10-FY073AA050RG01-LK14L08
datasheet

***flow*3xANPFC 1** | **650 V / 50 A**

Features

- 3xAdvanced Neutral Boost PFC
- Integrated DC capacitor
- Kelvin Emitter for improved switching performance

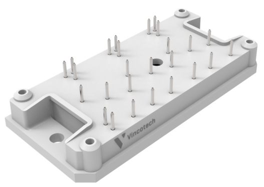
Target applications

- Charging Stations
- Power Supply

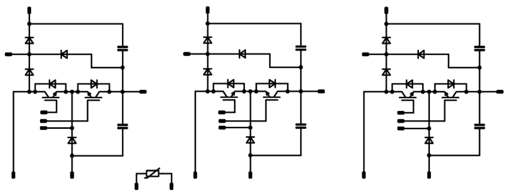
Types

- 10-FY073AA050RG01-LK14L08

flow 1 12 mm housing



Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Negative Neutral Point Switch					
Collector-emitter voltage	V_{CES}			650	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	46	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	77	W
Gate-emitter voltage	V_{GES}			±30	V
Maximum junction temperature	T_{jmax}			175	°C
Positive Neutral Point Switch					
Collector-emitter voltage	V_{CES}			650	V
Collector current (DC current)	I_C	$T_j = T_{jmax}$	T_s = 80 °C	46	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}		200	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	77	W
Gate-emitter voltage	V_{GES}			±30	V
Maximum junction temperature	T_{jmax}			175	°C
Negative Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	32	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	48	W
Maximum junction temperature	T_{jmax}			175	°C
Positive Boost Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	32	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	48	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Negative Neutral Point Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	36	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			360	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	46	W
Maximum junction temperature	T_{jmax}			150	°C
Positive Neutral Point Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	47	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			365	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	59	W
Maximum junction temperature	T_{jmax}			150	°C
Positive Boost Diode Protection Diode					
Peak repetitive reverse voltage	V_{RRM}			650	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	17	A
Repetitive peak forward current	I_{FRM}	t_p limited by T_{jmax}		20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	33	W
Maximum junction temperature	T_{jmax}			175	°C

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Conditions		Value	Unit
Positive Boost Blocking Diode					
Peak repetitive reverse voltage	V_{RRM}			1600	V
Forward current (DC current)	I_F	$T_j = T_{jmax}$	T_s = 80 °C	36	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			360	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$	T_s = 80 °C	46	W
Maximum junction temperature	T_{jmax}			150	°C
Capacitor (DC)					
Maximum DC voltage	V_{MAX}			500	V
Operation Temperature	T_{op}			-55 ... 125	°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	6000	V
Isolation voltage	V_{isol}	AC Voltage	t_p = 1 min	2500	V
Creepage distance				>12.7mm	mm
Clearance				8.58mm	mm
Comparative Tracking Index	CTI			≥ 200	

*100 % tested in production

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]	Values Min	Values Typ	Values Max	Unit
Negative Neutral Point Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$			5	0,033	25	5	6	7	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 125 150		1,5 1,66 1,7	1,9(1)	V
Collector-emitter cut-off current	I_{CES}		0	650		25			0,01	mA
Gate-emitter leakage current	I_{GES}		30	0		25			0,2	μA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	30		25		4200		pF
Output capacitance	C_{oes}	f = 1 Mhz	0	30		25		104		pF
Reverse transfer capacitance	C_{res}	f = 1 Mhz	0	30		25		79		pF
Gate charge	Q_g		15	400	50	25		141		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,23		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	-5/15	400	50	25 125 150		95,23 87,76 85,82		ns
Rise time	t_r	R_{gon} = 8 Ω R_{goff} = 8 Ω	-5/15	400	50	25 125 150		45,2 44,7 44,51		ns
Turn-off delay time	$t_{d(off)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	-5/15	400	50	25 125 150		139,47 155,63 160,31		ns
Fall time	t_f	R_{gon} = 8 Ω R_{goff} = 8 Ω	-5/15	400	50	25 125 150		29,45 41,3 44,8		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,437 μC Q_{rFWD}=1,61 μC Q_{rFWD}=2,04 μC	-5/15	400	50	25 125 150		0,931 1,34 1,48		mWs
Turn-off energy (per pulse)	E_{off}		-5/15	400	50	25 125 150		0,84 1,11 1,18		mWs

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]	Values Min	Typ	Max	Unit
Positive Neutral Point Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$			5	0,033	25	5	6	7	V
Collector-emitter saturation voltage	V_{CEsat}		15		50	25 125 150		1,5 1,66 1,7	1,9(1)	V
Collector-emitter cut-off current	I_{CES}		0	650		25			0,01	mA
Gate-emitter leakage current	I_{GES}		30	0		25			0,2	µA
Internal gate resistance	r_g							None		Ω
Input capacitance	C_{ies}	f = 1 Mhz	0	30		25		4200		pF
Output capacitance	C_{oes}							104		pF
Reverse transfer capacitance	C_{res}							79		pF
Gate charge	Q_g		15	400	50	25		141		nC
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,23		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{gon} = 8 Ω R_{goff} = 8 Ω	-5/15	400	50	25 125 150		97,41 89,46 86,89		ns
Rise time	t_r					25 125 150		45,18 45,16 45,85		ns
Turn-off delay time	$t_{d(off)}$					25 125 150		137,8 154,41 159,11		ns
Fall time	t_f					25 125 150		36,74 34,76 32,99		ns
Turn-on energy (per pulse)	E_{on}	Q_{rFWD}=0,429 µC Q_{rFWD}=1,58 µC Q_{rFWD}=2 µC				25 125 150		0,872 1,31 1,46		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		1,38 2,04 2,24		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	
Negative Boost Diode										
Static										
Forward voltage	V_F				30	25 125 150		2,33 1,76 1,65	3(1)	V
Reverse leakage current	I_R	V_r = 650 V				25			7	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,96		K/W
Dynamic										
Peak recovery current	I_{RRM}	d*i*/d*t*=1398 A/µs d*i*/d*t*=1424 A/µs d*i*/d*t*=1290 A/µs	-5/15	400	50	25 125 150		19,55 35,04 39,96		A
Reverse recovery time	t_{rr}					25 125 150		57,83 86,57 98,83		ns
Recovered charge	Q_r					25 125 150		0,437 1,61 2,04		µC
Reverse recovered energy	E_{rec}					25 125 150		0,096 0,381 0,486		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		2204,92 952,07 1057,36		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	
Positive Boost Diode										
Static										
Forward voltage	V_F				30	25 125 150		2,33 1,76 1,65	3(1)	V
Reverse leakage current	I_R	V_r = 650 V				25			7	μA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,96		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt=1385 A/μs di/dt=1466 A/μs di/dt=1348 A/μs	-5/15	400	50	25 125 150		20,19 36,15 40,92		A
Reverse recovery time	t_{rr}					25 125 150		44,97 83,1 94,81		ns
Recovered charge	Q_r					25 125 150		0,429 1,58 2		μC
Reverse recovered energy	E_{rec}					25 125 150		0,095 0,386 0,485		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		563,19 1064,32 1164,61		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	
Negative Neutral Point Diode										
Static										
Forward voltage	V_F				30	25 125 150		1,24 1,22	1,29(1) 1,26(1)	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			10 1	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,51		K/W
Positive Neutral Point Diode										
Static										
Forward voltage	V_F				50	25 125 150		1,27 1,27	1,3(1) 1,37(1)	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			20 1500	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,19		K/W

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
Positive Boost Diode Protection Diode										
Static										
Forward voltage	V_F				10	25 125	1,23	1,67 1,56	1,87(1)	V
Reverse leakage current	I_R	V_r = 650 V				25			0,14	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						2,87		K/W
Positive Boost Blocking Diode										
Static										
Forward voltage	V_F				30	25 125 150		1,24 1,22	1,29(1) 1,26(1)	V
Reverse leakage current	I_R	V_r = 1600 V				25 150			10 1	µA
Thermal										
Thermal resistance junction to sink (2)	$R_{th(j-s)}$	λ_{paste} = 3,4 W/mK (PSX)						1,51		K/W
Capacitor (DC)										
Static										
Capacitance	C	DC bias voltage = 0 V				25		150		nF
Tolerance							-10		10	%
Dissipation factor		f = 1 kHz				25		2,5		%

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

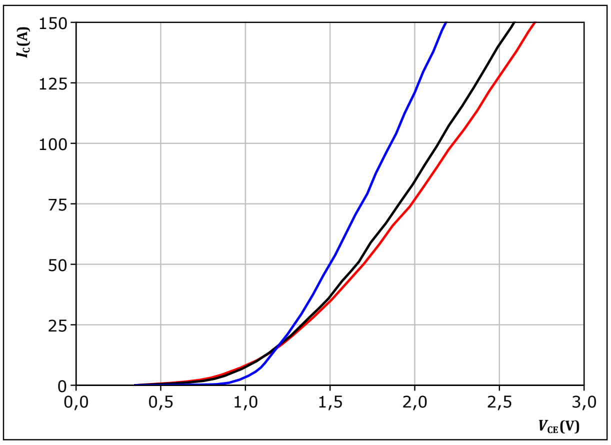
(1) Value at chip level
(2) Only valid with pre-applied Vincotech thermal interface material.

