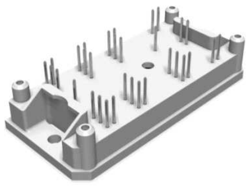
10-F1127PA035SC-L168E09
datasheet

***flow* 7PACK 1** | **1200 V / 35 A**

Features

- Compact Flow 1 housing
- Trench Fieldstop IGBT4 Technology
- Compact and Low Inductive Design
- Built-in NTC

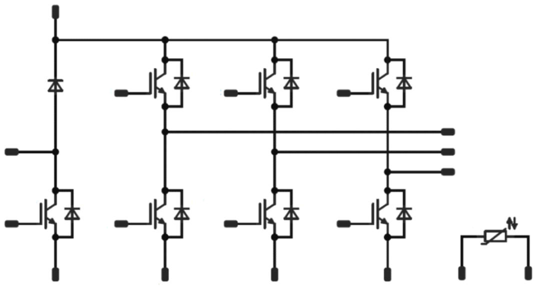
flow 1 17mm housing



Target applications

- Motor Drives
- Power Generation

Schematic



Types

- 10-F1127PA035SC-L168E09

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Inverter Switch\ Brake Switch					
Collector-emitter voltage	V_{CES}			1200	V
Collector current	I_C	T_j=$T_j$max	T_S=80°C	39	A
Repetitive peak collector current	I_{CRM}	t_p limited by $T_j$max		105	A
Total power dissipation	P_{tot}	T_j=$T_j$max	T_S=80°C	101	W
Gate-emitter voltage	V_{GES}			±20	V
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions		Value	Unit
Inverter Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j=T_{jmax}$	T_h=80°C	44	A
Repetitive peak forward current	I_{FRM}			70	A
Total power dissipation	P_{tot}	$T_j=T_{jmax}$	T_h=80°C	81	W
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions		Value	Unit
Brake Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j=T_{jmax}$	T_h=80°C	24	A
Repetitive peak forward current	I_{FRM}			30	A
Total power dissipation	P_{tot}	$T_j=T_{jmax}$	T_h=80°C	52	W
Maximum Junction Temperature	T_{jmax}			175	°C

Parameter	Symbol	Conditions		Value	Unit
Brake Inverse Diode					
Peak Repetitive Reverse Voltage	V_{RRM}			1200	V
Continuous (direct) forward current	I_F	$T_j=T_{jmax}$	T_h=80°C	15	A
Repetitive peak forward current	I_{FRM}			15	A
Total power dissipation	P_{tot}	$T_j=T_{jmax}$	T_h=80°C	33	W
Maximum Junction Temperature	T_{jmax}			150	°C

Parameter	Symbol	Conditions		Value	Unit
Module Properties					
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation Junction Temperature	T_{jop}			-40…+(T_{jmax} - 25)	°C
Isolation Properties					
Isolation voltage	V_{isol}	DC voltage	t_p=2s	4000	V
Creepage distance				min 12,7	mm
Clearance				12,63	mm
Comparative Tracking Index	CTI			>200	

Characteristic Values

Inverter Switch

Parameter	Symbol	Conditions	V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	Unit
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}$			0,0012	25 125	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		35	25 125 150	1,58	1,87 - 2,30	2,07	V
Collector-emitter cut-off current	I_{CES}		0	1200		25 125			5	µA
Gate-emitter leakage current	I_{GES}		20	0		25 125			120	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f=1 MHz	0	25		25		2000		pF
Reverse transfer capacitance	C_{res}	f=1 MHz	0	25		25		70		pF
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						0,94		K/W
IGBT Switching										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 16 Ω R_{gon} = 16 Ω	±15	600	35	25 125		91 94		ns
Rise time	t_r	R_{goff} = 16 Ω R_{gon} = 16 Ω	±15	600	35	25 125		19 23		ns
Turn-off delay time	$t_{d(off)}$	R_{goff} = 16 Ω R_{gon} = 16 Ω	±15	600	35	25 125		204 264		ns
Fall time	t_f	R_{goff} = 16 Ω R_{gon} = 16 Ω	±15	600	35	25 125		72 109		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 3,6 µC Q_{rFWD} = 6,9 µC	±15	600	35	25 125		2,018 3,093		mWs
Turn-off energy (per pulse)	E_{off}	Q_{rFWD} = 3,6 µC Q_{rFWD} = 6,9 µC	±15	600	35	25 125		1,762 2,805		mWs

Inverter Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				35	25 125 150		1,76 1,73 1,70	2,05	V
Reverse leakage current	I_r			1200		25 150			7,7 -	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						1,18		K/W
FWD Switching										
Peak recovery current	I_{RRM}	di/dt = 2303 A/µs di/dt = 1645 A/µs	±15	600	35	25 125		48 53		A
Reverse recovery time	t_{rr}					25 125		251 353		ns
Recovered charge	Q_r					25 125		3,559 6,933		µC
Reverse recovered energy	E_{rec}					25 125		1,382 2,829		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125		2000 390		A/µs

Brake Switch

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE}=V_{CE}$			0,00085	25 125	5,3	5,8	6,3	V
Collector-emitter saturation voltage	V_{CEsat}		15		25	25 125 150	1,58	1,96 2,22 2,28	2,07	V
Collector-emitter cut-off current	I_{CES}		0	1200		25 125			2,4	µA
Gate-emitter leakage current	I_{GES}		20	0		25 125			120	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f=1 MHz	0	25		25		1450		pF
Reverse transfer capacitance	C_{res}							50		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						0,96		K/W
IGBT Switching										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 16 Ω R_{gon} = 16 Ω	±15	600	35	25 125 150		86 87 89		ns
Rise time	t_r					25 125 150		42 43 42		
Turn-off delay time	$t_{d(off)}$					25 125 150		206 258 272		
Fall time	t_f					25 125 150		71 126 140		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 2,3 µC Q_{rFWD} = 3,9 µC Q_{rFWD} = 4,4 µC				25 125 150		2,600 3,278 3,463		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		2,058 3,158 3,526		

Brake Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				15	25 125 150		1,80 - 1,77	2,05	V
Reverse leakage current	I_r			1200		25 150			3,5 -	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						1,83		K/W
FWD Switching										
Peak recovery current	I_{RRM}	di/dt = 670 A/µs di/dt = 632 A/µs di/dt = 592 A/µs	±15	600	35	25 125 150		13 16 17		A
Reverse recovery time	t_{rr}					25 125 150		366 552 603		ns
Recovered charge	Q_r					25 125 150		2,330 3,923 4,389		µC
Reverse recovered energy	E_{rec}					25 125 150		0,966 1,677 1,890		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		41 41 41		A/µs

Brake Inverse Diode

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Static										
Forward voltage	V_F				7,5	25 125 150		1,65 1,61 -		V
Reverse leakage current	I_r			1200		25 150			250 -	μA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material λ=3,4W/mK						2,12		K/W

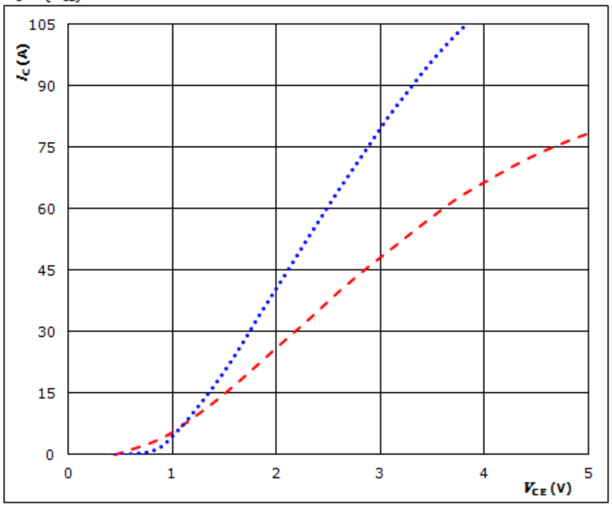
Thermistor

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	
Rated resistance	R					25		21,5		kΩ
Deviation of R100	$\Delta_{R/R}$	R100=1486 Ω				100	-4,5		+4,5	%
Power dissipation	P					25		210		mW
Power dissipation constant						25		3,5		mW/K
B-value	$B_{(25/50)}$					25		3884		K
B-value	$B_{(25/100)}$					25		3964		K
Vincotech NTC Reference									F	

Inverter\ Brake Switch Characteristics

Typical output characteristics IGBT

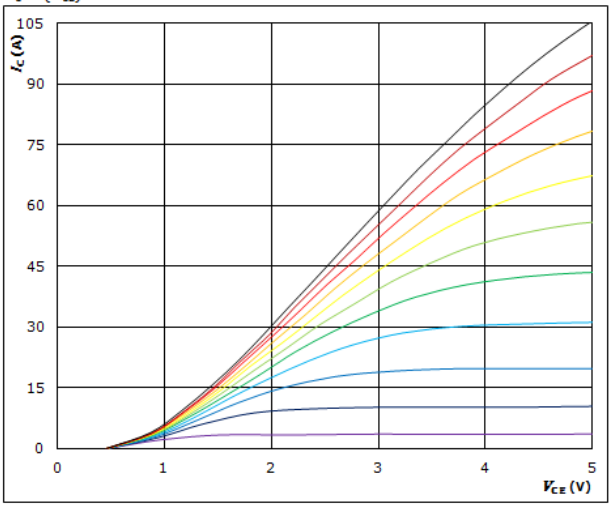
$I_C = f(V_{CE})$



t_p =	250	μs	25 °C	dotted (blue)
V_{GE}=	15	V	125 °C	solid (black)
			150 °C	dashed (red)

