Vincotech

10-EZ06PMA015SA-L924A38T
datasheet

***flow*PIM E1** | **600 V / 15 A**

Features

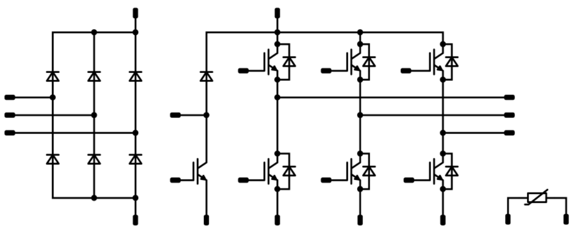
- Trenchstop™ IGBT3 technology
- Standard industrial housing
- Optimized $R_{th(j\text{-}s)}$ with Phase Change Material
- Built-in NTC

flow E1 12 mm housing

Target applications

- Industrial Drives

Schematic



Types

- 10-EZ06PMA015SA-L924A38T

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Inverter Switch				
Collector-emitter voltage	V_{CES}		600	V
Collector current	I_C	$T_j = T_{jmax}$ T_s = 80 °C	21	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	45	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	57	W
Gate-emitter voltage	V_{GES}		±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V V_{cc} = 360 V T_j = 150 °C	6	µs
Maximum junction temperature	T_{jmax}		175	°C

Vincotech

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Inverter Diode					
Peak repetitive reverse voltage	V_{RRM}			600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	21	A
Repetitive peak forward current	I_{FRM}			30	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	48	W
Maximum junction temperature	T_{jmax}			175	°C
Brake Switch					
Collector-emitter voltage	V_{CES}			600	V
Collector current	I_C	$T_j = T_{jmax}$	T_s = 80 °C	21	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		45	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	57	W
Gate-emitter voltage	V_{GES}			±20	V
Short circuit ratings	t_{SC}	V_{GE} = 15 V V_{cc} = 360 V	T_j = 150 °C	6	μs
Maximum junction temperature	T_{jmax}			175	°C
Brake Diode					
Peak repetitive reverse voltage	V_{RRM}			600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	14	A
Repetitive peak forward current	I_{FRM}			20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	41	W
Maximum junction temperature	T_{jmax}			175	°C
Rectifier Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$	T_s = 80 °C	47	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz 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	58	W
Maximum junction temperature	T_{jmax}			150	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Module Properties					
General Properties					
Stray inductance	L_P			30	nH
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{jop}			-40…(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC Test Voltage*	t_p = 2 s	6000	V
		AC Voltage	t_p = 1 min	2500	V
Creepage distance				min. 12,7	mm
Clearance				min. 12,7	mm
Comparative Tracking Index	CTI			≥ 600	

*100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Inverter Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{GE} = V_{CE}			0,00021	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		15	25 150	1,1	1,59 1,85	1,9	V
Collector-emitter cut-off current	I_{CES}		0	600		25			0,85	µA
Gate-emitter leakage current	I_{GES}		20	0		25			300	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	25		25		860		pF
Output capacitance	C_{oes}							55		
Reverse transfer capacitance	C_{res}							24		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,66		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 16 Ω R_{goff} = 16 Ω	±15	300	15	25 150		56 52		ns
Rise time	t_r					25 150		11 12		
Turn-off delay time	$t_{d(off)}$					25 150		104 124		
Fall time	t_f					25 150		98 121		
Turn-on energy (per pulse)*	E_{on}	Q_{rFWD} = 0,6 µC Q_{rFWD} = 1,3 µC				25 150		0,181 0,258		mWs
Turn-off energy (per pulse)*	E_{off}					25 150		0,364 0,484		

* L_s = 14 nH

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	25 150		1,60 1,51	1,95	V
Reverse leakage current	I_R			600		25			27	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,99		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 1807 A/µs di/dt = 1328 A/µs	±15	300	15	25 150		14 22		A
Reverse recovery time	t_{rr}					25 150		135 179		ns
Recovered charge	Q_r					25 150		0,625 1,28		µC
Reverse recovered energy	E_{rec}					25 150		0,154 0,282		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 150		865 780		A/µs

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Brake Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	V_{GE} = V_{CE}			0,00021	25	5	5,8	6,5	V
Collector-emitter saturation voltage	V_{CEsat}		15		15	25 150	1,1	1,59 1,85	1,9	V
Collector-emitter cut-off current	I_{CES}		0	600		25			0,85	µA
Gate-emitter leakage current	I_{GES}		20	0		25			300	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f= 1 Mhz	0	25		25		860		pF
Output capacitance	C_{oes}							55		
Reverse transfer capacitance	C_{res}							24		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,66		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 32 Ω R_{goff} = 32 Ω	0 / 15	400	15	25 125 150		30 31 28		ns
Rise time	t_r					25 125 150		34 35 35		
Turn-off delay time	$t_{d(off)}$					25 125 150		314 341 346		
Fall time	t_f					25 125 150		14 115 122		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,5 µC Q_{rFWD} = 1 µC Q_{rFWD} = 1,2 µC				25 125 150		0,516 0,680 0,718		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,499 0,616 0,648		

Characteristic Values

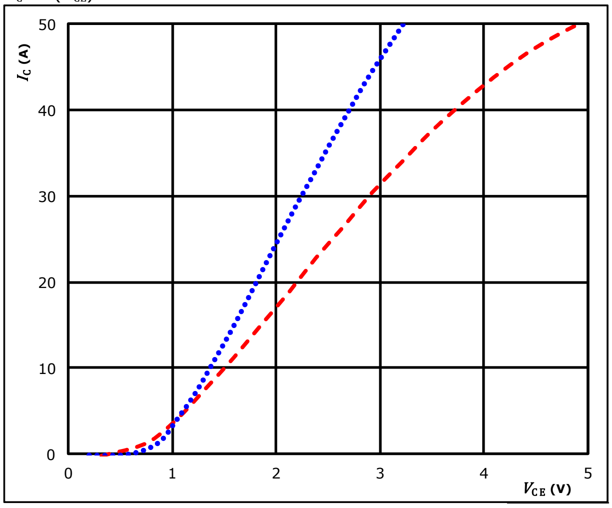
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Brake Diode										
Static										
Forward voltage	V_F				10	25 150		1,61 1,56	1,95	V
Reverse leakage current	I_R			600		25			27	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,33		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 348 A/µs di/dt = 432 A/µs di/dt = 422 A/µs	0 / 15	400	15	25 125 150		5 7 7		A
Reverse recovery time	t_{rr}					25 125 150		226 311 332		ns
Recovered charge	Q_r					25 125 150		0,521 1,03 1,18		µC
Reverse recovered energy	E_{rec}					25 125 150		0,137 0,273 0,314		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		20 34 36		A/µs
Rectifier Diode										
Static										
Forward voltage	V_F				35	25 125		1,17 1,13		V
Reverse leakage current	I_R			1600		25			50	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,20		K/W
Thermistor										
Rated resistance	R					25		5		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 493 Ω				100	-5		+5	%
Power dissipation	P					25		245		mW
Power dissipation constant						25		1,4		mW/K
B-value	$B_{(25/50)}$	Tol. ±2 %				25		3375		K
B-value	$B_{(25/100)}$	Tol. ±2 %				25		3437		K
Vincotech NTC Reference									K	