Negative Neutral Point Switch Characteristics

figure 1. IGBT

Typical output characteristics

I_C = f(V_{CE})

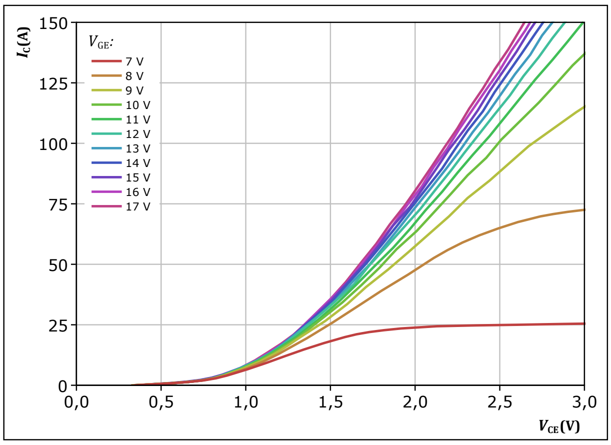


t_p =	250	µs		25 °C
V_{GE} =	15	V	T_j:	125 °C
				150 °C

figure 2. IGBT

Typical output characteristics

I_C = f(V_{CE})



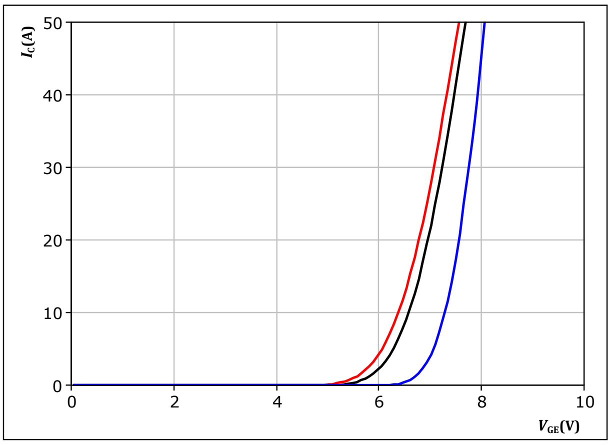
t_p =	250	µs
T_j =	150	°C

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

figure 3. IGBT

Typical transfer characteristics

I_C = f(V_{GE})

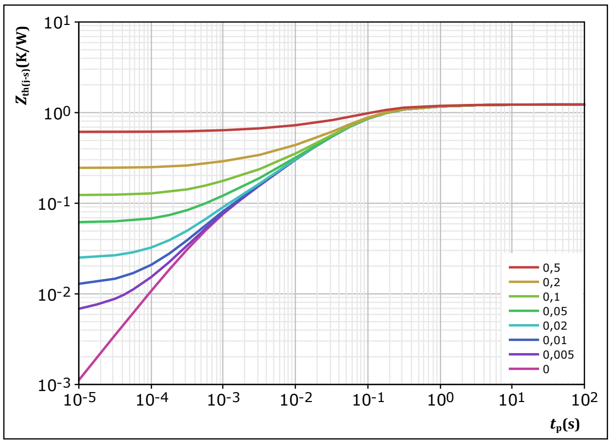


t_p =	250	µs		25 °C
V_{CE} =	10	V	T_j:	125 °C
				150 °C

figure 4. IGBT

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,228	K/W

IGBT thermal model values

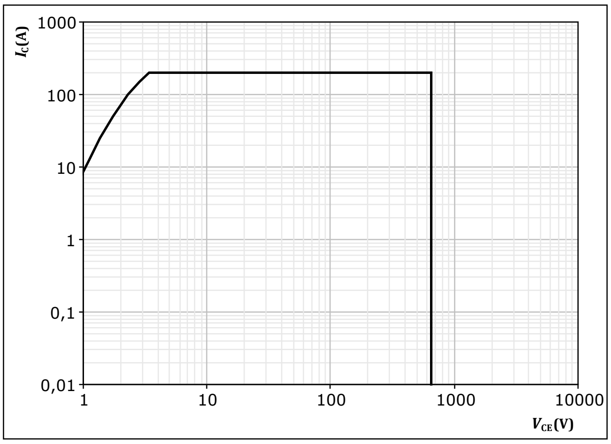
R (K/W)	τ (s)
5,07E-02	3,25E+00
1,43E-01	5,26E-01
5,97E-01	9,03E-02
2,58E-01	2,71E-02
1,27E-01	5,65E-03
5,33E-02	7,25E-04

Negative Neutral Point Switch Characteristics

figure 5. **IGBT**

Safe operating area

I_C = f(V_{CE})



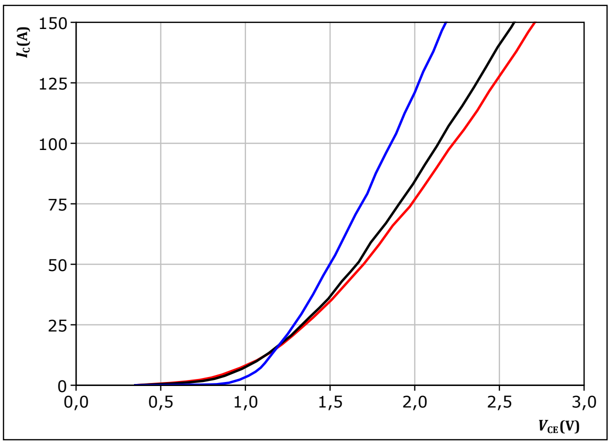
D = single pulse
T_s = 80 °C
V_{GE} = 15 V
T_j = T_{jmax}

Positive Neutral Point Switch Characteristics

figure 6. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



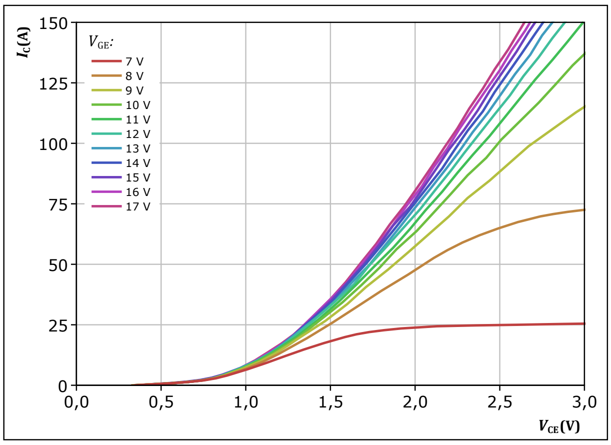
t_p =	250	μs
V_{GE} =	15	V

T_j: 25 °C, 125 °C, 150 °C

figure 7. **IGBT**

Typical output characteristics

$I_C = f(V_{CE})$



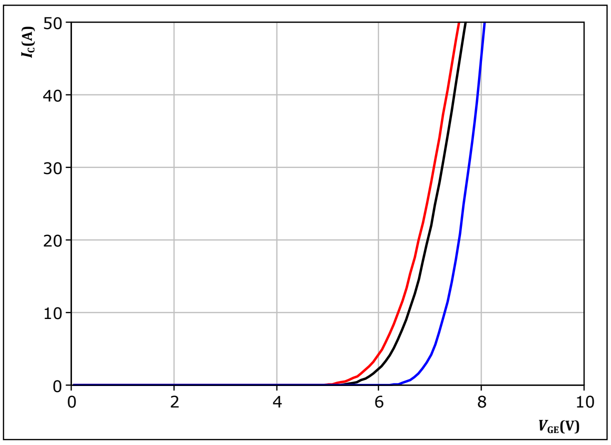
t_p =	250	μs
T_j =	150	°C

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

figure 8. **IGBT**

Typical transfer characteristics

$I_C = f(V_{GE})$



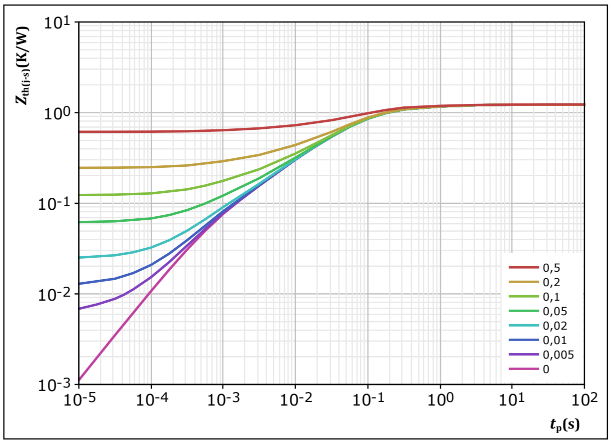
t_p =	250	μs
V_{CE} =	10	V

T_j: 25 °C, 125 °C, 150 °C

figure 9. **IGBT**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,228	K/W

IGBT thermal model values

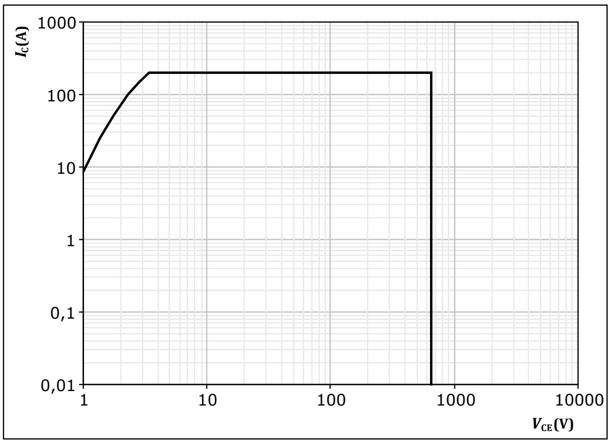
R (K/W)	τ (s)
5,07E-02	3,25E+00
1,43E-01	5,26E-01
5,97E-01	9,03E-02
2,58E-01	2,71E-02
1,27E-01	5,65E-03
5,33E-02	7,25E-04