Typical output characteristics IGBT

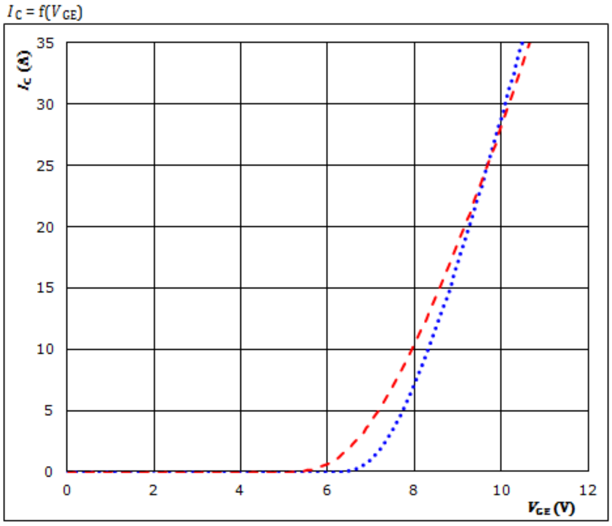
$I_C = f(V_{CE})$



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

Typical transfer characteristics IGBT

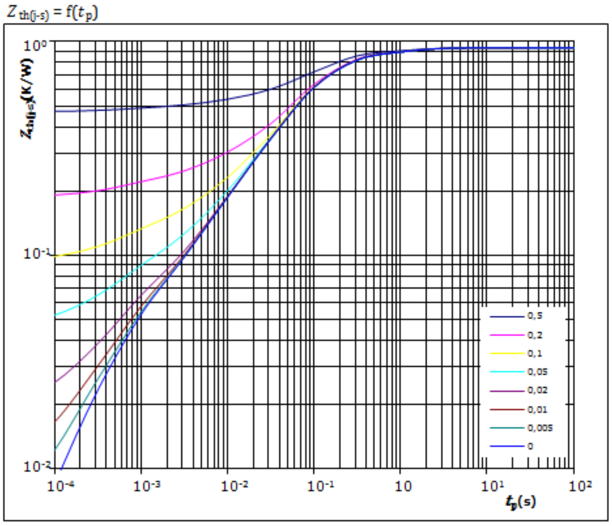
$I_C = f(V_{GE})$



t_p =	100	μs	25 °C	dotted (blue)
V_{CE} =	10	V	125 °C	solid (black)
			150 °C	dashed (red)

Transient Thermal Impedance as function of Pulse duration IGBT

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



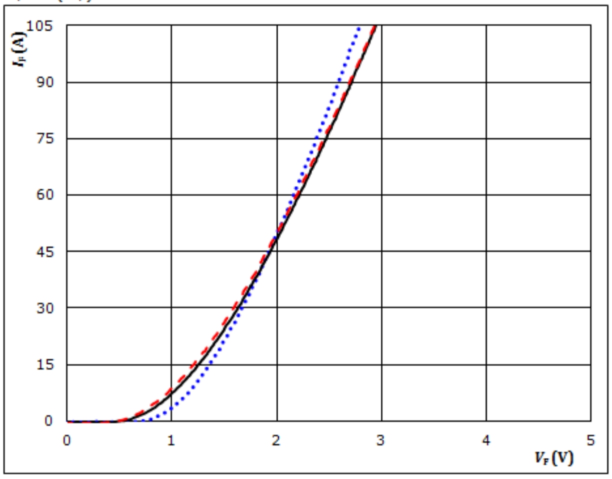
D =	t_p / T	
$R_{th(j-s)}$ =	0,94	K/W

IGBT thermal model values

R_{th} (K/W)	τ (s)
1,15E-01	9,47E-01
4,15E-01	1,24E-01
2,99E-01	4,81E-02
7,22E-02	5,86E-03
3,82E-02	5,62E-04

Inverter Diode Characteristics

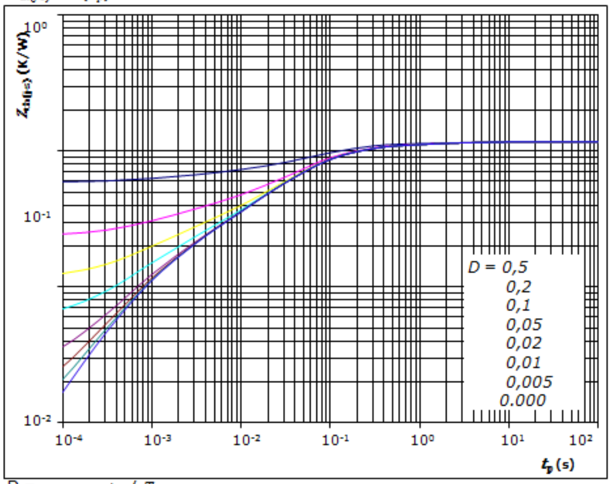
Typical forward characteristics **FWD**



t_p = 250 μs

T_j: 25 °C, 125 °C, 150 °C

Transient thermal impedance as a function of pulse width **FWD**



D = t_p / T

$R_{th(j-s)}$ = 1,18 K/W

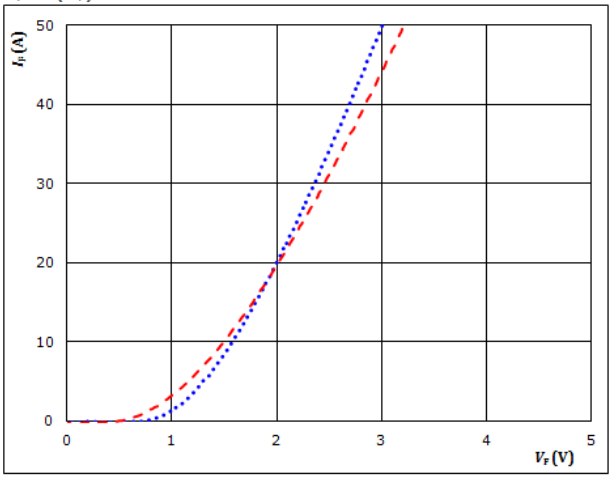
FWD thermal model values

R (K/W)	τ (s)
6,77E-02	2,72E+00
1,35E-01	3,69E-01
5,80E-01	6,91E-02
2,11E-01	1,69E-02
1,22E-01	2,63E-03
6,36E-02	5,82E-04

Brake Diode Characteristics

Typical forward characteristics **FWD**

$I_F = f(V_F)$

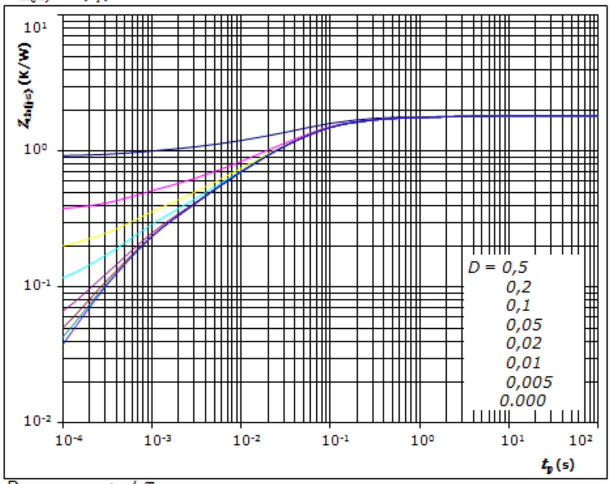


t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

Transient thermal impedance as a function of pulse width **FWD**

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



D = t_p / T

$R_{th(j-s)}$ = 1,83 K/W

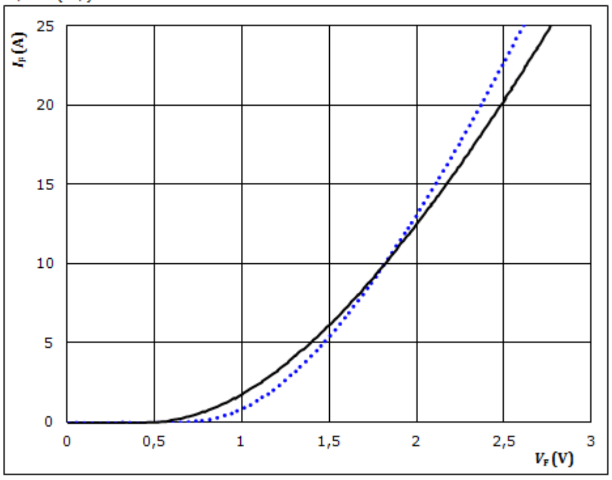
FWD thermal model values

R (K/W)	τ (s)
6,16E-02	2,79E+00
1,40E-01	3,93E-01
7,06E-01	6,76E-02
4,97E-01	1,96E-02
2,49E-01	4,04E-03
1,76E-01	5,86E-04
1,96E-01	3,48E-04

Brake Inverse Diode Characteristics

Typical forward characteristics FWD

$I_F = f(V_F)$

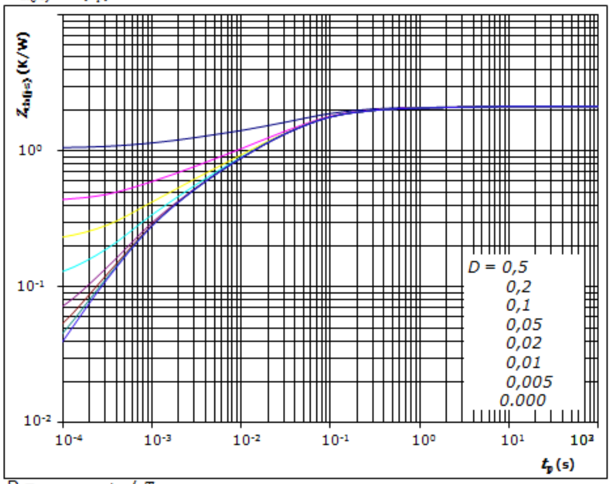


t_p = 250 μs

T_j: 25 °C; 125 °C; 150 °C

Transient thermal impedance as a function of pulse width FWD

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



D = t_p / T

$R_{th(j-s)}$ = 2,12 K/W

FWD thermal model values

R (K/W)	τ (s)
7,00E-02	3,23E+00
1,48E-01	4,03E-01
7,34E-01	6,67E-02
5,90E-01	2,04E-02
3,47E-01	4,32E-03
2,36E-01	8,05E-04

