80-M212PMA025I7-K229A90

datasheet

Vincotech

MiniSKiiP® PIM 2 | **1200 V / 25 A**

Topology features

- Converter+Brake+Inverter
- Kelvin Emitter for improved switching performance
- Temperature sensor

Component features

- Easy paralleling
- Low collector emitter saturation voltage
- Low turn-off losses
- Positive temperature coefficient

Housing features

- Base isolation: Al_2O_3
- Easy assembly in one mounting step
- Flexible PCB design w/o pin holes
- Rugged solderless spring contacts

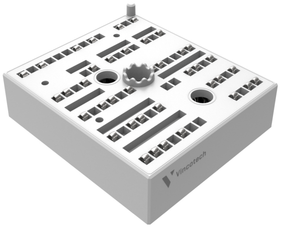
Target applications

- Industrial Drives

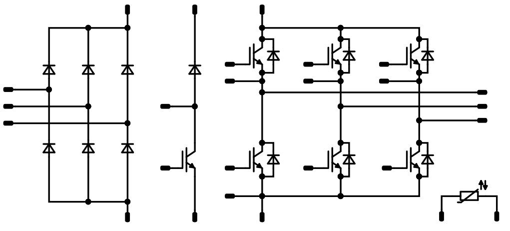
Types

- 80-M212PMA025I7-K229A90

MiniSKiiP® 2 16 mm housing



Schematic



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	38	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		50	A
Turn off safe operating area		T_j = 150°C, V_{CE} = 1200 V		50	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	94	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V, V_{CC} = 800 V	T_j = 175 °C	7	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	32	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		42	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	65	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	38	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		50	A
Turn off safe operating area		T_j = 150°C, V_{CE} = 1200 V		50	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	94	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V, V_{CC} = 800 V	T_j = 175 °C	7	µs
Maximum junction temperature	T_{jmax}			175	°C

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	32	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		42	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	65	W
Maximum junction temperature	T_{jmax}			175	°C
Rectifier Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	50	A
Surge (non-repetitive) forward current	I_{FSM}	Single Half Sine Wave, t_p = 10 ms	T_j = 150 °C	270	A
Surge current capability	I^2t			370	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	64	W
Maximum junction temperature	T_{jmax}			150	°C
Module Properties					
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{jop}			-40…+(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC Test Voltage*	t_p = 2 s	5500	V
Isolation voltage	V_{isol}	AC Voltage	t_p = 1 min	2500	V
Creepage distance		With std lid For more informations see handling instructions		6,3	mm
Clearance		With std lid For more informations see handling instructions		6,3	mm
Comparative Tracking Index	CTI			≥ 600	

*100 % tested in production

Vincotech

Characteristic Values

Parameter	Symbol	Conditions	V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	Unit
Inverter Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00053	25	5,15	5,8	6,45	V
Collector-emitter saturation voltage	V_{CEsat}		15		25	25 125 150	1,35	1,6 1,78 1,83	1,75(1)	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			5,6	µA
Gate-emitter leakage current	I_{GES}		20	0		25			100	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 100 kHz	0	25		25		4800		pF
Reverse transfer capacitance	C_{res}	f = 100 kHz	0	25		25		17		pF
Gate charge	Q_g	V_{CC} = 600 V	±15		25	25		395		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 2,5 W/mK (HPTP)						1,01		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	±15	600	25	25 125 150		103,14 105,28 106,46		ns
Rise time	t_r	R_{gon} = 8 Ω R_{goff} = 8 Ω	±15	600	25	25 125 150		37,8 41,02 41,29		ns
Turn-off delay time	$t_{d(off)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	±15	600	25	25 125 150		188,17 248,45 261,57		ns
Fall time	t_f	R_{gon} = 8 Ω R_{goff} = 8 Ω	±15	600	25	25 125 150		117,92 185,65 204,96		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=1,34 µC Q_{rFWD}=2,83 µC Q_{rFWD}=3,32 µC	±15	600	25	25 125 150		1,84 2,54 2,74		mWs
Turn-off energy (per pulse)	E_{off}		±15	600	25	25 125 150		1,59 2,55 2,84		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										
Forward voltage	V_F				21	25 125 150	1,55	1,8 1,72 1,69	2(1)	V
Reverse leakage current	I_R	V_r = 1200 V				25			0,27	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 2,5 W/mK (HPTP)						1,46		K/W
Dynamic										
Peak recovery current	I_{RM}	d*i*/d*t*=405 A/µs d*i*/d*t*=392 A/µs d*i*/d*t*=430 A/µs	±15	600	25	25 125 150		11,95 16,39 17,5		A
Reverse recovery time	t_{rr}					25 125 150		207,88 318,19 353,32		ns
Recovered charge	Q_r					25 125 150		1,34 2,83 3,32		µC
Reverse recovered energy	E_{rec}					25 125 150		0,474 1,06 1,27		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		140,15 72,64 73,37		A/µs

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	$V_{GE(th)}$	$V_{CE} = V_{GE}$			0,00053	25	5,15	5,8	6,45	V
Collector-emitter saturation voltage	V_{CEsat}		15		25	25 125 150	1,35	1,6 1,78 1,83	1,75(1)	V
Collector-emitter cut-off current	I_{CES}		0	1200		25			5,6	µA
Gate-emitter leakage current	I_{GES}		20	0		25			100	nA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 100 kHz	0	25		25		4800		pF
Reverse transfer capacitance	C_{res}	f = 100 kHz	0	25		25		17		pF
Gate charge	Q_g	V_{CC} = 600 V	±15		25	25		395		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 2,5 W/mK (HPTP)						1,01		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	0/15	700	25	25 125 150		34,4 35,2 35,4		ns
Rise time	t_r	R_{gon} = 8 Ω R_{goff} = 8 Ω	0/15	700	25	25 125 150		22,2 26 26,6		ns
Turn-off delay time	$t_{d(off)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	0/15	700	25	25 125 150		242 313 331		ns
Fall time	t_f	R_{gon} = 8 Ω R_{goff} = 8 Ω	0/15	700	25	25 125 150		80,47 149,94 176		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=1,68 µC Q_{rFWD}=3,2 µC Q_{rFWD}=3,67 µC	0/15	700	25	25 125 150		2,72 3,72 3,97		mWs
Turn-off energy (per pulse)	E_{off}		0/15	700	25	25 125 150		1,75 2,76 3,06		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	
Brake Diode										
Static										
Forward voltage	V_F				21	25 125 150	1,55	1,8 1,72 1,69	2[1]	V
Reverse leakage current	I_R	V_r = 1200 V				25			0,27	µA
Thermal										
Thermal resistance junction to sink [2]	$R_{th(j-s)}$	λ_{paste} = 2,5 W/mK (HPTP)						1,46		K/W
Dynamic										
Peak recovery current	I_{RM}	d*i*/d*t*=410 A/µs d*i*/d*t*=590 A/µs d*i*/d*t*=602 A/µs	0/15	700	25	25 125 150		10,36 13,28 13,81		A
Reverse recovery time	t_{rr}					25 125 150		257,68 362,39 393		ns
Recovered charge	Q_r					25 125 150		1,68 3,2 3,67		µC
Reverse recovered energy	E_{rec}					25 125 150		0,601 1,23 1,42		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		157,9 114,37 96,4		A/µs

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										
Forward voltage	V_F				13	25 125		0,988 0,899	1,21(1) 1,1(1)	V
Reverse leakage current	I_R	V_r = 1600 V				25			50	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 2,5 W/mK (HPTP)						1,1		K/W
Thermistor										
Static										
Rated resistance	R					25		1		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1670 Ω				100	-2		2	%
Maximum Current	I_{max}							3		mA
Power dissipation constant	d					25		0,76		mW/K
A-value	A							$7{,}635 \times 10^{-3}$		1/K
B-value	B							$1{,}73 \times 10^{-5}$		$1/K^2$
Vincotech Thermistor Reference									E	

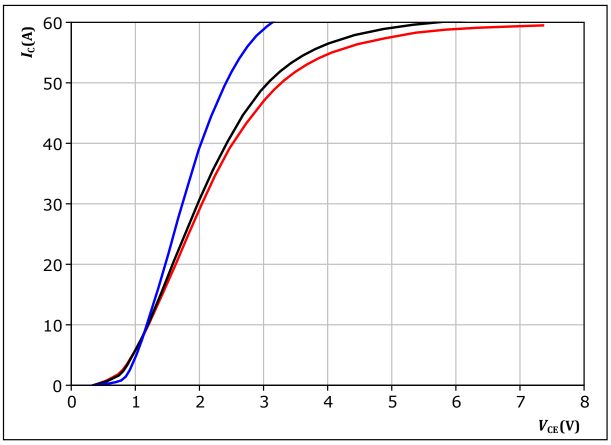
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