Positive Neutral Point Switch Characteristics

figure 10. **IGBT**

Safe operating area

$I_C = f(V_{CE})$



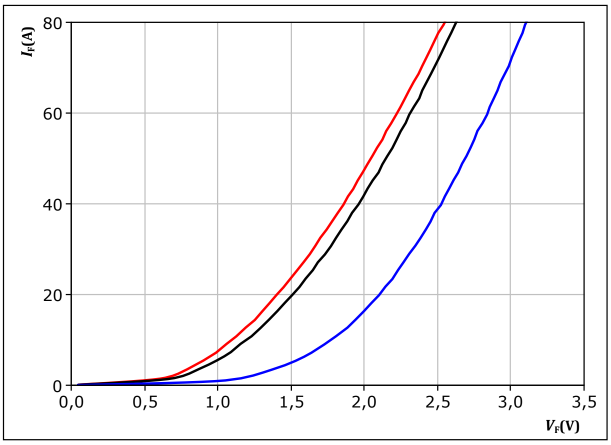
D =	single pulse	
T_s =	80	°C
V_{GE} =	15	V
T_j =	T_{jmax}	

Negative Boost Diode Characteristics

figure 11. FWD

Typical forward characteristics

$I_F = f(V_F)$



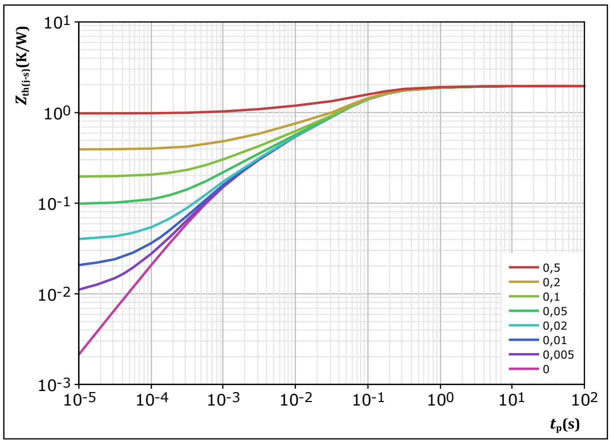
t_p = 250 μs

T_j: 25 °C, 125 °C, 150 °C

figure 12. FWD

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,96 K/W

FWD thermal model values

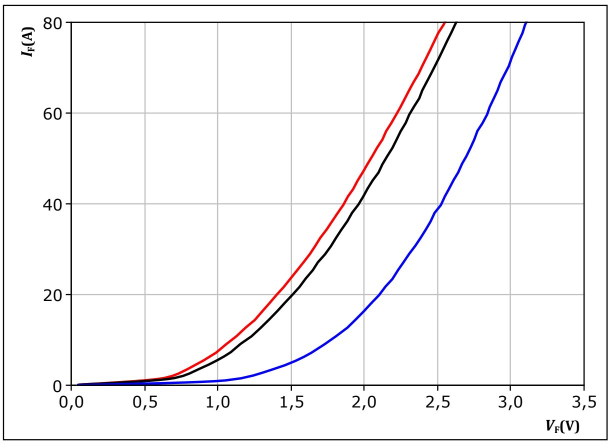
R (K/W)	τ (s)
1,16E-01	2,07E+00
3,73E-01	2,36E-01
1,04E+00	6,08E-02
3,05E-01	5,87E-03
1,23E-01	8,48E-04

Positive Boost Diode Characteristics

figure 13. **FWD**

Typical forward characteristics

$I_F = f(V_F)$



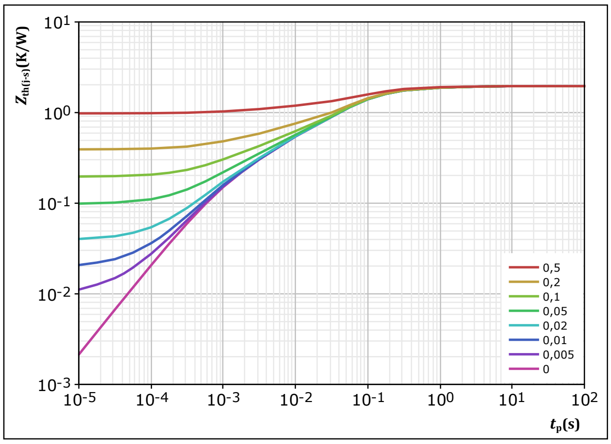
t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 14. **FWD**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,96 K/W

FWD thermal model values

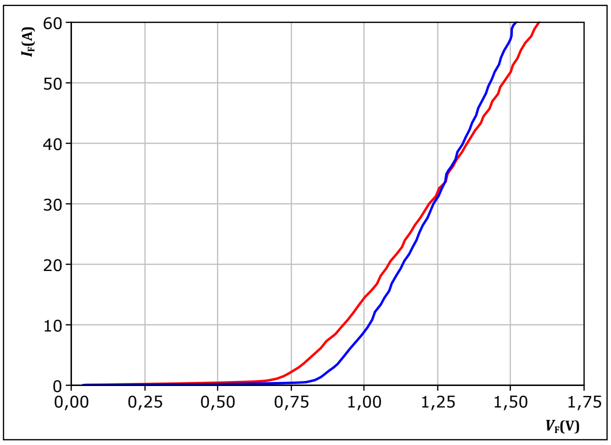
R (K/W)	τ (s)
1,16E-01	2,07E+00
3,73E-01	2,36E-01
1,04E+00	6,08E-02
3,05E-01	5,87E-03
1,23E-01	8,48E-04

Negative Neutral Point Diode Characteristics

figure 15. **Rectifier**

Typical forward characteristics

$I_F = f(V_F)$



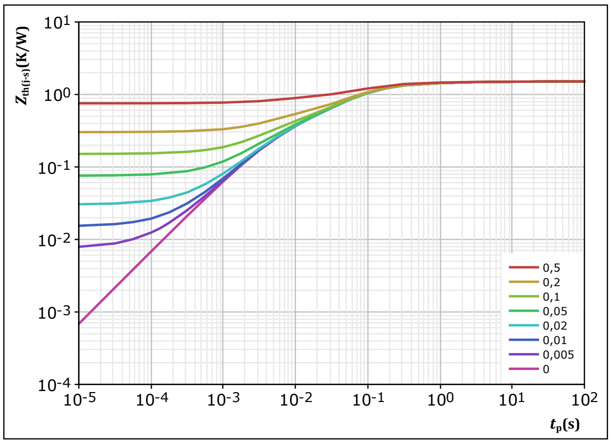
t_p =	250	μs

T_j: 25 °C, 125 °C

figure 16. **Rectifier**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	1,511	K/W

Rectifier thermal model values

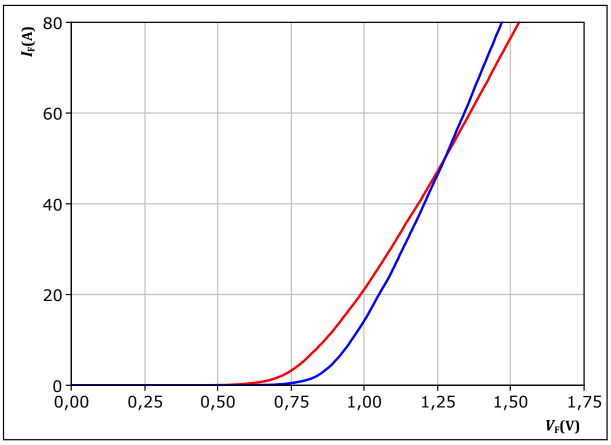
R (K/W)	τ (s)
3,93E-02	9,06E+00
1,22E-01	9,78E-01
5,85E-01	1,29E-01
5,38E-01	3,98E-02
2,27E-01	4,50E-03

Positive Neutral Point Diode Characteristics

figure 17. **Rectifier**

Typical forward characteristics

$I_F = f(V_F)$



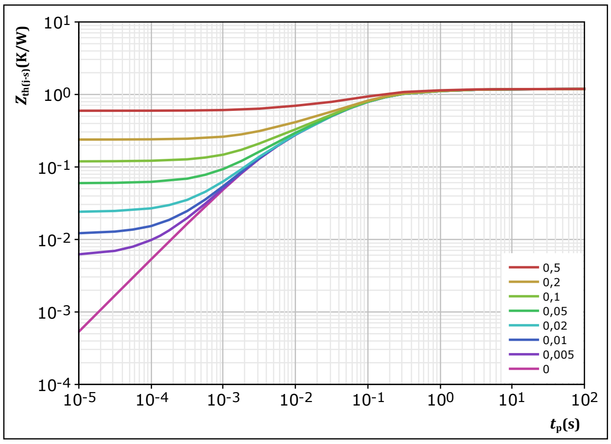
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 18. **Rectifier**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,192 K/W

Rectifier thermal model values

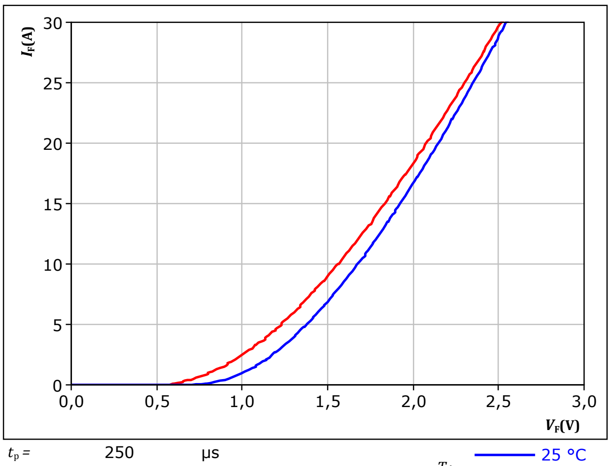
R (K/W)	τ (s)
2,46E-02	2,42E+01
1,39E-01	1,10E+00
5,40E-01	1,24E-01
3,49E-01	2,80E-02
1,41E-01	3,85E-03