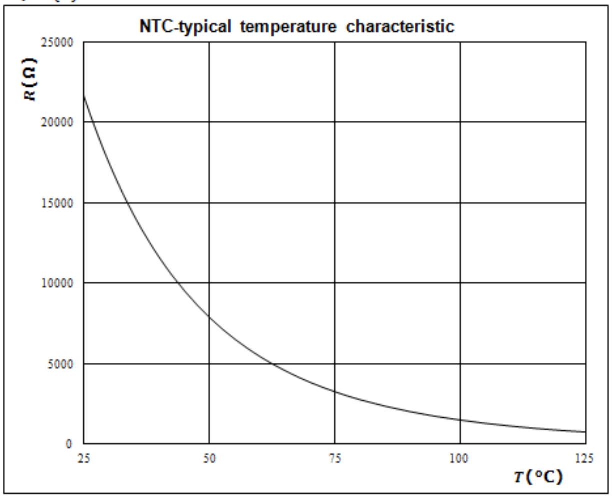
Thermistor Characteristics

Thermistor typical temperature characteristic

Typical NTC characteristic

as a function of temperature

$R_T = f(T)$

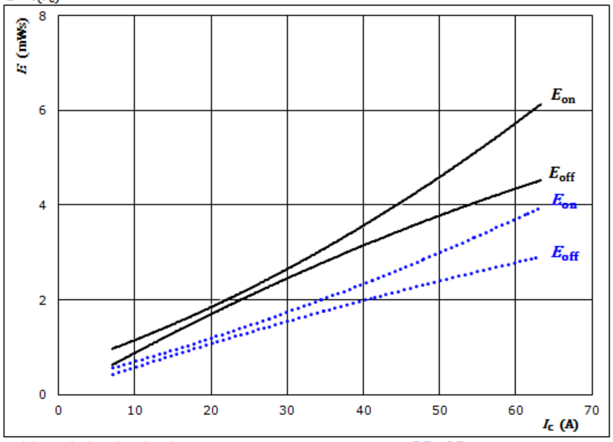


Inverter Switching Characteristics

Figure 1. IGBT

Typical switching energy losses as a function of collector current

$E = f(I_C)$



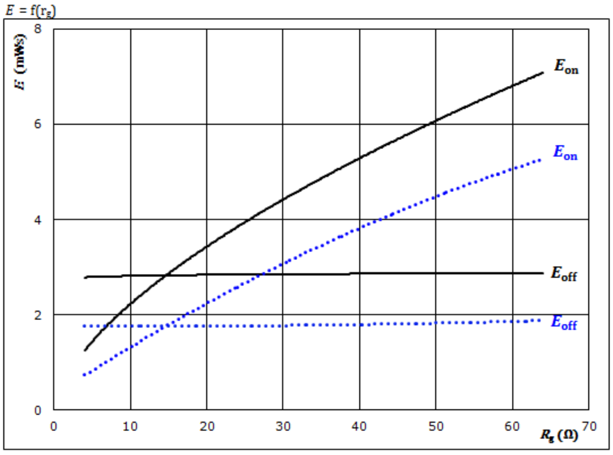
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C (dotted)
V_{GE} =	±15	V		125 °C (solid)
R_{gon} =	16	Ω		150 °C (dashed)
R_{goff} =	16	Ω		

Figure 2. IGBT

Typical switching energy losses as a function of gate resistor

$E = f(r_g)$



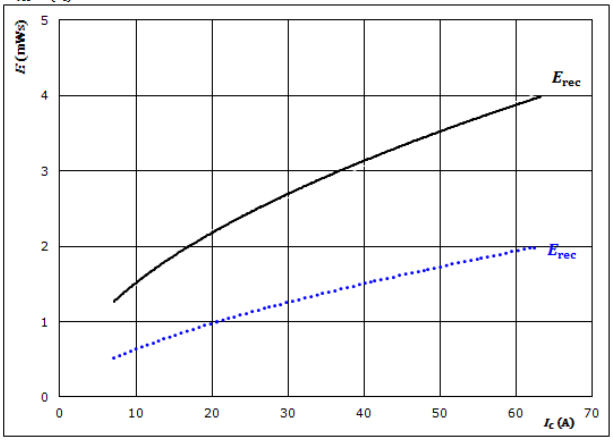
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C (dotted)
V_{GE} =	±15	V		125 °C (solid)
I_C =	35	A		150 °C (dashed)

Figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



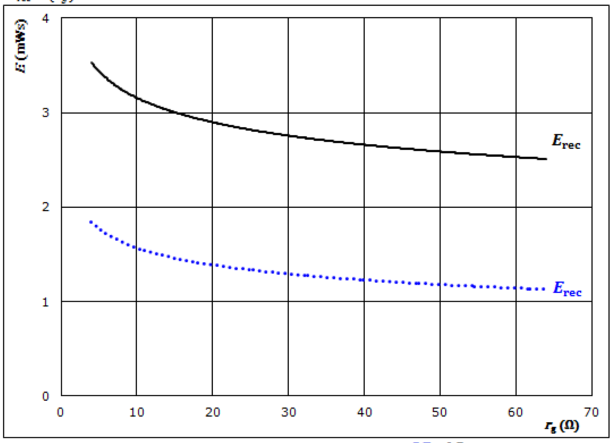
With an inductive load at

V_{CE} =	600	V	T_j:	25 °C (dotted)
V_{GE} =	±15	V		125 °C (solid)
R_{gon} =	16	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

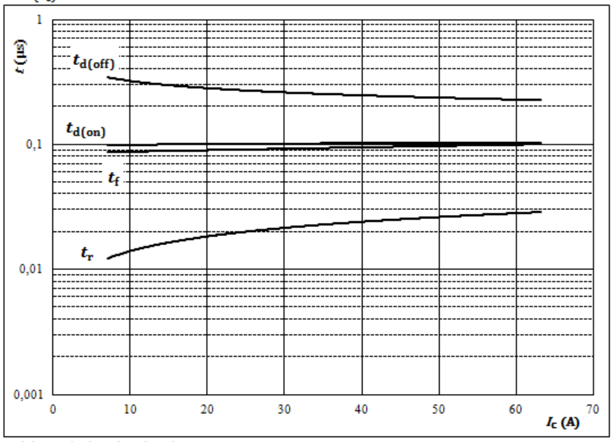
V_{CE} =	600	V	T_j:	25 °C (dotted)
V_{GE} =	±15	V		125 °C (solid)
I_C =	35	A		150 °C (dashed)

Inverter Switching Characteristics

Figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



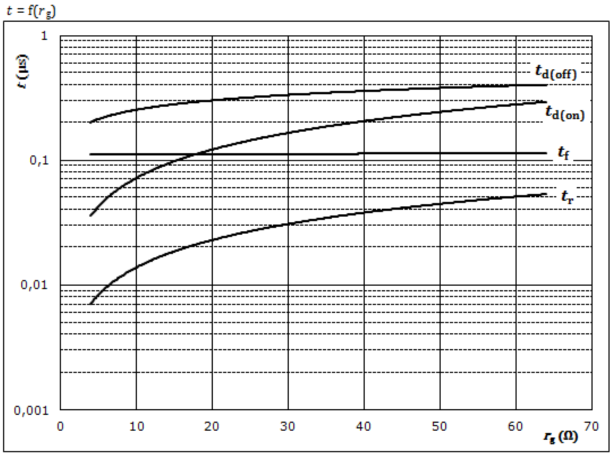
With an inductive load at

T_j =	125	°C
V_{CE} =	600	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

$t = f(r_g)$



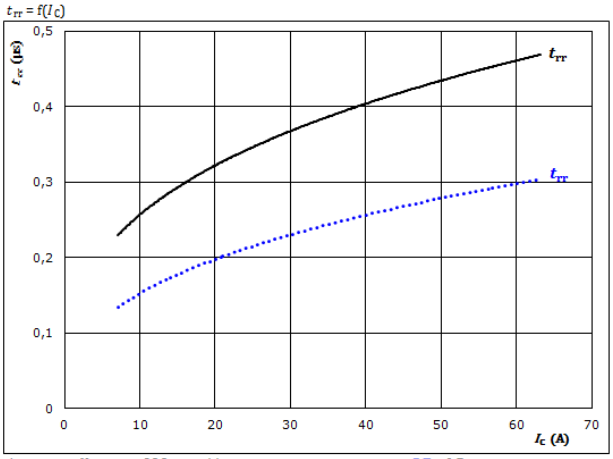
With an inductive load at

T_j =	125	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	35	A

Figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

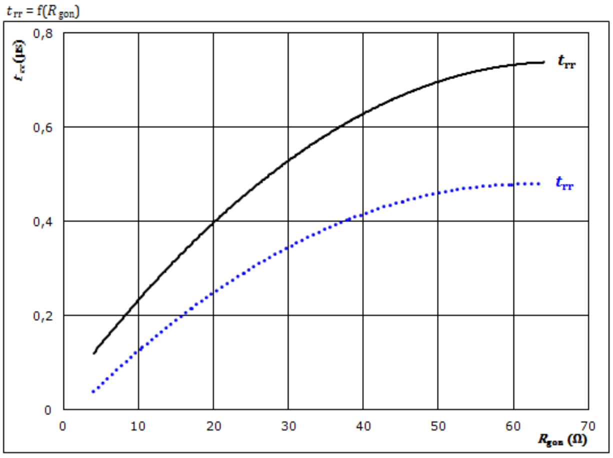


At					
V_{CE} =	600	V		25 °C	···········
V_{GE} =	±15	V	T_j:	125 °C	———
R_{gon} =	16	Ω		150 °C	– – – –

Figure 8. **FWD**

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

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



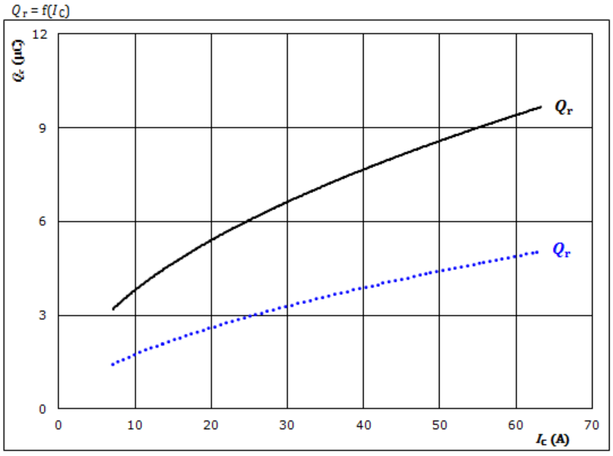
At					
V_{CE} =	600	V		25 °C	···········
V_{GE} =	±15	V	T_j:	125 °C	———
I_C =	35	A		150 °C	– – – –