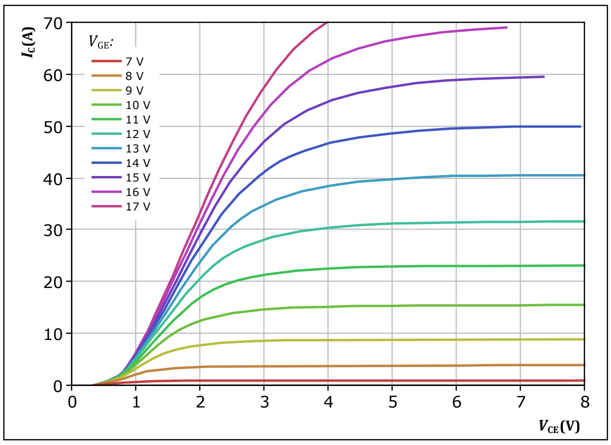


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



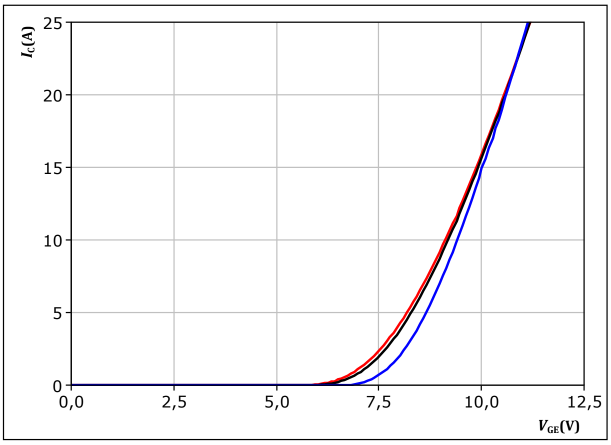
t_p =	250	µs
T_j =	150	°C

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

figure 3. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})

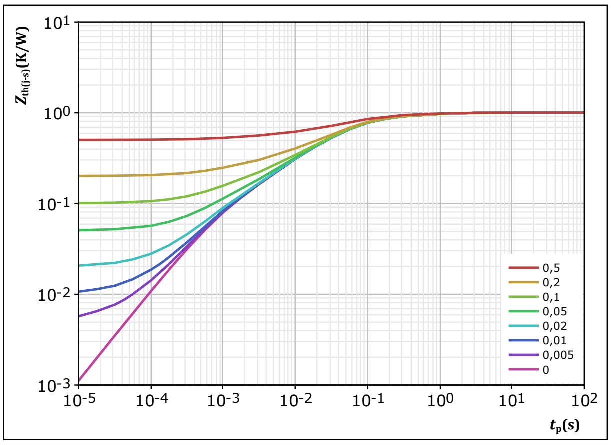


t_p =	250	µs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,007	K/W

IGBT thermal model values

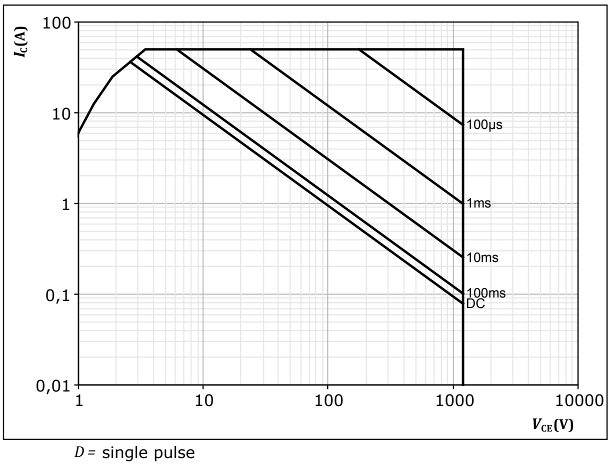
R (K/W)	τ (s)
6,89E-02	1,35E+00
1,76E-01	2,01E-01
5,09E-01	4,60E-02
1,86E-01	7,66E-03
6,61E-02	8,72E-04

Inverter Switch Characteristics

figure 5. **IGBT**

Safe operating area

I_C = f(V_{CE})

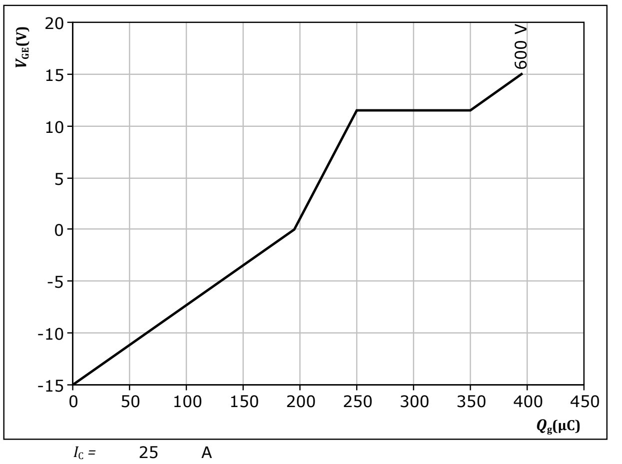


D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

figure 6. **IGBT**

Gate voltage vs gate charge

V_{GE} = f(Q_g)



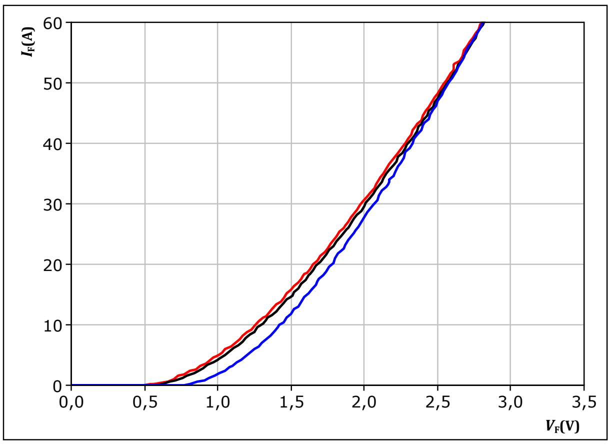
I_C =	25	A
T_j =	25	°C

Inverter Diode Characteristics

figure 7. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



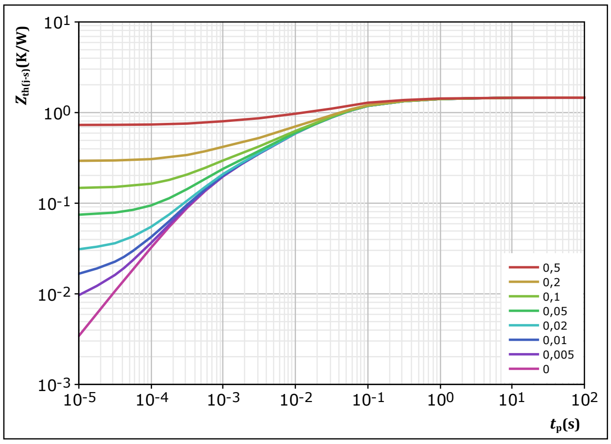
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 8. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,46 K/W

FWD thermal model values

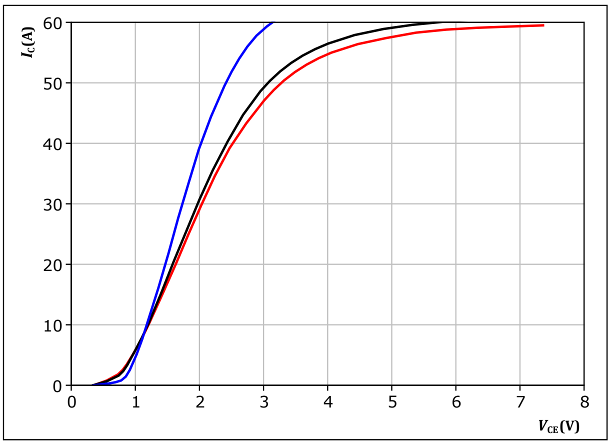
R (K/W)	τ (s)
6,56E-02	2,77E+00
2,64E-01	2,28E-01
6,81E-01	3,57E-02
3,05E-01	4,77E-03
1,44E-01	5,52E-04

Brake Switch Characteristics

figure 9. **IGBT**

Typical output characteristics

I_C = f(V_{CE})