Positive Boost Diode Protection Diode Characteristics

figure 19. **FWD**

Typical forward characteristics

I_F = f(V_F)



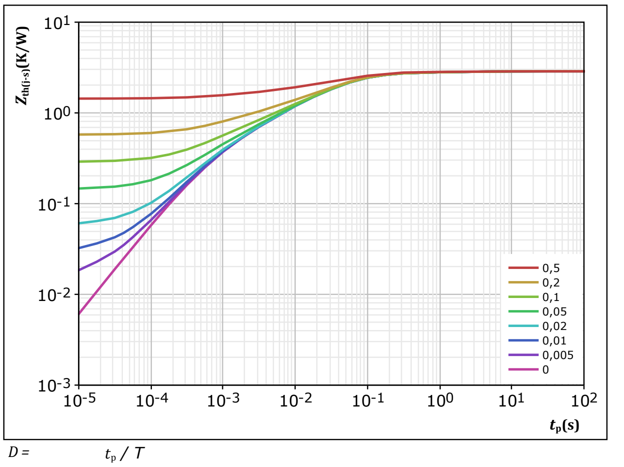
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 20. **FWD**

Transient thermal impedance as a function of pulse width

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



D = t_p / T

$R_{th(j-s)}$ = 2,873 K/W

FWD thermal model values

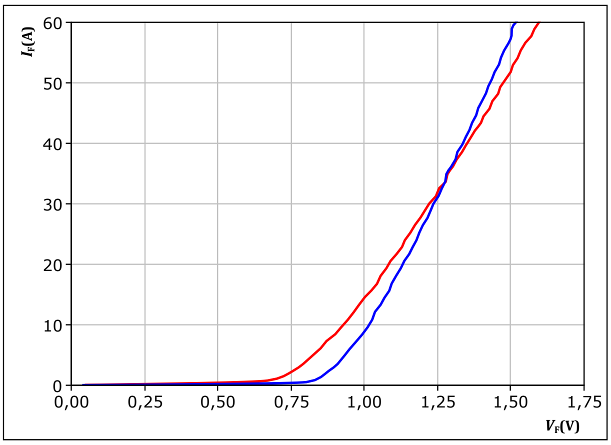
R (K/W)	τ (s)
6,53E-02	3,94E+00
1,48E-01	4,48E-01
1,31E+00	5,96E-02
7,32E-01	1,36E-02
4,04E-01	2,79E-03
2,11E-01	5,37E-04

Positive Boost Blocking Diode Characteristics

figure 21. **Rectifier**

Typical forward characteristics

$I_F = f(V_F)$



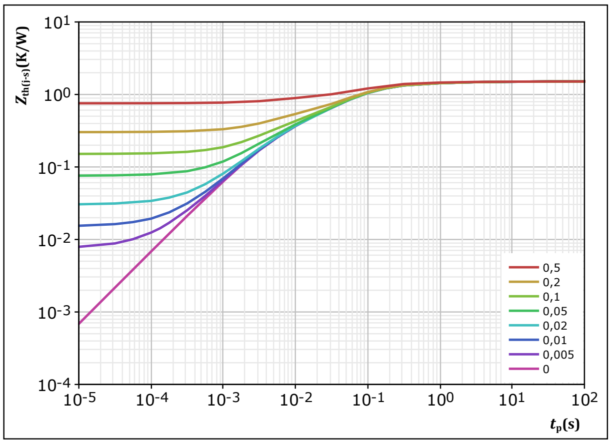
t_p = 250 µs

T_j: 25 °C, 125 °C

figure 22. **Rectifier**

Transient thermal impedance as a function of pulse width

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



$D = t_p / T$

$R_{th(j-s)}$ = 1,511 K/W

Rectifier thermal model values

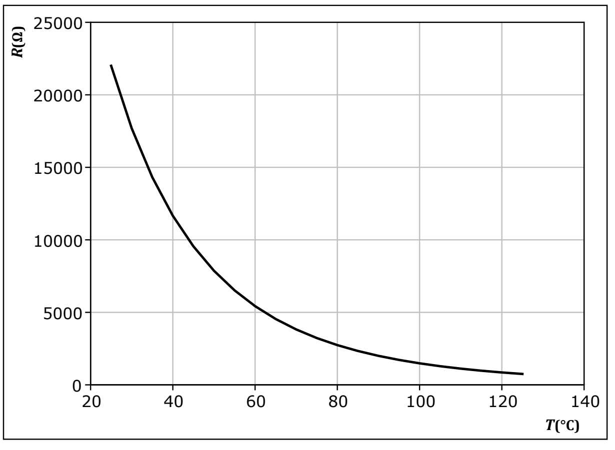
R (K/W)	τ (s)
3,93E-02	9,06E+00
1,22E-01	9,78E-01
5,85E-01	1,29E-01
5,38E-01	3,98E-02
2,27E-01	4,50E-03

Thermistor Characteristics

figure 23. **Thermistor**

Typical NTC characteristic as function of temperature

R_T = f(T)

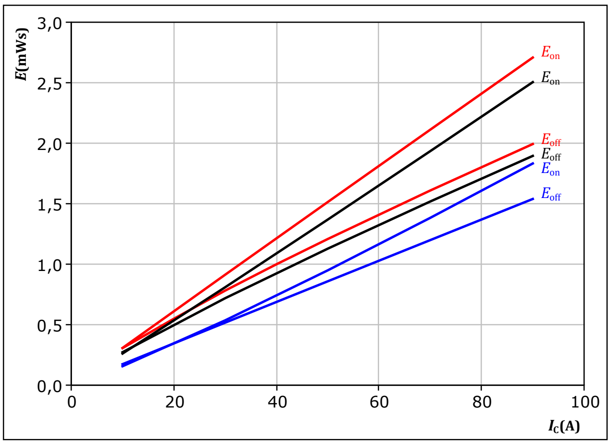


Negative Neutral Point Switching Characteristics

figure 24. **IGBT**

Typical switching energy losses as a function of collector current

E = f(I_C)



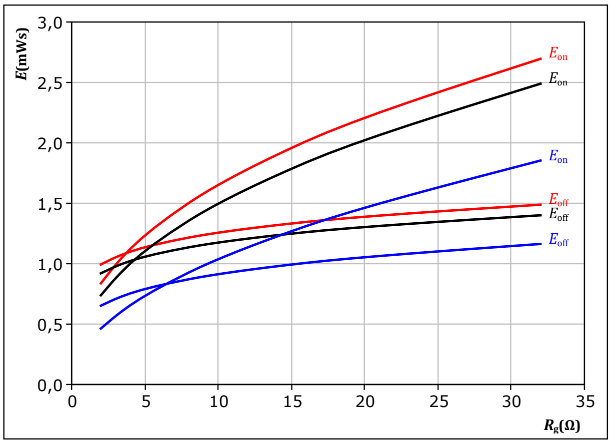
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C / 125 °C / 150 °C
V_{GE} =	-5/15	V		
R_{gon} =	8	Ω		
R_{goff} =	8	Ω		

figure 25. **IGBT**

Typical switching energy losses as a function of gate resistor

E = f(R_g)



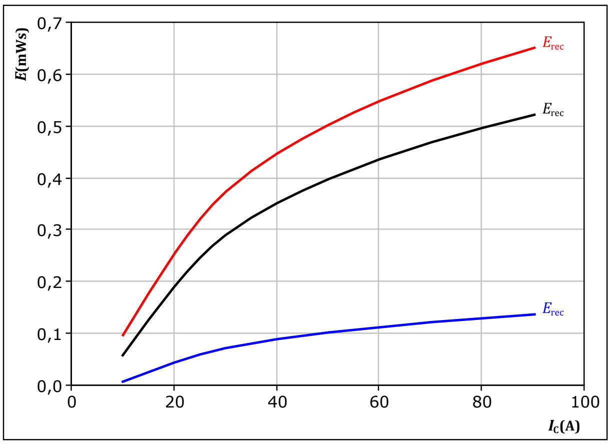
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C / 125 °C / 150 °C
V_{GE} =	-5/15	V		
I_C =	50	A		

figure 26. **FWD**

Typical reverse recovered energy loss as a function of collector current

E_{rec} = f(I_C)



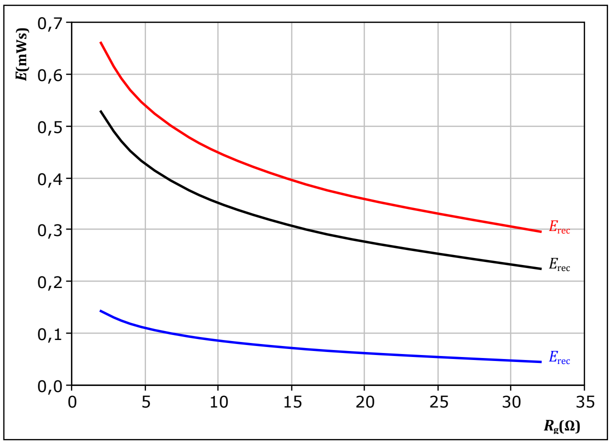
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C / 125 °C / 150 °C
V_{GE} =	-5/15	V		
R_{gon} =	8	Ω		

figure 27. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

E_{rec} = f(R_g)



