Vincotech

10-PC12PMA015M7-P840A26Y
datasheet

*flow*PIM 0	1200 V / 15 A

Topology features

- Open Emitter configuration
- Temperature sensor
- Converter+Brake+Inverter

Component features

- Easy paralleling
- Low turn-off losses
- Low collector emitter saturation voltage
- Positive temperature coefficient
- Short tail current
- Switching optimized for EMC

Housing features

- Base isolation: Al_2O_3
- Convex shaped substrate for superior thermal contact
- Thermo-mechanical push-and-pull force relief
- Press-fit pin
- Reliable cold welding connection

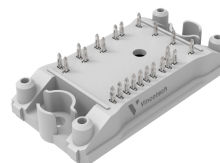## Extra features

- With three-phase standard rectifier
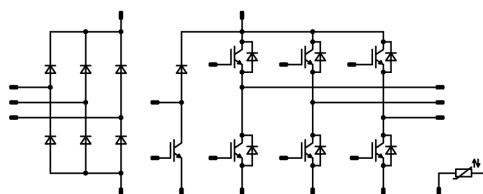
Target applications

- Industrial Drives

Types

- 10-PC12PMA015M7-P840A26Y

flow 0 12 mm housing

Schematic

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Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Inverter Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	22	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 °C	60	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V, V_{CC} = 800 V	T_j = 150 °C	9,5	µs
Maximum junction temperature	T_{jmax}			175	°C
Inverter Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	22	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	45	W
Maximum junction temperature	T_{jmax}			175	°C
Brake Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s <= 80 °C	20 [1]	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 °C	55	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V, V_{CC} = 800 V	T_j = 150 °C	9,5	µs
Maximum junction temperature	T_{jmax}			175	°C

[1] limited by I_{CRM}

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Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Brake Diode					
Peak repetitive reverse voltage	V_{RRM}			1200	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s <= 80 °C	10 [2]	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		10	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	27	W
Maximum junction temperature	T_{jmax}			175	°C

[2] limited by I_{FRM}

Parameter	Symbol	Conditions		Value	Unit
Rectifier Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	33	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	200	A
Surge current capability	I^2t			200	A²s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	44	W
Maximum junction temperature	T_{jmax}			150	°C

Module Properties

Thermal Properties

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

Isolation Properties

Parameter	Symbol	Conditions		Value	Unit
Isolation voltage	V_{isol}	DC Test Voltage*	t_p = 2 s	6000	V
Creepage distance				>12,7	mm
Clearance				9,19	mm
Comparative Tracking Index	CTI			≥ 200	

*100 % tested in production

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Characteristic Values

Parameter	Symbol	Conditions				Values			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

Parameter	Symbol	V_{GE}/V_{GS} [V]	$V_{CE}/V_{DS}/V_{F}$ [V]	$I_{C}/I_{D}/I_{F}$ [A]	T_{j} [°C]	Min	Typ	Max	Unit
Gate-emitter threshold voltage	$V_{GE(th)}$		10	0,0015	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}	15		15	25 125 150		1,7 1,95 2,01	2,1[3]	V
Collector-emitter cut-off current	I_{CES}	0	1200		25			60	µA
Gate-emitter leakage current	I_{GES}	20	0		25			200	nA
Internal gate resistance	r_{g}						None		Ω
Input capacitance	C_{ies}						2900		pF
Output capacitance	C_{oes}	0	10		25		120		pF
Reverse transfer capacitance	C_{res}						34		pF
Gate charge	Q_{g}	V_{CC} = 600 V 0/15		15	25		110		nC

Thermal

Parameter	Symbol	Conditions				Min	Typ	Max	Unit
Thermal resistance junction to sink[4]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)					1,6		K/W

Dynamic

Parameter	Symbol	Conditions	$V_{CE}/V_{DS}/V_{F}$ [V]	$I_{C}/I_{D}/I_{F}$ [A]	T_{j} [°C]	Min	Typ	Max	Unit
Turn-on delay time	$t_{d(on)}$	R_{gon} = 32 Ω R_{goff} = 32 Ω			25 150		176 173,5		ns
Rise time	t_{r}				25 150		43 48		ns
Turn-off delay time	$t_{d(off)}$				25 150		191 217,5		ns
Fall time	t_{f}	±15	600	15	25 150		119,26 126,71		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=1,55 µC Q_{rFWD}=2,59 µC			25 150		1,55 2,01		mWs
Turn-off energy (per pulse)	E_{off}				25 150		0,925 1,32		mWs

Characteristic Values

Parameter	Symbol	Conditions				Values			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

Parameter	Symbol	Conditions				Min	Typ	Max	Unit
Forward voltage	V_{F}			15	25 125 150		1,63 1,74 1,73	1,9[3]	V
Reverse leakage current	I_{R}	V_{r} = 1200 V			25			30	µA

Thermal

Parameter	Symbol	Conditions				Min	Typ	Max	Unit
Thermal resistance junction to sink[4]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)					2,11		K/W

Dynamic

Parameter	Symbol	Conditions				Min	Typ	Max	Unit
Peak recovery current	I_{RM}	di/dt=293 A/µs di/dt=244 A/µs	±15	600	15 / 25 150		10,98 12,18		A
Reverse recovery time	t_{rr}				25 150		264,68 422,59		ns
Recovered charge	Q_{r}				25 150		1,55 2,59		µC
Reverse recovered energy	E_{rec}				25 150		0,488 0,938		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$				25 150		91,88 52,3		A/µs

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Characteristic Values

Parameter	Symbol	Conditions				Values			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	$V_{GE(th)}$		10	0,001	25	5,4	6	6,6	V
Collector-emitter saturation voltage	V_{CEsat}	15		10	25 125 150		1,66 1,9 1,96	2,1[3]	V
Collector-emitter cut-off current	I_{CES}	0	1200		25			35	µA
Gate-emitter leakage current	I_{GES}	20	0		25			200	nA
Internal gate resistance	r_g						None		Ω
Input capacitance	C_{ies}						2000		pF
Output capacitance	C_{oes}	0	10		25		86		pF
Reverse transfer capacitance	C_{res}						23		pF
Gate charge	Q_g	V_{CC} = 600 V 0/15		10	25		80		nC
Thermal									
Thermal resistance junction to sink[4]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)					1,72		K/W
Dynamic									
Turn-on delay time	$t_{d(on)}$	R_{gon} = 64 Ω R_{goff} = 64 Ω 0/15	700	10	25 125 150		123,6 114,8 112,2		ns
Rise time	t_r				25 125 150		65,6 72,6 73,6		ns
Turn-off delay time	$t_{d(off)}$				25 125 150		353,2 386 395,2		ns
Fall time	t_f				25 125 150		93,6 113,08 117,94		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,761 µC Q_{rFWD}=1,14 µC Q_{rFWD}=1,27 µC			25 125 150		1,26 1,54 1,58		mWs
Turn-off energy (per pulse)	E_{off}				25 125 150		0,822 1,09 1,14		mWs

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Characteristic Values

Parameter	Symbol	Conditions					Values			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

Parameter	Symbol	Conditions					Values			Unit
Forward voltage	V_F				5	25 125 150		1,57 1,66 1,65	2,1[3]	V
Reverse leakage current	I_R	V_r = 1200 V				25			20	µA

Thermal

Parameter	Symbol	Conditions					Values			Unit
Thermal resistance junction to sink[4]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						3,5		K/W