Inverter Switching Characteristics

Figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

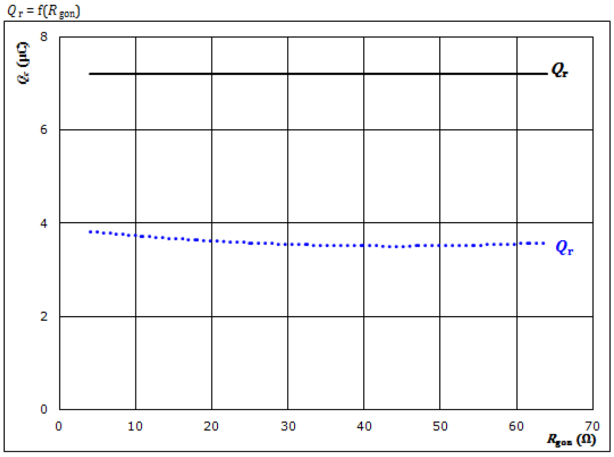


At	V_{CE} =	600	V		25 °C	············
	V_{GE} =	±15	V	T_j:	125 °C	———
	R_{gon} =	16	Ω		150 °C	– – – –

Figure 10. **FWD**

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

$Q_r = f(R_{gon})$

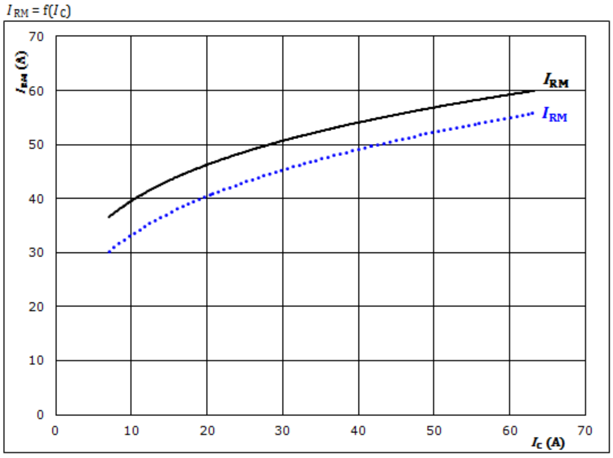


At	V_{CE}=	600	V		25 °C	············
	V_{GE} =	±15	V	T_j:	125 °C	———
	I_C=	35	A		150 °C	– – – –

Figure 11. **FWD**

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

$I_{RM} = f(I_C)$

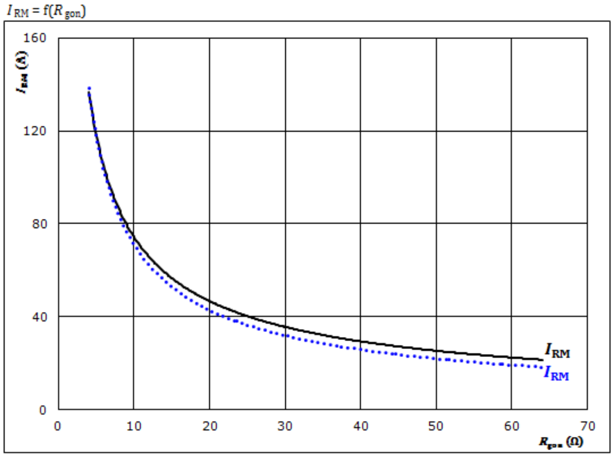


At	V_{CE}	600	V		25 °C	············
	V_{GE} =	±15	V	T_j:	125 °C	———
	R_{gon} =	16	Ω		150 °C	– – – –

Figure 12. **FWD**

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

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



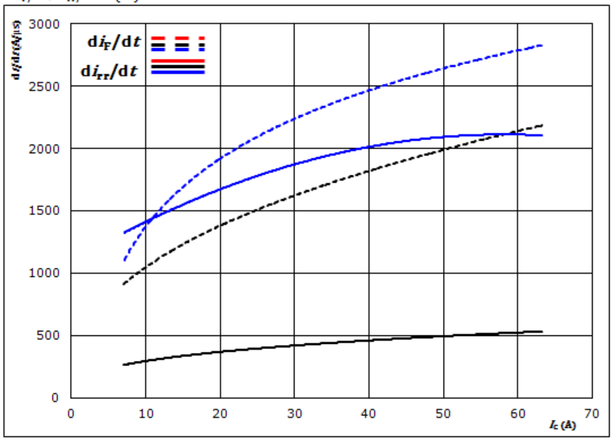
At	V_{CE} =	600	V		25 °C	············
	V_{GE} =	±15	V	T_j:	125 °C	———
	I_C=	35	A		150 °C	– – – –

Inverter Switching Characteristics

Figure 13. **FWD**

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

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

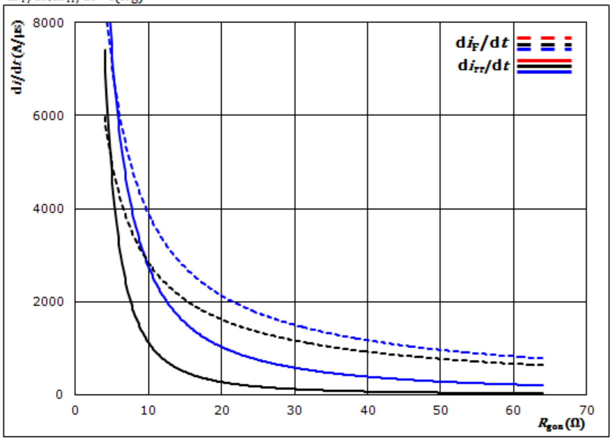


At					
V_{CE} =	600	V		25 °C	·············
V_{GE} =	±15	V	T_j:	125 °C	————
R_{gon} =	16	Ω		150 °C	– – – –

Figure 14. **FWD**

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

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

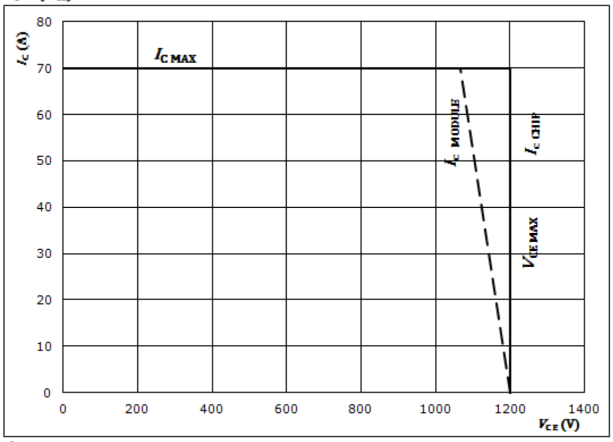


At				
V_{CE} =	600	V	25 °C	·············
V_{GE} =	±15	V	125 °C	————
I_C =	35	A	150 °C	– – – –

Figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At

T_j =	175	°C
R_{gon} =	16	Ω
R_{goff} =	16	Ω

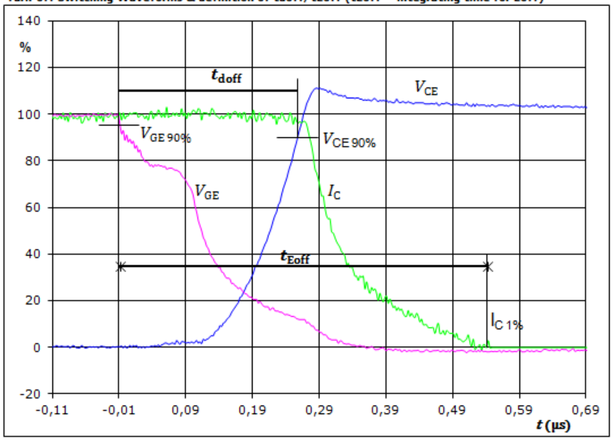
Inverter Switching Definitions

General conditions

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

Figure 1. **IGBT**

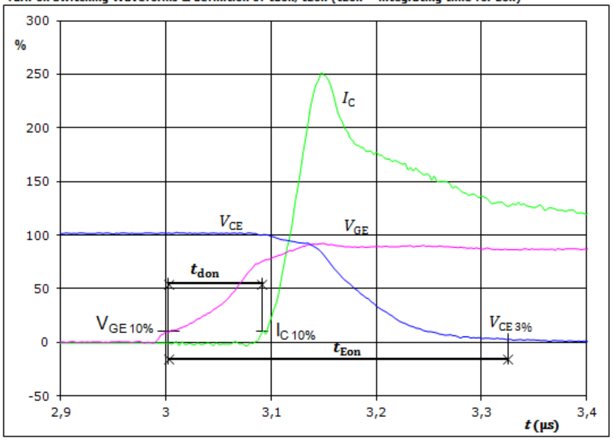
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	35	A
t_{doff} =	0,264	µs
t_{Eoff} =	0,551	µs

Figure 2. **IGBT**

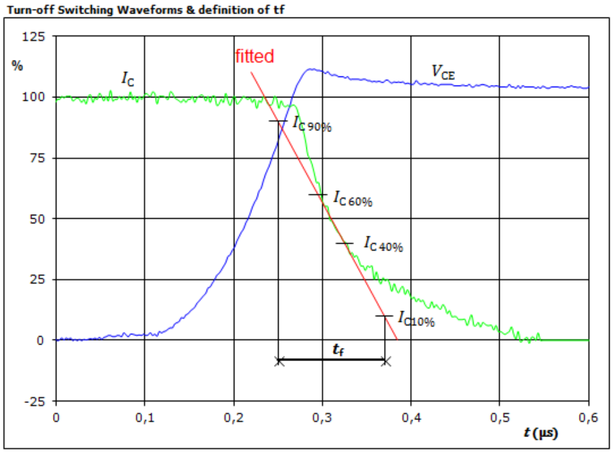
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	35	A
t_{don} =	0,094	µs
t_{Eon} =	0,322	µs