Inverter Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

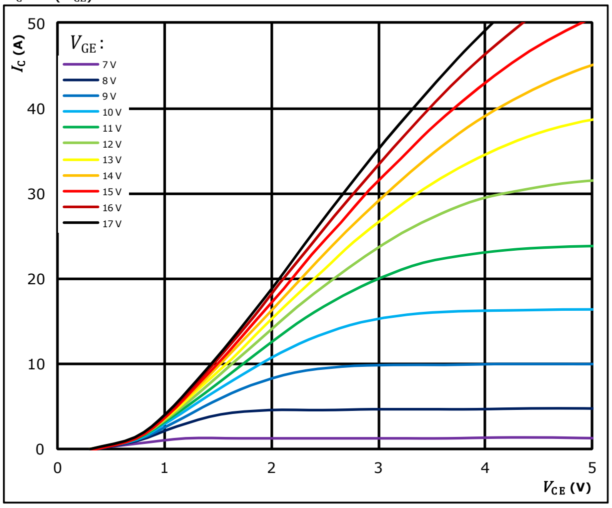


t_p =	250	µs	T_j: 25 °C	··········
V_{GE} =	15	V	T_j: 150 °C	– – –

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



t_p = 250 µs

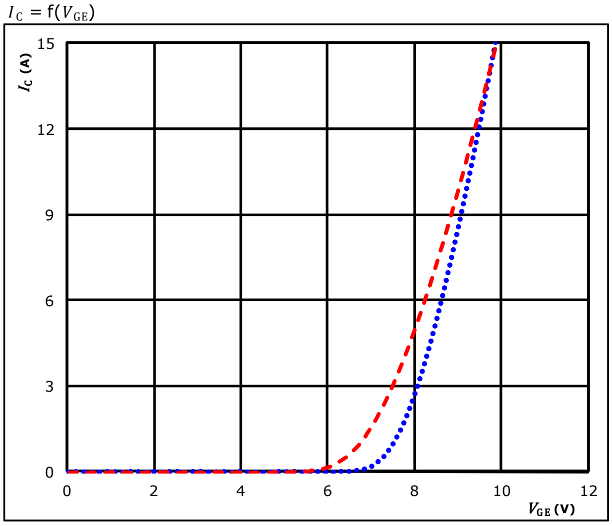
T_j = 150 °C

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

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

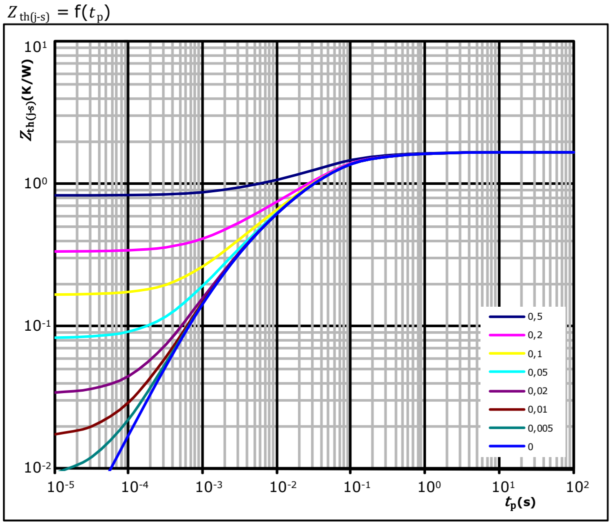


t_p =	100	µs	T_j: 25 °C	··········
V_{CE} =	10	V	T_j: 150 °C	– – –

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j-s)}$ = 1,66 K/W

IGBT thermal model values

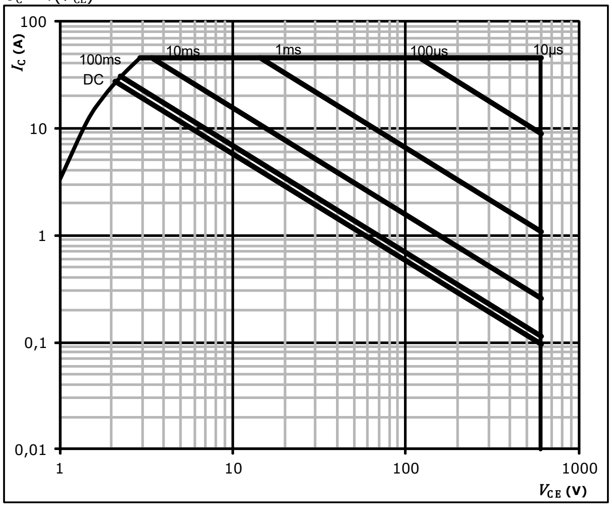
R (K/W)	τ (s)
9,65E-02	1,16E+00
2,18E-01	1,85E-01
8,07E-01	4,32E-02
3,94E-01	8,04E-03
1,48E-01	1,43E-03

Inverter Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



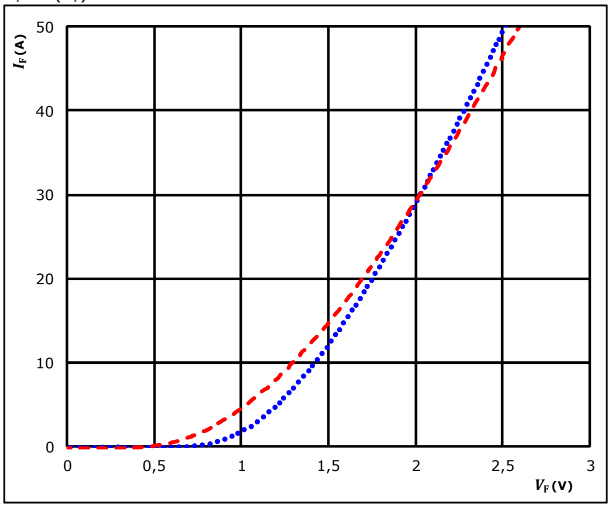
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Inverter Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



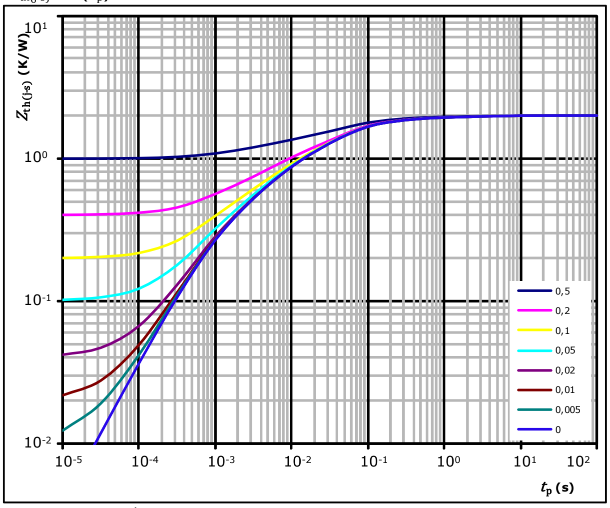
t_p = 250 µs

T_j: 25 °C (dotted) / 150 °C (dashed)

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j\text{-}s)}$ = 1,99 K/W

FWD thermal model values

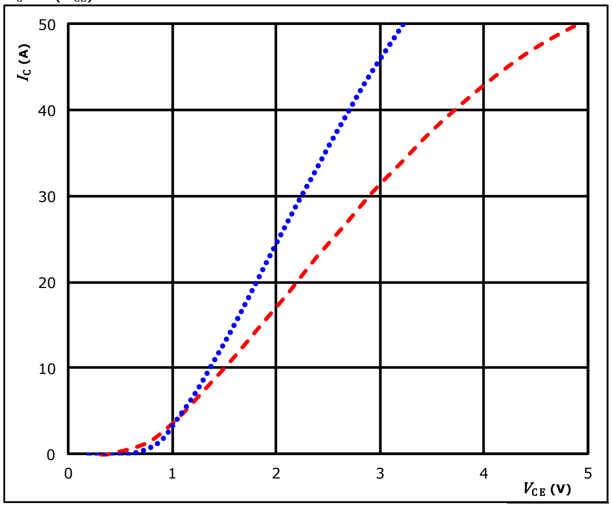
R (K/W)	τ (s)
8,91E-02	2,40E+00
2,69E-01	2,02E-01
8,60E-01	4,04E-02
5,20E-01	6,01E-03
2,47E-01	9,08E-04

Brake Switch Characteristics

figure 1. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

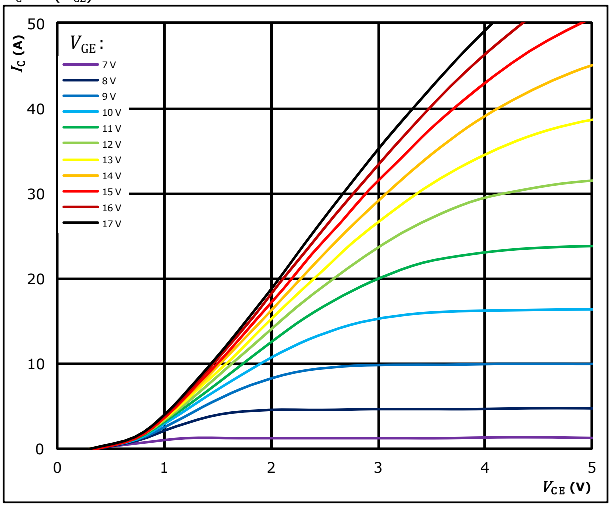


t_p =	250	µs	T_j:	25 °C	··········
V_{GE} =	15	V		150 °C	– – –

figure 2. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$

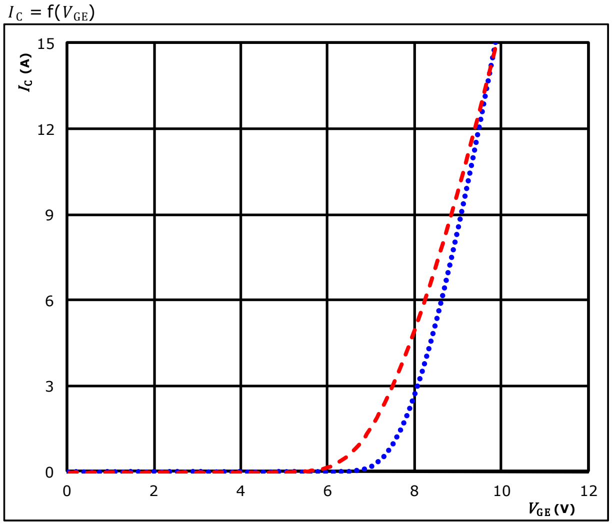


t_p =	250	µs
T_j =	150	°C
V_{GE} from	7 V to 17 V in steps of 1 V	

figure 3. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$

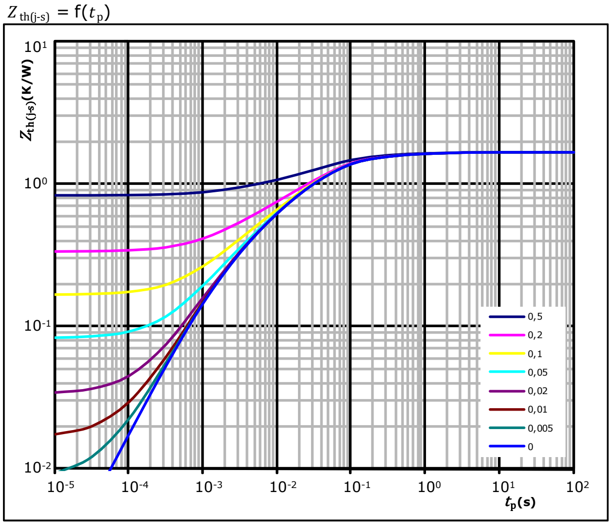


t_p =	100	µs	T_j:	25 °C	··········
V_{CE} =	10	V		150 °C	– – –

figure 4. **IGBT**

Transient thermal impedance as function of pulse duration

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



D = t_p / T

$R_{th(j\text{-}s)}$ = 1,66 K/W

IGBT thermal model values

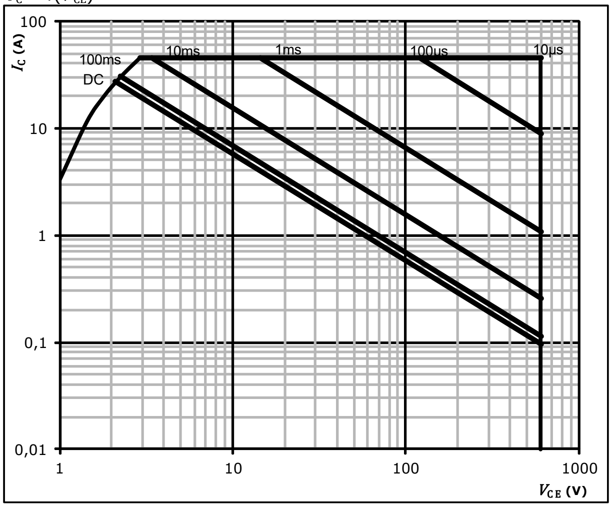
R (K/W)	τ (s)
9,65E-02	1,16E+00
2,18E-01	1,85E-01
8,07E-01	4,32E-02
3,94E-01	8,04E-03
1,48E-01	1,43E-03