With an inductive load at

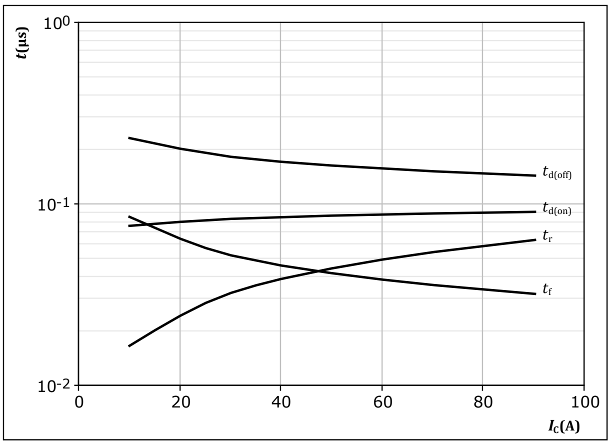
V_{CE} =	400	V	T_j:	25 °C / 125 °C / 150 °C
V_{GE} =	-5/15	V		
I_C =	50	A		

Negative Neutral Point Switching Characteristics

figure 28. **IGBT**

Typical switching times as a function of collector current

$t = f(I_C)$



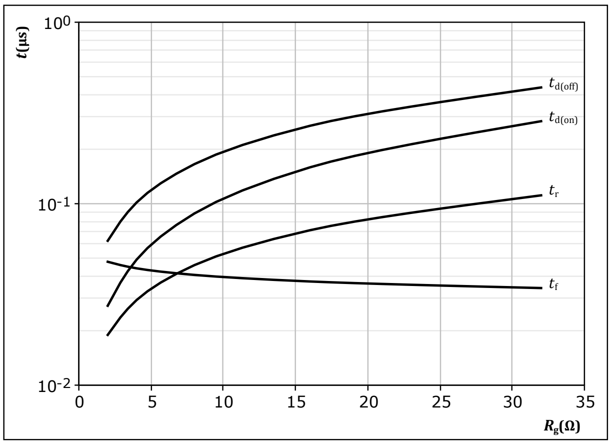
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	-5/15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 29. **IGBT**

Typical switching times as a function of gate resistor

$t = f(R_g)$



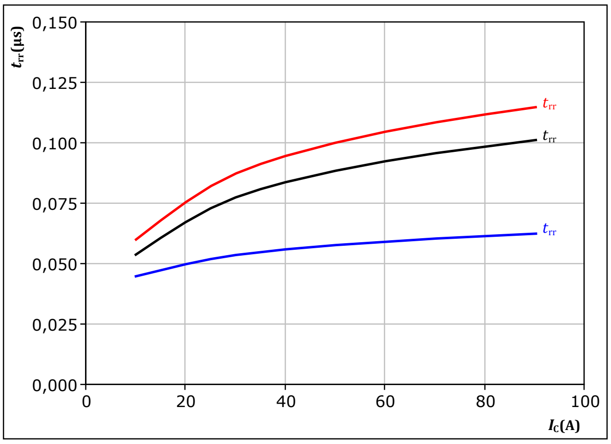
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	-5/15	V
I_C =	50	A

figure 30. **FWD**

Typical reverse recovery time as a function of collector current

$t_{rr} = f(I_C)$



With an inductive load at

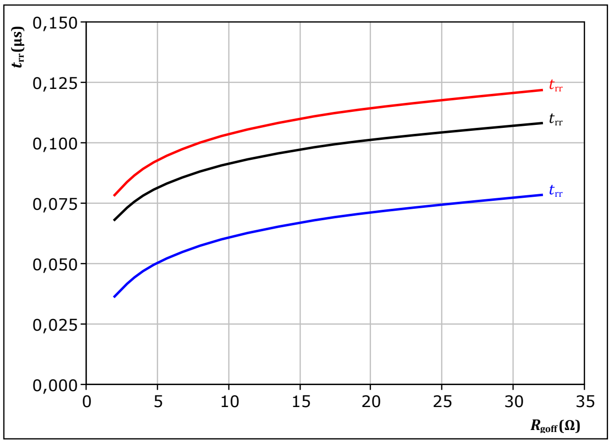
V_{CE} =	400	V
V_{GE} =	-5/15	V
R_{gon} =	8	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 31. **FWD**

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

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



With an inductive load at

V_{CE} =	400	V
V_{GE} =	-5/15	V
I_C =	50	A

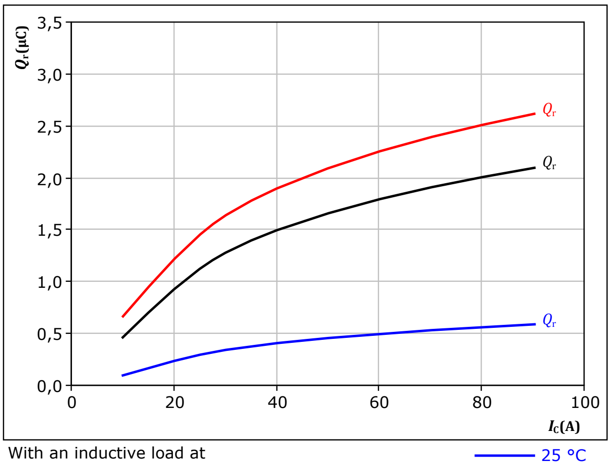
T_j: 25 °C, 125 °C, 150 °C

Negative Neutral Point Switching Characteristics

figure 32. **FWD**

Typical recovered charge as a function of collector current

Q_r = f(I_C)



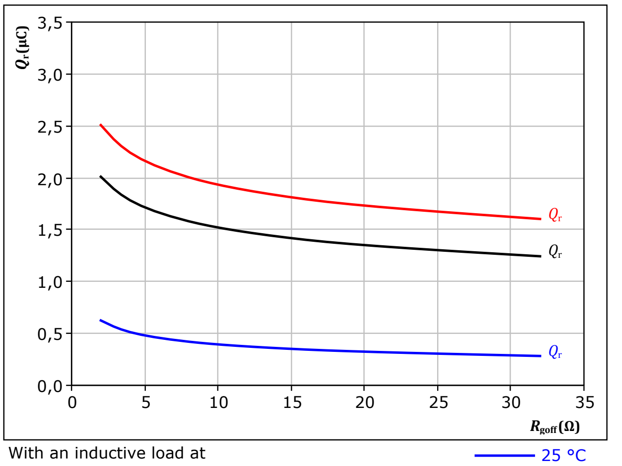
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	-5/15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 33. **FWD**

Typical recovered charge as a function of turn off gate resistor

Q_r = f(R_{goff})



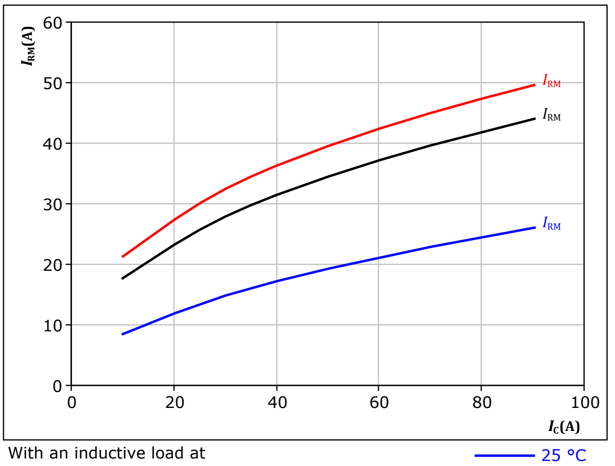
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	-5/15	V		125 °C
I_C =	50	A		150 °C

figure 34. **FWD**

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



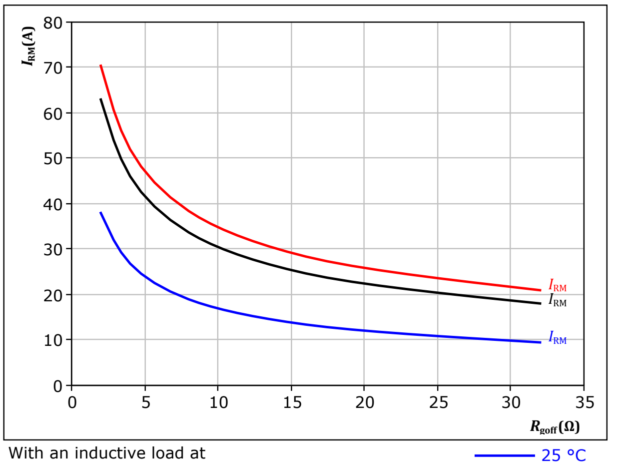
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	-5/15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 35. **FWD**

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

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



With an inductive load at

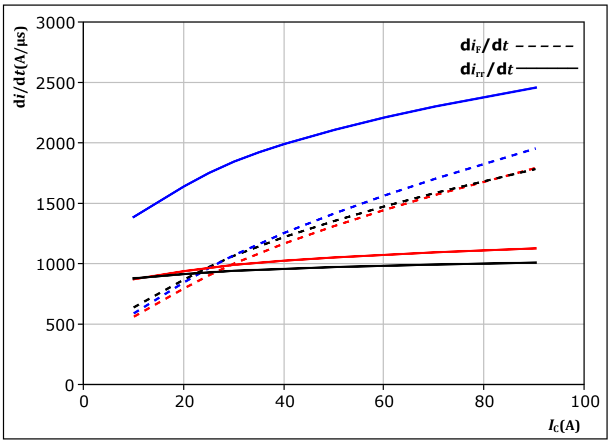
V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	-5/15	V		125 °C
I_C =	50	A		150 °C