Figure 3. **IGBT**

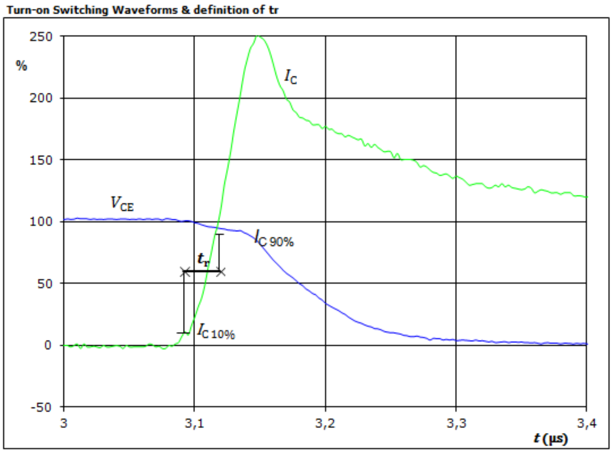
Turn-off Switching Waveforms & definition of tf



V_C (100%) =	600	V
I_C (100%) =	35	A
t_f =	0,109	µs

Figure 4. **IGBT**

Turn-on Switching Waveforms & definition of tr

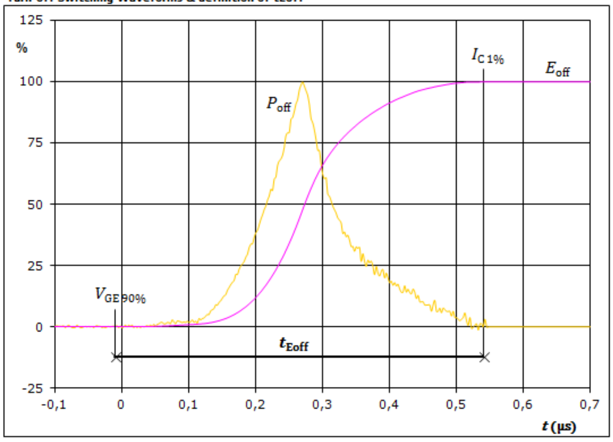


V_C (100%) =	600	V
I_C (100%) =	35	A
t_r =	0,023	µs

Inverter Switching Definitions

Figure 5. **IGBT**

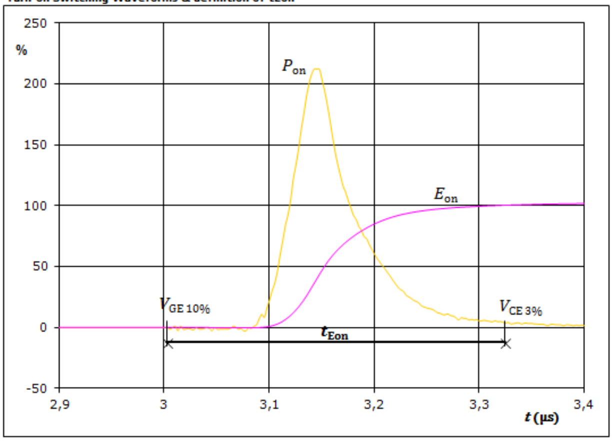
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	20,98	kW
E_{off} (100%) =	2,81	mJ
t_{Eoff} =	0,55	µs

Figure 6. **IGBT**

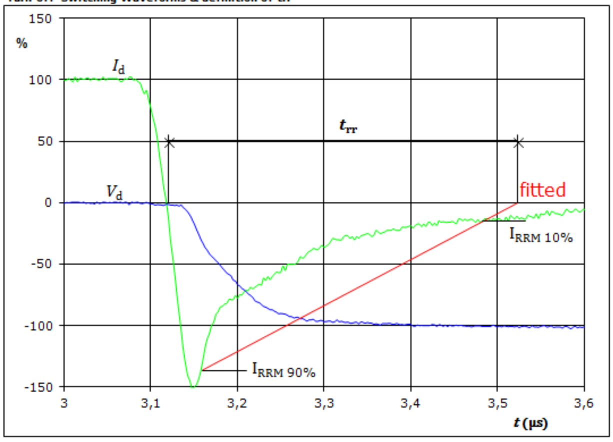
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	20,98	kW
E_{on} (100%) =	3,09	mJ
t_{Eon} =	0,32	µs

Figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

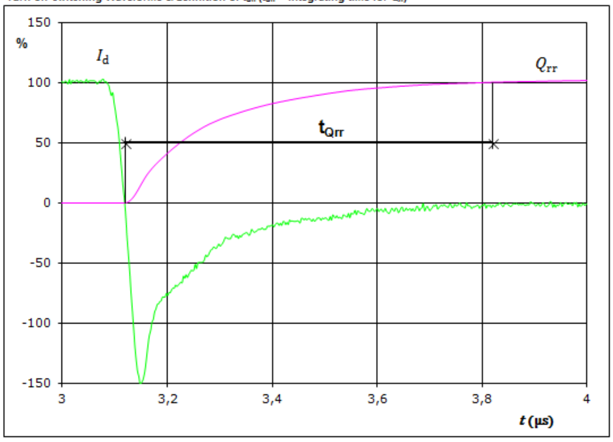


V_d (100%) =	600	V
I_d (100%) =	35	A
I_{RRM} (100%) =	-53	A
t_{rr} =	0,353	µs

Inverter Switching Definitions

Figure 8. **FWD**

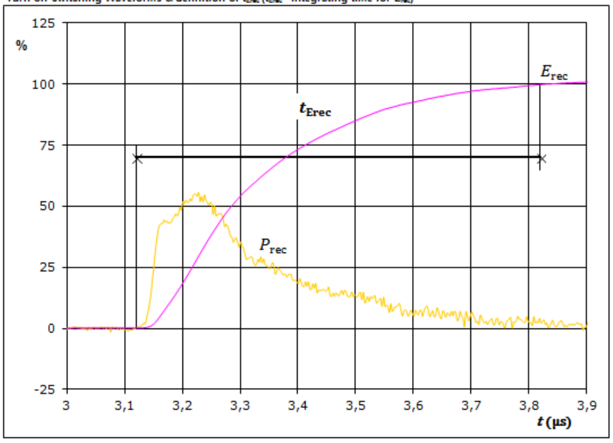
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	35	A
Q_{rr} (100%) =	6,93	µC
t_{Qrr} =	0,70	µs

Figure 9. **FWD**

Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec} = integrating time for E_{rec})



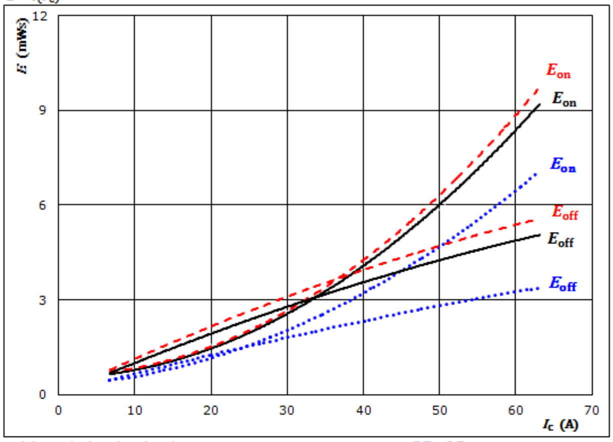
P_{rec} (100%) =	20,98	kW
E_{rec} (100%) =	2,83	mJ
t_{Erec} =	0,70	µs

Brake Switching Characteristics

Figure 1. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



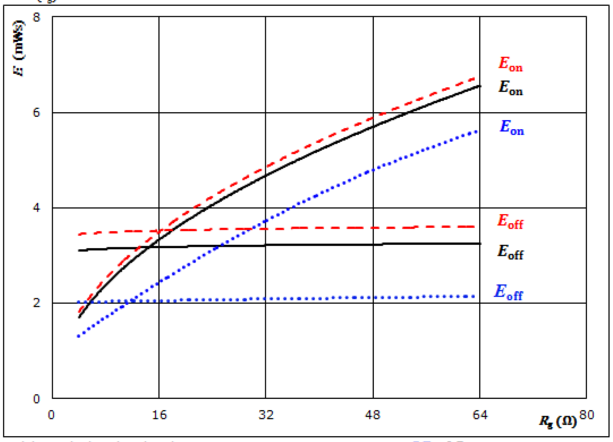
With an inductive load at

V_{CE} =	600	V	T_j:	25	°C	dotted
V_{GE} =	±15	V		125	°C	solid
R_{gon} =	16	Ω		150	°C	dashed
R_{goff} =	16	Ω				

Figure 2. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(r_g)$



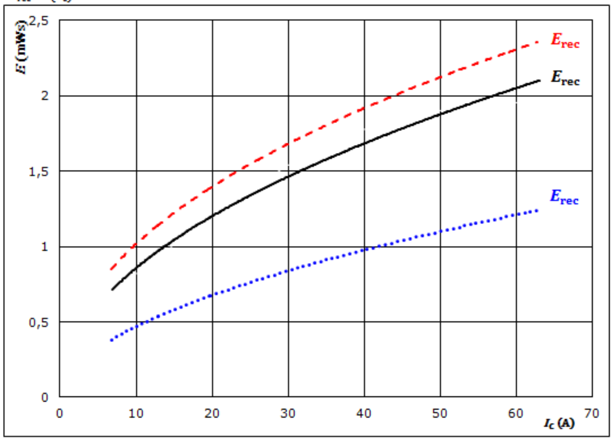
With an inductive load at

V_{CE} =	600	V	T_j:	25	°C	dotted
V_{GE} =	±15	V		125	°C	solid
I_C =	35	A		150	°C	dashed