Brake Switch Characteristics

figure 5. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



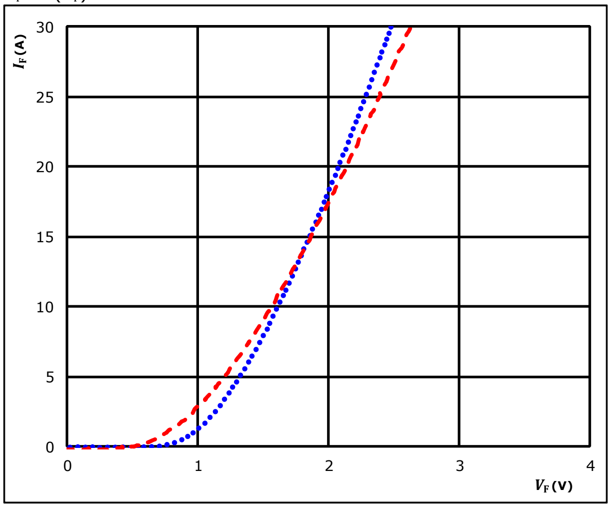
D =	single pulse	
T_s =	80	ºC
V_{GE} =	±15	V
T_j =	T_{jmax}	

Brake Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



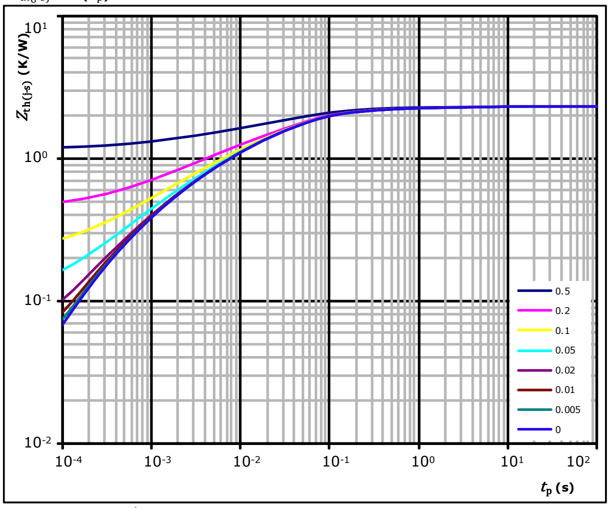
t_p = 250 µs

T_j: 25 °C / 150 °C

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 2,33 K/W

FWD thermal model values

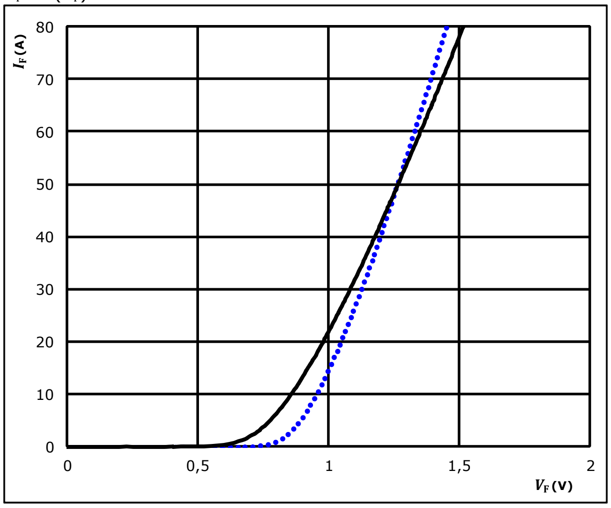
R (K/W)	τ (s)
8,21E-02	3,70E+00
2,22E-01	2,65E-01
9,31E-01	4,46E-02
5,61E-01	8,56E-03
3,70E-01	1,89E-03
1,62E-01	3,41E-04

Rectifier Diode Characteristics

figure 1. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



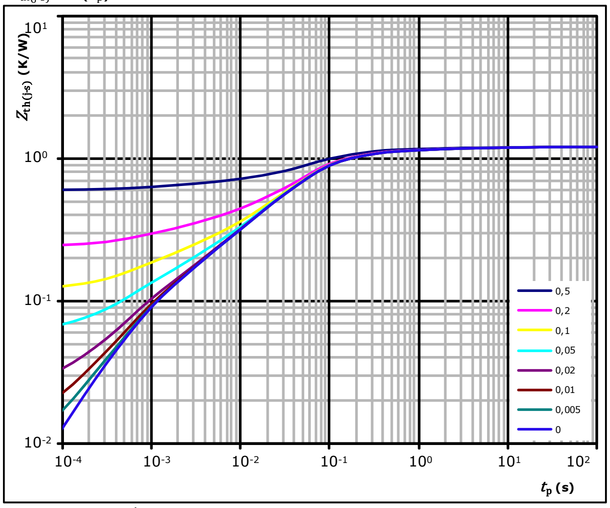
t_p = 250 µs

T_j: 25 °C (dotted line), 125 °C (solid line)

figure 2. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j\text{-}s)}$ = 1,20 K/W

FWD thermal model values

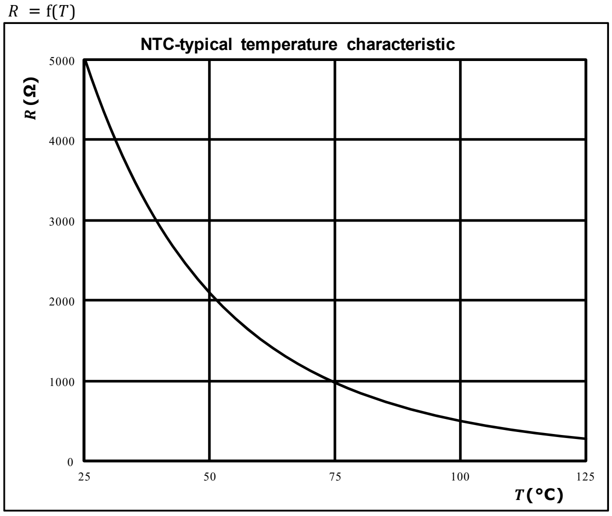
R (K/W)	τ (s)
3,54E-02	9,31E+00
8,09E-02	9,99E-01
2,12E-01	1,71E-01
6,76E-01	4,85E-02
1,19E-01	5,88E-03
7,98E-02	8,33E-04

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

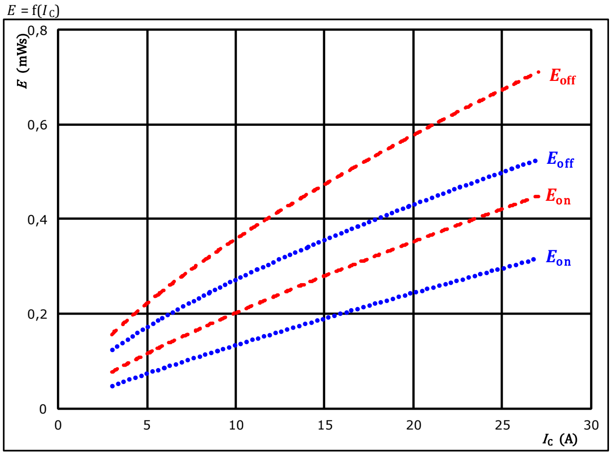


Inverter Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



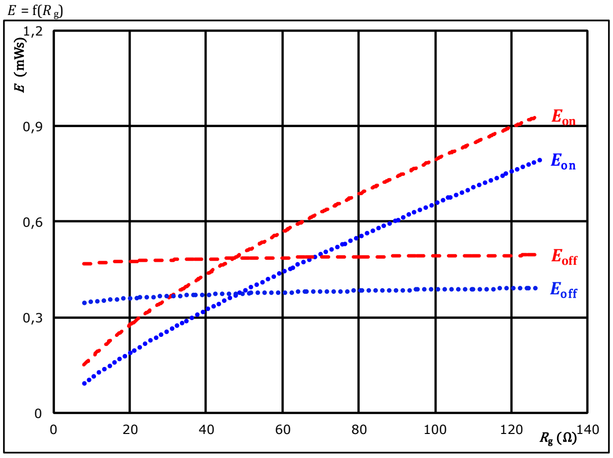
With an inductive load at

V_{CE} =	300	V	T_j: 25 °C (dotted)
V_{GE} =	±15	V	T_j: 150 °C (dashed)
R_{gon} =	16	Ω	
R_{goff} =	16	Ω	