Negative Neutral Point Switching Characteristics

figure 36. **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

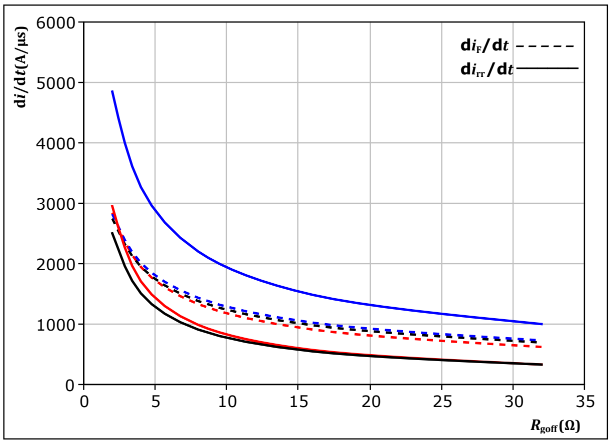
V_{CE} =	400	V	
V_{GE} =	-5/15	V	
R_{gon} =	8	Ω	

T_j: 25 °C, 125 °C, 150 °C

figure 37. **FWD**

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

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



With an inductive load at

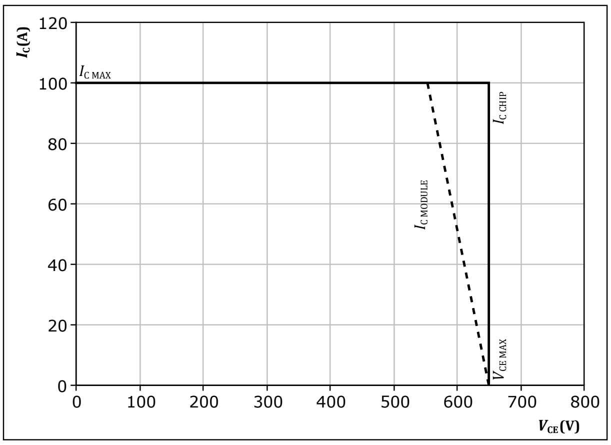
V_{CE} =	400	V
V_{GE} =	-5/15	V
I_C =	50	A

T_j: 25 °C, 125 °C, 150 °C

figure 38. **IGBT**

Reverse bias safe operating area

I_C = f(V_{CE})



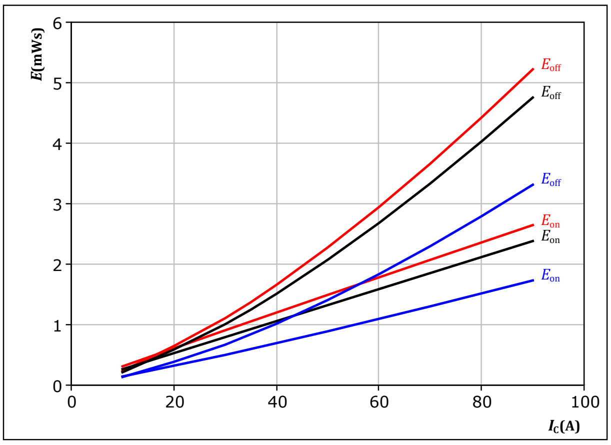
At	T_j =	150	°C
	R_{gon} =	8	Ω
	R_{goff} =	8	Ω

Positive Neutral Point Switching Characteristics

figure 39. **IGBT**

Typical switching energy losses as a function of collector current

$E = f(I_C)$



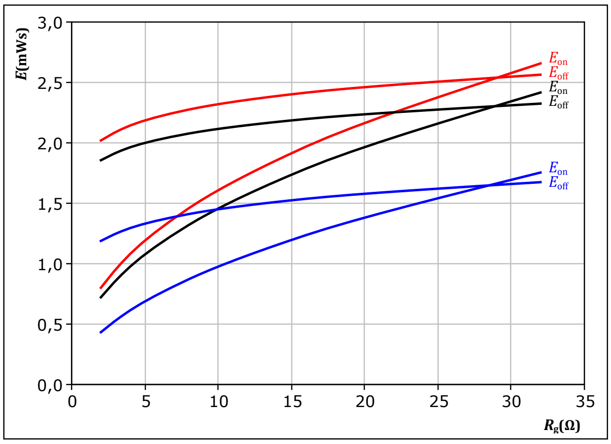
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	-5/15	V		125 °C
R_{gon} =	8	Ω		150 °C
R_{goff} =	8	Ω		

figure 40. **IGBT**

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



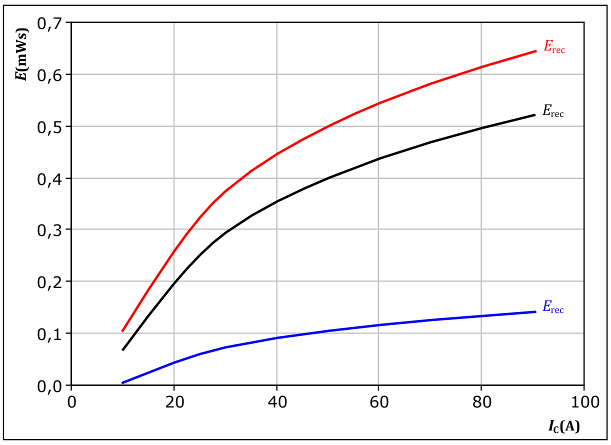
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	-5/15	V		125 °C
I_C =	50	A		150 °C

figure 41. **FWD**

Typical reverse recovered energy loss as a function of collector current

$E_{rec} = f(I_C)$



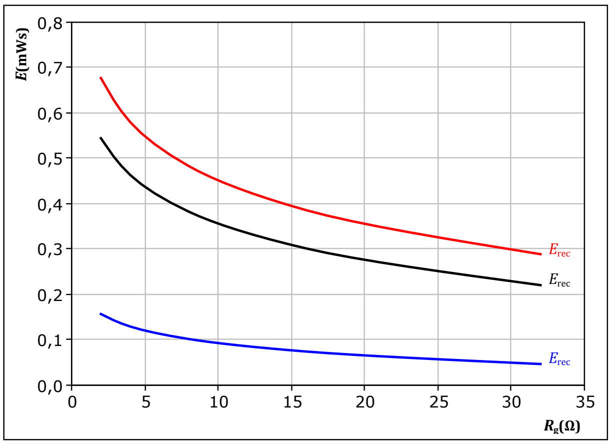
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	-5/15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 42. **FWD**

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

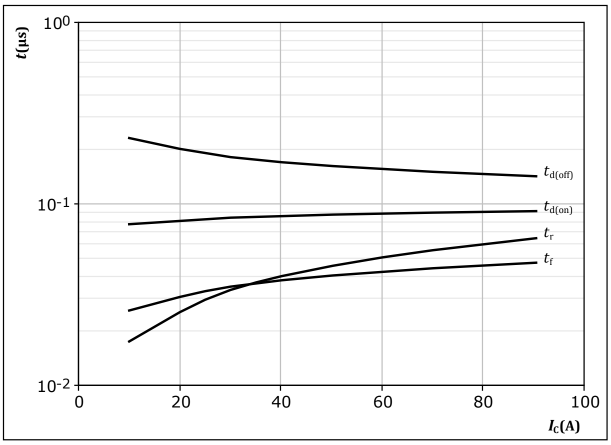
V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	-5/15	V		125 °C
I_C =	50	A		150 °C

Positive Neutral Point Switching Characteristics

figure 43. **IGBT**

Typical switching times as a function of collector current

t = f(I_C)



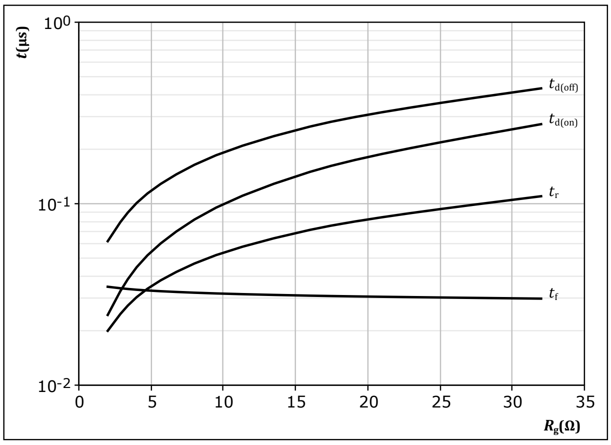
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	-5/15	V
R_{gon} =	8	Ω
R_{goff} =	8	Ω

figure 44. **IGBT**

Typical switching times as a function of gate resistor

t = f(R_g)



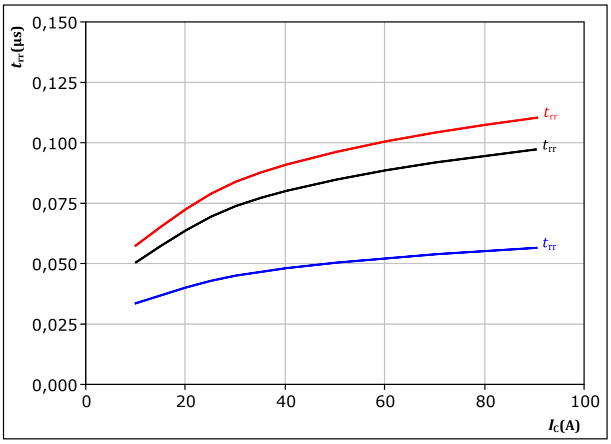
With an inductive load at

T_j =	150	°C
V_{CE} =	400	V
V_{GE} =	-5/15	V
I_C =	50	A

figure 45. **FWD**

Typical reverse recovery time as a function of collector current

t_{rr} = f(I_C)



