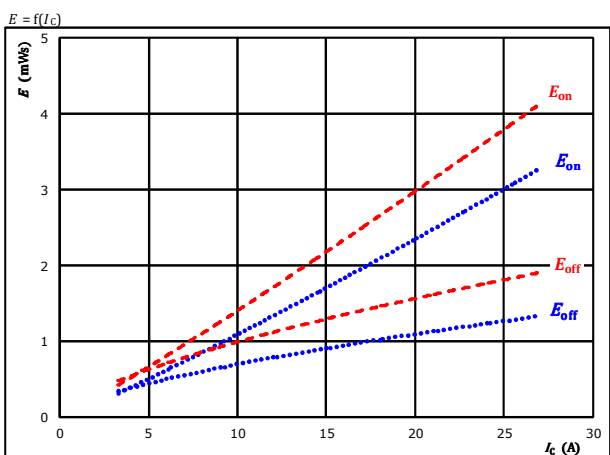
Vincotech

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Inverter Switching Characteristics

figure 1. IGBT

Typical switching energy losses as a function of collector current



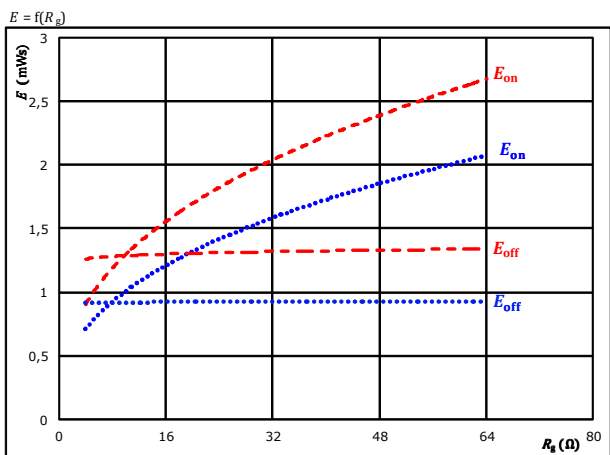
With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 32$ Ω
 $R_{goff} = 32$ Ω

T_j : 25 °C (blue dotted)
150 °C (red dashed)

figure 2. IGBT

Typical switching energy losses as a function of gate resistor



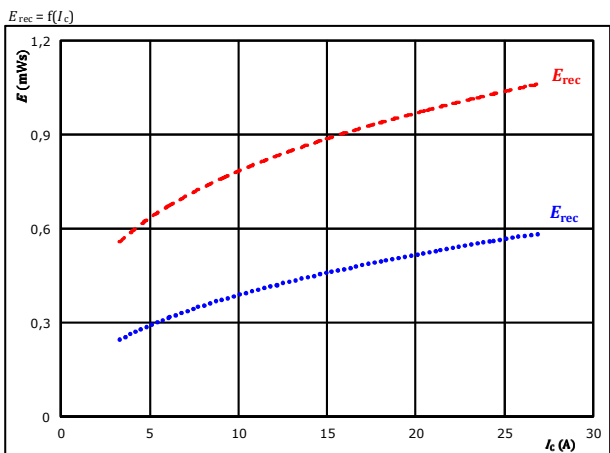
With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 15$ A

T_j : 25 °C (blue dotted)
150 °C (red dashed)

figure 3. FWD

Typical reverse recovered energy loss as a function of collector current



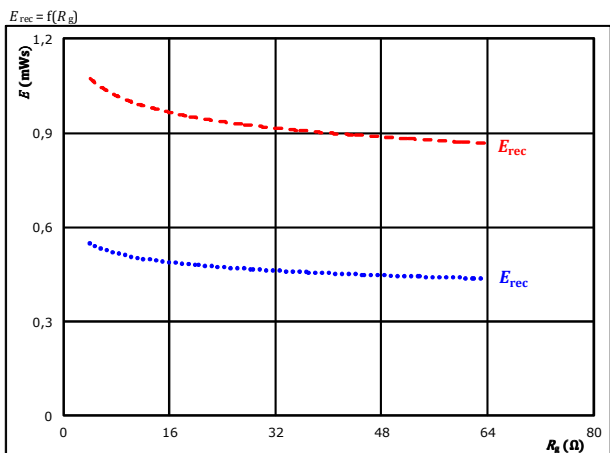
With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 32$ Ω

T_j : 25 °C (blue dotted)
150 °C (red dashed)

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at

$V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 15$ A

T_j : 25 °C (blue dotted)
150 °C (red dashed)



Vincotech

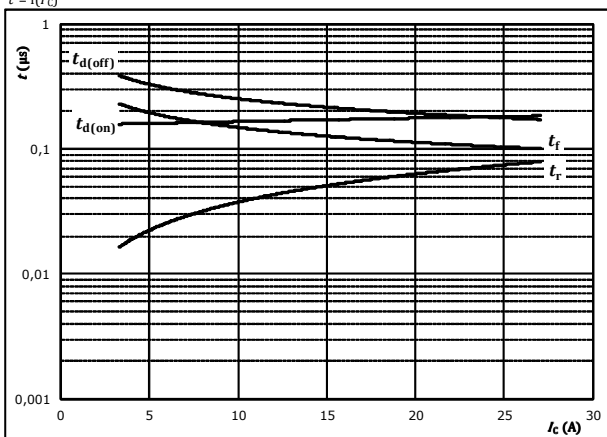
10-xZ12PMA015M7-P840A28x 10-x012PMA015M7-P840A29x datasheet

Inverter Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$



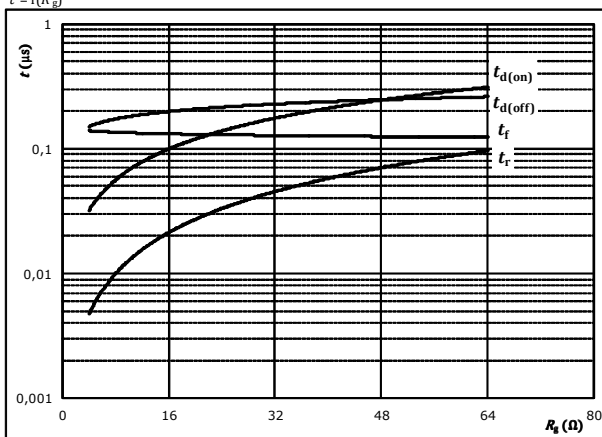
With an inductive load at

$T_j =$	150	°C
$V_{CE} =$	600	V
$V_{GE} =$	±15	V
$R_{gon} =$	32	Ω
$R_{goff} =$	32	Ω

figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$



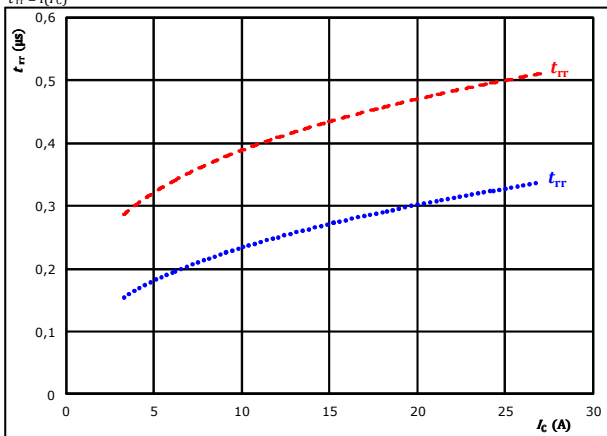
With an inductive load at

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

figure 7. FWD

Typical reverse recovery time as a function of collector current

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

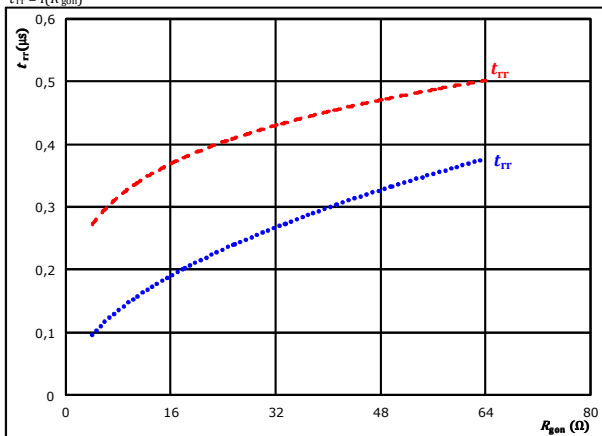


At	$V_{CE} =$	600	V	$T_j:$	25 °C	
	$V_{GE} =$	±15	V		150 °C	-----
	$R_{gon} =$	32	Ω			

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		150 °C	-----
	$I_C =$	15	A			



Vincotech

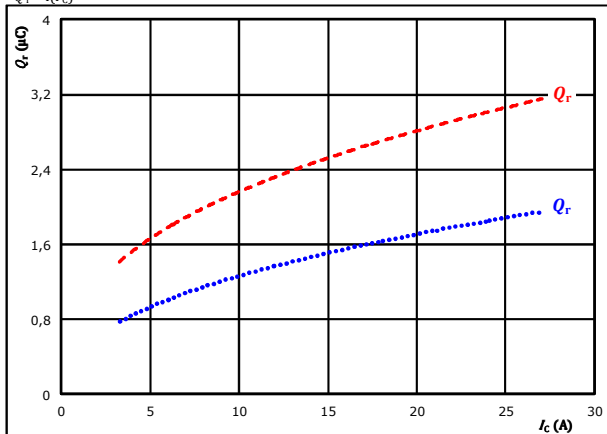
10-xZ12PMA015M7-P840A28x
10-x012PMA015M7-P840A29x
 datasheet

Inverter Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_C)$$

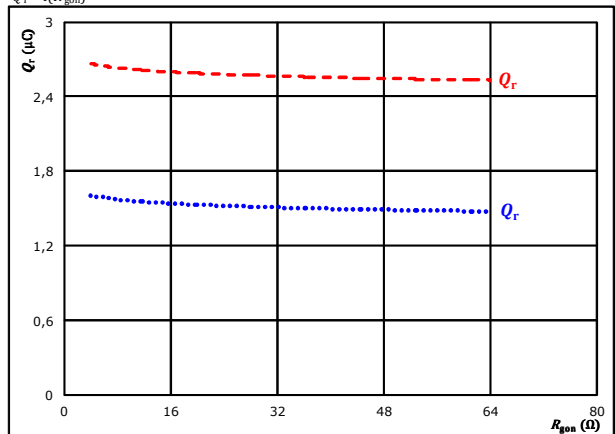


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 32$ Ω
 $T_j: 25$ °C (blue dotted line)
 150 °C (red dashed line)

figure 10. FWD

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

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

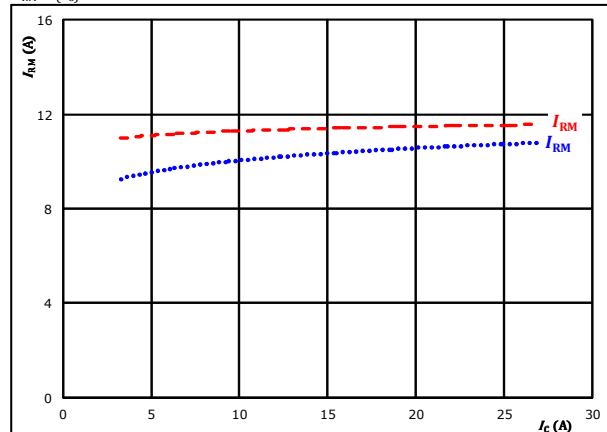


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 15$ A
 $T_j: 25$ °C (blue dotted line)
 150 °C (red dashed line)

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

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

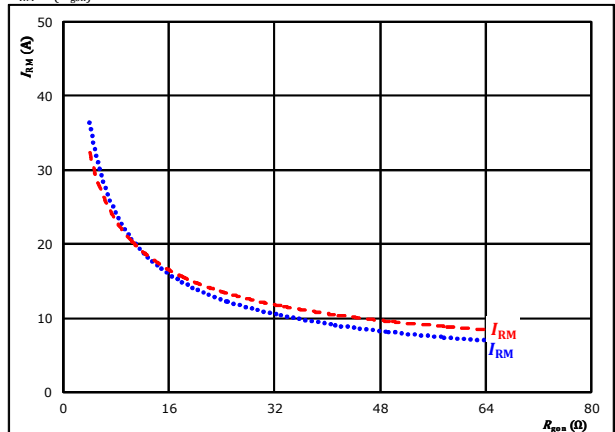


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 32$ Ω
 $T_j: 25$ °C (blue dotted line)
 150 °C (red dashed line)

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
 $V_{GE} = \pm 15$ V
 $I_C = 15$ A
 $T_j: 25$ °C (blue dotted line)
 150 °C (red dashed line)



Vincotech

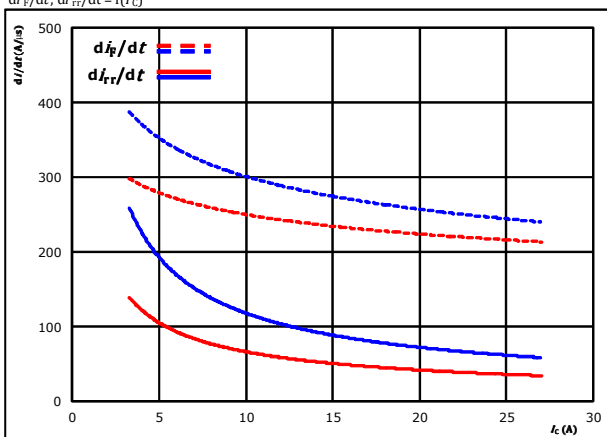
10-xZ12PMA015M7-P840A28x
10-x012PMA015M7-P840A29x
 datasheet