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



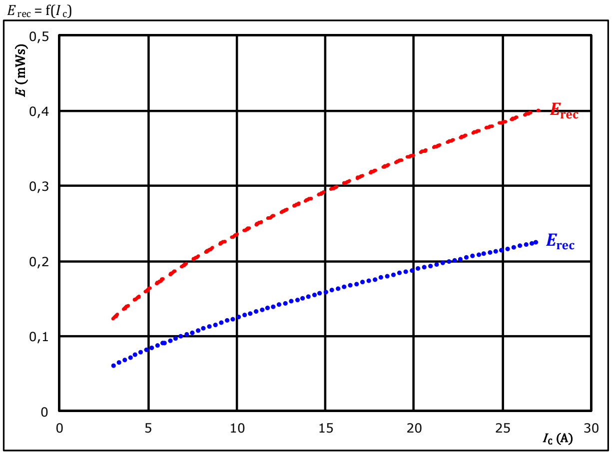
With an inductive load at

V_{CE} =	300	V	T_j: 25 °C (dotted)
V_{GE} =	±15	V	T_j: 150 °C (dashed)
I_C =	15	A	

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



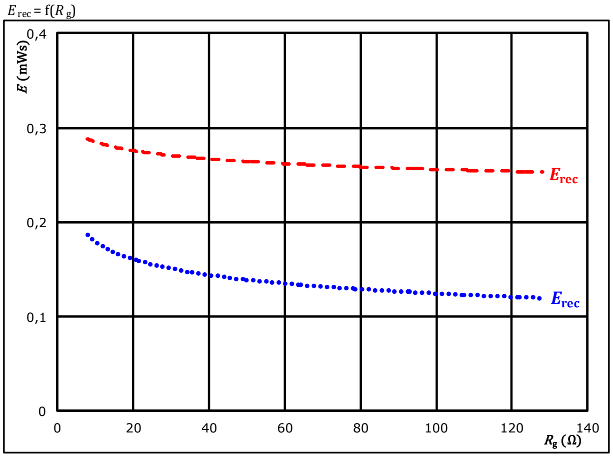
With an inductive load at

V_{CE} =	300	V	T_j: 25 °C (dotted)
V_{GE} =	±15	V	T_j: 150 °C (dashed)
R_{gon} =	16	Ω	

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

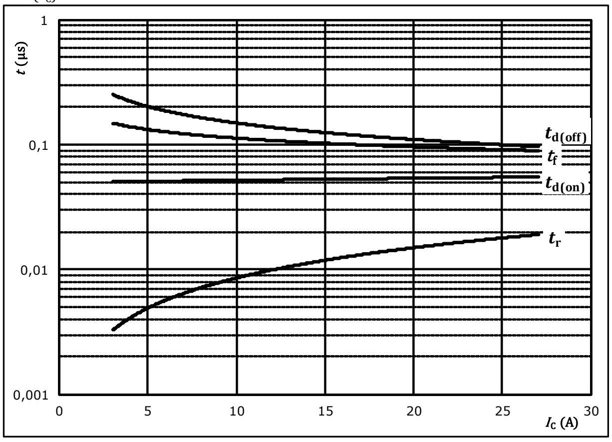
V_{CE} =	300	V	T_j: 25 °C (dotted)
V_{GE} =	±15	V	T_j: 150 °C (dashed)
I_C =	15	A	

Inverter Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



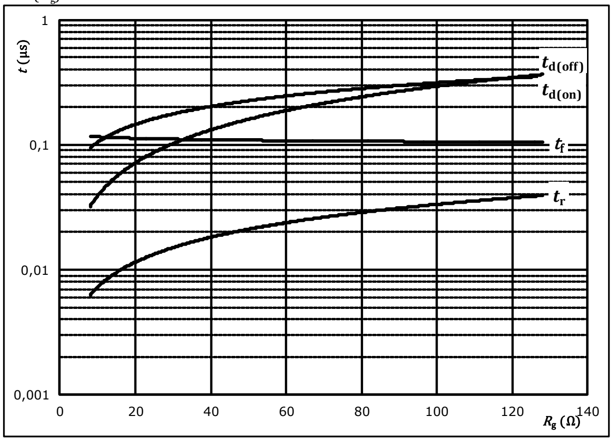
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
R_{gon} =	16	Ω
R_{goff} =	16	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



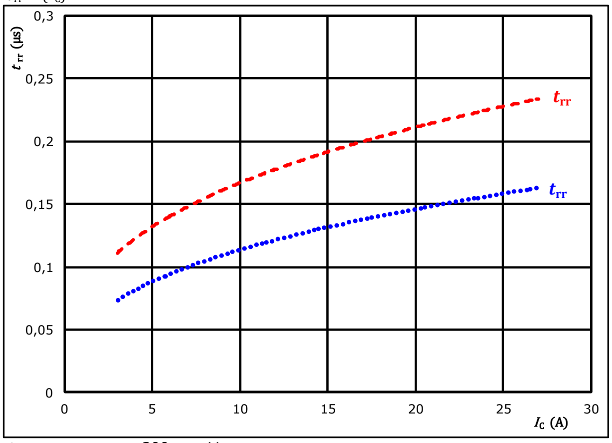
With an inductive load at

T_j =	150	°C
V_{CE} =	300	V
V_{GE} =	±15	V
I_C =	15	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



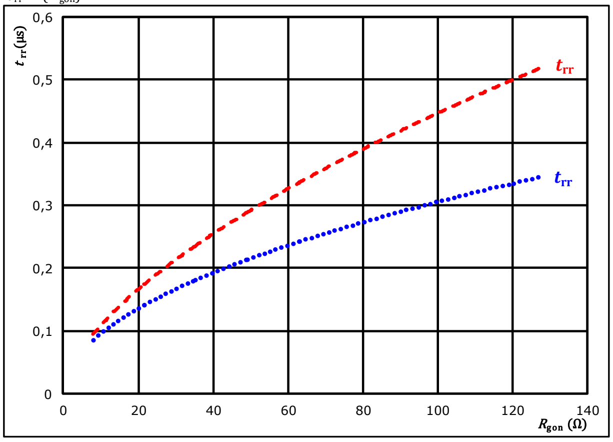
At V_{CE} = 300 V, V_{GE} = ±15 V, R_{gon} = 16 Ω

T_j: 25 °C (dotted), 150 °C (dashed)

figure 8. **FWD**

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

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



At V_{CE} = 300 V, V_{GE} = ±15 V, I_C = 15 A

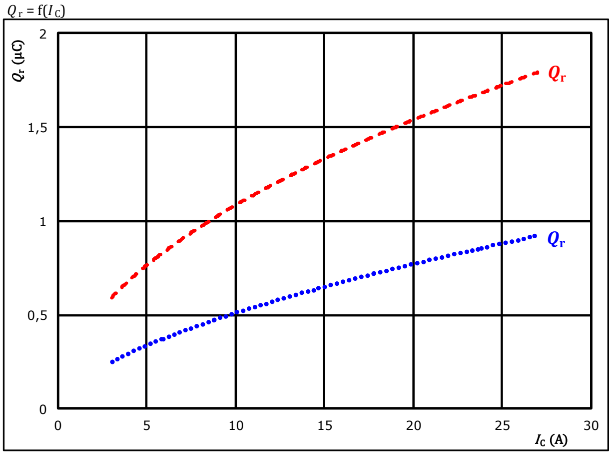
T_j: 25 °C (dotted), 150 °C (dashed)

Inverter Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

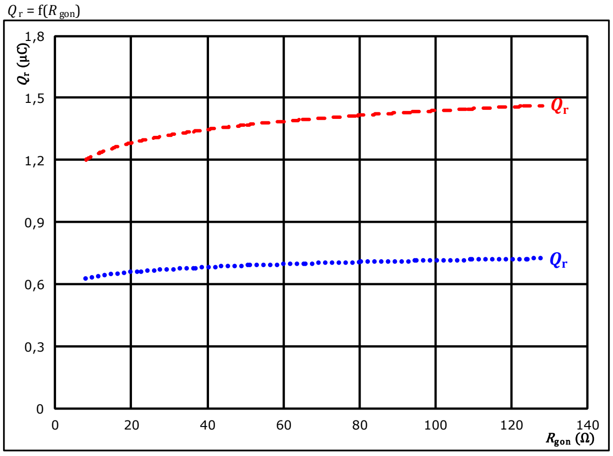


At					
V_{CE} =	300	V	T_j:	25 °C	············
V_{GE} =	±15	V		150 °C	– – – –
R_{gon} =	16	Ω			

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

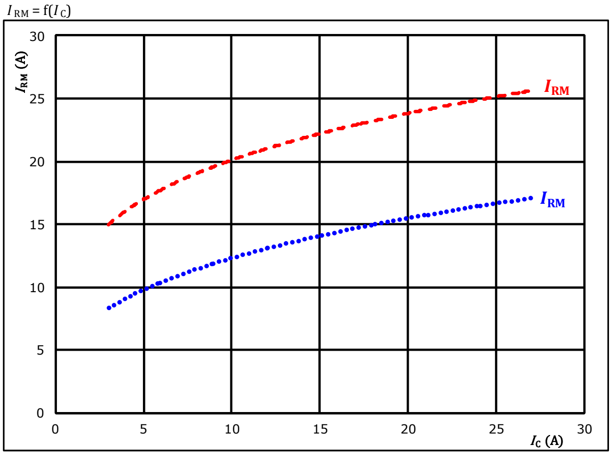


At					
V_{CE}=	300	V	T_j:	25 °C	············
V_{GE} =	±15	V		150 °C	– – – –
I_C=	15	A			

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

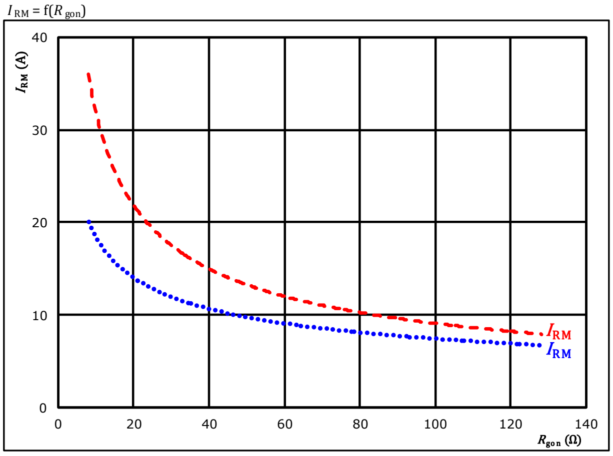


At					
V_{CE} =	300	V	T_j:	25 °C	············
V_{GE} =	±15	V		150 °C	– – – –
R_{gon} =	16	Ω			