With an inductive load at

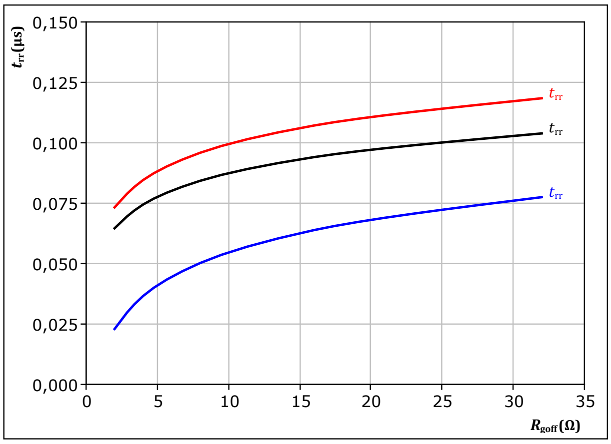
V_{CE} =	400	V
V_{GE} =	-5/15	V
R_{gon} =	8	Ω

T_j: 25 °C, 125 °C, 150 °C

figure 46. **FWD**

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

t_{rr} = f(R_{goff})



With an inductive load at

V_{CE} =	400	V
V_{GE} =	-5/15	V
I_C =	50	A

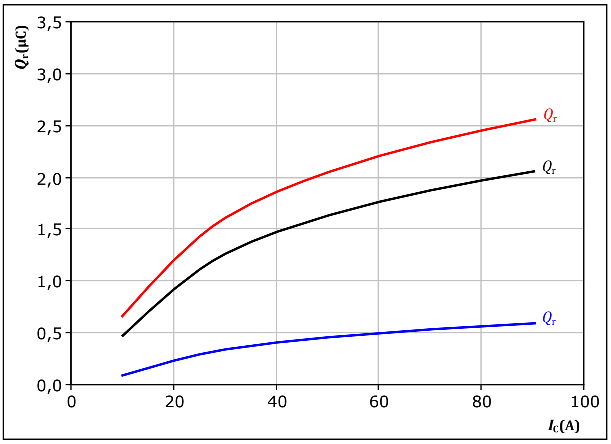
T_j: 25 °C, 125 °C, 150 °C

Positive Neutral Point Switching Characteristics

figure 47. FWD

Typical recovered charge as a function of collector current

Q_r = f(I_C)



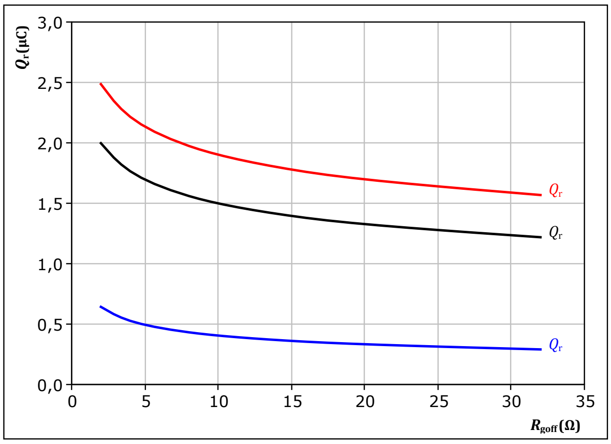
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	-5/15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 48. FWD

Typical recovered charge as a function of turn off gate resistor

Q_r = f(R_{goff})



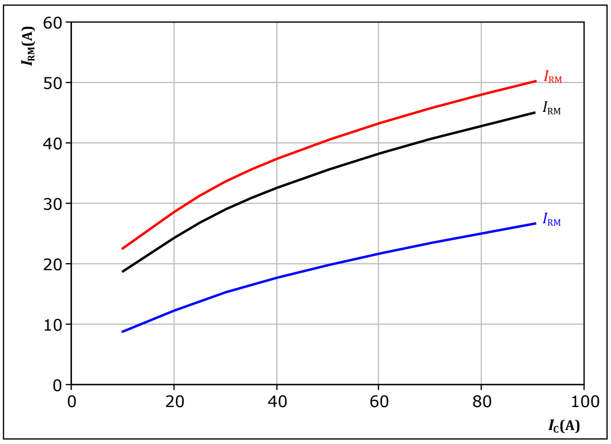
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	-5/15	V		125 °C
I_C =	50	A		150 °C

figure 49. FWD

Typical peak reverse recovery current as a function of collector current

I_{RM} = f(I_C)



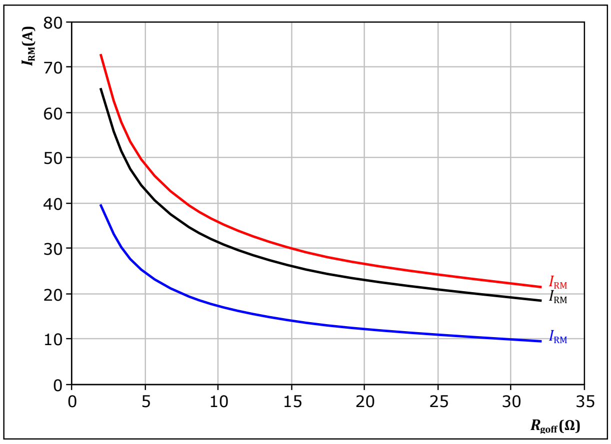
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	-5/15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 50. FWD

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

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



With an inductive load at

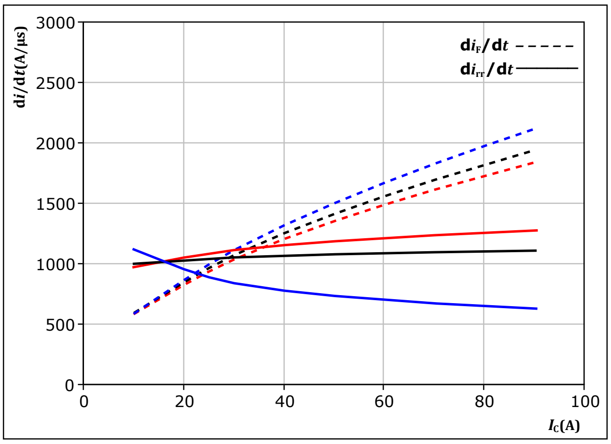
V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	-5/15	V		125 °C
I_C =	50	A		150 °C

Positive Neutral Point Switching Characteristics

figure 51. **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)



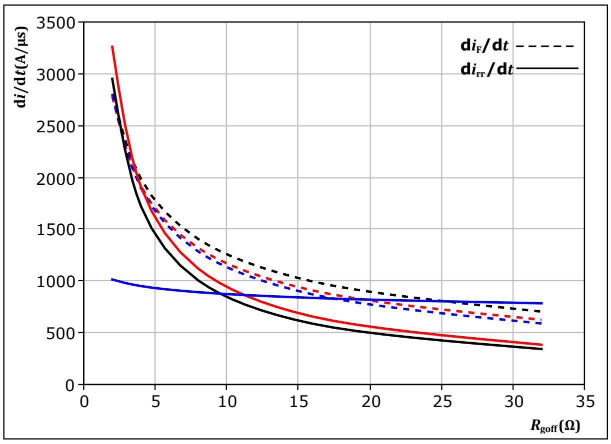
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	-5/15	V		125 °C
R_{gon} =	8	Ω		150 °C