Figure 3. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



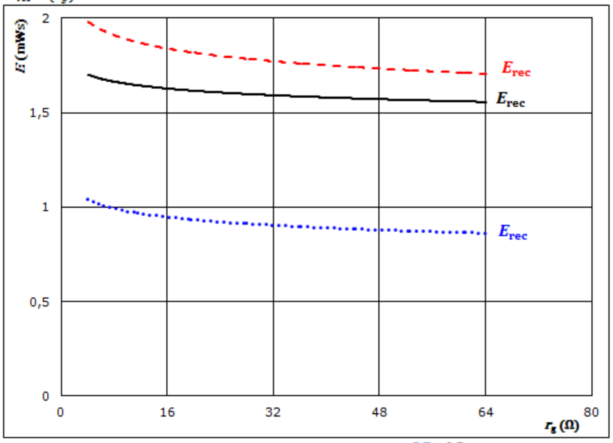
With an inductive load at

V_{CE} =	600	V	T_j:	25	°C	dotted
V_{GE} =	±15	V		125	°C	solid
R_{gon} =	16	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

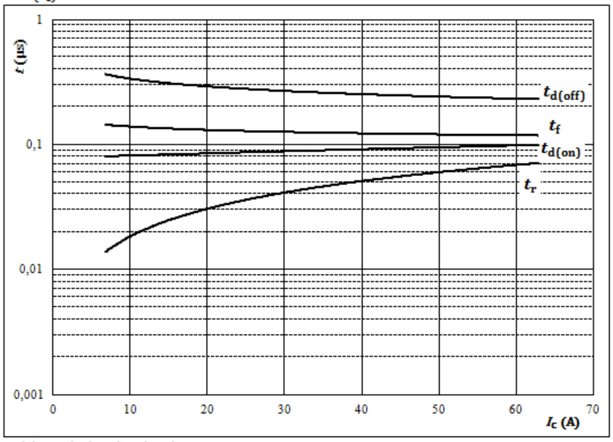
V_{CE} =	600	V	T_j:	25	°C	dotted
V_{GE} =	±15	V		125	°C	solid
I_C =	35	A		150	°C	dashed

Brake Switching Characteristics

Figure 5. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



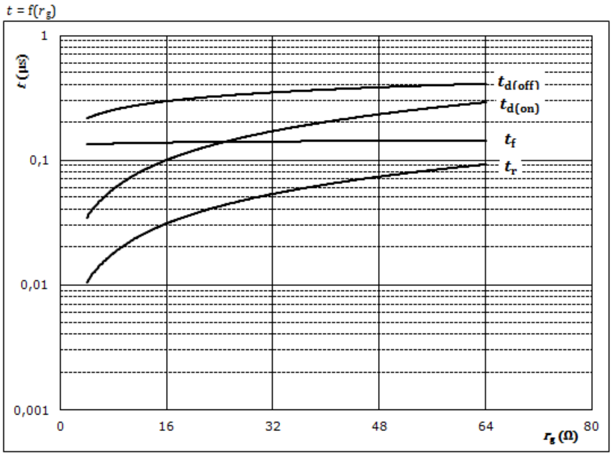
With an inductive load at

T_j =	150	°C
V_{CE} =	600	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

$t = f(r_g)$



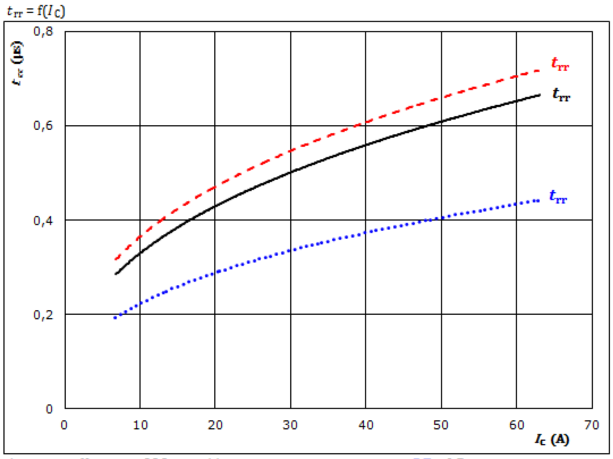
With an inductive load at

T_j =	150	°C
V_{CE} =	600	V
V_{GE} =	±15	V
I_C =	35	A

Figure 7. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$

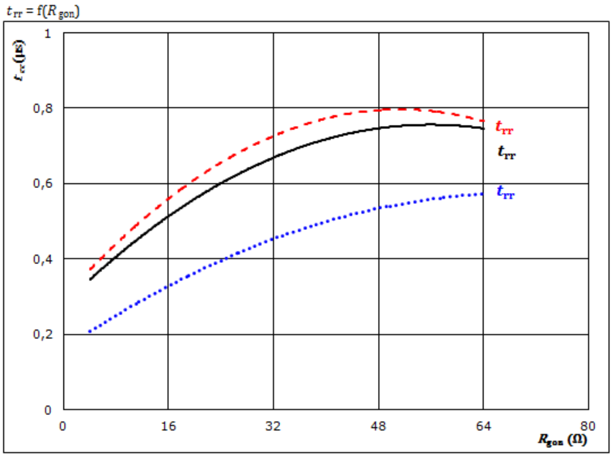


At						
V_{CE}=	600	V			25 °C	···········
V_{GE} =	±15	V		T_j:	125 °C	———
R_{gon} =	16	Ω			150 °C	– – – –

Figure 8. **FWD**

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

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



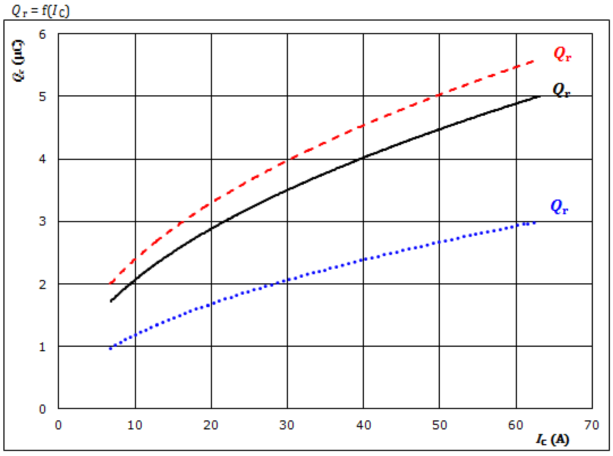
At						
V_{CE} =	600	V			25 °C	···········
V_{GE} =	±15	V		T_j:	125 °C	———
I_C =	35	A			150 °C	– – – –

Brake Switching Characteristics

Figure 9. **FWD**

Typical recovered charge as a function of collector current

$Q_r = f(I_C)$

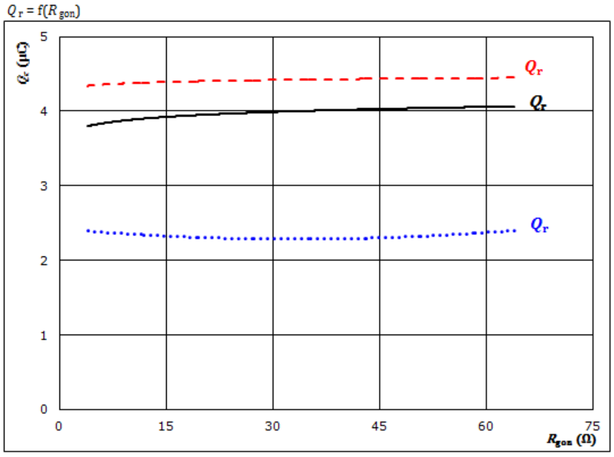


At	V_{CE} =	600	V		25 °C	··········
	V_{GE} =	±15	V	T_j:	125 °C	———
	R_{gon} =	16	Ω		150 °C	– – – –

Figure 10. **FWD**

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

$Q_r = f(R_{gon})$

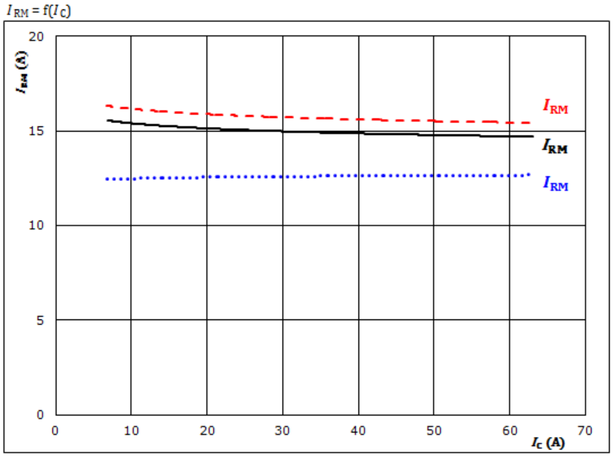


At	V_{CE}=	600	V		25 °C	··········
	V_{GE} =	±15	V	T_j:	125 °C	———
	I_C=	35	A		150 °C	– – – –

Figure 11. **FWD**

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

$I_{RM} = f(I_C)$

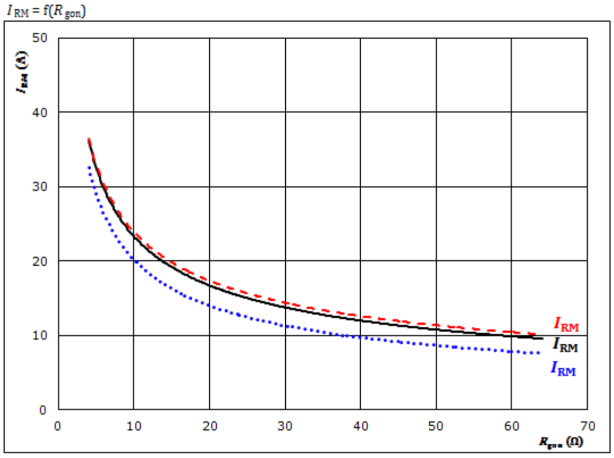


At	V_{CE}	600	V		25 °C	··········
	V_{GE} =	±15	V	T_j:	125 °C	———
	R_{gon} =	16	Ω		150 °C	– – – –