Dynamic

Parameter	Symbol	Conditions					Values			Unit
Peak recovery current	I_{RM}					25 125 150		4,68 4,93 5,07		A
Reverse recovery time	t_{rr}					25 125 150		290,46 419,43 463,02		ns
Recovered charge	Q_r	di/dt=118 A/µs di/dt=104 A/µs di/dt=106 A/µs	0/15	700	10	25 125 150		0,761 1,14 1,27		µC
Reverse recovered energy	E_{rec}					25 125 150		0,296 0,483 0,557		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		24,89 18,9 18,93		A/µs

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Characteristic Values

Parameter	Symbol	Conditions				Values			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

Parameter	Symbol	Conditions				Values			Unit
Forward voltage	V_F			8	25 125		0,996 0,907	1,21[3] 1,1[3]	V
Reverse leakage current	I_R	V_r = 1600 V			25			50	µA

Thermal

Parameter	Symbol	Conditions				Values			Unit
Thermal resistance junction to sink[4]	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)					1,59		K/W

Thermistor

Static

Parameter	Symbol	Conditions				Values			Unit
Rated resistance	R				25		22		kΩ
Deviation of R100	$\Delta_{R/R}$	R_{100} = 1484 Ω			100	-5		5	%
Power dissipation	P				25		130		mW
Power dissipation constant	d				25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %					3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %					4000		K
Vincotech Thermistor Reference								I	

[3] Value at chip level

[4] Only valid with pre-applied Vincotech thermal interface material.

Inverter Switch Characteristics

figure 1. IGBT

Typical output characteristics
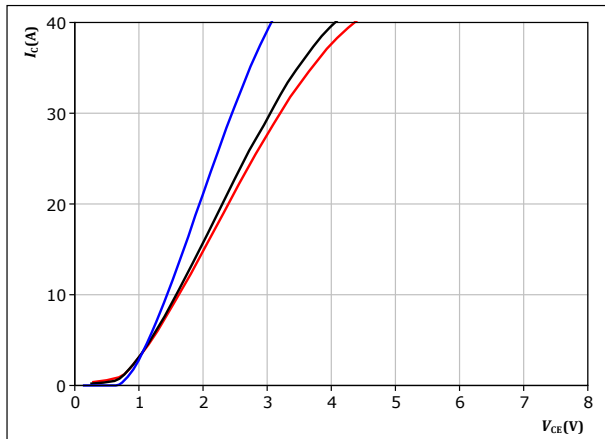
I_C = f(V_{CE})

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

figure 2. IGBT

Typical output characteristics

I_C = f(V_{CE})

V_{GE}:
- 7 V
- 8 V
- 9 V
- 10 V
- 11 V
- 12 V
- 13 V
- 14 V
- 15 V
- 16 V
- 17 V

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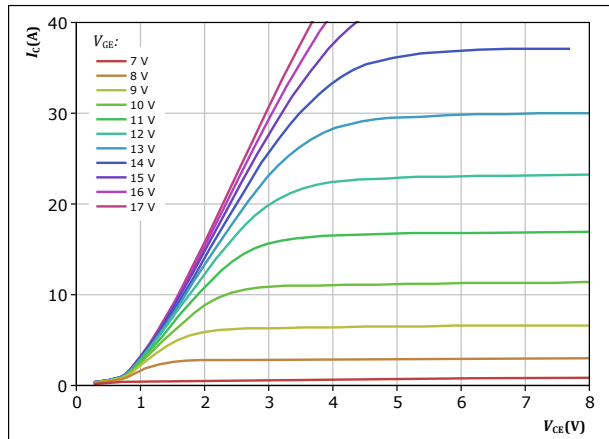
V_{GE} from 7 V to 17 V in steps of 1 V

figure 3. IGBT

Typical transfer characteristics

I_C = f(V_{GE})
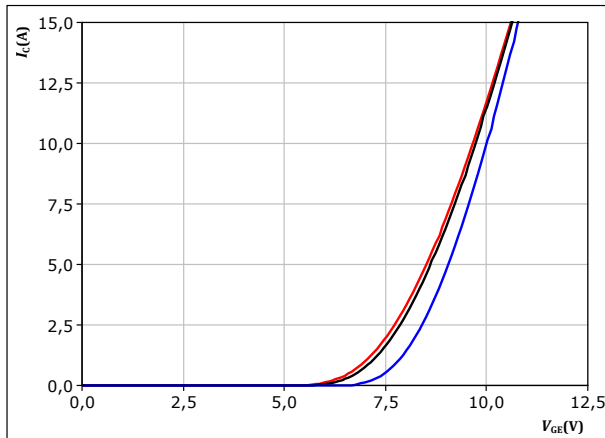
t_p =	250	µs		
V_{CE} =	10	V		25 °C
			T_j:	125 °C
				150 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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

- 0,5
- 0,2
- 0,1
- 0,05
- 0,02
- 0,01
- 0,005
- 0
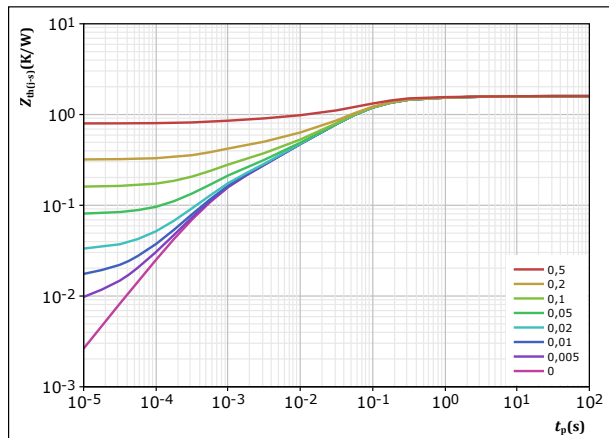
D = t_p / T

$R_{th(j-s)}$ = 1,595 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

Inverter Switch Characteristics

figure 5.	IGBT

Safe operating area

$I_C = f(V_{CE})$
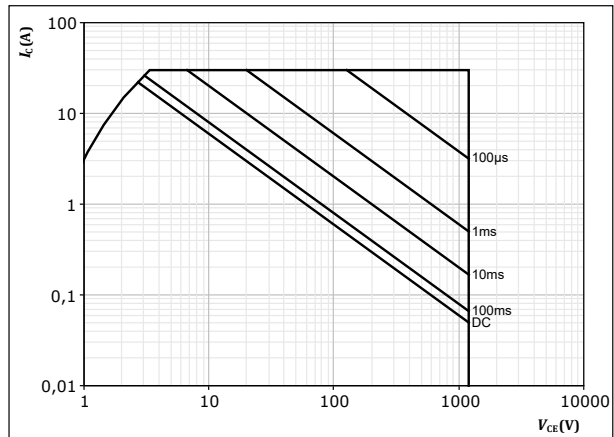
D = single pulse

T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

figure 6.	IGBT

Gate voltage vs gate charge

$V_{GE} = f(Q_g)$
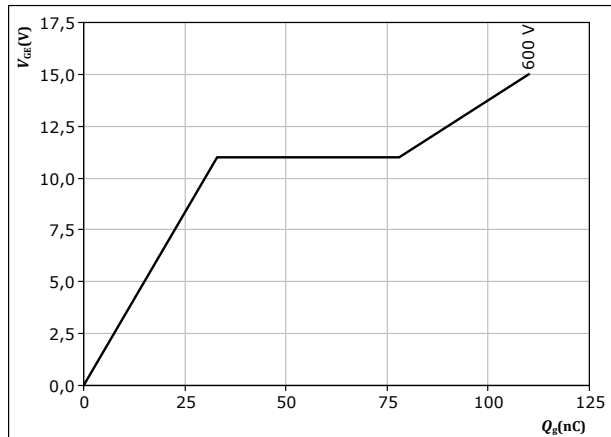
I_C =	15	A
T_j =	25	°C