figure 12. **FWD**

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

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



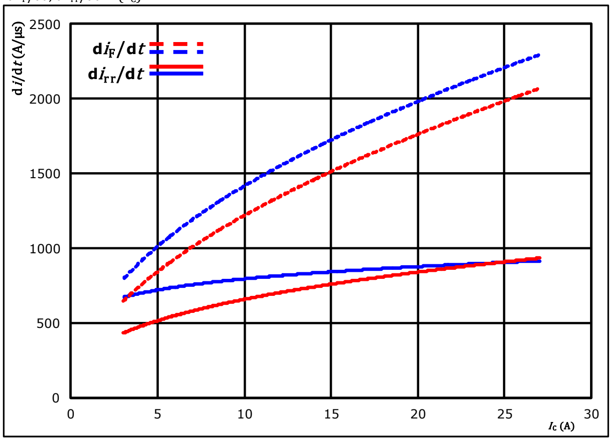
At					
V_{CE} =	300	V	T_j:	25 °C	············
V_{GE} =	±15	V		150 °C	– – – –
I_C =	15	A			

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

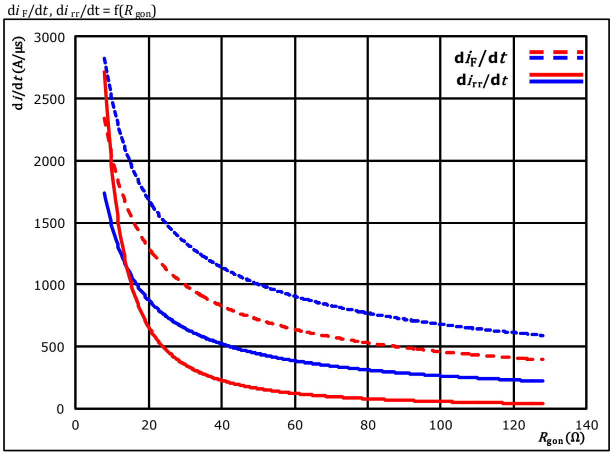


At				
V_{CE} =	300	V	T_j:	25 °C
V_{GE} =	±15	V		150 °C
R_{gon} =	16	Ω		

figure 14. **FWD**

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

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

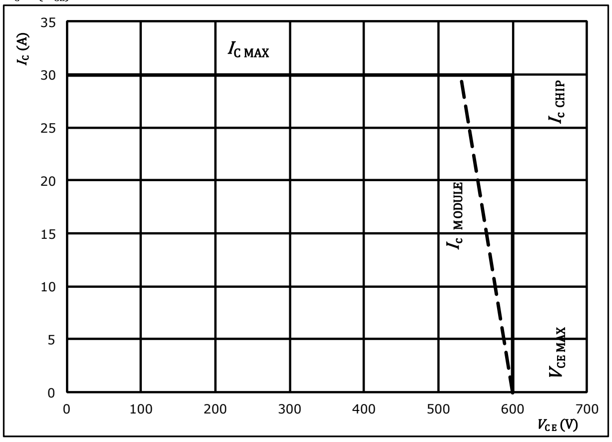


At				
V_{CE} =	300	V	T_j:	25 °C
V_{GE} =	±15	V		150 °C
I_C =	15	A		

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	150	°C
R_{gon} =	16	Ω
R_{goff} =	16	Ω

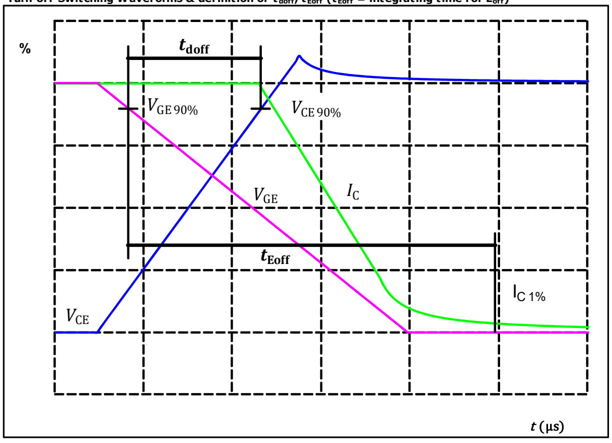
Inverter Switching Definitions

General conditions

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

figure 1. **IGBT**

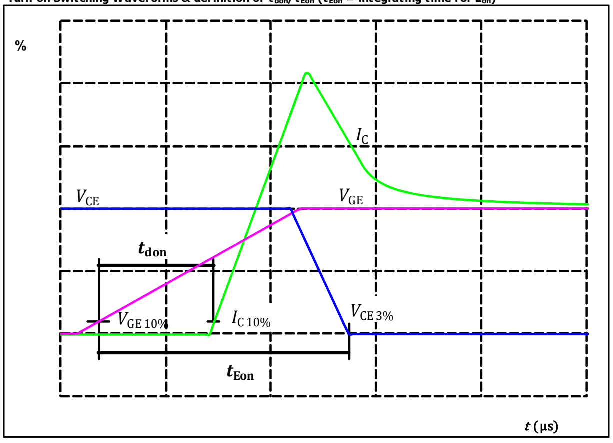
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	15	A
t_{doff} =	124	ns

figure 2. **IGBT**

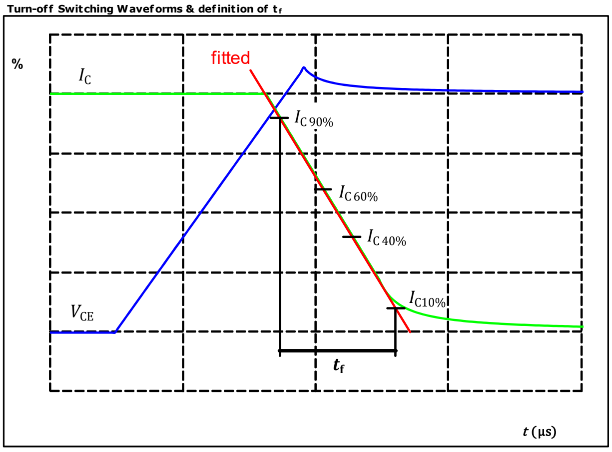
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	-15	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	15	A
t_{don} =	52	ns

figure 3. **IGBT**

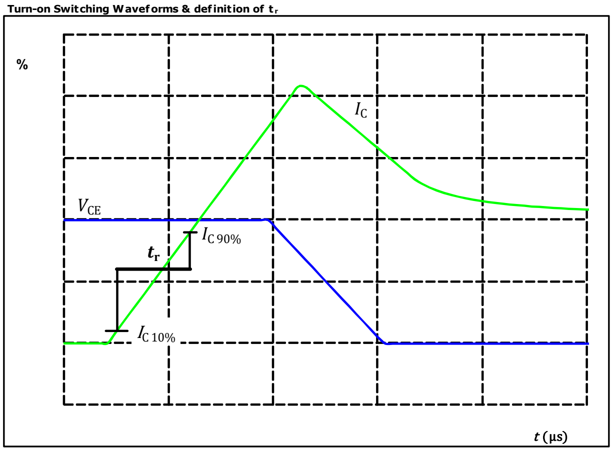
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	15	A
t_f =	121	ns

figure 4. **IGBT**

Turn-on Switching Waveforms & definition of t_r



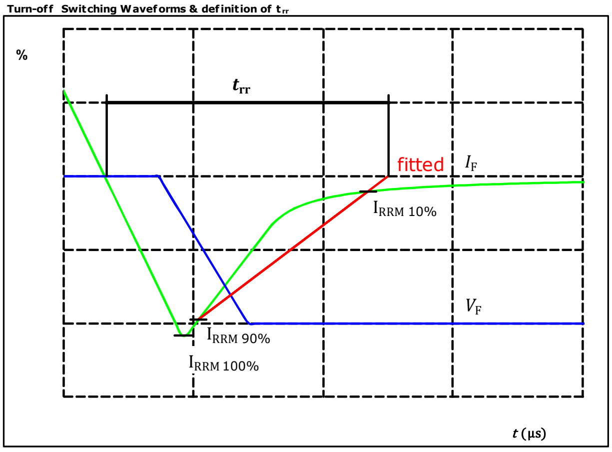
$V_C(100\%)$ =	300	V
$I_C(100\%)$ =	15	A
t_r =	12	ns