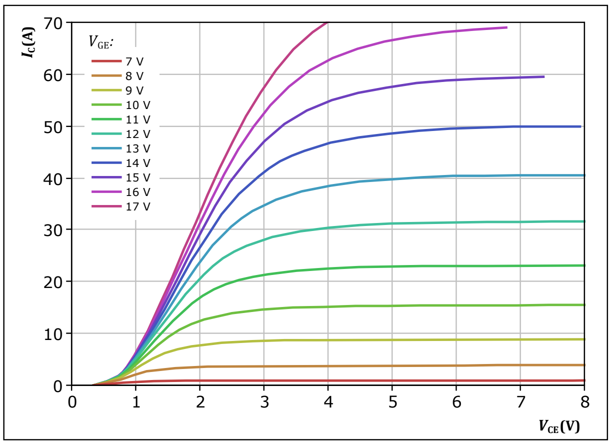


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 10. **IGBT**

Typical output characteristics

I_C = f(V_{CE})



t_p = 250 µs

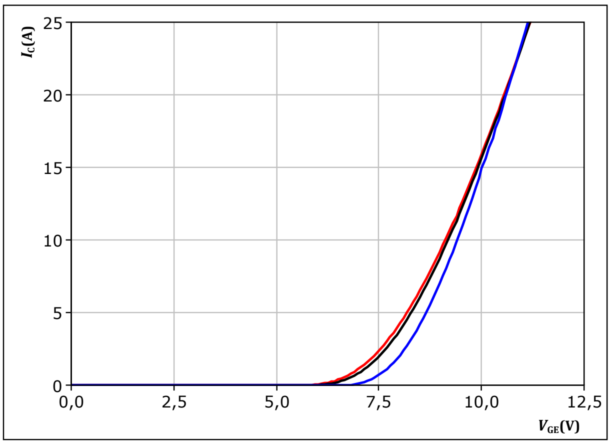
T_j = 150 °C

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

figure 11. **IGBT**

Typical transfer characteristics

I_C = f(V_{GE})

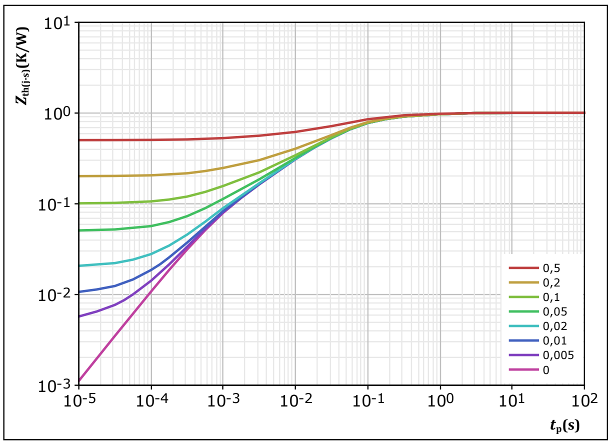


t_p =	250	µs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 12. **IGBT**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 1,007 K/W

IGBT thermal model values

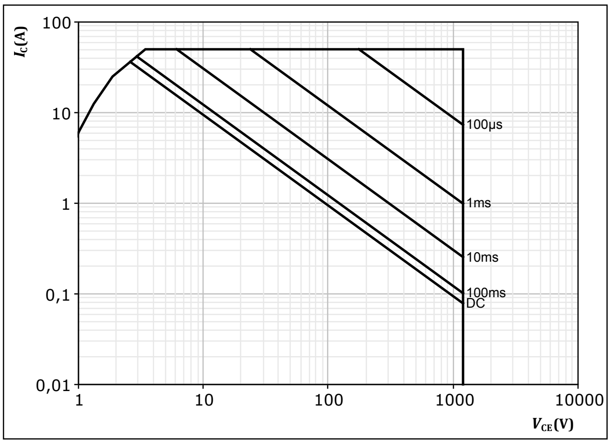
R (K/W)	τ (s)
6,89E-02	1,35E+00
1,76E-01	2,01E-01
5,09E-01	4,60E-02
1,86E-01	7,66E-03
6,61E-02	8,72E-04

Brake Switch Characteristics

figure 13. **IGBT**

Safe operating area

I_C = f(V_{CE})

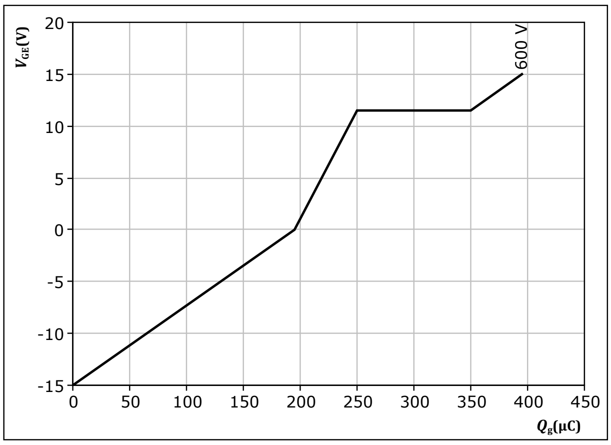


D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

figure 14. **IGBT**

Gate voltage vs gate charge

V_{GE} = f(Q_g)



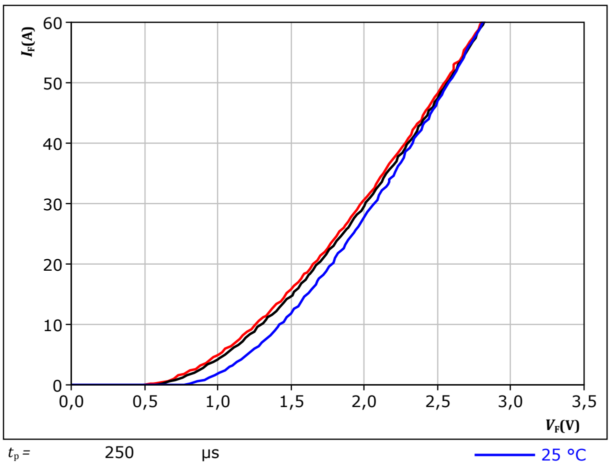
I_C =	25	A
T_j =	25	°C

Brake Diode Characteristics

figure 15. FWD

Typical forward characteristics

$I_F = f(V_F)$



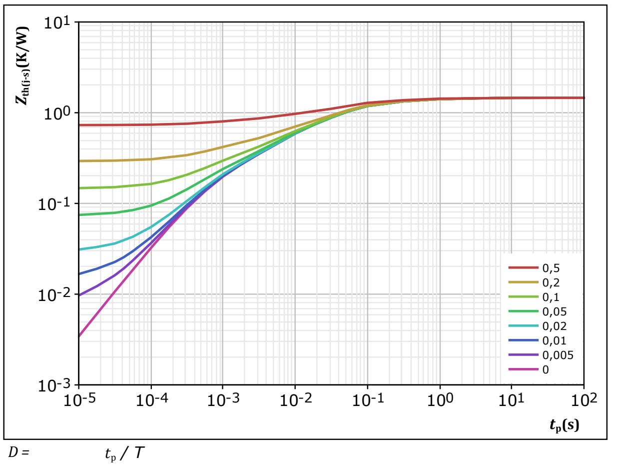
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 16. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,46 K/W

FWD thermal model values

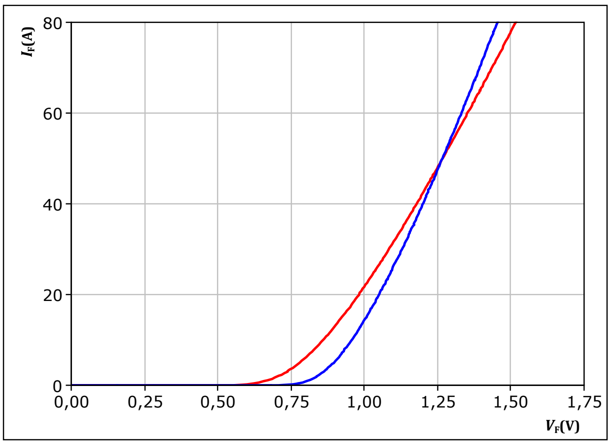
R (K/W)	τ (s)
6,56E-02	2,77E+00
2,64E-01	2,28E-01
6,81E-01	3,57E-02
3,05E-01	4,77E-03
1,44E-01	5,52E-04

Rectifier Diode Characteristics

figure 17. **Rectifier**

Typical forward characteristics

I_F = f(V_F)