Inverter Switching Characteristics

figure 13. FWD

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

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

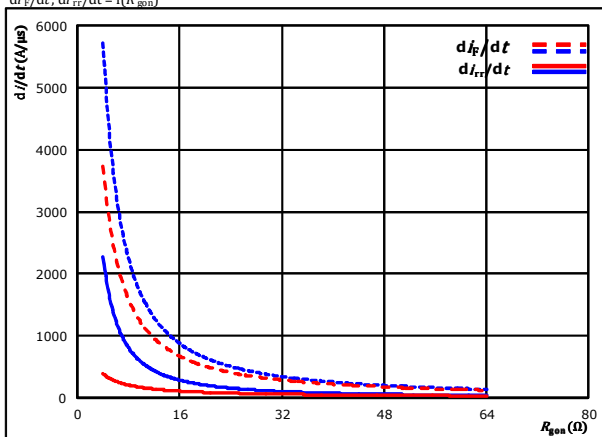


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $R_{g0n} = 32$ Ω
 $T_j = 25$ °C (dotted blue line)
 $T_j = 150$ °C (dashed red line)

figure 14. FWD

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

$$di_F/dt, di_{rr}/dt = f(R_{g0n})$$

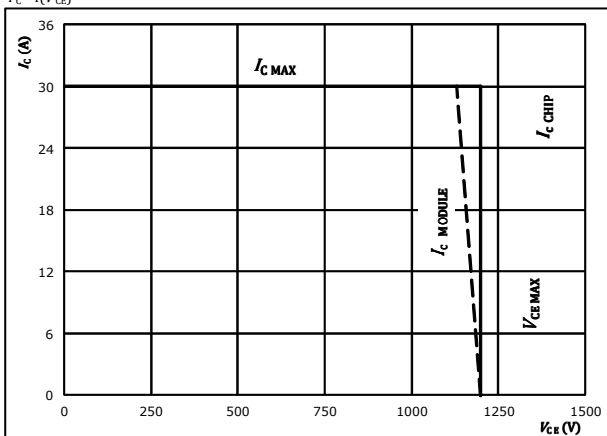


At $V_{CE} = 600$ V
 $V_{GE} = \pm 15$ V
 $I_C = 15$ A
 $T_j = 25$ °C (dotted blue line)
 $T_j = 150$ °C (dashed red line)

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



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10-x012PMA015M7-P840A29x
datasheet

Inverter Switching Definitions

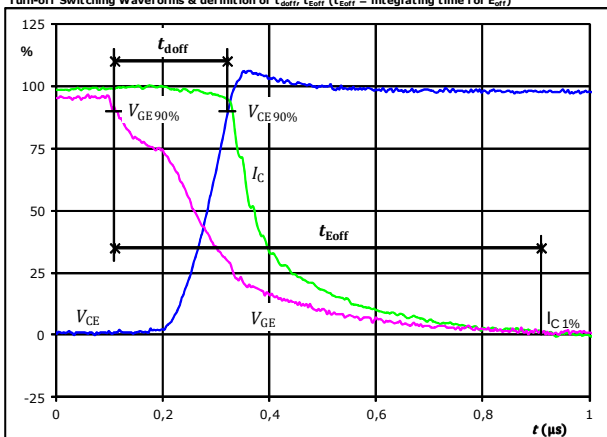
General conditions

T_j	=	150 °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})

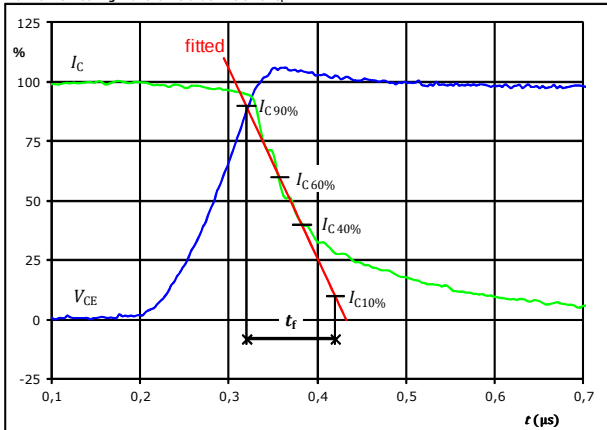


$V_{GE}(0\%)$	=	-15	V
$V_{GE}(100\%)$	=	15	V
$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	15	A
t_{doff}	=	0,218	μs
t_{Eoff}	=	0,800	μs

figure 3.

IGBT

Turn-off Switching Waveforms & definition of t_r

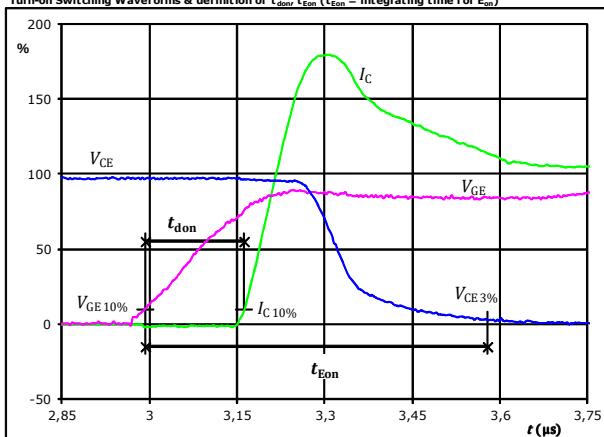


$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	15	A
t_r	=	0,127	μs

figure 2.

IGBT

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

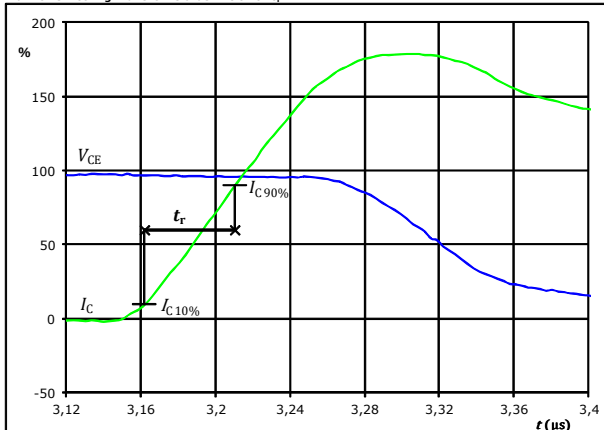


$V_{GE}(0\%)$	=	-15	V
$V_{GE}(100\%)$	=	15	V
$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	15	A
t_{don}	=	0,174	μs
t_{Eon}	=	0,586	μs

figure 4.