Vincotech

Inverter Switching Characteristics

figure 5. **FWD**

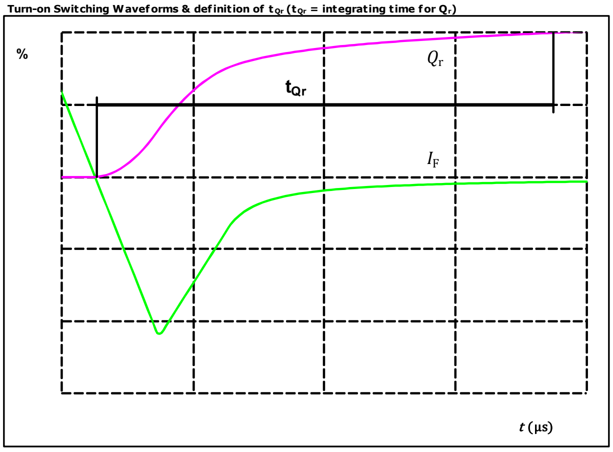
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	300	V
I_F (100%) =	15	A
I_{RRM} (100%) =	22	A
t_{rr} =	179	ns

figure 6. **FWD**

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



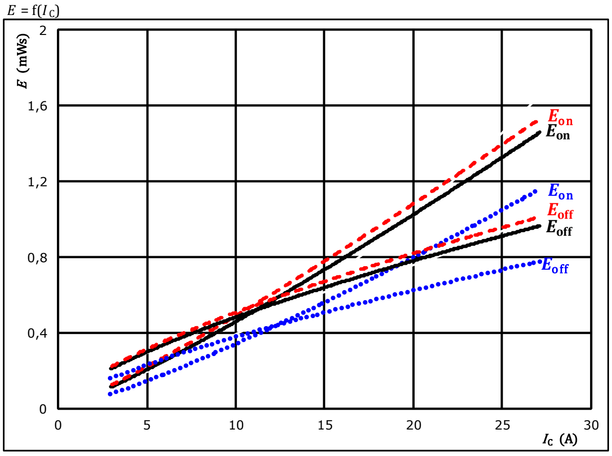
I_F (100%) =	15	A
Q_r (100%) =	1,28	µC

Brake Switching Characteristics

figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



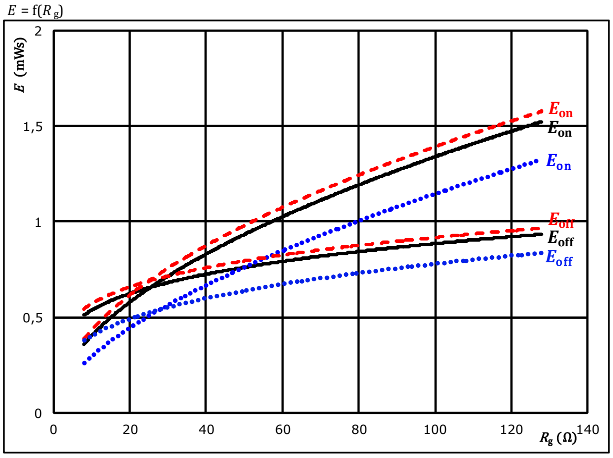
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	0 / 15	V		125 °C	solid
R_{gon} =	32	Ω		150 °C	dashed
R_{goff} =	32	Ω			

figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



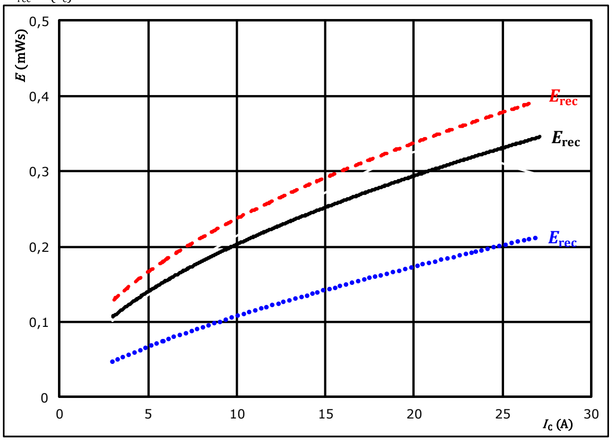
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	0 / 15	V		125 °C	solid
I_C =	15	A		150 °C	dashed

figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



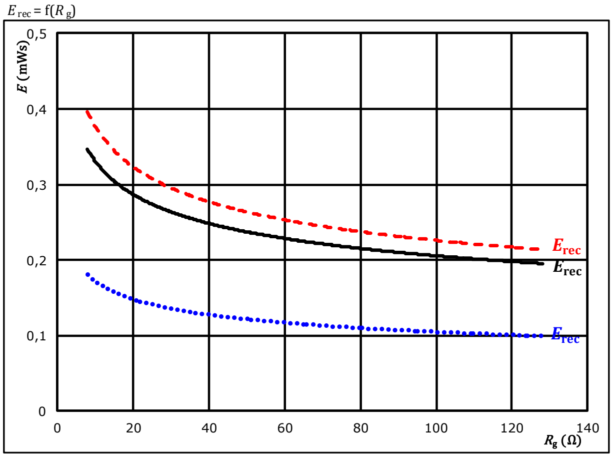
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	0 / 15	V		125 °C	solid
R_{gon} =	32	Ω		150 °C	dashed

figure 4. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

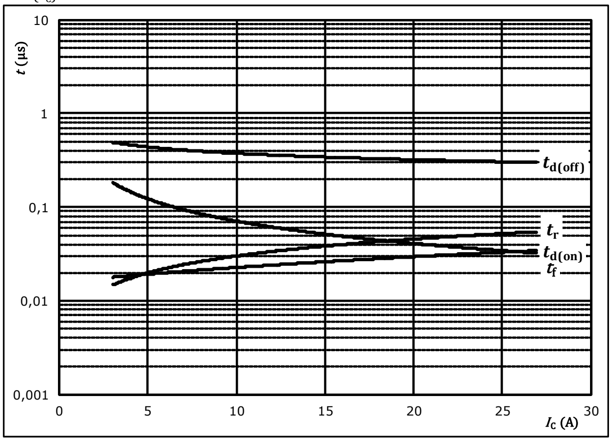
V_{CE} =	400	V	T_j:	25 °C	dotted
V_{GE} =	0 / 15	V		125 °C	solid
I_C =	15	A		150 °C	dashed

Brake Switching Characteristics

figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



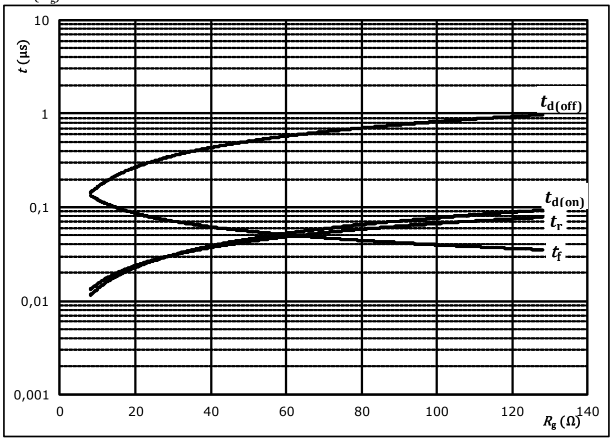
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	0 / 15	V
R_{gon} =	32	Ω
R_{goff} =	32	Ω

figure 6. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



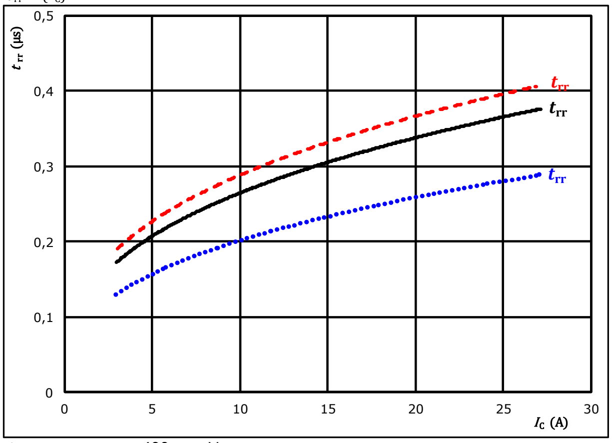
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	0 / 15	V
I_C =	15	A

figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

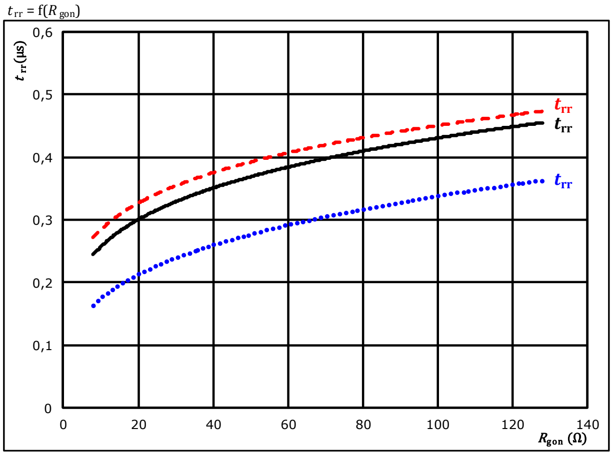


At					
V_{CE} =	400	V	T_j:	25 °C	············
V_{GE} =	0 / 15	V		125 °C	———
R_{gon} =	32	Ω		150 °C	– – –

figure 8. **FWD**

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

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



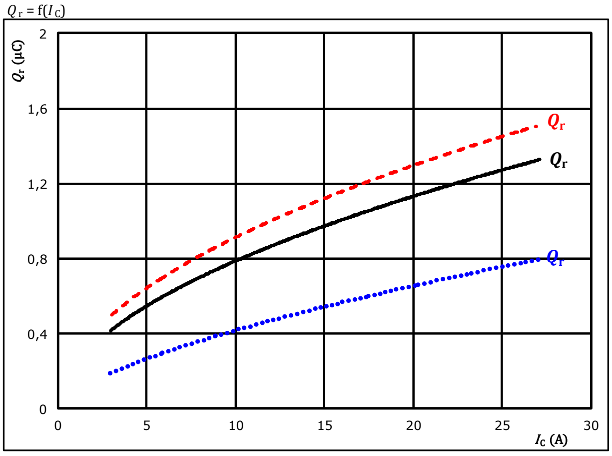
At					
V_{CE} =	400	V	T_j:	25 °C	············
V_{GE} =	0 / 15	V		125 °C	———
I_C =	15	A		150 °C	– – –