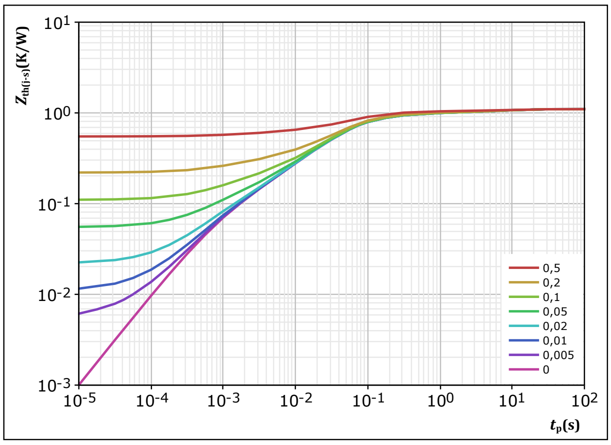
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 18. **Rectifier**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

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

Rectifier thermal model values

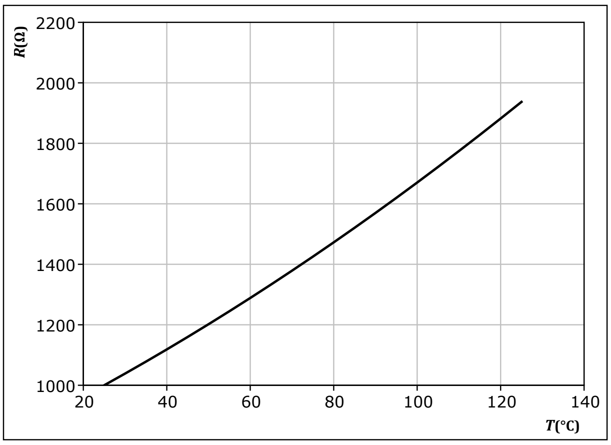
R (K/W)	τ (s)
1,03E-01	7,70E+00
1,17E-01	4,31E-01
5,19E-01	6,42E-02
2,38E-01	2,35E-02
7,64E-02	3,81E-03
4,71E-02	7,57E-04

Thermistor Characteristics

figure 19.	Thermistor

Typical PTC characteristic as function of temperature

R_T = f(T)

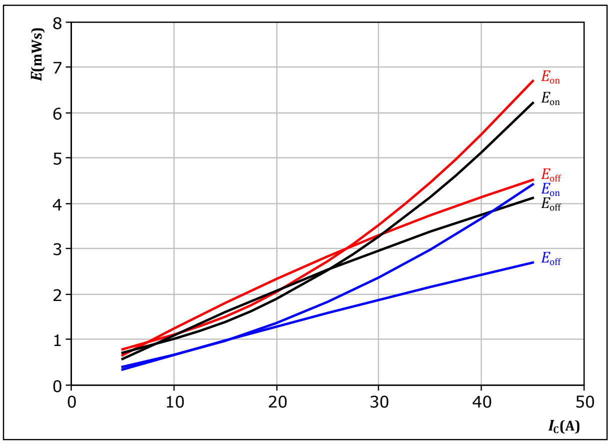


Inverter Switching Characteristics

figure 20. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



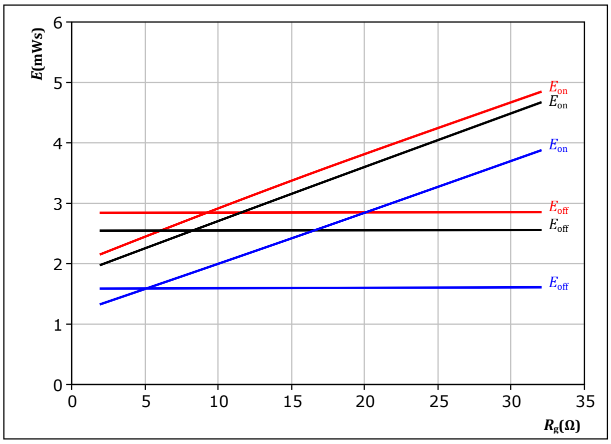
With an inductive load at

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

figure 21. IGBT

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

$E = f(R_g)$



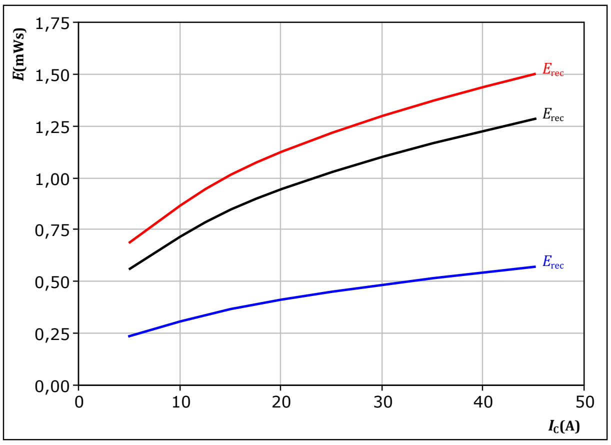
With an inductive load at

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

figure 22. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



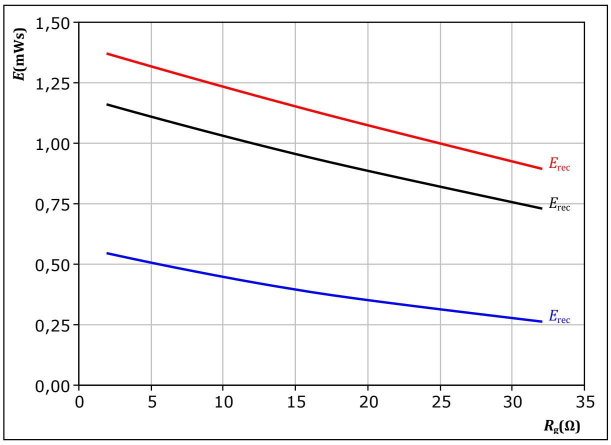
With an inductive load at

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

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

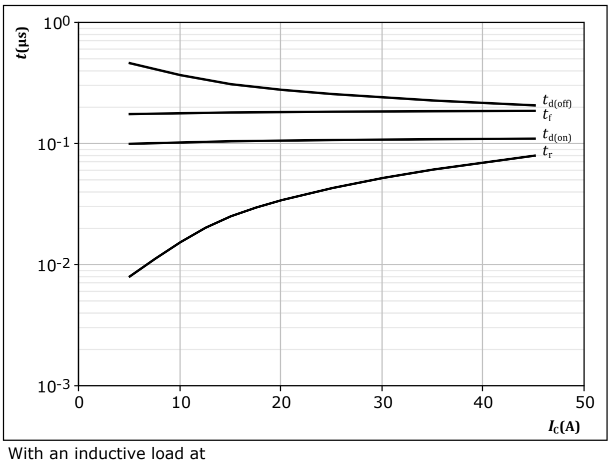
V_{CE} =	600	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
I_C =	25	A	

Inverter Switching Characteristics

figure 24. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



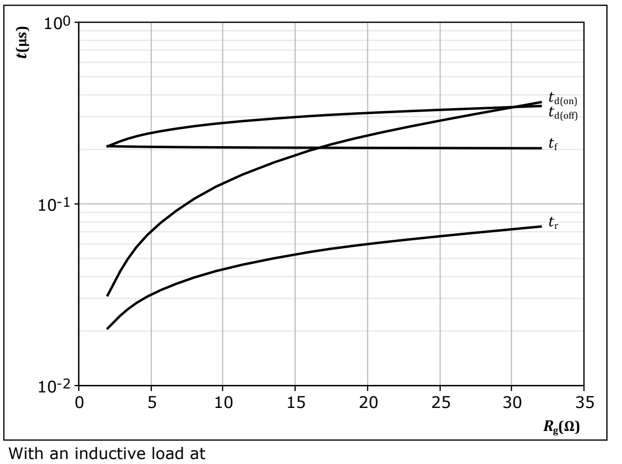
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 25. **IGBT**