Inverter Diode Characteristics

figure 7.	FWD

Typical forward characteristics

$I_F = f(V_F)$

$t_p =$ 250 µs

		25 °C
T_j:		125 °C
		150 °C
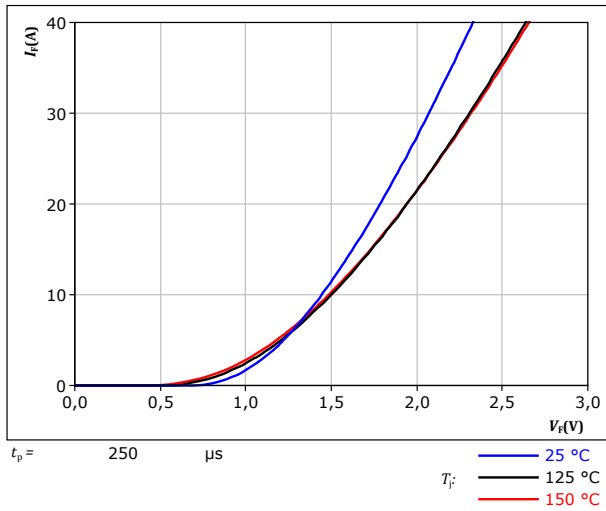
figure 8.	FWD

Transient thermal impedance as a function of pulse width

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

Legend: 0,5 / 0,2 / 0,1 / 0,05 / 0,02 / 0,01 / 0,005 / 0
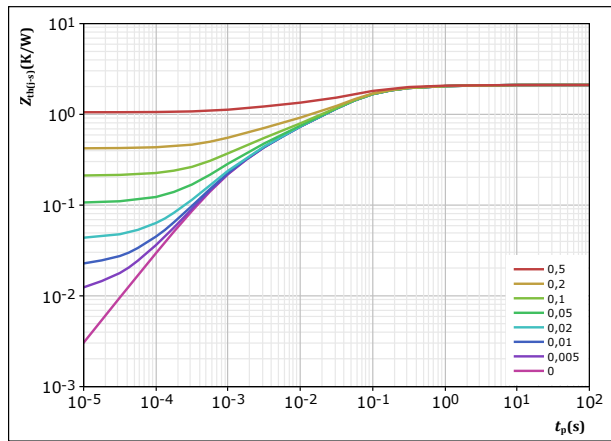
$D = \quad t_p / T$

$R_{th(j-s)} = \quad 2,108 \quad$ 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

Brake Switch Characteristics

figure 9. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

t_p =	250	µs
V_{GE} =	15	V

25 °C (blue)
T_j: 125 °C (black)
150 °C (red)
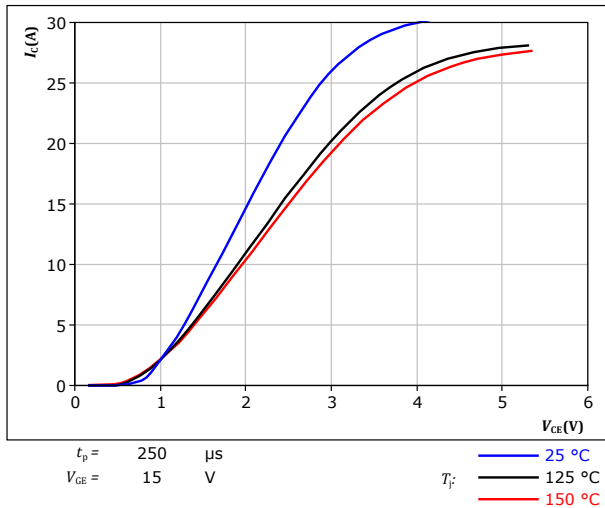
figure 10. IGBT

Typical output characteristics

$I_C = f(V_{CE})$

V_{GE}:
7 V
8 V
9 V
10 V
11 V
12 V
13 V
14 V
15 V
16 V
17 V

t_p =	250	µs
T_j =	150	°C

V_{GE} from 7 V to 17 V in steps of 1 V
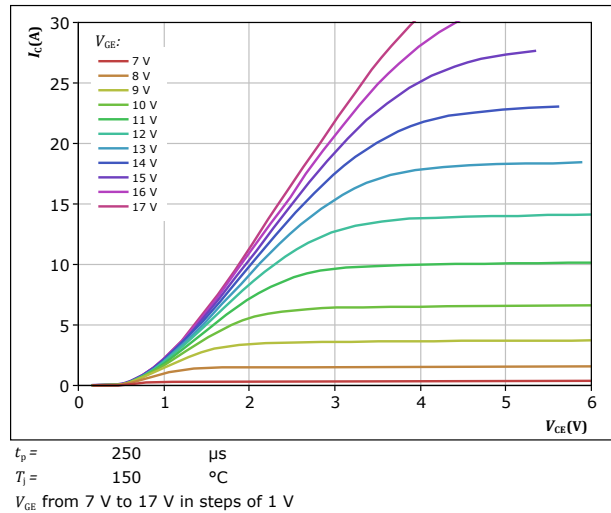
figure 11. IGBT

Typical transfer characteristics

$I_C = f(V_{GE})$

t_p =	250	µs
V_{CE} =	10	V

25 °C (blue)
T_j: 125 °C (black)
150 °C (red)
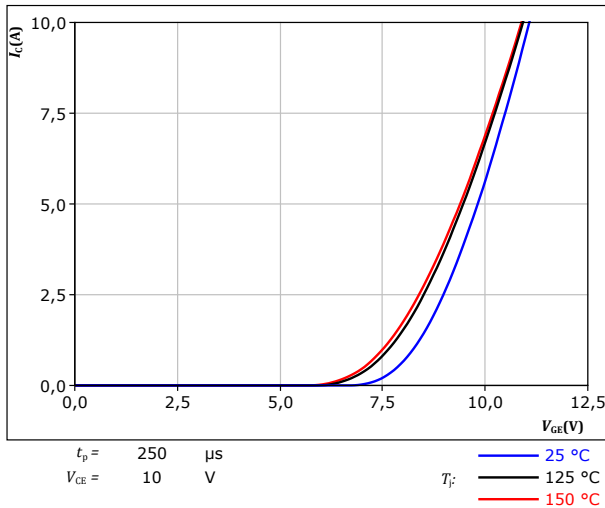
figure 12. IGBT