Figure 12. **FWD**

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

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



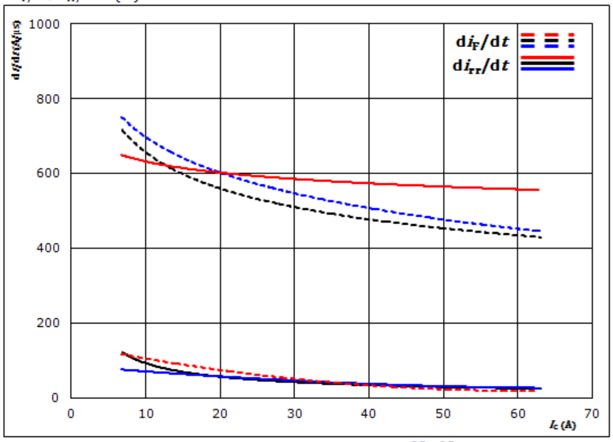
At	V_{CE} =	600	V		25 °C	··········
	V_{GE} =	±15	V	T_j:	125 °C	———
	I_C=	35	A		150 °C	– – – –

Brake Switching Characteristics

Figure 13. **FWD**

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

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

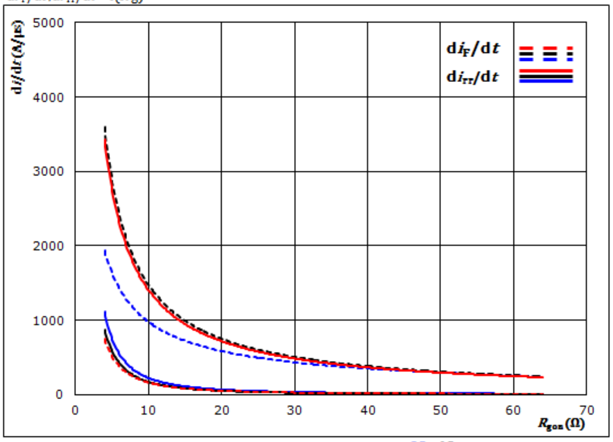


At						
V_{CE} =	600	V		25	°C	dotted
V_{GE} =	±15	V	T_j:	125	°C	solid
R_{gon} =	16	Ω		150	°C	dashed

Figure 14. **FWD**

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

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

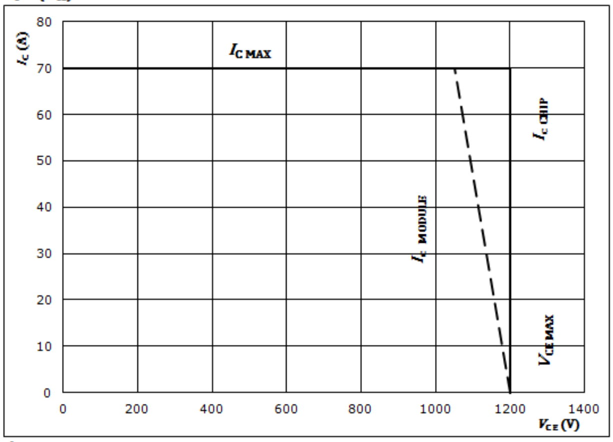


At						
V_{CE} =	600	V		25	°C	dotted
V_{GE} =	±15	V	T_j:	125	°C	solid
I_C =	35	A		150	°C	dashed

Figure 15. **IGBT**

Reverse bias safe operating area

$I_C = f(V_{CE})$



At		
T_j =	175	°C
R_{gon} =	16	Ω
R_{goff} =	16	Ω

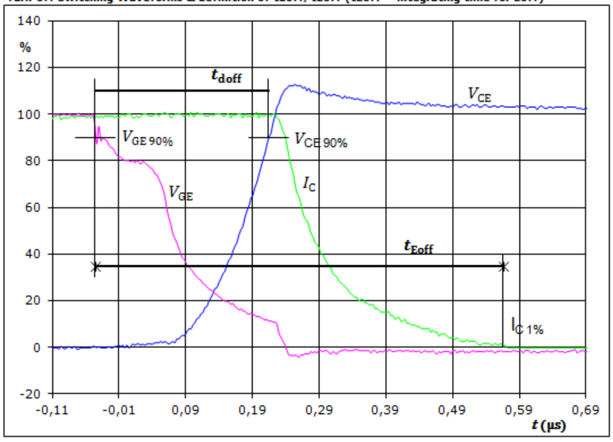
Brake Switching Definitions

General conditions

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

Figure 1. **IGBT**

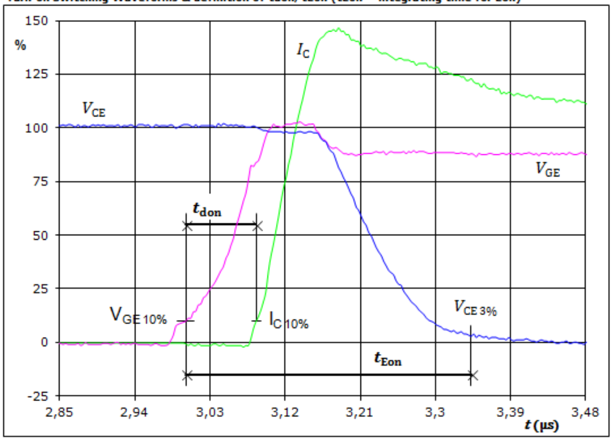
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	35	A
t_{doff} =	0,258	μs
t_{Eoff} =	0,612	μs

Figure 2. **IGBT**

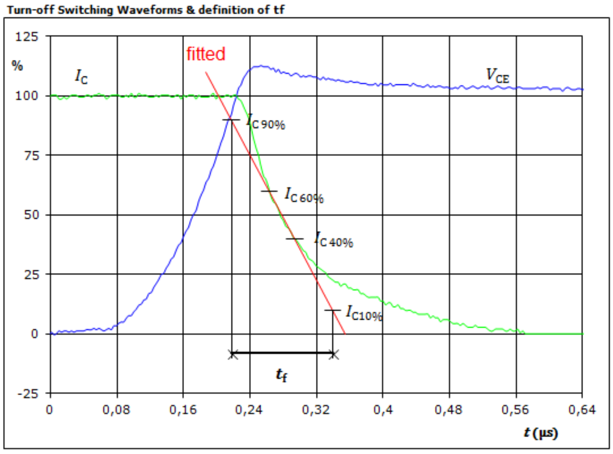
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



V_{GE} (0%) =	-15	V
V_{GE} (100%) =	15	V
V_C (100%) =	600	V
I_C (100%) =	35	A
t_{don} =	0,087	μs
t_{Eon} =	0,342	μs

Figure 3. **IGBT**

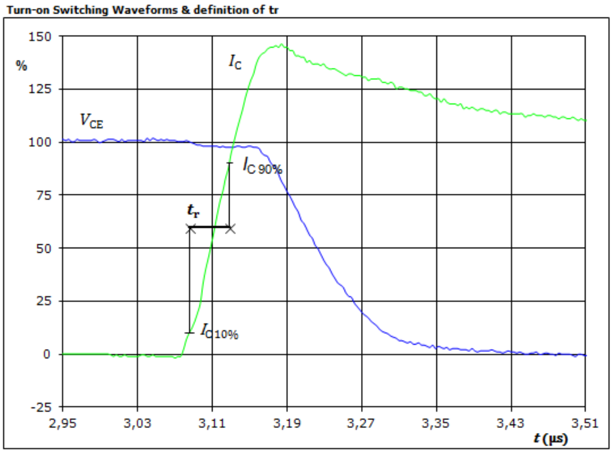
Turn-off Switching Waveforms & definition of tf



V_C (100%) =	600	V
I_C (100%) =	35	A
t_f =	0,126	μs

Figure 4. **IGBT**

Turn-on Switching Waveforms & definition of tr

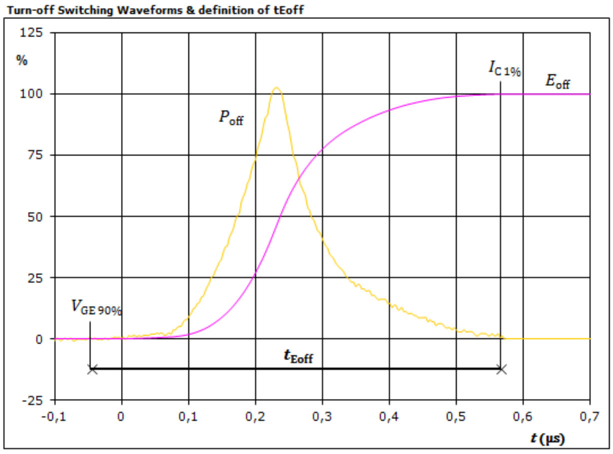


V_C (100%) =	600	V
I_C (100%) =	35	A
t_r =	0,043	μs

Brake Switching Definitions

Figure 5. **IGBT**

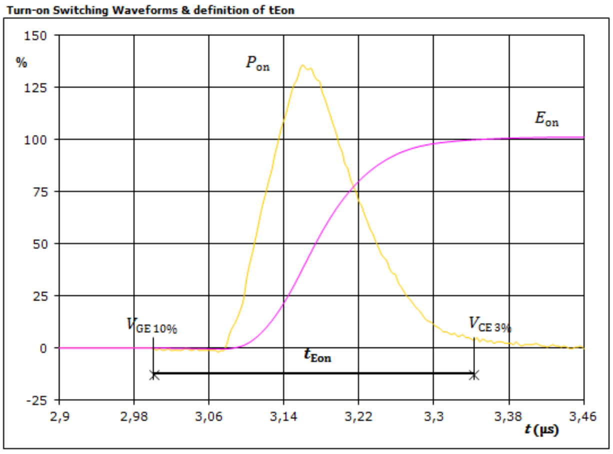
Turn-off Switching Waveforms & definition of tEoff