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

$t = f(R_g)$



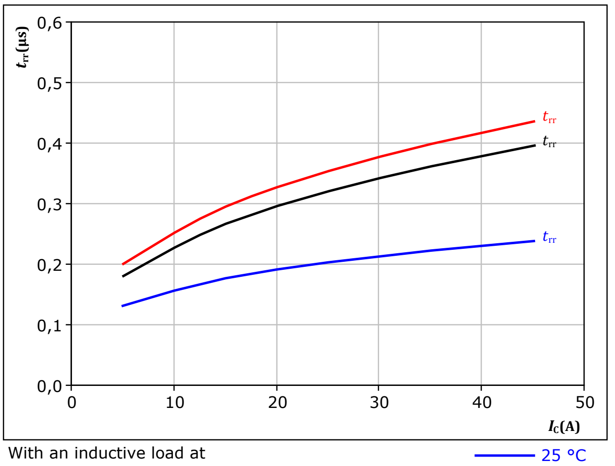
With an inductive load at

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

figure 26. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

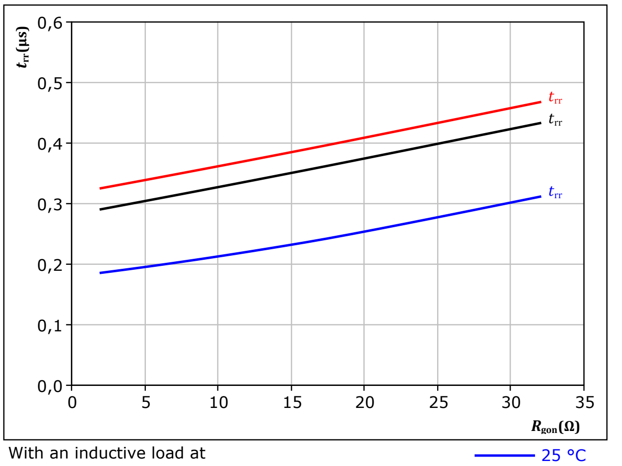
V_{CE} =	600	V
V_{GE} =	±15	V
R_{gon} =	8	Ω

T_j: 25 °C, 125 °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 =	25	A

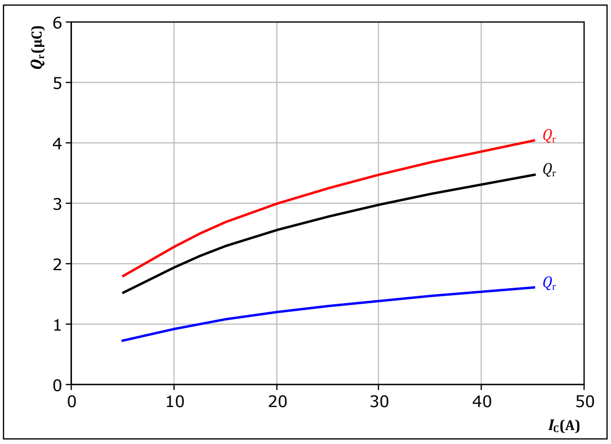
T_j: 25 °C, 125 °C, 150 °C

Inverter Switching Characteristics

figure 28. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



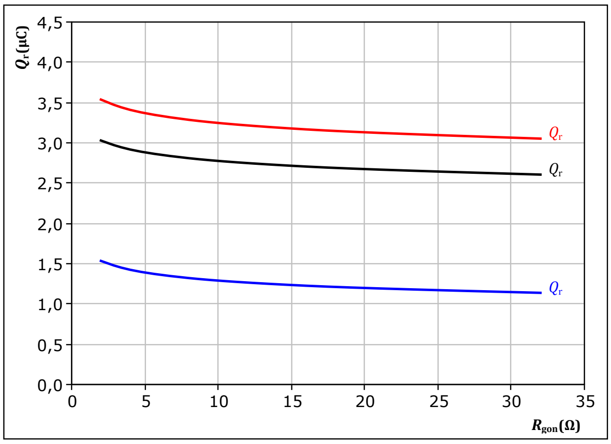
With an inductive load at

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

figure 29. **FWD**

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

Q_r = f(R_{gon})



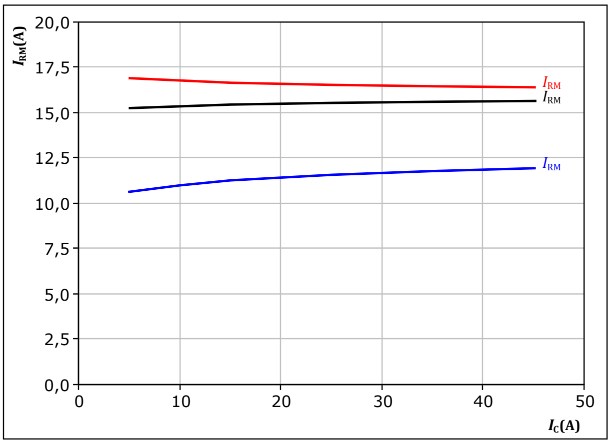
With an inductive load at

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

figure 30. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



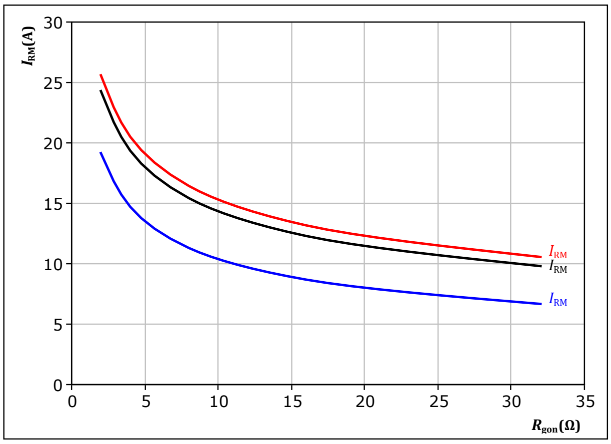
With an inductive load at

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

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

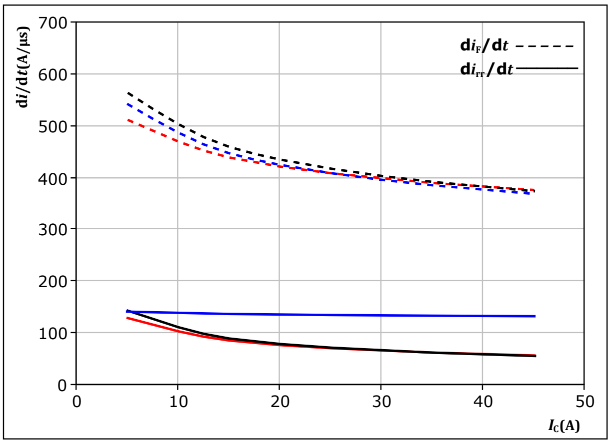
V_{CE} =	600	V	T_j: 25 °C / 125 °C / 150 °C
V_{GE} =	±15	V	
I_C =	25	A	

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

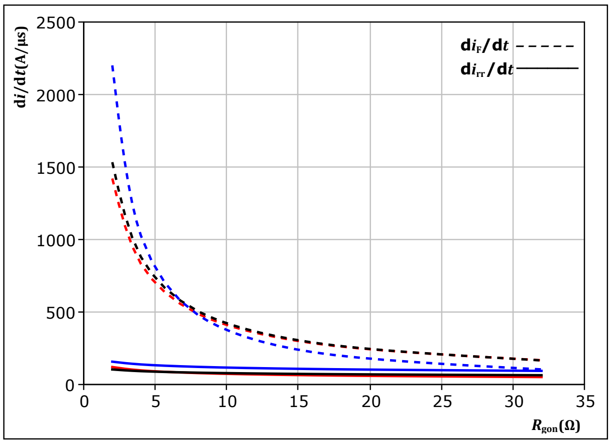
V_{CE} =	600	V	
V_{GE} =	±15	V	
R_{gon} =	8	Ω	

T_j: 25 °C, 125 °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

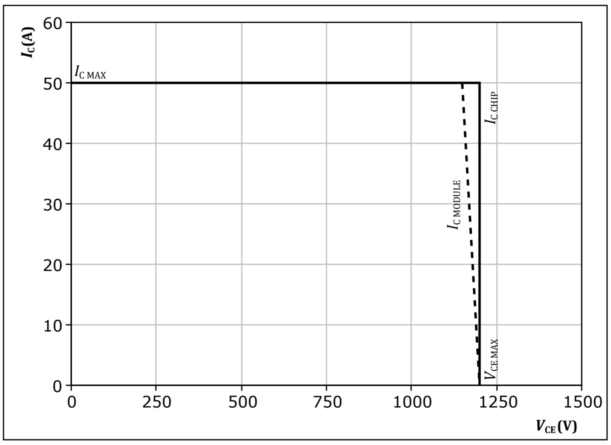
V_{CE} =	600	V	
V_{GE} =	±15	V	
I_C =	25	A	