Transient thermal impedance as a function of pulse width

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

0,5
0,2
0,1
0,05
0,02
0,01
0,005
0

D =	t_p / T	
$R_{th(j-s)}$ =	1,722	K/W
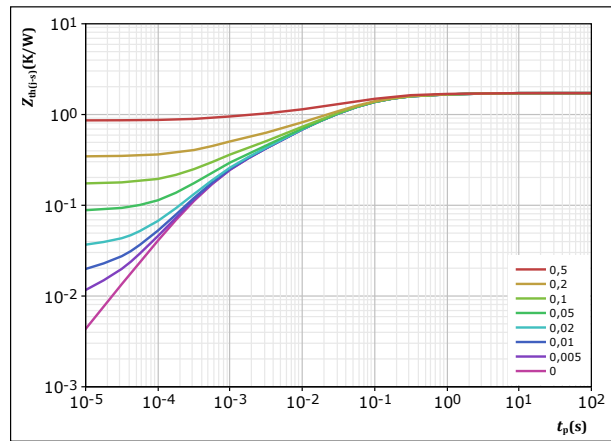
IGBT thermal model values

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

Brake Switch Characteristics

figure 13. **IGBT**

Safe operating area

$I_C = f(V_{CE})$
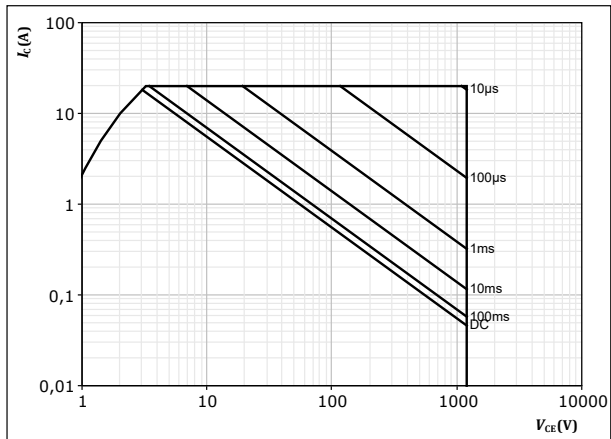
D = single pulse

T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

figure 14. **IGBT**

Gate voltage vs gate charge

$V_{GE} = f(Q_g)$
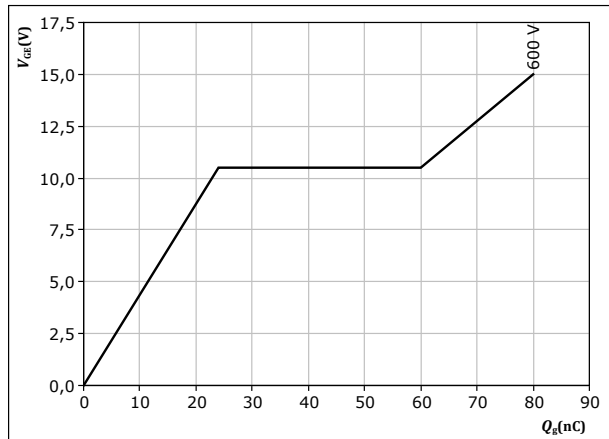
I_C =	10	A
T_j =	25	°C

Brake Diode Characteristics

figure 15.	FWD

Typical forward characteristics

$I_F = f(V_F)$

$t_p =$ 250 µs

T_j:
- 25 °C (blue)
- 125 °C (black)
- 150 °C (red)
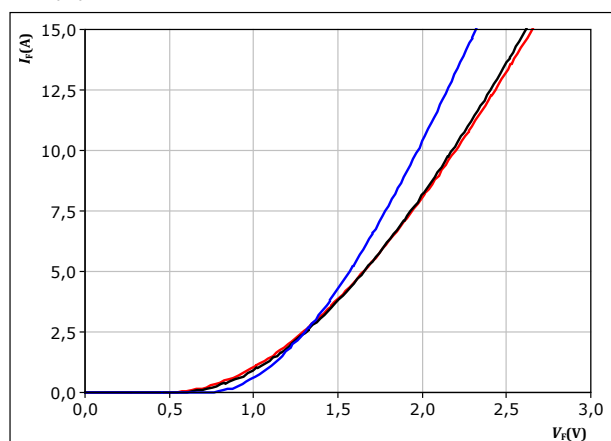
figure 16.	FWD

Transient thermal impedance as a function of pulse width

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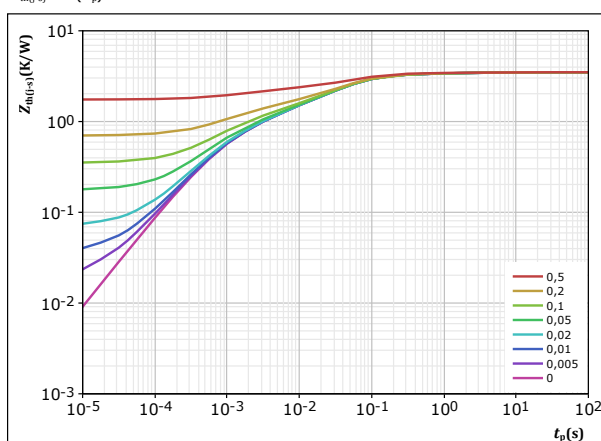
$D = t_p / T$

$R_{th(j-s)} =$ 3,495 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

Rectifier Diode Characteristics

Typical forward characteristics

$I_F = f(V_F)$

| $t_p =$ | 250 | µs |

T_j: ── 25 °C ── 125 °C

Transient thermal impedance as a function of pulse width

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

Legend: 0,5 / 0,2 / 0,1 / 0,05 / 0,02 / 0,01 / 0,005 / 0
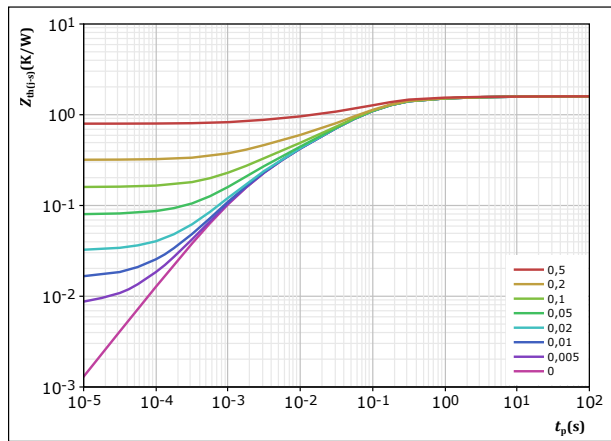
| $D =$ | t_p / T | |
| $R_{th(j-s)} =$ | 1,594 | K/W |

Rectifier thermal model values

R (K/W)	τ (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
1,81E-02	7,88E-04