Brake Switching Characteristics

figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

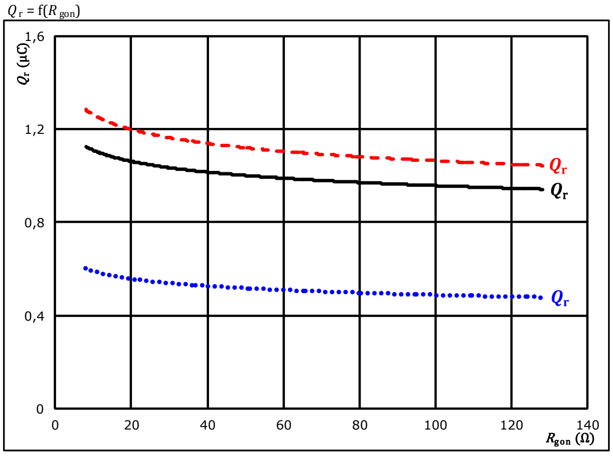


At						
	V_{CE} =	400	V	T_j:	25 °C	···········
	V_{GE} =	0 / 15	V		125 °C	———
	R_{gon} =	32	Ω		150 °C	– – –

figure 10. **FWD**

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

$Q_r = f(R_{gon})$

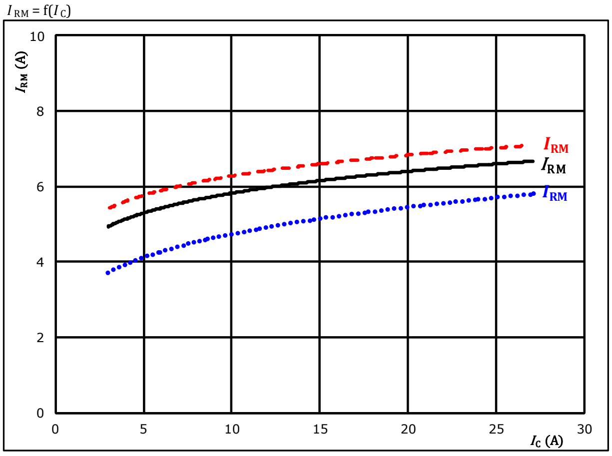


At						
	V_{CE}=	400	V	T_j:	25 °C	···········
	V_{GE} =	0 / 15	V		125 °C	———
	I_C=	15	A		150 °C	– – –

figure 11. **FWD**

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

$I_{RM} = f(I_C)$

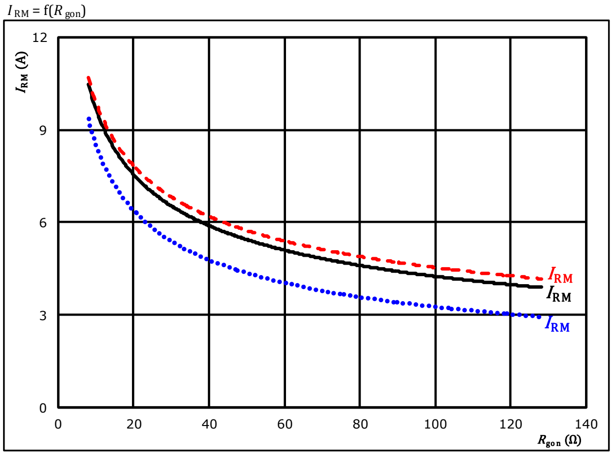


At						
	V_{CE}:	400	V	T_j:	25 °C	···········
	V_{GE} =	0 / 15	V		125 °C	———
	R_{gon} =	32	Ω		150 °C	– – –

figure 12. **FWD**

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

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



At						
	V_{CE} =	400	V	T_j:	25 °C	···········
	V_{GE} =	0 / 15	V		125 °C	———
	I_C =	15	A		150 °C	– – –

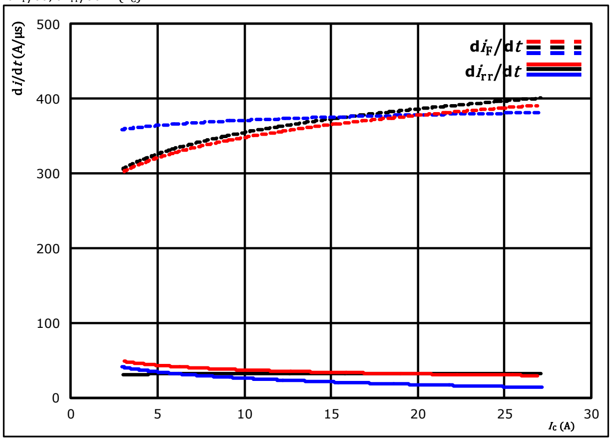
Vincotech

Brake Switching Characteristics

figure 13. **FWD**

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

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

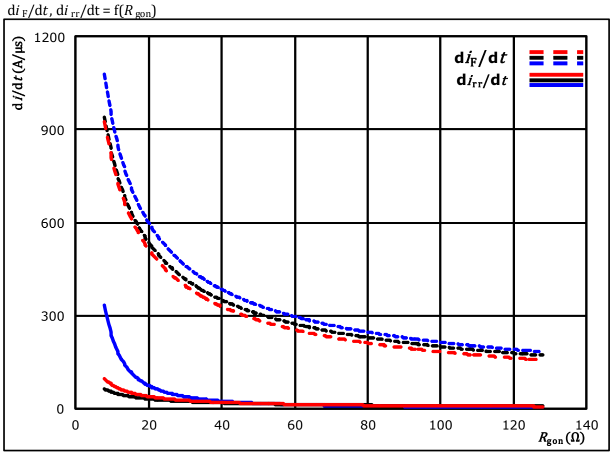


At				
V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
R_{gon} =	32	Ω		150 °C

figure 14. **FWD**

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

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

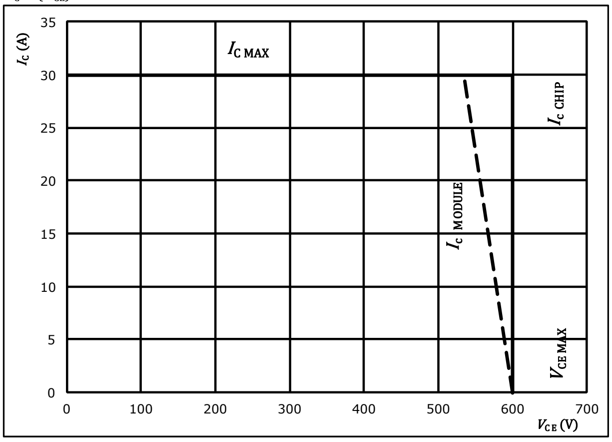


At				
V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	0 / 15	V		125 °C
I_C =	15	A		150 °C

figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



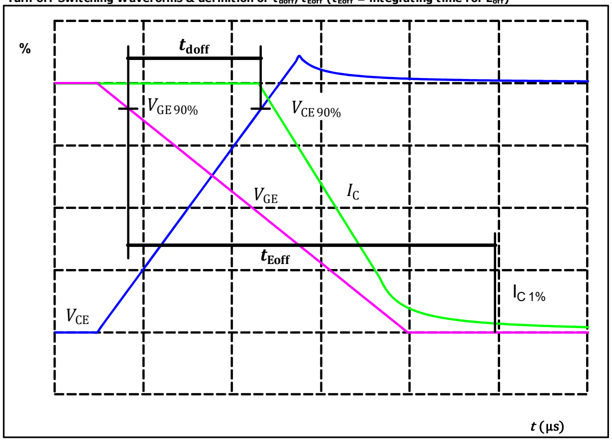
At		
T_j =	125	°C
R_{gon} =	32	Ω
R_{goff} =	32	Ω

Brake Switching Definitions

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

figure 1. IGBT

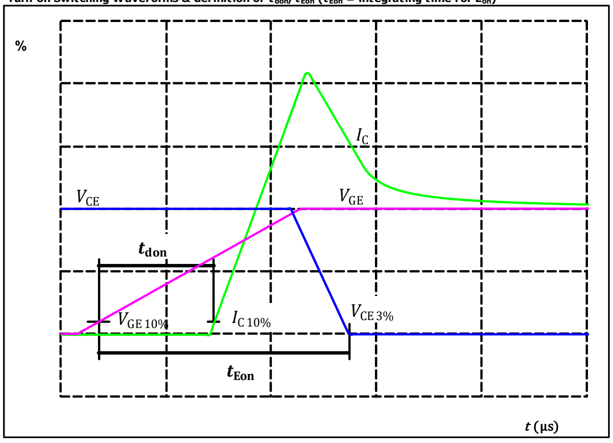
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff} (t_{Eoff} = integrating time for E_{off})



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	15	A
t_{doff} =	341	ns

figure 2. IGBT

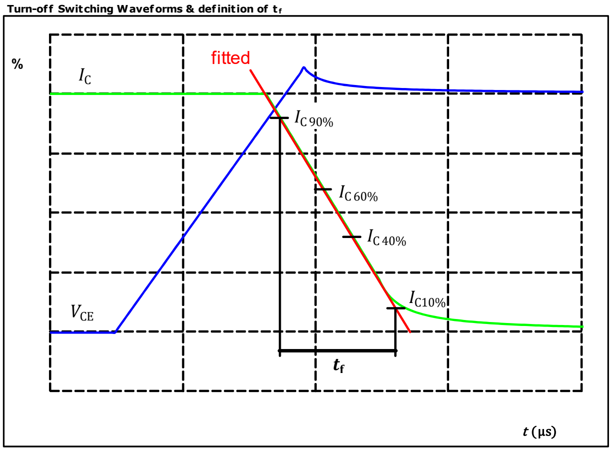
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon} (t_{Eon} = integrating time for E_{on})