T_j: 25 °C, 125 °C, 150 °C

figure 34. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



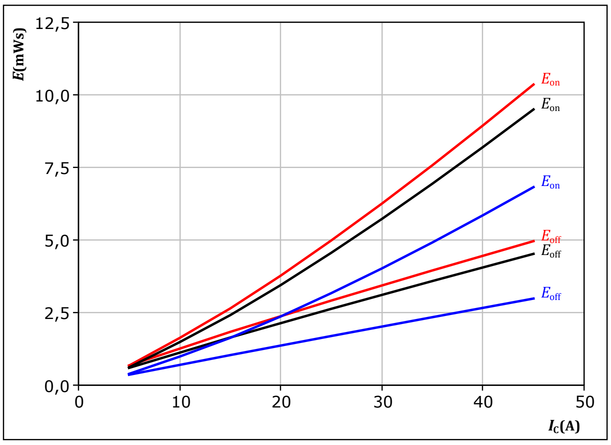
At	T_j =	150	°C
	R_{gon} =	8	Ω
	R_{goff} =	8	Ω

Brake Switching Characteristics

figure 35. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



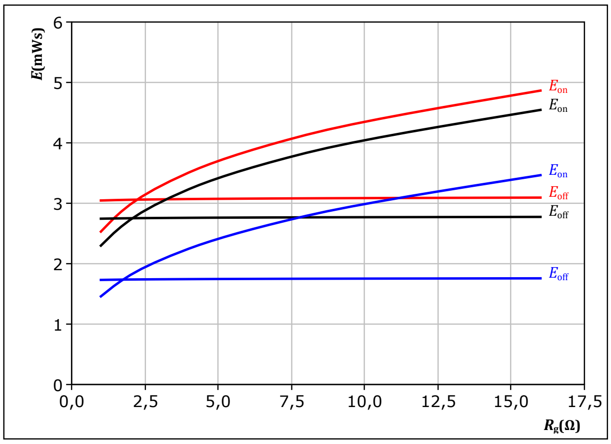
With an inductive load at

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

figure 36. **IGBT**

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

$E = f(R_g)$



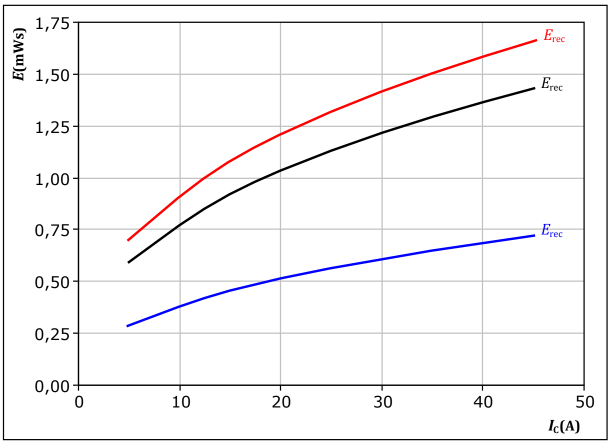
With an inductive load at

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

figure 37. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



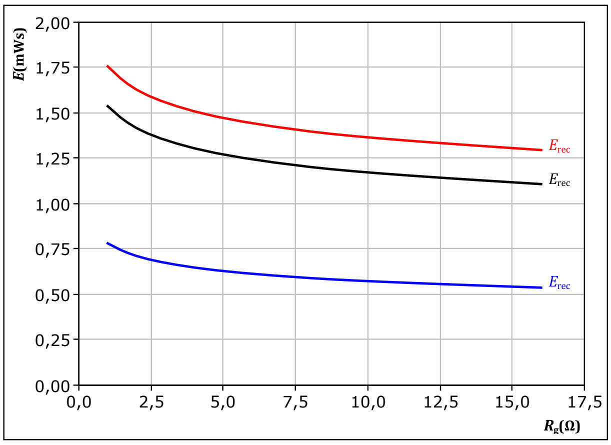
With an inductive load at

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

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

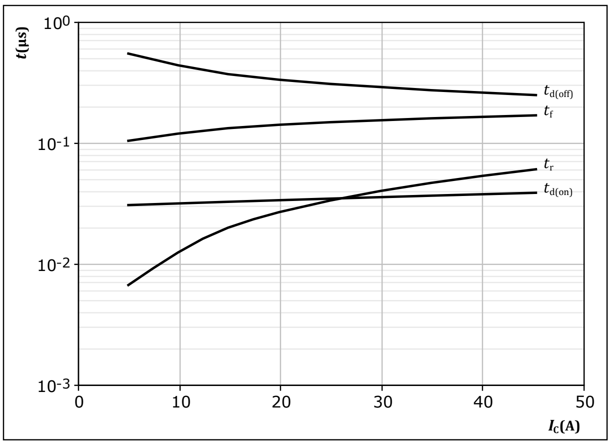
V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	25	A		150 °C

Brake Switching Characteristics

figure 39. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



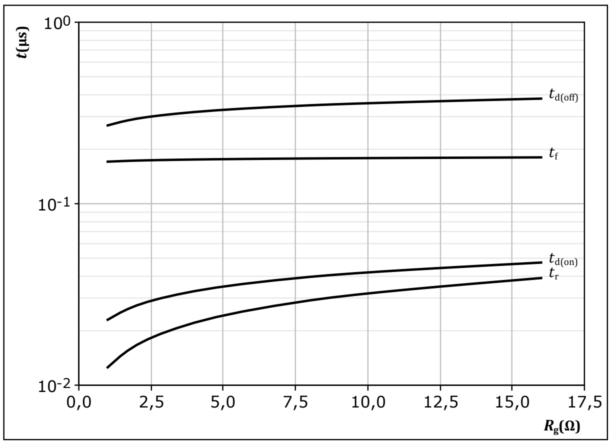
With an inductive load at

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

figure 40. **IGBT**

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

t = f(R_g)



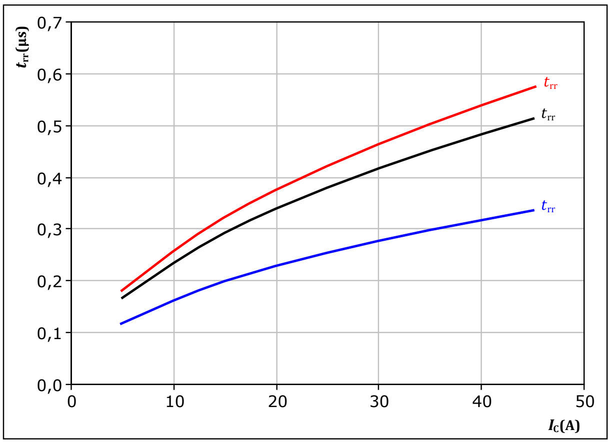
With an inductive load at

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

figure 41. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

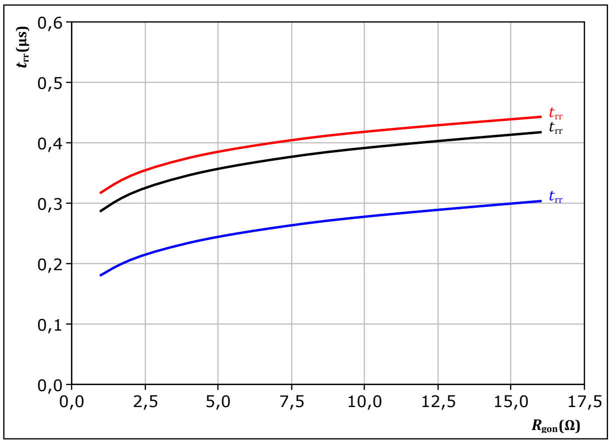
V_{CE} =	700	V
V_{GE} =	0/15	V
R_{gon} =	8	Ω

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 =	25	A

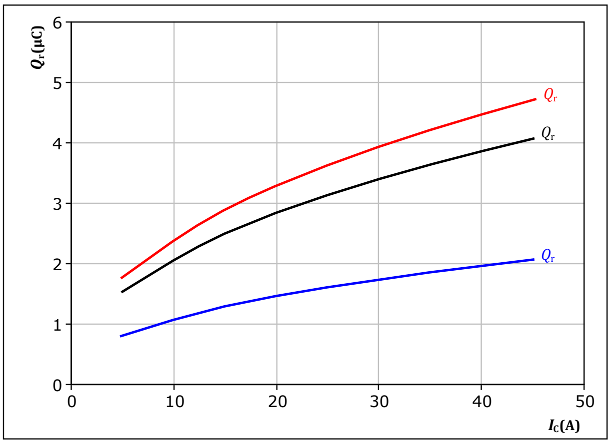
T_j: 25 °C, 125 °C, 150 °C

Brake Switching Characteristics

figure 43. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



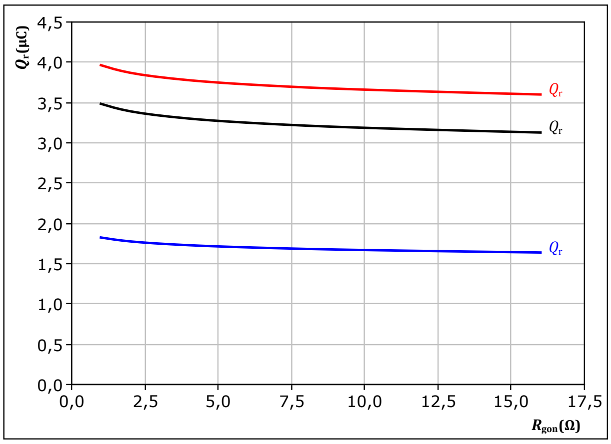
With an inductive load at

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

figure 44. **FWD**

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

Q_r = f(R_{gon})