IGBT

Turn-on Switching Waveforms & definition of t_r



$V_C(100\%)$	=	600	V
$I_C(100\%)$	=	15	A
t_r	=	0,048	μs



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 datasheet

Inverter Switching Characteristics

figure 5. IGBT

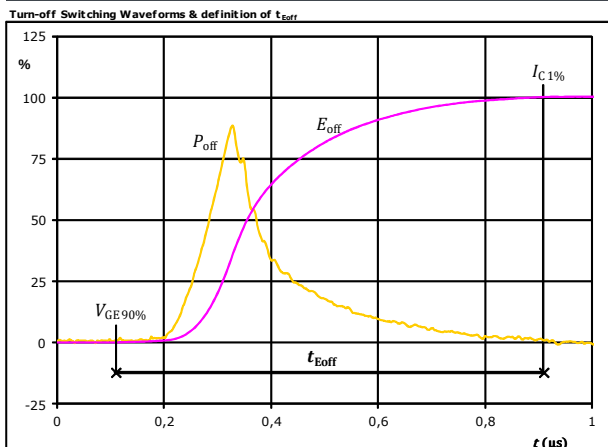


figure 6. IGBT

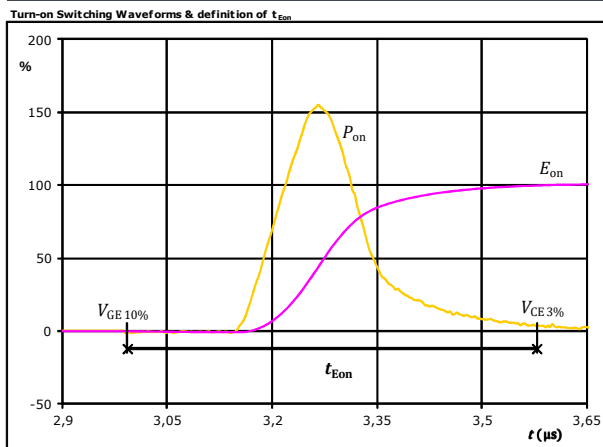
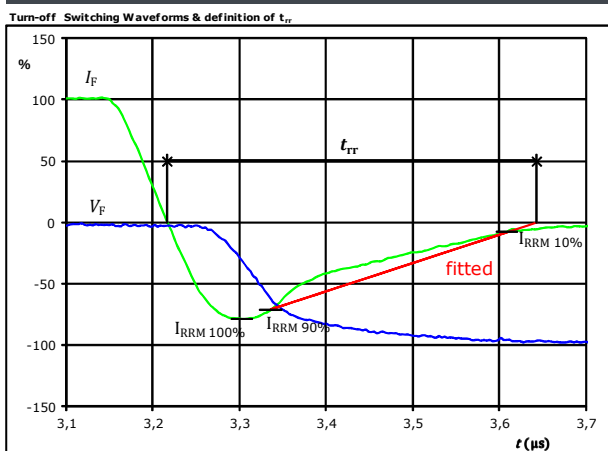


figure 7. FWD





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10-x012PMA015M7-P840A29x
 datasheet

Inverter Switching Characteristics

figure 8. FWD

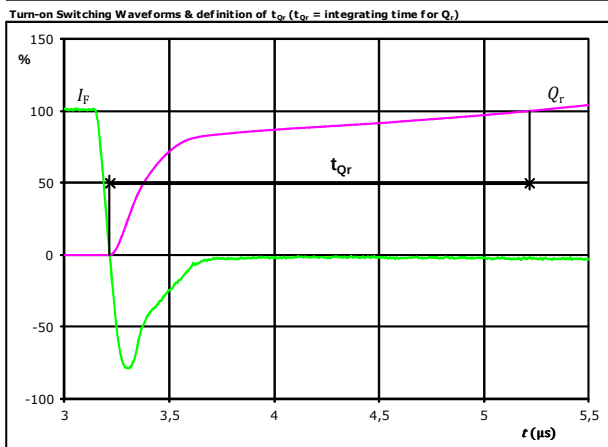
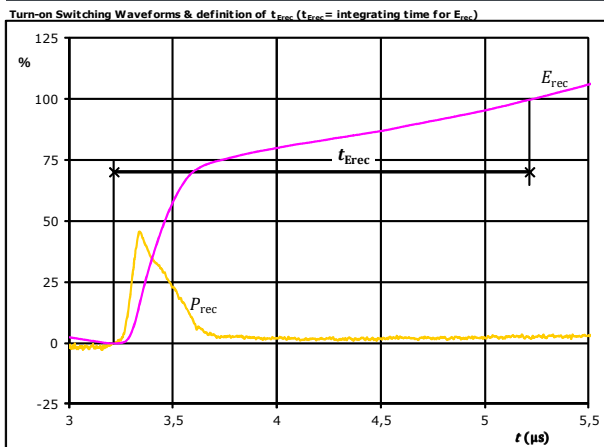


figure 9. FWD





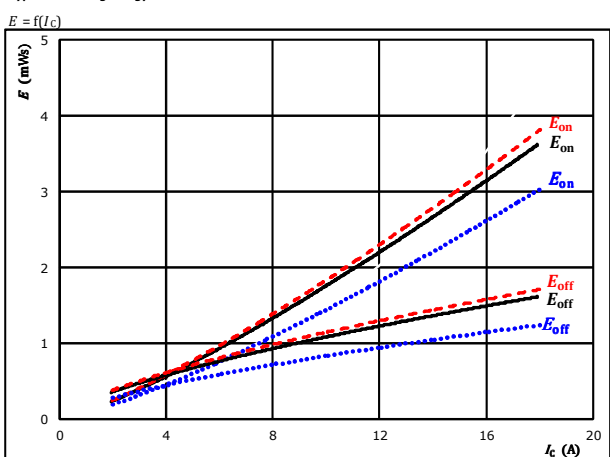
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Brake Switching Characteristics

figure 1. IGBT

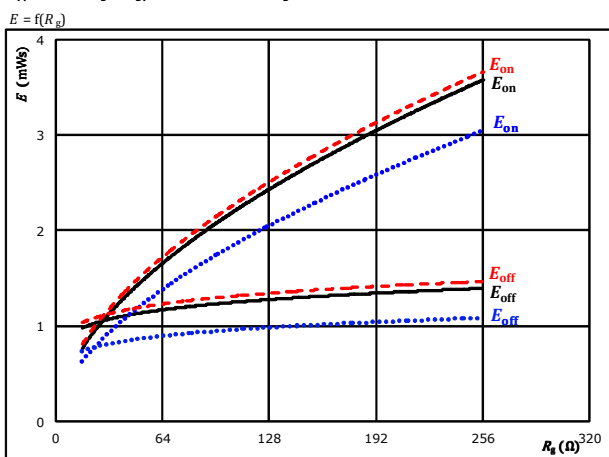
Typical switching energy losses as a function of collector current



With an inductive load at
 $V_{CE} = 700$ V
 $V_{GE} = 15/0$ V
 $R_{gon} = 64$ Ω
 $R_{goff} = 64$ Ω
 T_J : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

figure 2. IGBT

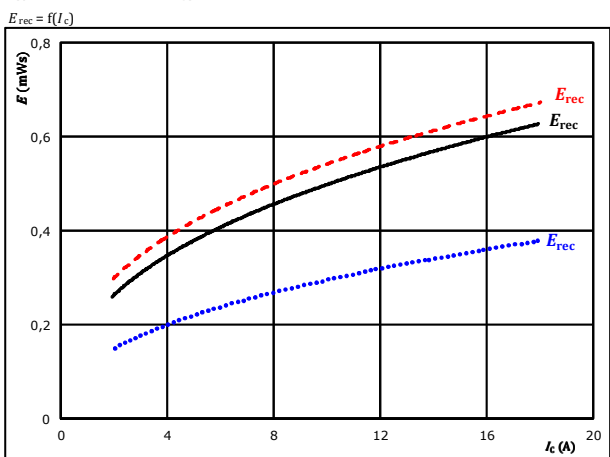
Typical switching energy losses as a function of gate resistor



With an inductive load at
 $V_{CE} = 700$ V
 $V_{GE} = 15/0$ V
 $I_C = 10$ A
 T_J : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

figure 3. FWD

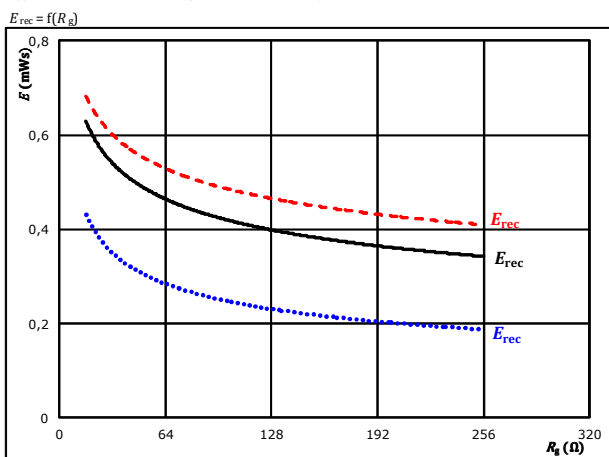
Typical reverse recovered energy loss as a function of collector current