$V_{GE}(0\%)$ =	0	V
$V_{GE}(100\%)$ =	15	V
$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	15	A
t_{don} =	31	ns

figure 3. IGBT

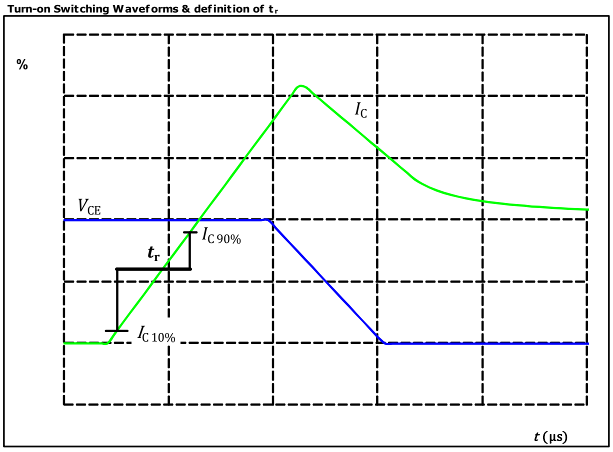
Turn-off Switching Waveforms & definition of t_f



$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	15	A
t_f =	115	ns

figure 4. IGBT

Turn-on Switching Waveforms & definition of t_r

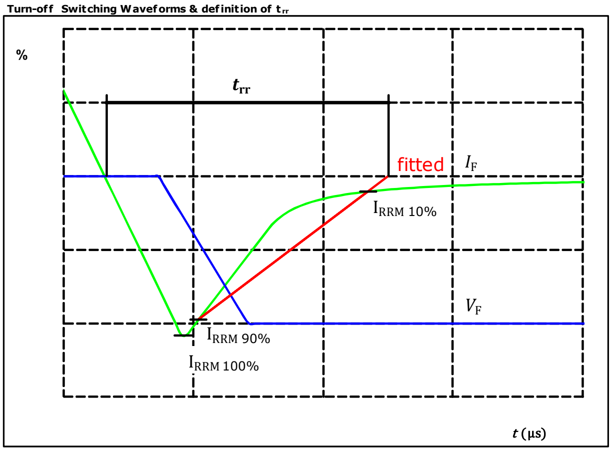


$V_C(100\%)$ =	400	V
$I_C(100\%)$ =	15	A
t_r =	35	ns

Brake Switching Characteristics

figure 5. **FWD**

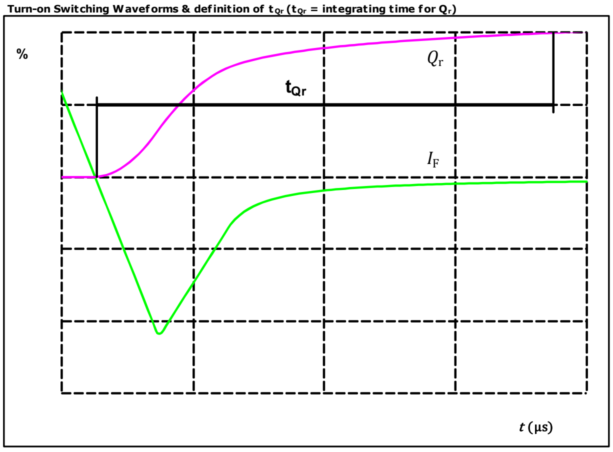
Turn-off Switching Waveforms & definition of t_{rr}



V_F (100%) =	400	V
I_F (100%) =	15	A
I_{RRM} (100%) =	7	A
t_{rr} =	311	ns

figure 6. **FWD**

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



I_F (100%) =	15	A
Q_r (100%) =	1,03	μC

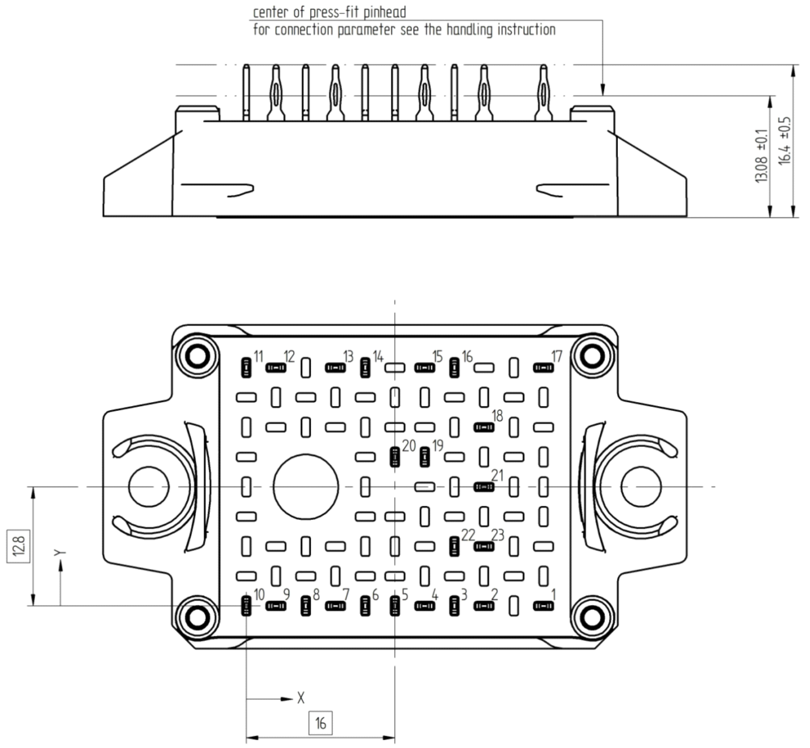
Ordering Code & Marking	
Version	**Ordering Code**
without thermal paste 12 mm housing with press-fit pins	10-EZ06PMA015SA-L924A38T
with thermal paste 12 mm housing with press-fit pins	10-EZ06PMA015SA-L924A38T-/3/

	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

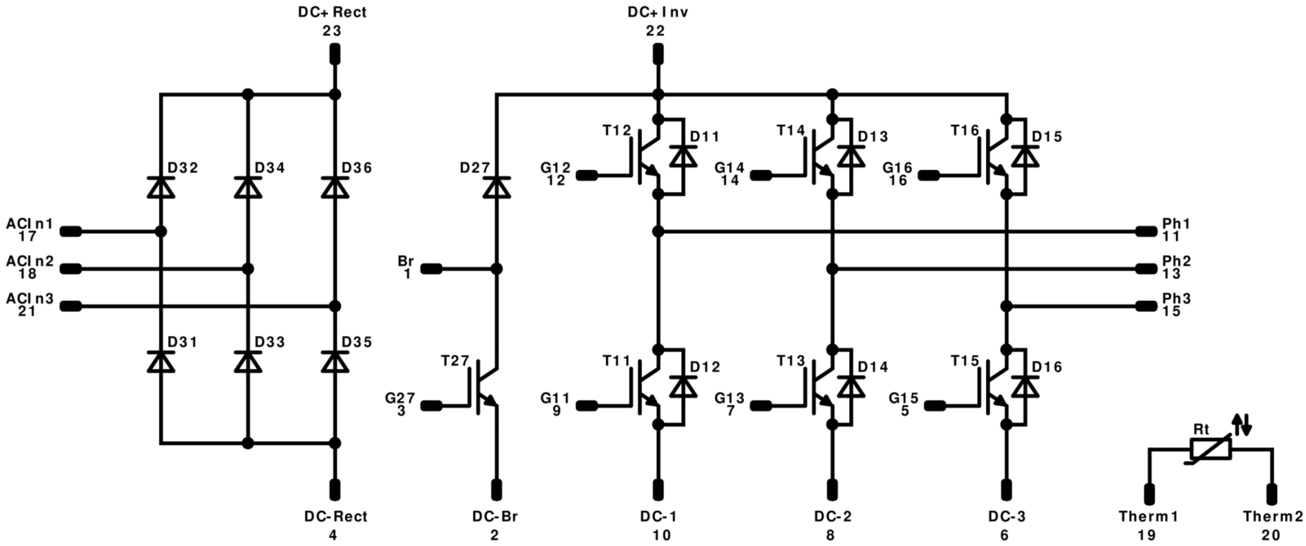
Pin table

Pin	X	Y	Function
1	32	0	Br
2	25,6	0	DC-Br
3	22,4	0	G27
4	19,2	0	DC-Rect
5	16	0	G15
6	12,8	0	DC-3
7	9,6	0	G13
8	6,4	0	DC-2
9	3,2	0	G11
10	0	0	DC-1
11	0	25,6	Ph1
12	3,2	25,6	G12
13	9,6	25,6	Ph2
14	12,8	25,6	G14
15	19,2	25,6	Ph3
16	22,4	25,6	G16
17	32	25,6	ACIn1
18	25,6	19,2	ACIn2
19	19,2	16	Therm1
20	16	16	Therm2
21	25,6	12,8	ACIn3
22	22,4	6,4	DC+Inv
23	25,6	6,4	DC+Rect



Tolerance of pinpositions: ±0.4mm 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	600 V	15 A	Inverter Switch	
D11, D12, D13, D14, D15, D16	FWD	600 V	15 A	Inverter Diode	
T27	IGBT	600 V	15 A	Brake Switch	
D27	FWD	600 V	10 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) 100	>SPQ	Standard	<SPQ	Sample

Handling instruction
Handling instructions for *flow* E1 packages see vincotech.com website.

Package data
Package data for *flow* E1 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-EZ06PMA015SA-L924A38T-D2-14	29 Mar. 2019	Correction of I_c/I_f values	1,2