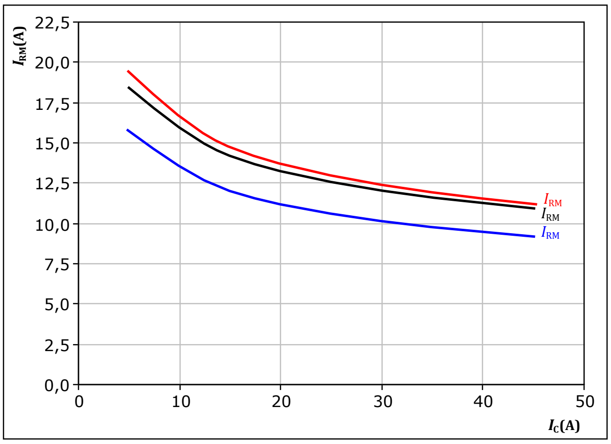
With an inductive load at

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

figure 45. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



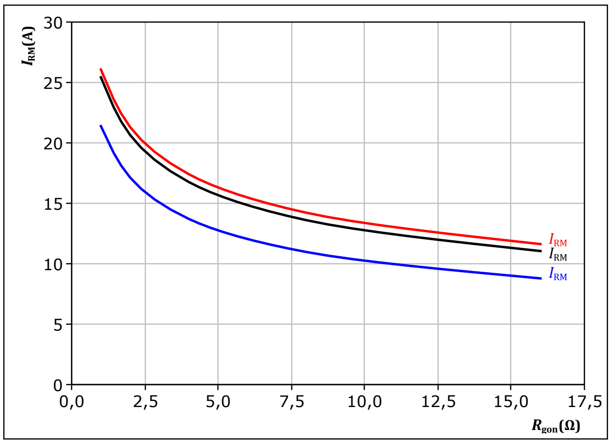
With an inductive load at

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

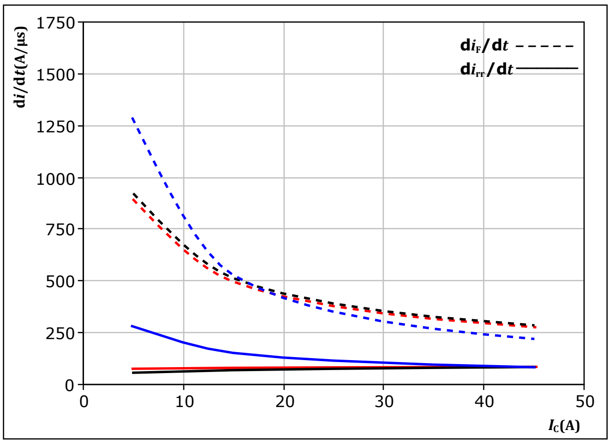
V_{CE} =	700	V	T_j:	25 °C
V_{GE} =	0/15	V		125 °C
I_C =	25	A		150 °C

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)



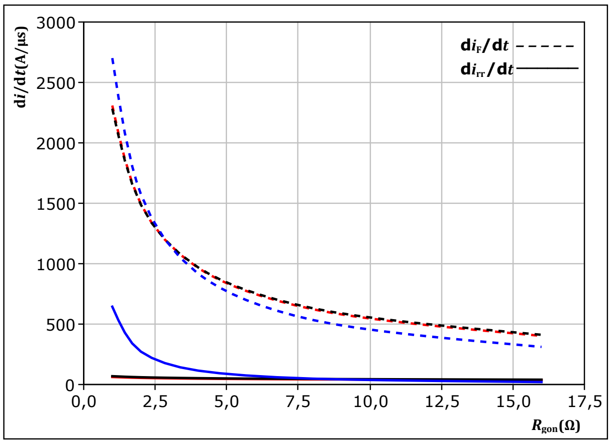
With an inductive load at

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



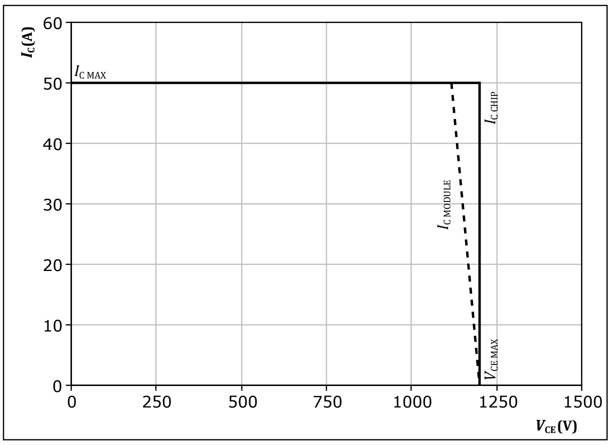
With an inductive load at

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

figure 49. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



At	T_j =	150	°C
	R_{gon} =	8	Ω
	R_{goff} =	8	Ω

Switching Definitions

figure 50. IGBT

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

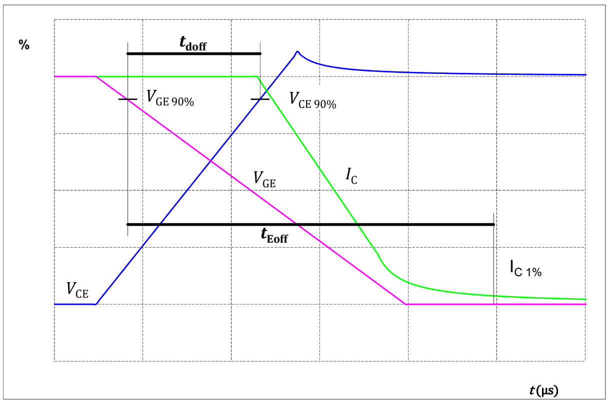


figure 51. IGBT

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

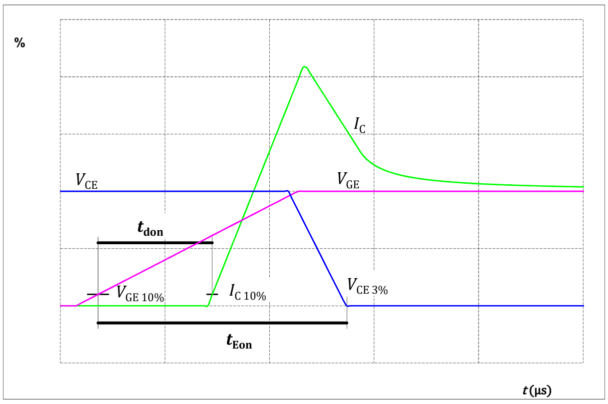


figure 52. IGBT

Turn-off Switching Waveforms & definition of t_f

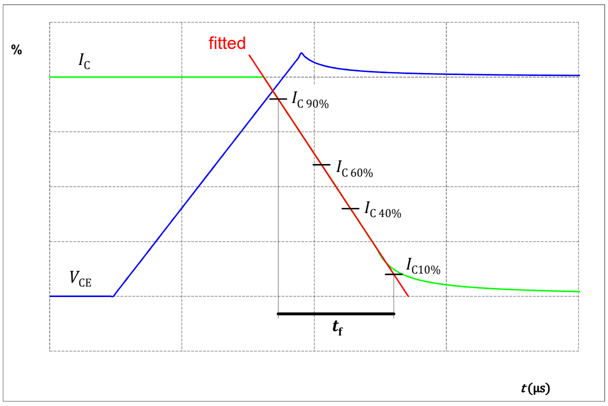
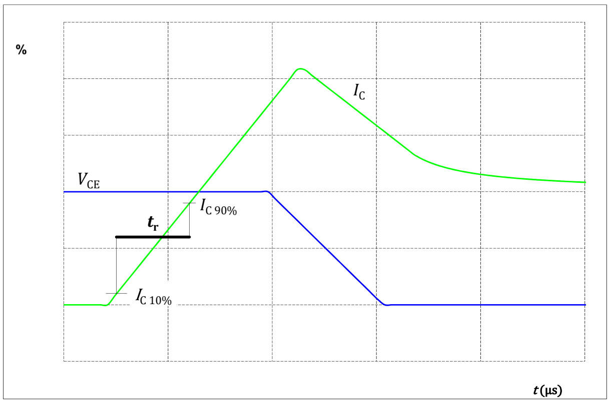