With an inductive load at
 $V_{CE} = 700$ V
 $V_{GE} = 15/0$ V
 $R_{gon} = 64$ Ω
 T_J : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

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
 $I_C = 10$ A
 T_J : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)



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10-x012PMA015M7-P840A29x
 datasheet

Brake Switching Characteristics

figure 5. IGBT

Typical switching times as a function of collector current

$$t = f(I_C)$$

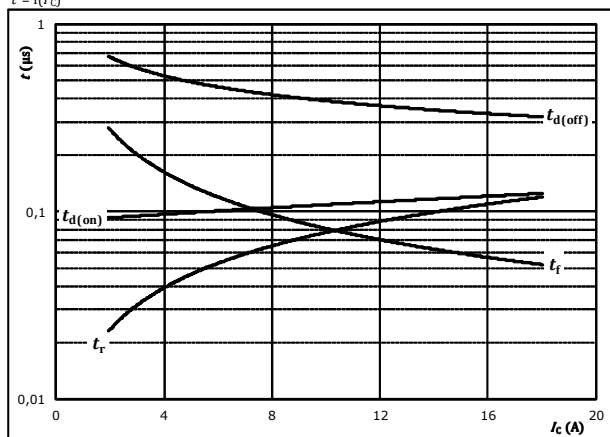


figure 6. IGBT

Typical switching times as a function of gate resistor

$$t = f(R_g)$$

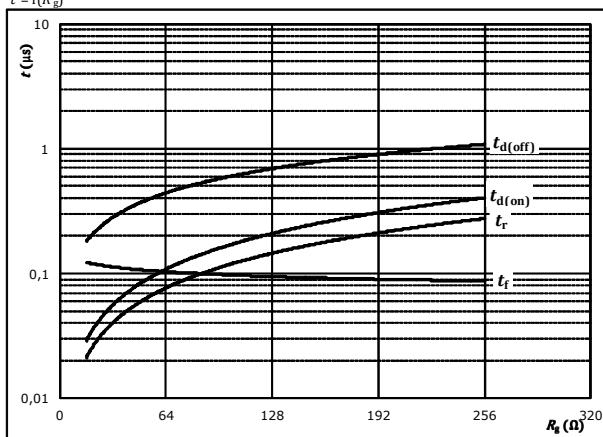


figure 7. FWD

Typical reverse recovery time as a function of collector current

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

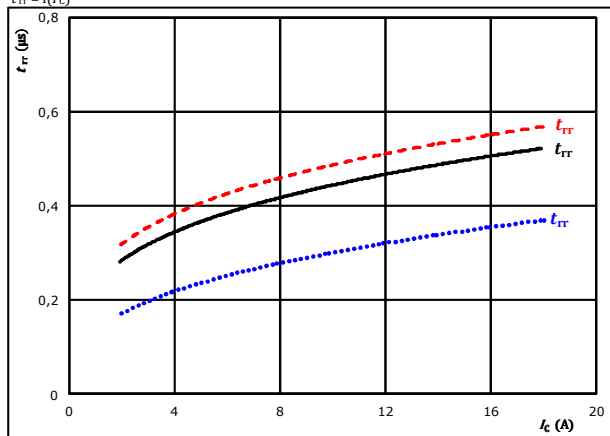
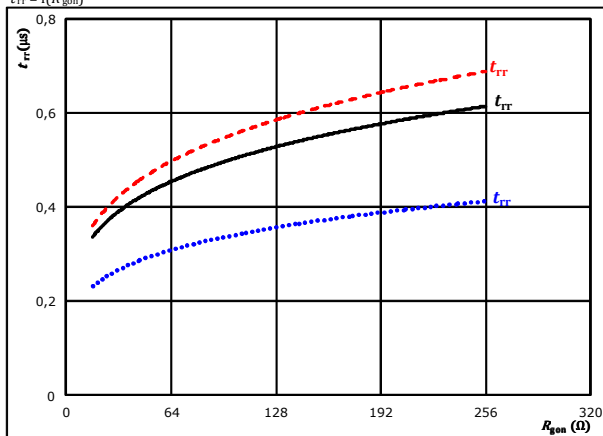


figure 8. FWD

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

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





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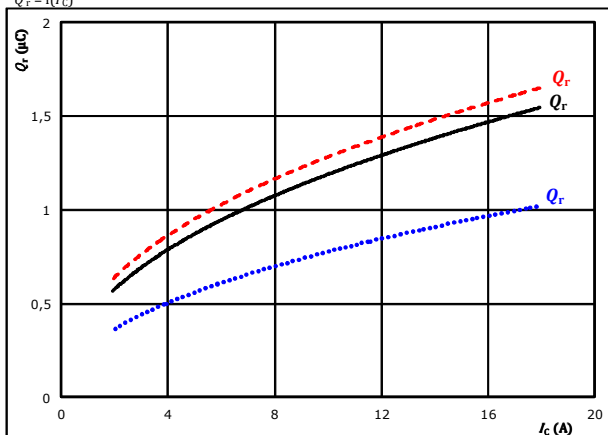
10-xZ12PMA015M7-P840A28x
10-x012PMA015M7-P840A29x
 datasheet

Brake Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of collector current

$$Q_r = f(I_C)$$

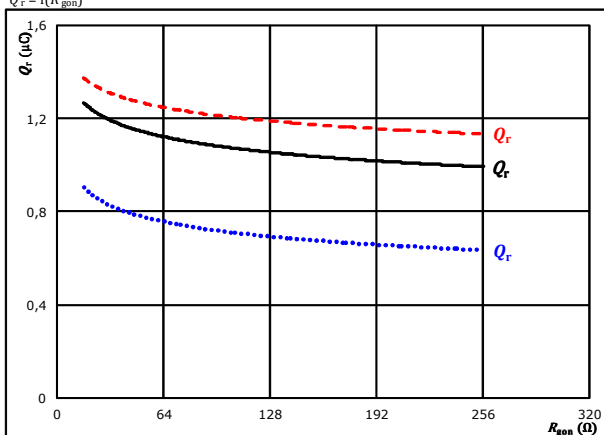


At $V_{CE} = 700$ V
 $V_{GE} = 15/0$ V
 $R_{gon} = 64$ Ω
 T_j : 25 °C
 125 °C ———
 150 °C - - - - -