Thermistor Characteristics

figure 19.	Thermistor

Typical NTC characteristic as function of temperature

$R_T = f(T)$

Inverter Switching Characteristics

figure 20. IGBT
Typical switching energy losses as a function of collector current
$E = f(I_C)$
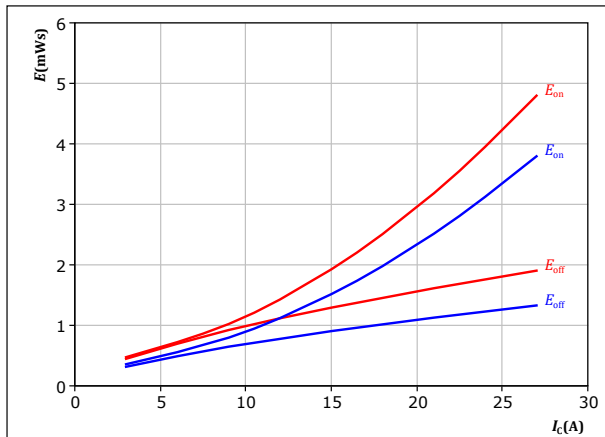
With an inductive load at
V_{CE} = 600 V
V_{GE} = ±15 V
R_{gon} = 32 Ω
R_{goff} = 32 Ω
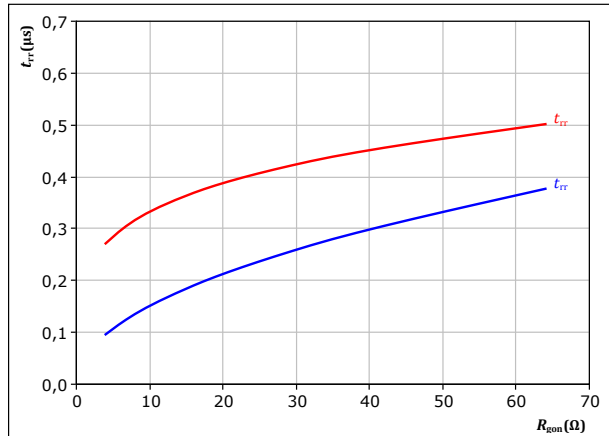T_j: 25 °C / 150 °C

figure 21. IGBT
Typical switching energy losses as a function of IGBT turn on gate resistor
$E = f(R_g)$
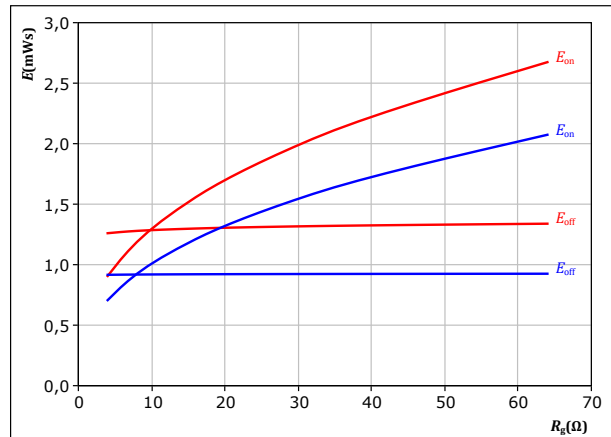
With an inductive load at
V_{CE} = 600 V
V_{GE} = ±15 V
I_C = 15 A
T_j: 25 °C / 150 °C

figure 22. 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
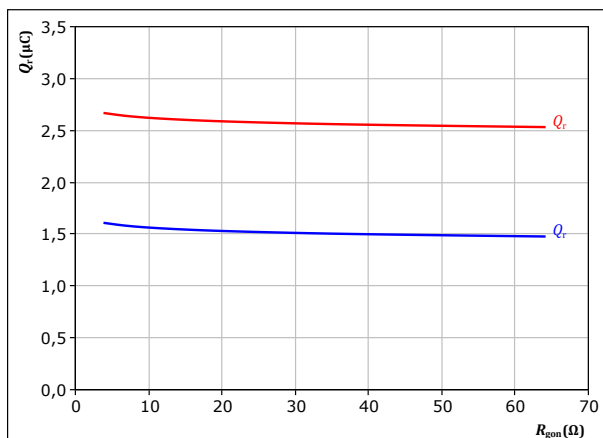V_{GE} = ±15 V
R_{gon} = 32 Ω
T_j: 25 °C / 150 °C

figure 23. FWD
Typical reverse recovered energy loss as a function of IGBT turn on gate resistor
$E_{rec} = f(R_g)$
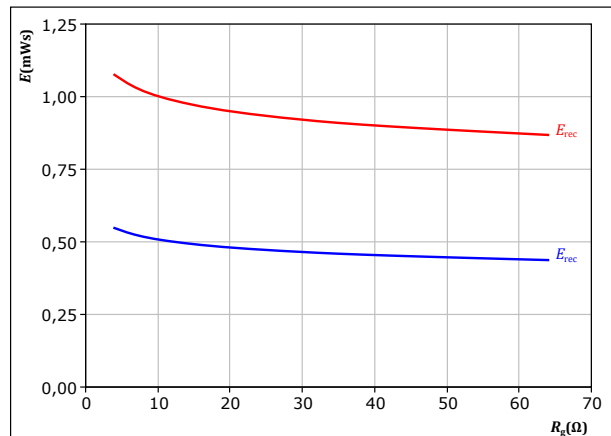
With an inductive load at
V_{CE} = 600 V
V_{GE} = ±15 V
I_C = 15 A
T_j: 25 °C / 150 °C
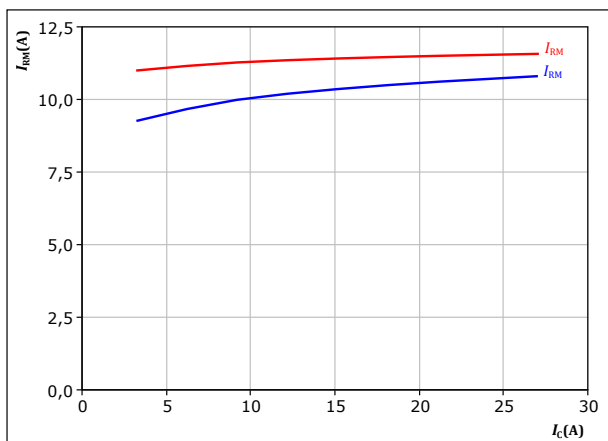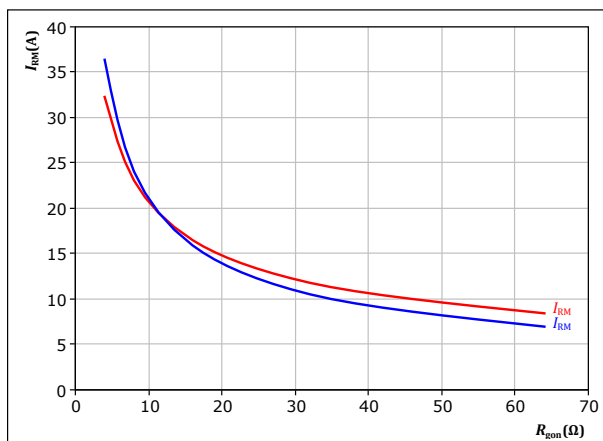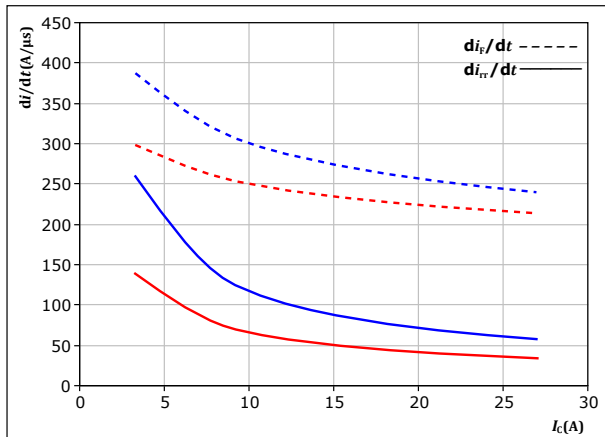
Inverter Switching Characteristics