figure 53. IGBT

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 54.	FWD

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

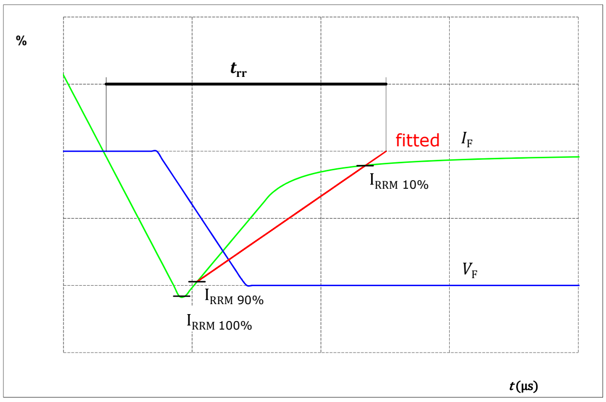
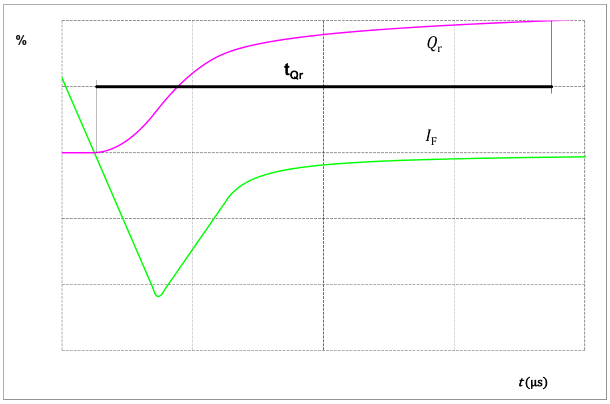


figure 55.	FWD

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



Ordering Code

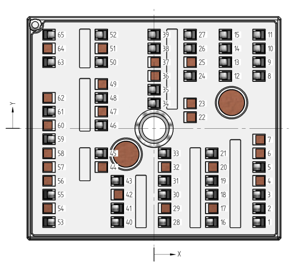
Version	Ordering Code
With std lid (6.5mm height) + no thermal grease	80-M212PMA025I7-K229A90-/0A/
With thin lid (2.8mm height) + no thermal grease	80-M212PMA025I7-K229A90-/0B/
With std lid (6.5mm height) + thermal grease (0,8 W/mK, P12, silicone-based)	80-M212PMA025I7-K229A90-/1A/
With thin lid (2.8mm height) + thermal grease (0,8 W/mK, P12, silicone-based)	80-M212PMA025I7-K229A90-/1B/
With std lid (6.5mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)	80-M212PMA025I7-K229A90-/4A/
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, TG20032, silicone-free)	80-M212PMA025I7-K229A90-/4B/
With std lid (6.5mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)	80-M212PMA025I7-K229A90-/5A/
With thin lid (2.8mm height) + thermal grease (2,5 W/mK, HPTP, silicone-based)	80-M212PMA025I7-K229A90-/5B/

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		

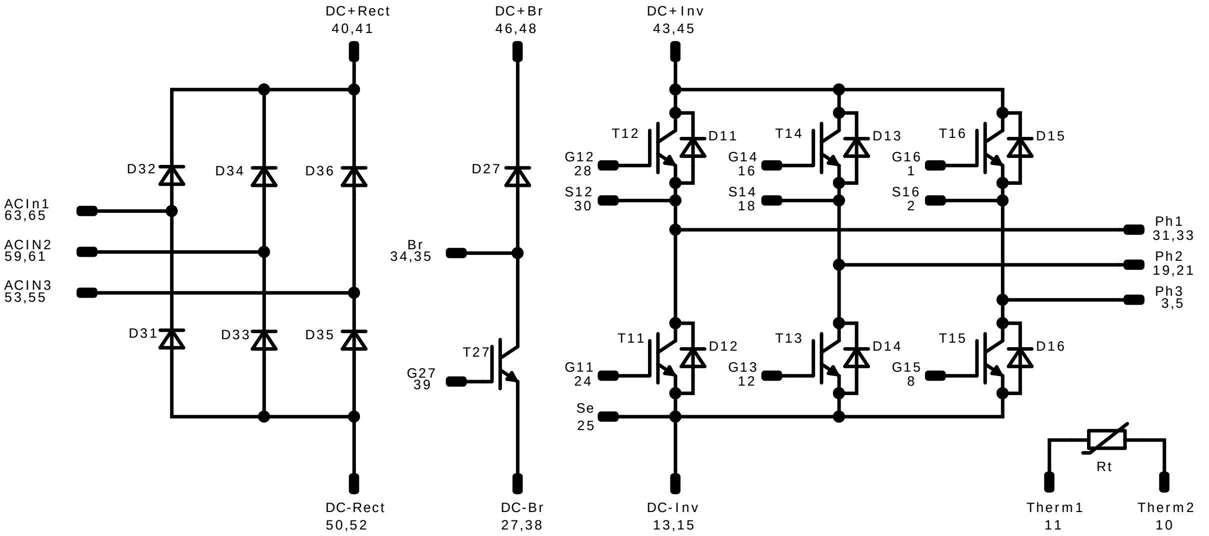
Outline

Pin table [mm]							
Pin	X	Y	Function	34	0,03	5,8	Br
1	24,38	-21,8	G16	35	0,03	9	Br
2	24,38	-18,6	S16	36	not assembled		
3	24,38	-15,4	Ph3	37	not assembled		
4	not assembled			38	0,03	18,6	DC-Br
5	24,38	-9	Ph3	39	0,03	21,8	G27
6	not assembled			40	-8,5	-21,8	DC+Rect
7	not assembled			41	-8,5	-18,6	DC+Rect
8	24,38	12,2	G15	42	not assembled		
9	not assembled			43	-8,5	-12,2	DC+Inv
10	24,38	18,6	Therm2	44	not assembled		
11	24,38	21,8	Therm1	45	-12,22	-5,8	DC+Inv
12	16,58	12,2	G13	46	-12,22	0,7	DC+Br
13	16,58	15,4	DC-Inv	47	not assembled		
14	not assembled			48	-12,22	7,1	DC+Br
15	16,58	21,8	DC-Inv	49	not assembled		
16	13,42	-21,8	G14	50	-12,22	15,4	DC-Rect
17	not assembled			51	not assembled		
18	13,42	-15,4	S14	52	-12,22	21,8	DC-Rect
19	13,42	-12,2	Ph2	53	-24,38	-21,8	ACIn3
20	not assembled			54	not assembled		
21	13,42	-5,8	Ph2	55	-24,38	-15,4	ACIn3
22	not assembled			56	not assembled		
23	not assembled			57	not assembled		
24	8,38	12,2	G11	58	not assembled		
25	8,38	15,4	Se	59	-24,38	-2,5	ACIn2
26	not assembled			60	not assembled		
27	8,38	21,8	DC-Br	61	-24,38	3,9	ACIn2
28	2,46	-21,8	G12	62	not assembled		
29	not assembled			63	-24,38	15,4	ACIn1
30	2,46	-15,4	S12	64	not assembled		
31	2,46	-12,2	Ph1	65	-24,38	21,8	ACIn1
32	not assembled						
33	2,46	-5,8	Ph1				



Pad positions refers to center point. For more informations on pad design please see package data

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T11, T12, T13, T14, T15, T16	IGBT	1200 V	25 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	1200 V	21 A	Inverter Diode	
T27	IGBT	1200 V	25 A	Brake Switch	
D27	FWD	1200 V	21 A	Brake Diode	
D31, D32, D33, D34, D35, D36	Rectifier	1600 V	35 A	Rectifier Diode	
Rt	NTC			Thermistor	

Packaging instruction				
Standard packaging quantity (SPQ) 72	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for MiniSKiiP® 2 packages see vincotech.com website.

Package data
Package data for MiniSKiiP® 2 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 certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
80-M212PMA025I7-K229A90-D1-14	7 Aug. 2022		