P_{off} (100%) =	20,92	kW
E_{off} (100%) =	3,16	mJ
t_{Eoff} =	0,612	µs

Figure 6. **IGBT**

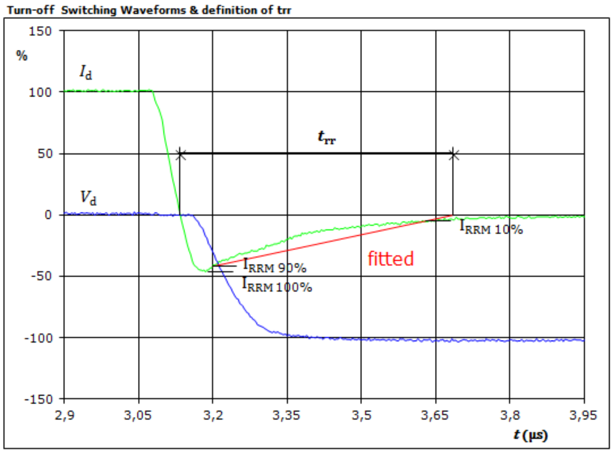
Turn-on Switching Waveforms & definition of tEon



P_{on} (100%) =	20,92	kW
E_{on} (100%) =	3,28	mJ
t_{Eon} =	0,342	µs

Figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

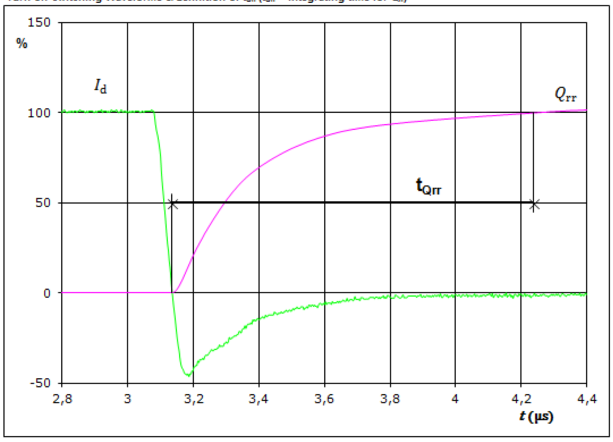


V_d (100%) =	600	V
I_d (100%) =	35	A
I_{RRM} (100%) =	-16	A
t_{rr} =	0,552	µs

Brake Switching Definitions

Figure 8. **FWD**

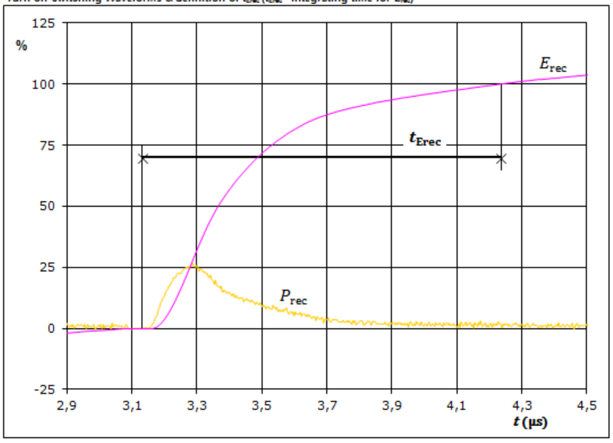
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	35	A
Q_{rr} (100%) =	3,92	µC
t_{Qrr} =	1,10	µs

Figure 9. **FWD**

Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec}= integrating time for E_{rec})



P_{rec} (100%) =	20,92	kW
E_{rec} (100%) =	1,68	mJ
t_{Erec} =	1,10	µs

Ordering Code & Marking

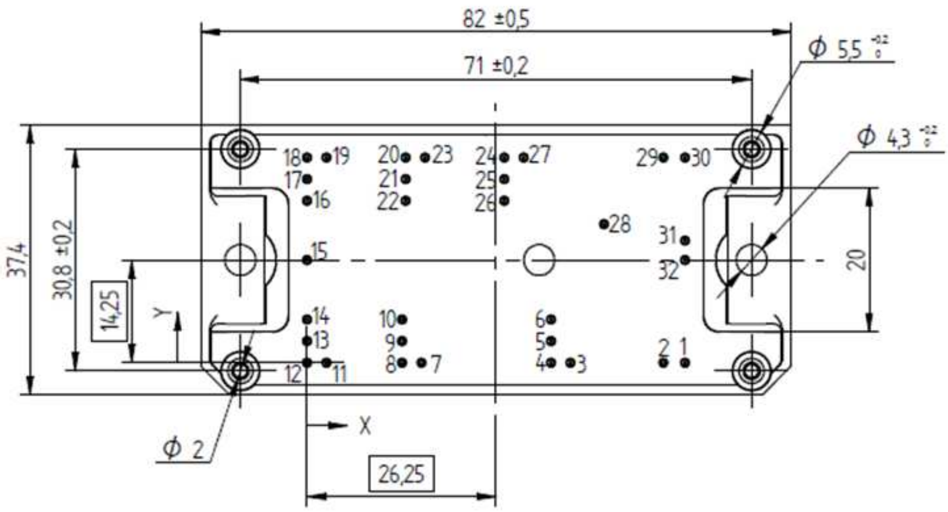
Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 17mm housing	10-F1127PA035SC-L168E09	L168E09	L168E09

	Name		Date code	UL & Vinco	Lot	Serial
Text	NN-NNNNNNNNNNNNNN-NNNNNNNN		WWYY	UL Vinco	LLLLL	SSSS
Datamatrix	Type&Ver	Lot number	Serial	Date code		
	TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]

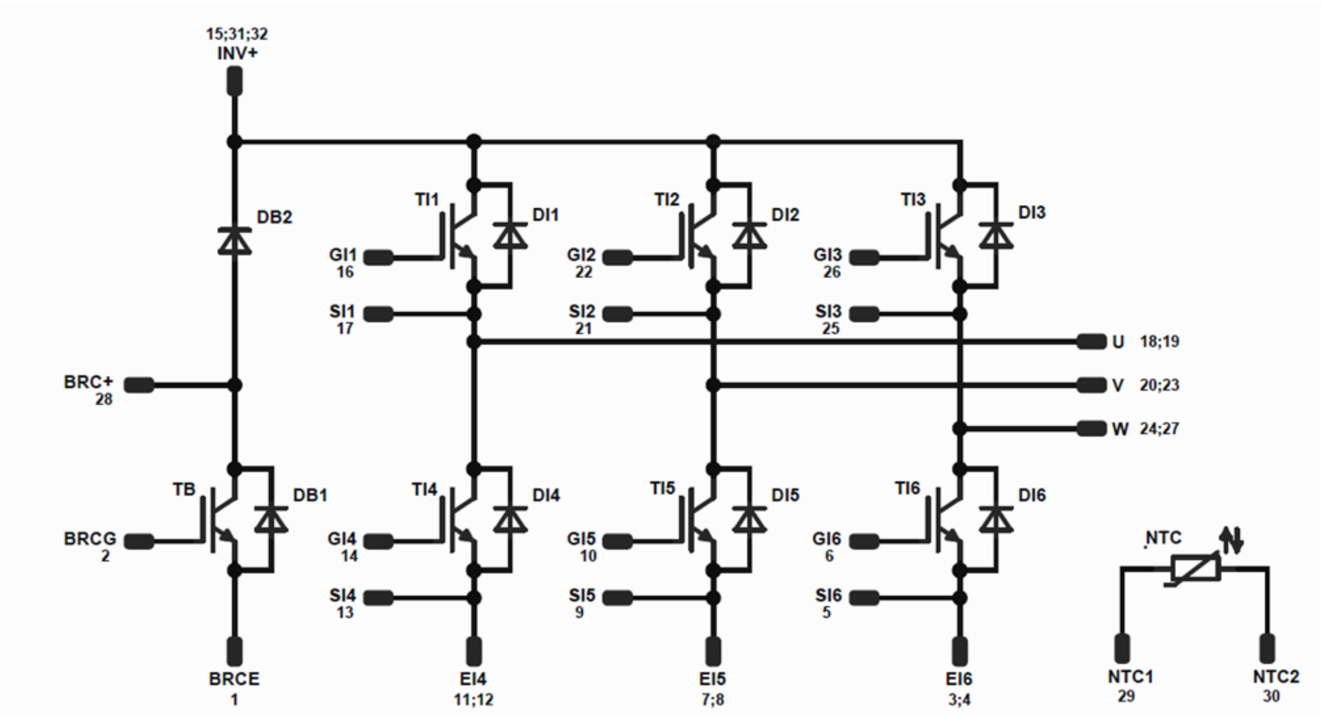
Pin	X	Y	Function
1	52,5	0	BRCE
2	49,5	0	BRCG
3	36,6	0	EI6
4	33,9	0	EI6
5	33,9	3	SI6
6	33,9	6	GI6
7	15,9	0	EI5
8	13,2	0	EI5
9	13,2	3	SI5
10	13,2	6	GI5
11	2,7	0	EI4
12	0	0	EI4
13	0	3	SI4
14	0	6	GI4
15	0	14,25	INV+
16	0	22,5	GI1
17	0	25,5	SI1
18	0	28,5	U
19	2,7	28,5	U
20	13,7	28,5	V
21	13,7	25,5	SI2
22	13,7	22,5	GI2
23	16,4	28,5	V
24	27,4	28,5	W
25	27,4	25,5	SI3
26	27,4	22,5	GI3
27	30,1	28,5	W
28	41,25	19,25	BRC+
29	49,5	28,5	NTC1



Pin table [mm]

Pin	X	Y	Function
30	52,5	28,5	NTC2
31	52,5	16,95	INV+
32	52,5	14,25	INV+

Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
TI1,TI2, TI3, TI4,TI5,TI6	IGBT	1200V	35A	Inverter Switch	
DI1,DI2,DI3, DI4,DI5,DI6	FWD	1200V	35A	Inverter Diode	
TB	IGBT	1200V	35A	Brake Switch	
DB2	FWD	1200V	15A	Brake Diode	
DB1	FWD	1200V	7,5A	Brake Inverse Diode	
NTC	NTC	-	-	Thermistor	

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

Handling instruction
Handling instructions for *flow* 1 packages see vincotech.com website.

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