figure 24.	IGBT

Typical switching times as a function of collector current

$t = f(I_c)$
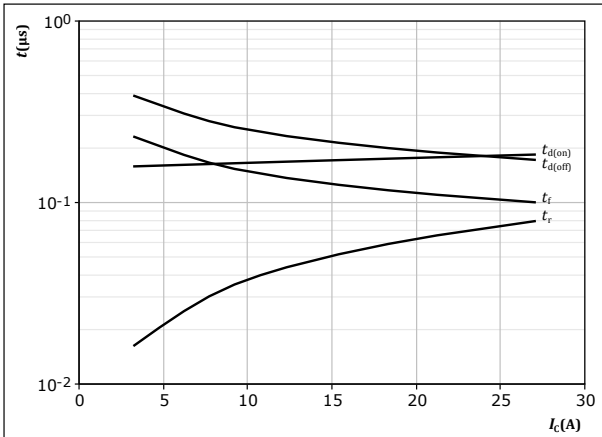
With an inductive load at

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

figure 25.	IGBT

Typical switching times as a function of IGBT turn on gate resistor

$t = f(R_g)$
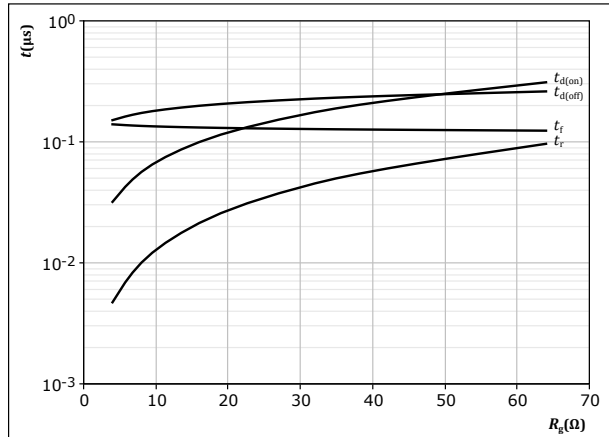
With an inductive load at

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

figure 26.	FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_c)$

With an inductive load at

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

T_j: — 25 °C   — 150 °C

figure 27.	FWD

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

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

With an inductive load at

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

T_j: — 25 °C   — 150 °C

Inverter Switching Characteristics

figure 28.   **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)

With an inductive load at

V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	32	Ω

T_j: —— 25 °C —— 150 °C

figure 29.   **FWD**

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

Q_r = f(R_{gon})

With an inductive load at

V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	15	A

T_j: —— 25 °C —— 150 °C

figure 30.   **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)

With an inductive load at

V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	32	Ω

T_j: —— 25 °C —— 150 °C

figure 31.   **FWD**

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

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

With an inductive load at

V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	15	A

T_j: —— 25 °C —— 150 °C

Inverter Switching Characteristics

figure 32. FWD

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

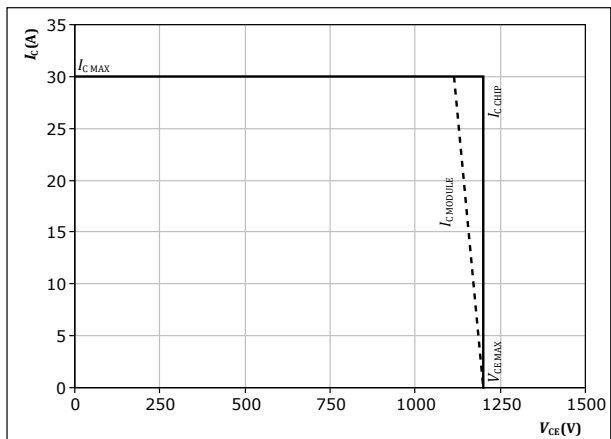di_F/dt, $di_{rr}/dt = f(I_C)$

With an inductive load at

V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	32	Ω

T_j: — 25 °C
— 150 °C

figure 33. FWD

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

di_F/dt, $di_{rr}/dt = f(R_{gon})$
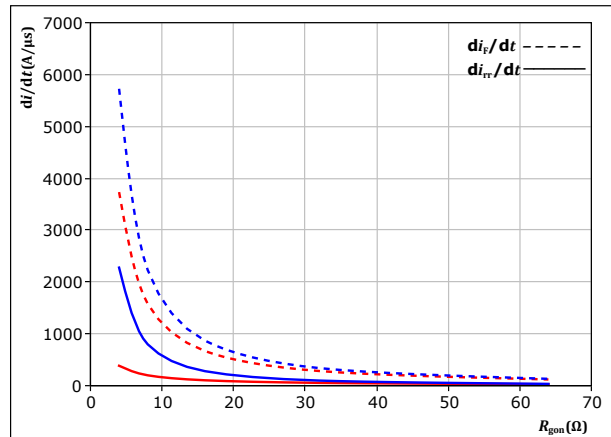
With an inductive load at

V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	15	A

T_j: — 25 °C
— 150 °C

figure 34. IGBT

Reverse bias safe operating area

$I_C = f(V_{CE})$

At

T_j =	150	°C
R_{gon} =	32	Ω
R_{goff} =	32	Ω

Brake Switching Characteristics

figure 35.	IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$

With an inductive load at

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

figure 36.	IGBT

Typical switching energy losses as a function of IGBT turn on gate resistor

$E = f(R_g)$

With an inductive load at

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

figure 37.	FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$

With an inductive load at

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

figure 38.	FWD

Typical reverse recovered energy loss as a function of IGBT turn on gate resistor

$E_{rec} = f(R_g)$

With an inductive load at

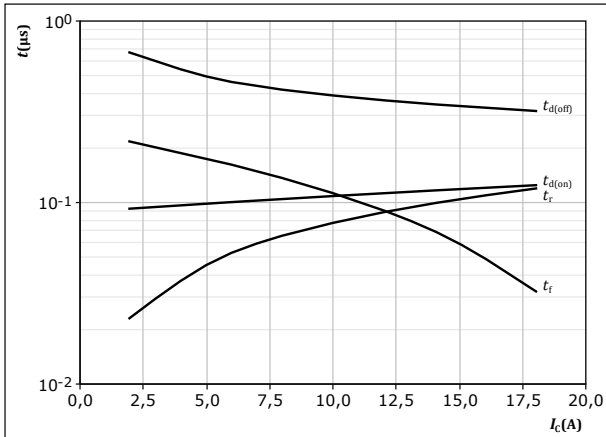|				T_j:	25 °C
V_{CE} =	700	V			125 °C
V_{GE} =	0/15	V			150 °C
I_C =	10	A			