figure 10. FWD

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

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

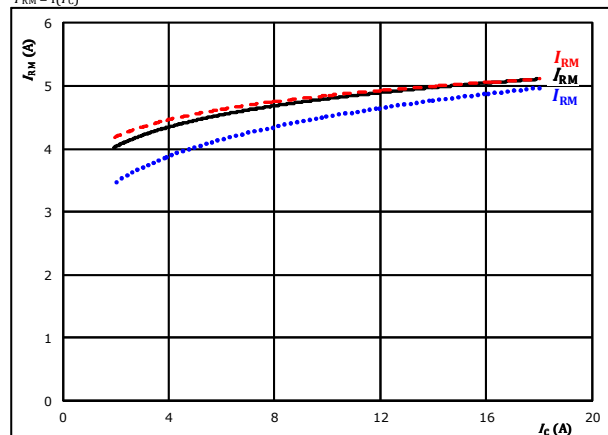


At $V_{CE} = 700$ V
 $V_{GE} = 15/0$ V
 $I_C = 10$ A
 T_j : 25 °C
 125 °C ———
 150 °C - - - - -

figure 11. FWD

Typical peak reverse recovery current as a function of collector current

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

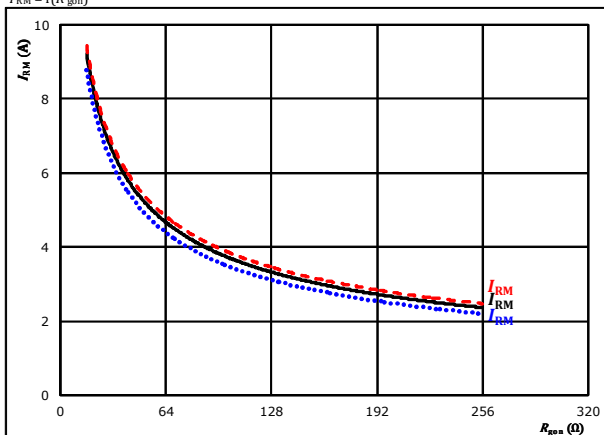


At $V_{CE} = 700$ V
 $V_{GE} = 15/0$ V
 $R_{gon} = 64$ Ω
 T_j : 25 °C
 125 °C ———
 150 °C - - - - -

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
 $V_{GE} = 15/0$ V
 $I_C = 10$ A
 T_j : 25 °C
 125 °C ———
 150 °C - - - - -



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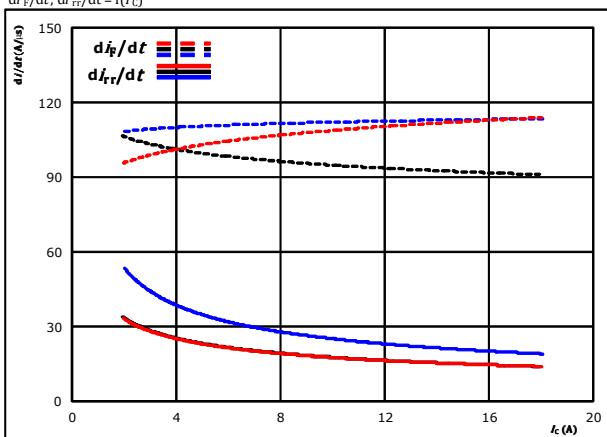
10-xZ12PMA015M7-P840A28x 10-x012PMA015M7-P840A29x datasheet

Brake Switching Characteristics

figure 13. FWD

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

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

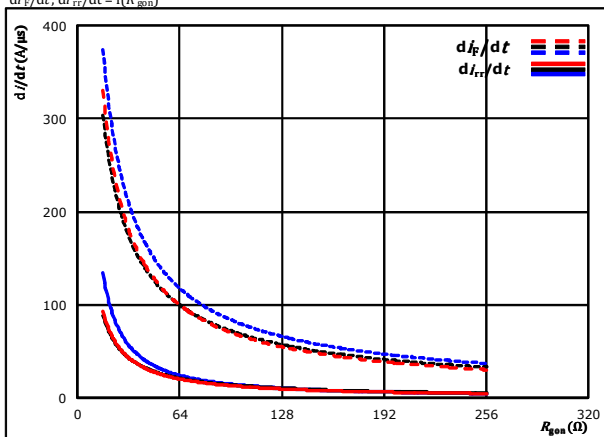


At $V_{CE} = 700$ V
 $V_{GE} = 15/0$ V
 $R_{g0n} = 64$ Ω
 $T_J = 25$ °C (blue dotted)
 $T_J = 125$ °C (black solid)
 $T_J = 150$ °C (red dashed)

figure 14. FWD

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

$$di_F/dt, di_{rr}/dt = f(R_{g0n})$$

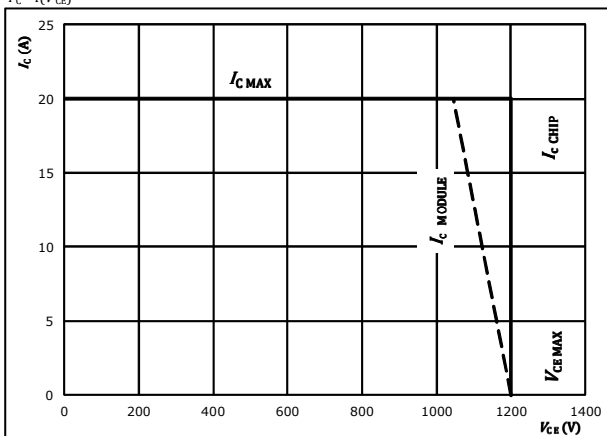


At $V_{CE} = 700$ V
 $V_{GE} = 15/0$ V
 $I_C = 10$ A
 $T_J = 25$ °C (blue dotted)
 $T_J = 125$ °C (black solid)
 $T_J = 150$ °C (red dashed)

figure 15. IGBT

Reverse bias safe operating area

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



At $T_J = 175$ °C
 $R_{g0n} = 64$ Ω
 $R_{g0ff} = 64$ Ω



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10-x012PMA015M7-P840A29x
 datasheet

Brake Switching Definitions

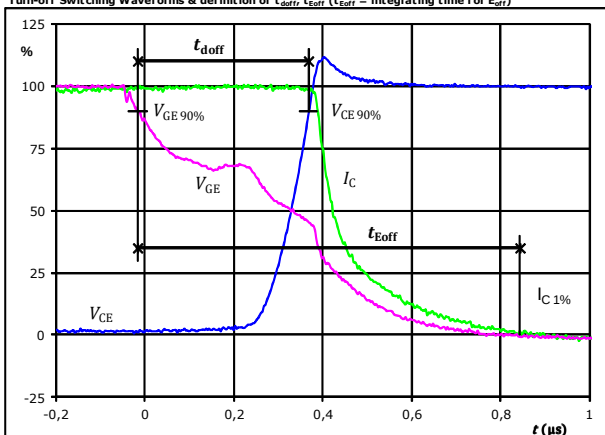
General conditions

T_j	=	125 °C
R_{gon}	=	64 Ω
R_{goff}	=	64 Ω

figure 1.

IGBT

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

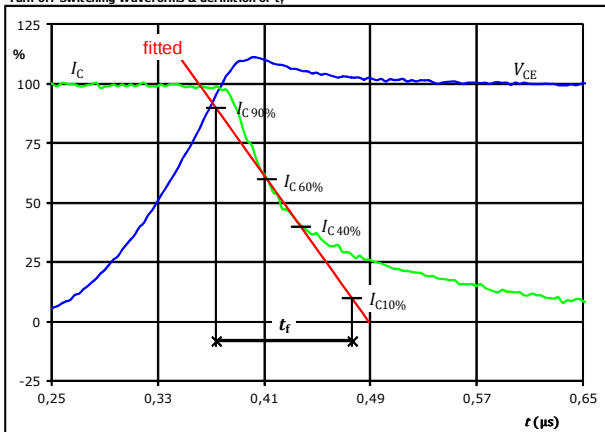


$V_{GE}(0\%) =$	0	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	700	V
$I_C(100\%) =$	10	A
$t_{doff} =$	0,386	μs
$t_{Eoff} =$	0,861	μs

figure 3.