figure 52. **FWD**

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

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



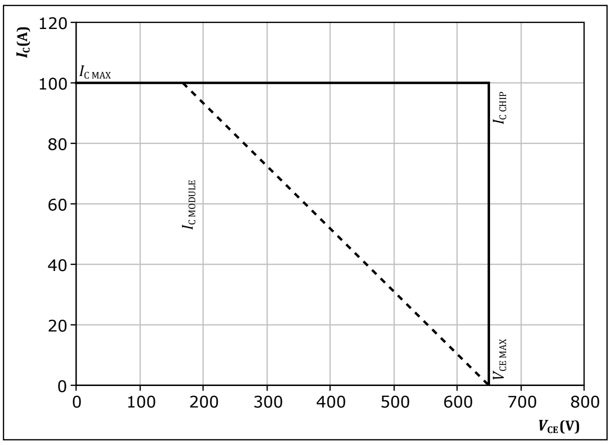
With an inductive load at

V_{CE} =	400	V	T_j:	25 °C
V_{GE} =	-5/15	V		125 °C
I_C =	50	A		150 °C

figure 53. **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 54. **IGBT**

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

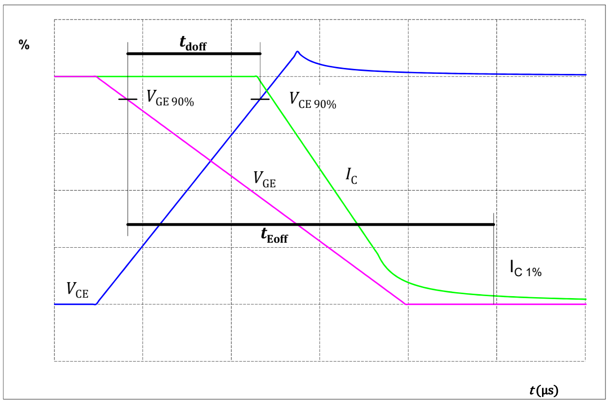


figure 55. **IGBT**

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

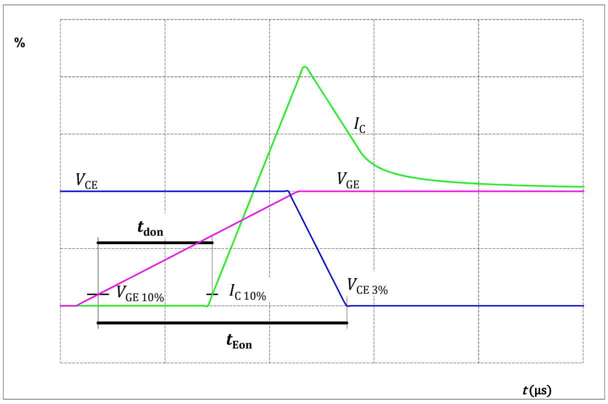


figure 56. **IGBT**

Turn-off Switching Waveforms & definition of t_f

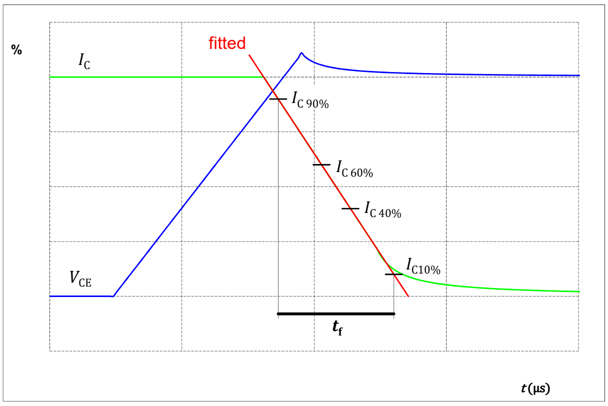
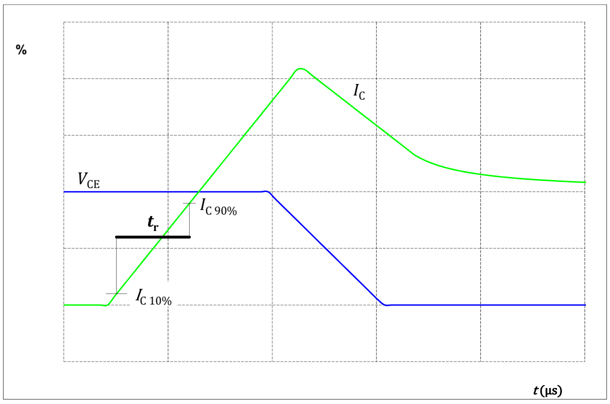


figure 57. **IGBT**

Turn-on Switching Waveforms & definition of t_r



Switching Definitions

figure 58. **FWD**

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

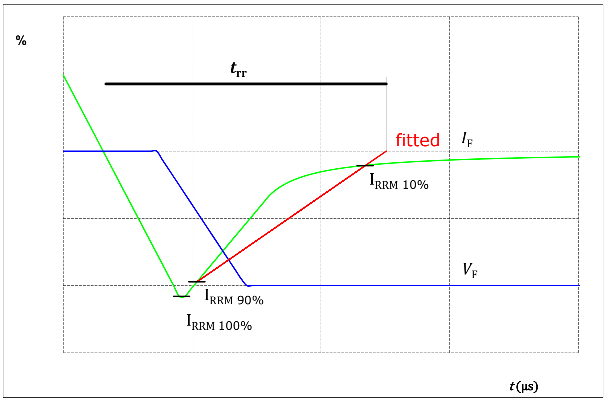
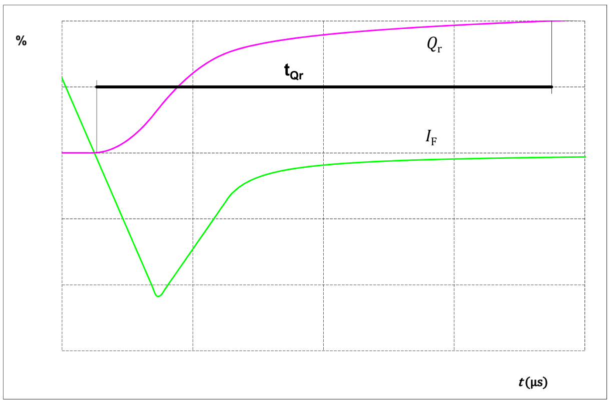


figure 59. **FWD**

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



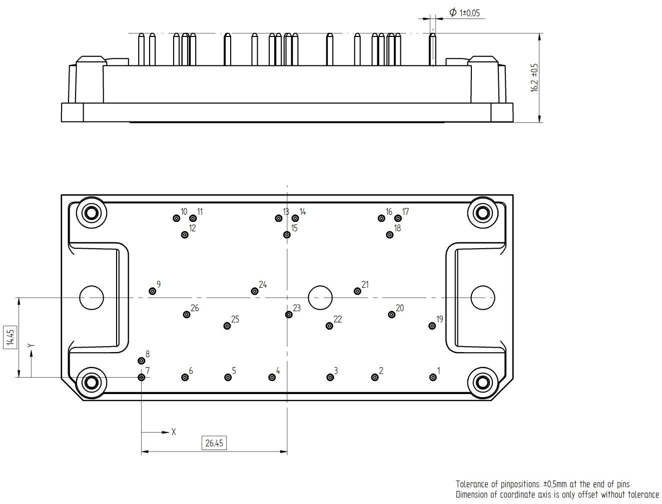
Ordering Code	
Version	**Ordering Code**
Without thermal paste	10-FY073AA050RG01-LK14L08
With thermal paste (5,2 W/mK, PTM6000HV)	10-FY073AA050RG01-LK14L08-/7/
With thermal paste (3,4 W/mK, PSX-P7)	10-FY073AA050RG01-LK14L08-/3/

Marking

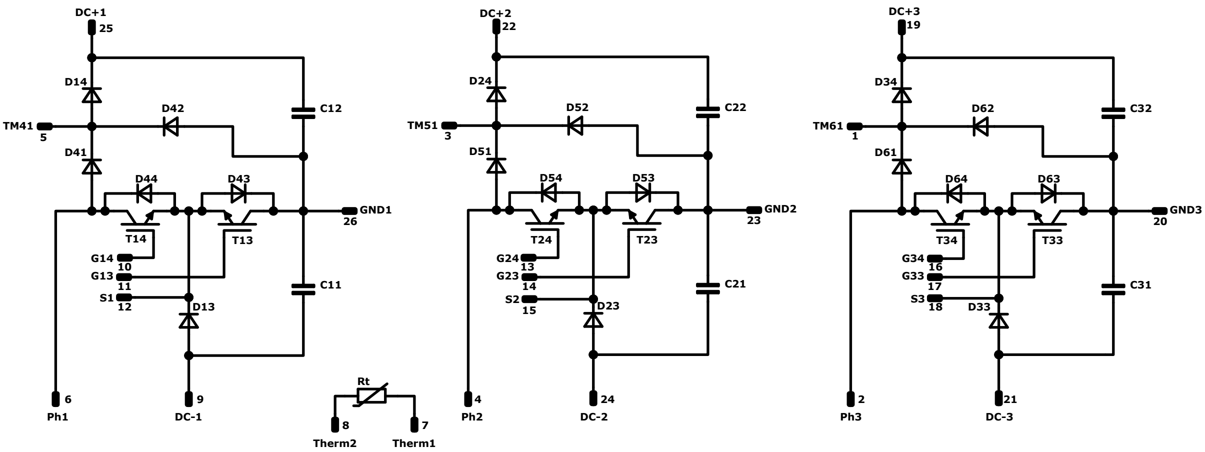
		Name		**Date code**	**UL & VIN**	**Lot**	**Serial**
	**Text**	NN-NNNNNNNNNNNNNN-TTTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
	Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
		TTTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table [mm]			
Pin	X	Y	Function
1	52,9	0	TM61
2	42,35	0	Ph3
3	34,25	0	TM51
4	23,7	0	Ph2
5	15,7	0	TM41
6	7,9	0	Ph1
7	0	0	Therm1
8	0	3	Therm2
9	2	15,65	DC-1
10	6,35	28,9	G14
11	9,35	28,9	G13
12	7,85	25,9	S1
13	24,9	28,9	G24
14	27,9	28,9	G23
15	26,4	25,9	S2
16	43,55	28,9	G34
17	46,55	28,9	G33
18	45,05	25,9	S3
19	52,75	9,35	DC+3
20	45,4	11,4	GND3
21	39,2	15,65	DC-3
22	34,1	9,35	DC+2
23	26,75	11,4	GND2
24	20,55	15,65	DC-2
25	15,55	9,35	DC+1
26	8,2	11,4	GND1



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T13, T23, T33	IGBT	650 V	50 A	Negative Neutral Point Switch	
T14, T24, T34	IGBT	650 V	50 A	Positive Neutral Point Switch	
D13, D23, D33	FWD	650 V	30 A	Negative Boost Diode	
D14, D24, D34	FWD	650 V	30 A	Positive Boost Diode	
D43, D53, D63	Rectifier	1600 V	20 A	Negative Neutral Point Diode	
D44, D54, D64	Rectifier	1600 V	31 A	Positive Neutral Point Diode	
D42, D52, D62	FWD	650 V	10 A	Positive Boost Diode Protection Diode	
D41, D51, D61	Rectifier	1600 V	20 A	Positive Boost Blocking Diode	
C11, C12, C21, C22, C31, C32	Capacitor	500 V		Capacitor (DC)	
Rt	Thermistor			Thermistor	

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

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

Package data
Package data for *flow* 1 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**
10-FY073AA050RG01-LK14L08-D2-14	29 Nov. 2021	Negative/Positive Boost Diode changed according to PCN-21-2021	