Brake Switching Characteristics

figure 39. **IGBT**

Typical switching times as a function of collector current

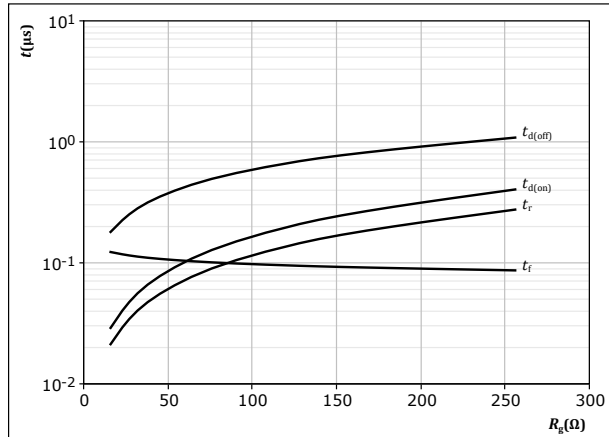$t = f(I_C)$

With an inductive load at

T_j =	150	°C
V_{CE} =	700	V
V_{GE} =	0/15	V
R_{gon} =	64	Ω
R_{goff} =	64	Ω

figure 40. **IGBT**

Typical switching times as a function of IGBT turn on gate resistor
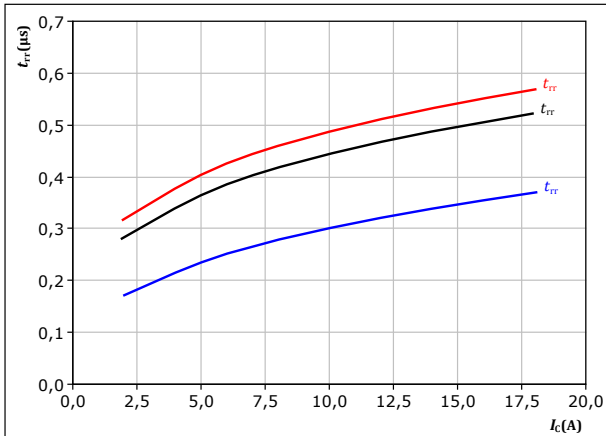
$t = f(R_g)$

With an inductive load at

T_j =	150	°C
V_{CE} =	700	V
V_{GE} =	0/15	V
I_C =	10	A

figure 41. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

With an inductive load at

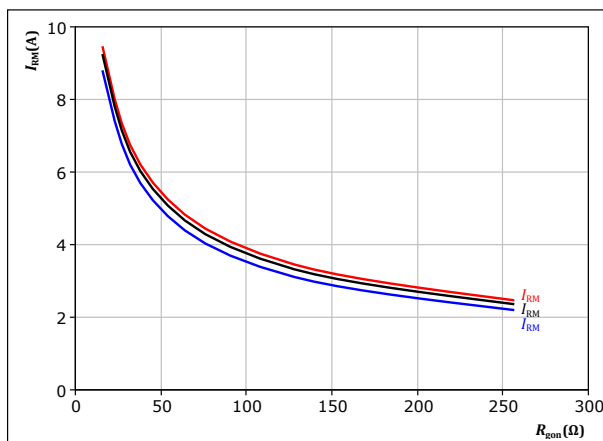|		
V_{CE} =	700	V
V_{GE} =	0/15	V
R_{gon} =	64	Ω

T_j: — 25 °C — 125 °C — 150 °C

figure 42. **FWD**

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

$t_{rr} = f(R_{gon})$
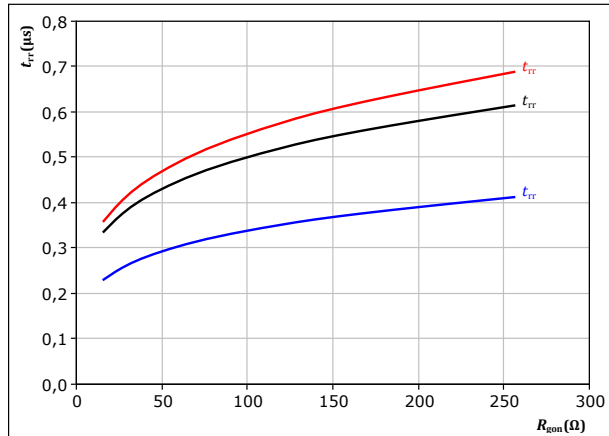
With an inductive load at

V_{CE} =	700	V
V_{GE} =	0/15	V
I_C =	10	A

T_j: — 25 °C — 125 °C — 150 °C

Brake Switching Characteristics

figure 43.	FWD

Typical recovered charge as a function of collector current

Q_r = f(I_C)

With an inductive load at

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

figure 44.	FWD

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

Q_r = f(R_{gon})

With an inductive load at

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

figure 45.	FWD

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)

With an inductive load at

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

figure 46.	FWD

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

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

With an inductive load at

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

Brake Switching Characteristics

figure 47.	FWD

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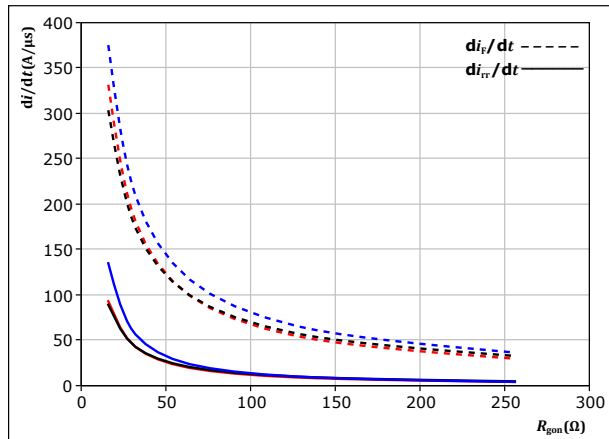
di_F/dt, di_{rr}/dt = f(I_C)

With an inductive load at

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

figure 48.	FWD

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

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

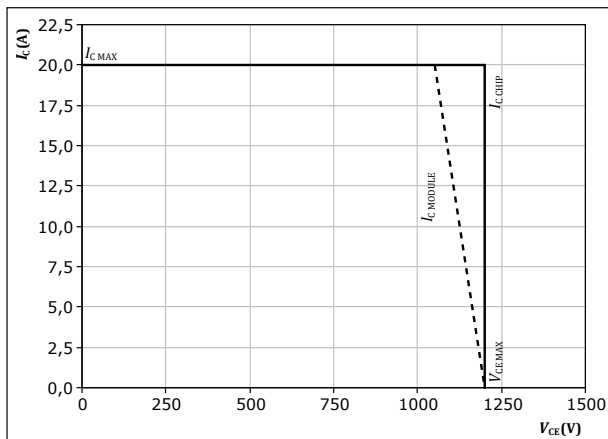With an inductive load at

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

figure 49.	IGBT

Reverse bias safe operating area

I_C = f(V_{CE})

At	T_j =	150	°C
	R_{gon} =	64	Ω
	R_{goff} =	64	Ω

Switching Definitions

figure 50. **IGBT**

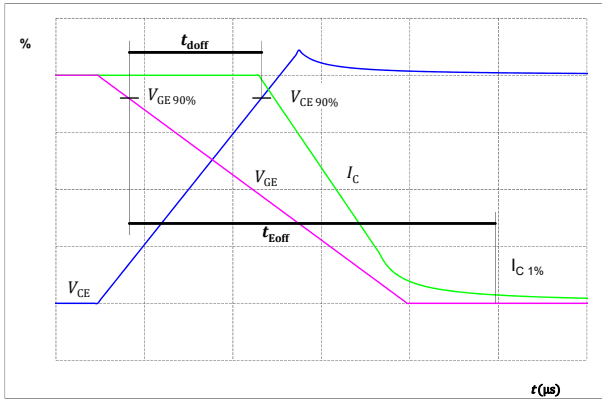Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{tEoff} = integrating time for E_{off})

figure 51. **IGBT**

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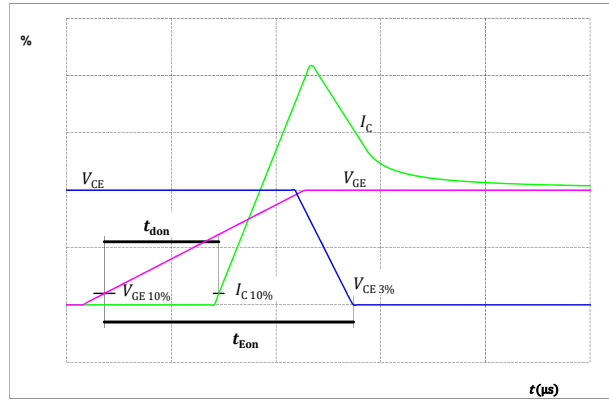