IGBT

Turn-off Switching Waveforms & definition of t_f

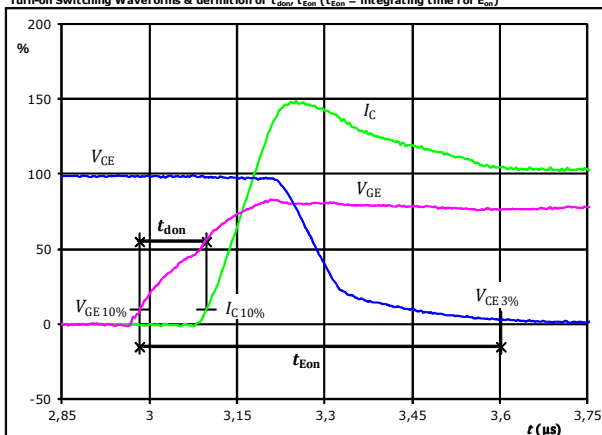


$V_C(100\%) =$	700	V
$I_C(100\%) =$	10	A
$t_f =$	0,113	μs

figure 2.

IGBT

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

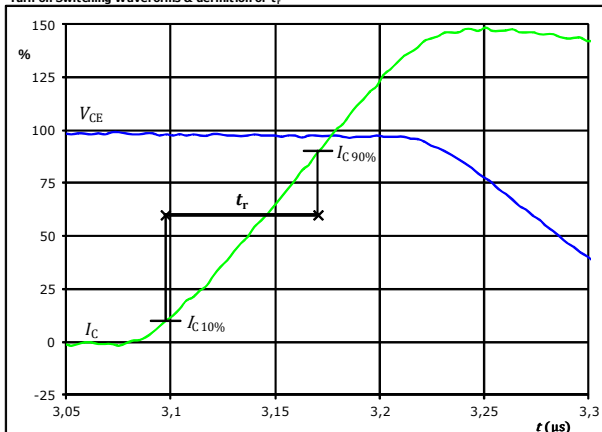


$V_{GE}(0\%) =$	0	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	700	V
$I_C(100\%) =$	10	A
$t_{don} =$	0,115	μs
$t_{Eon} =$	0,619	μs

figure 4.

IGBT

Turn-on Switching Waveforms & definition of t_r



$V_C(100\%) =$	700	V
$I_C(100\%) =$	10	A
$t_r =$	0,073	μs



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Brake Switching Characteristics

figure 5. IGBT

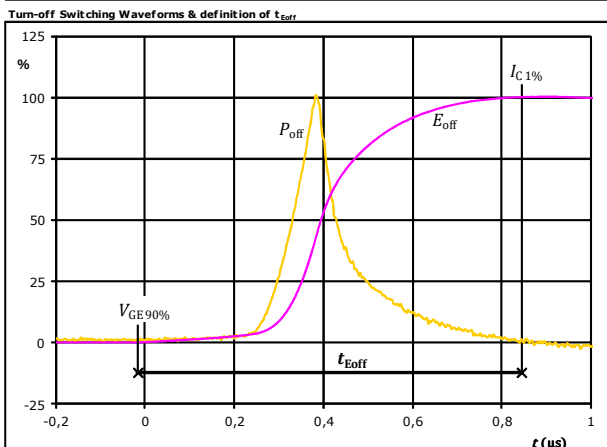


figure 6. IGBT

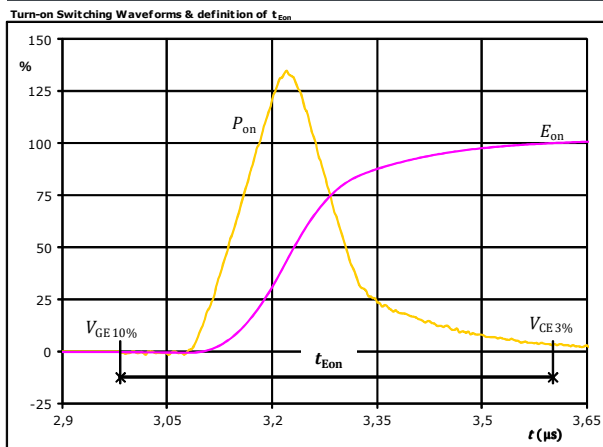
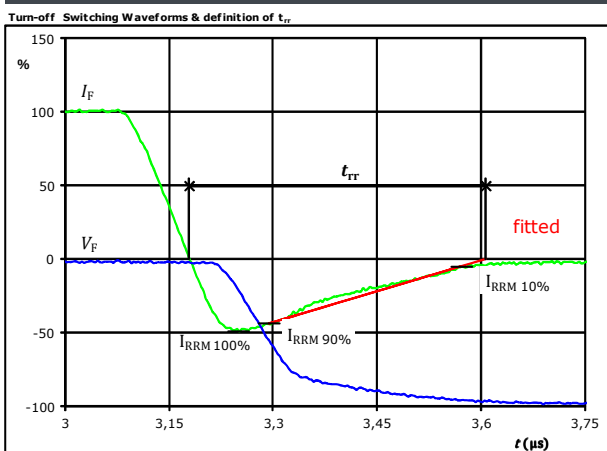


figure 7. FWD





Vincotech

10-xZ12PMA015M7-P840A28x
10-x012PMA015M7-P840A29x
 datasheet

Brake Switching Characteristics

figure 8. FWD

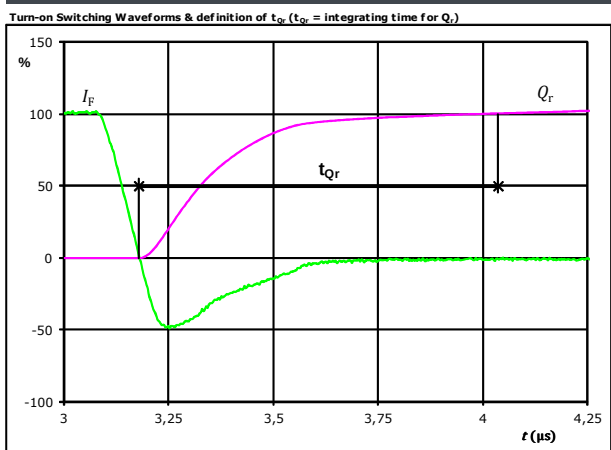
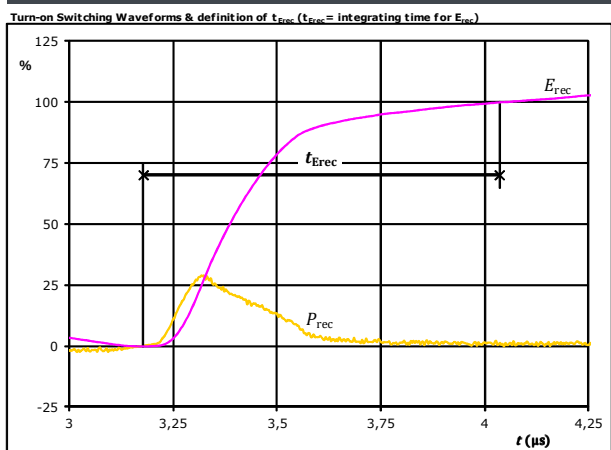