figure 52. **IGBT**
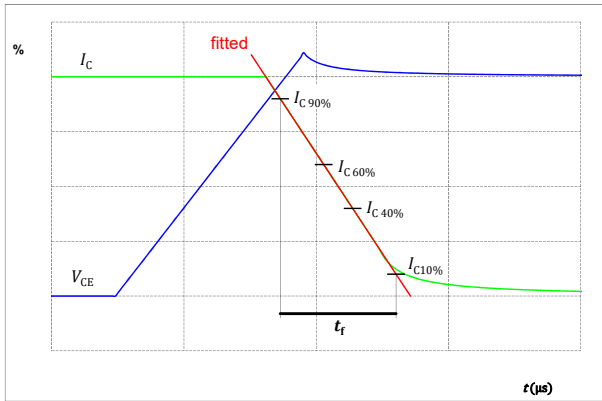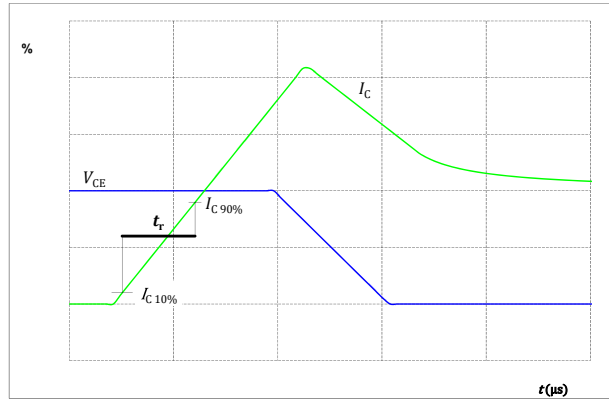
Turn-off Switching Waveforms & definition of t_f

figure 53. **IGBT**

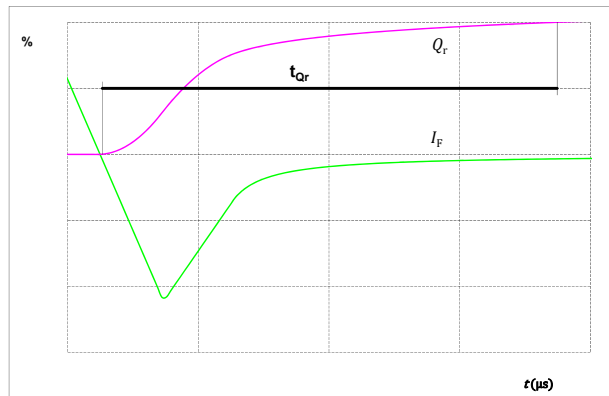Turn-on Switching Waveforms & definition of t_r

Switching Definitions

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

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

Vincotech

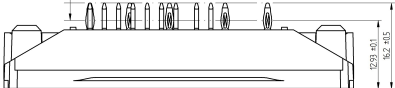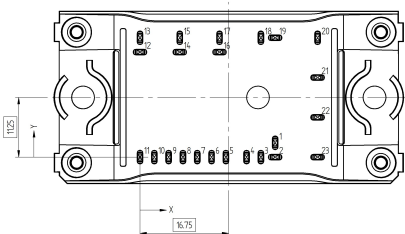| Ordering Code	
Version	**Ordering Code**
Without thermal paste	10-PC12PMA015M7-P840A26Y
With thermal paste (5,2 W/mK, PTM6000HV)	10-PC12PMA015M7-P840A26Y-/7/

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

Outline

Pin table [mm]			
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

center of press-fit pin head
pin head type "Y", PCB plated through-hole Ø145 mm +0.09 / −0.06
for further PCB design rules refer to the latest handling instruction

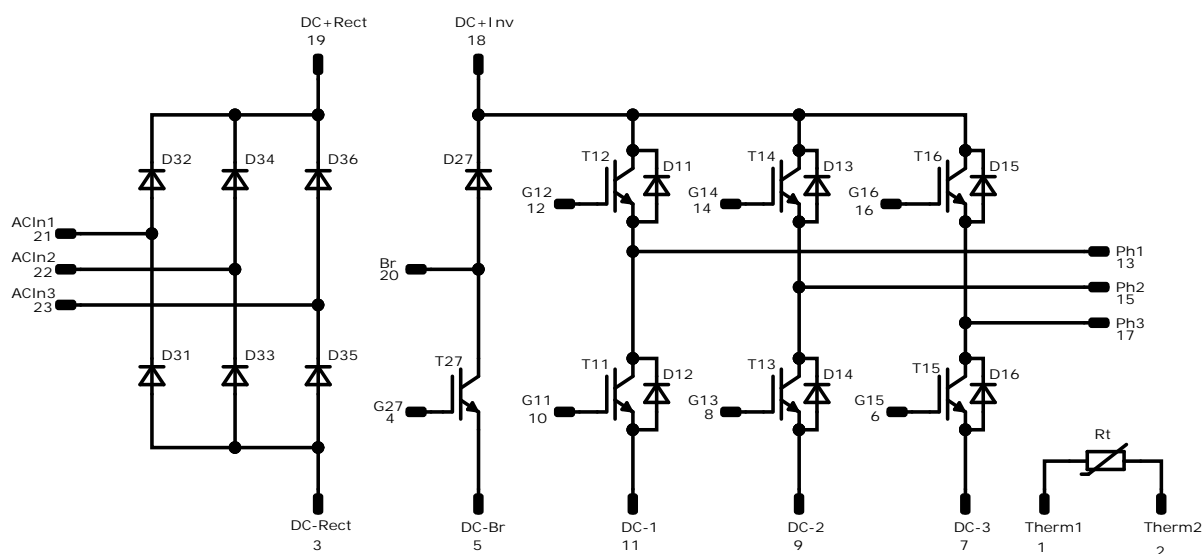Tolerance of pinpositions ±0.5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance

Pinout

Identification					
ID	**Component**	**Voltage**	**Current**	**Function**	**Comment**
T11, T12, T13, T14, T15, T16	IGBT	1200 V	15 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	15 A	Inverter Diode	
T27	IGBT	1200 V	10 A	Brake Switch	
D27	FWD	1200 V	5 A	Brake Diode	
D31, D32, D33, D34, D35, D36	Rectifier	1600 V	25 A	Rectifier Diode	
Rt	NTC			Thermistor	

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

Handling instruction
Handling instructions for *flow* 0 packages see vincotech.com website.

Package data
Package data for *flow* 0 packages see vincotech.com website.

Vincotech thermistor reference
See Vincotech thermistor reference table at vincotech.com website.

UL recognition and file number	
This device is UL 1557 recognized under E192116 up to a junction temperature under switching condition $T_{j,op}$=175°C and up to 3500VAC/1min isolation voltage. For more information see vincotech.com website.	(UL)

Document No.:	**Date:**	**Modification:**	**Pages**
10-PC12PMA015M7-P840A26Y-D1-14	16 Jan. 2026	Initial release	

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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.