figure 9. FWD





Vincotech

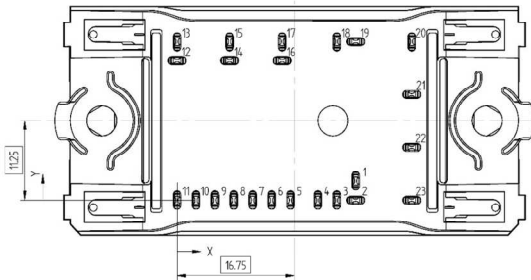
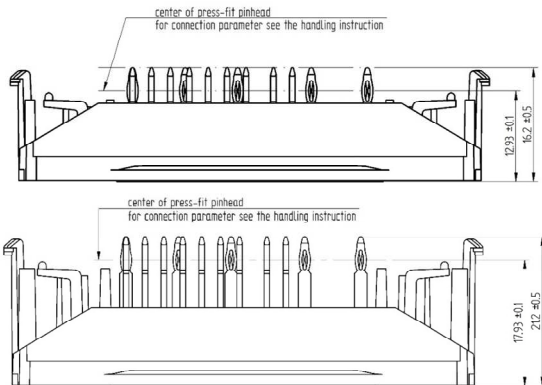
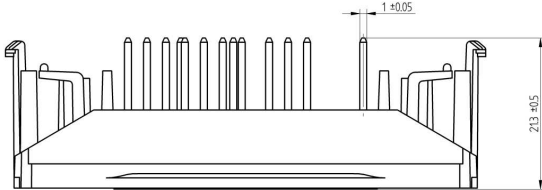
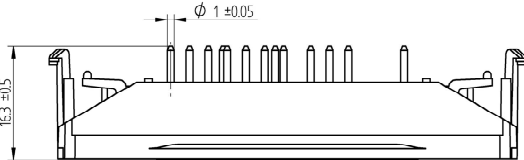
10-xZ12PMA015M7-P840A28x 10-x012PMA015M7-P840A29x datasheet

Version				Ordering Code				
without thermal paste 12 mm housing with solder pins				10-FZ12PMA015M7-P840A28				
with thermal paste 12 mm housing with solder pins				10-FZ12PMA015M7-P840A28-/3/				
without thermal paste 17 mm housing with solder pins				10-F012PMA015M7-P840A29				
with thermal paste 17 mm housing with solder pins				10-F012PMA015M7-P840A29-/3/				
without thermal paste 12 mm housing with Press-fit pins				10-PZ12PMA015M7-P840A28Y				
with thermal paste 12 mm housing with Press-fit pins				10-PZ12PMA015M7-P840A28Y-/3/				
without thermal paste 17 mm housing with Press-fit pins				10-P012PMA015M7-P840A29Y				
with thermal paste 17 mm housing with Press-fit pins				10-P012PMA015M7-P840A29Y-/3/				
NN-NNNNNNNNNNNN TTTTTWW WWYY UL VIN LLLLL SSSS  		Text	Name		Date code	UL & VIN	Lot	Serial
			NN-NNNNNNNNNNNN-TTTTTV		WWYY	UL VIN	LLLLL	SSSS
		Datamatrix	Type&Ver	Lot number	Serial	Date code		
		TTTTTWW	LLLLL	SSSS	WWYY			

Outline

Pin table

Pin	X	Y	Function
1	25,5	2,7	Therm1
2	25,5	0	Therm2
3	22,8	0	DC-Rect
4	20,1	0	G27
5	16,2	0	DC-Br
6	13,5	0	G15
7	10,8	0	DC-3
8	8,1	0	G13
9	5,4	0	DC-2
10	2,7	0	G11
11	0	0	DC-1
12	0	19,8	G12
13	0	22,5	Ph1
14	7,5	19,8	G14
15	7,5	22,5	Ph2
16	15	19,8	G16
17	15	22,5	Ph3
18	22,8	22,5	DC+Inv
19	25,5	22,5	DC+Rect
20	33,5	22,5	Br
21	33,5	15	ACIn1
22	33,5	7,5	ACIn2
23	33,5	0	ACIn3



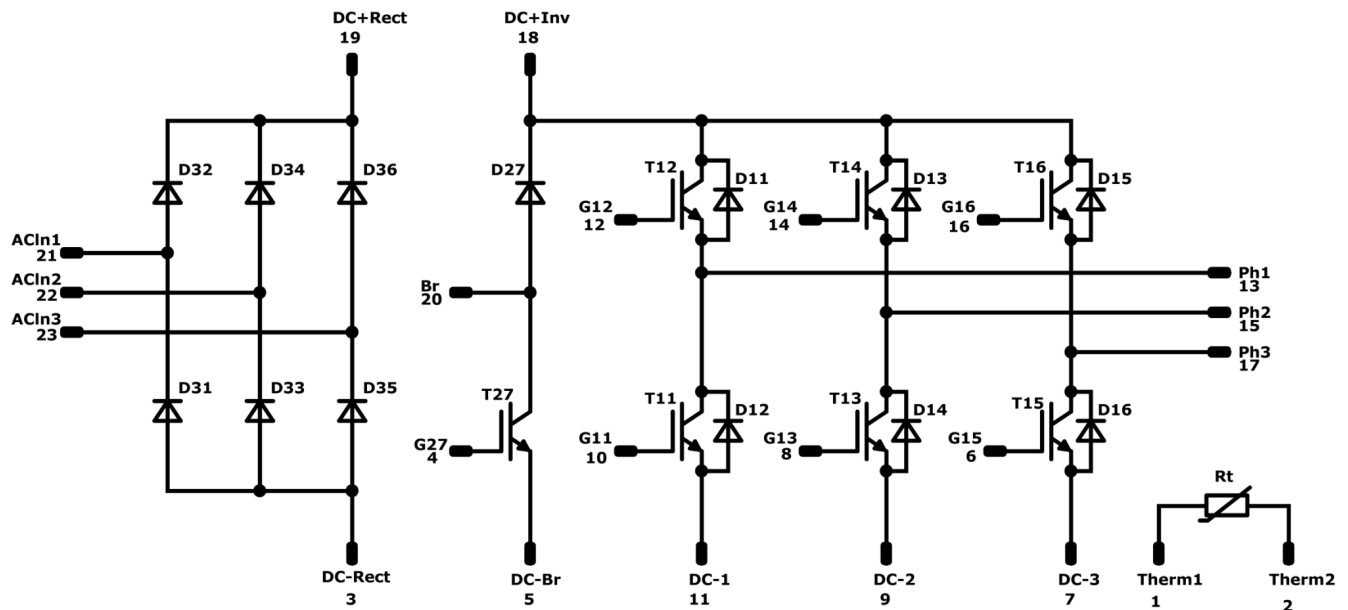
Tolerance of pinpositions: ±0.5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance



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 datasheet

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
D31-D36	Rectifier	1600 V	25 A	Rectifier Diode	
T11-T16	IGBT	1200 V	15 A	Inverter Switch	
D11-D16	FWD	1200 V	15 A	Inverter Diode	
T27	IGBT	1200 V	10 A	Brake Switch	
D27	FWD	1200 V	5 A	Brake Diode	
Rt	NTC			Thermistor	



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datasheet

Packaging instruction			
Standard packaging quantity (SPQ) 135	>SPQ	Standard	<SPQ Sample

Handling instruction
Handling instructions for <i>flow 0</i> packages see vincotech.com website.

Package data
Package data for <i>flow 0</i> 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-xx12PMA015M7-P840A2xx-D3-14	11 Jan. 2019	Added thermal paste options to ordering code section	29

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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.