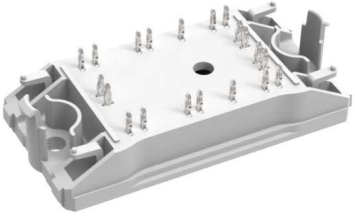
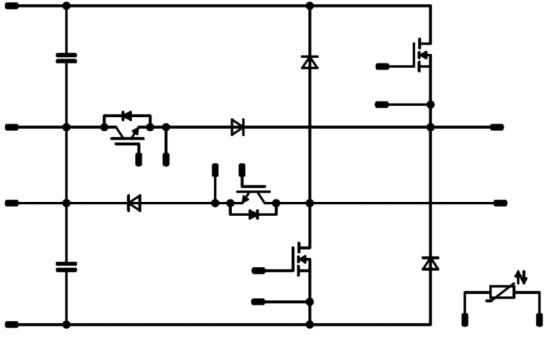




Vincotech

<i>flow</i> MNPC 0-SiC	1200 V / 27 mΩ
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Features</div> <ul style="list-style-type: none"> Rohm™ Silicon Carbide Power MOSFET Rohm™ Silicon Carbide Power Schottky Diode MNPC Topology with Split Output Ultra Low Inductance with Integrated DC-capacitors Extremely Fast Switching with No "Tail" Current Unensitivity for Cross Through Conduction Solderless Press-fit Mounting Technology Temperature Sensor 	<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">flow 0 12mm housing</div> 
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Target applications</div> <ul style="list-style-type: none"> High Efficient Solar Inverter UPS 	<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Schematic</div> 
<div style="background-color: #eee; padding: 2px; margin-bottom: 5px;">Types</div> <ul style="list-style-type: none"> 10-PZ12NMA027MR-M340F68Y 	

Maximum Ratings

$T_j=25^{\circ}\text{C}$, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Buck Switch				
Drain-source voltage	V_{DSS}		1200	V
Drain current	I_D	$T_j = T_{jmax}$ $T_s = 80^{\circ}\text{C}$	46	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	240	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80^{\circ}\text{C}$	129	W
Gate-source voltage	V_{GSS}		22	V
Maximum Junction Temperature	T_{jmax}		150	$^{\circ}\text{C}$



Vincotech

Parameter	Symbol	Conditions	Value	Unit
Buck Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_h = 80^\circ\text{C}$	32	A
Repetitive peak forward current	I_{FRM}		120	A
Surge (non-repetitive) forward current	I_{FSM}	PW=8,3ms Single Sine Wave $T_j = \text{ }^\circ\text{C}$	120	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_h = 80^\circ\text{C}$	57	W
Maximum Junction Temperature	T_{jmax}		175	$^\circ\text{C}$

Parameter	Symbol	Condition	Value	Unit
Boost Switch				
Collector-emitter voltage	V_{CES}		650	V
Collector current	I_C	$T_j = T_{jmax}$ $T_s = 80^\circ\text{C}$	60	A
Repetitive peak collector current	I_{CRM}	t_p limited by T_{jmax}	240	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_s = 80^\circ\text{C}$	109	W
Gate-emitter voltage	V_{GES}		± 20	V
Maximum Junction Temperature	T_{jmax}		175	$^\circ\text{C}$

Parameter	Symbol	Conditions	Value	Unit
Boost Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_h = 80^\circ\text{C}$	13	A
Repetitive peak forward current	I_{FRM}		46	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_h = 80^\circ\text{C}$	29	W
Maximum Junction Temperature	T_{jmax}		175	$^\circ\text{C}$

Parameter	Symbol	Conditions	Value	Unit
Boost Inverse Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		650	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ $T_h = 80^\circ\text{C}$	12	A
Repetitive peak forward current	I_{FRM}		12	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ $T_h = 80^\circ\text{C}$	30	W
Maximum Junction Temperature	T_{jmax}		175	$^\circ\text{C}$



Vincotech

Parameter	Symbol	Conditions	Value	Unit
DC Link Capacitor				
Maximum DC voltage	V_{MAX}		500	V
Operation Temperature	T_{op}		-55...+125	°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				9,17	mm
Comparative Tracking Index	CTI			>200	



Vincotech

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
		V_{GS} [V]	V_{DS} [V]	I_D [A]	T_j [°C]	Min	Typ	Max		
Buck Switch										
Static										
Drain-source on-state resistance	$r_{DS(on)}$	18		30	25 125 150		27 47 52	37		mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}$		0,0044	25 125	1,6		4		V
Gate to Source Leakage Current	I_{GSS}	22	0		25 125			300		nA
Zero Gate Voltage Drain Current	I_{DSS}	0	1200		25 125			30		μA
Internal gate resistance	r_g						3			Ω
Gate charge	Q_g						318			nC
Gate to source charge	Q_{GS}	18	400	10	25		81			
Gate to drain charge	Q_{GD}						93			
Short-circuit input capacitance	C_{iss}						6240			pF
Short-circuit output capacitance	C_{oss}	f=1MHz	0	800	25		231			
Reverse transfer capacitance	C_{rss}						48			
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material $\lambda=3,4$ W/mK					0,54			K/W
MOSFET Switching										
Turn-on delay time	$t_{d(on)}$				25 125 150		36 32 32			ns
Rise time	t_r	$R_{goff} = 4 \Omega$ $R_{gon} = 4 \Omega$			25 125 150		20 18 17			
Turn-off delay time	$t_{d(off)}$				25 125 150		108 118 121			
Fall time	t_f		±15	700	44		17 23 29			
Turn-on energy (per pulse)	E_{on}	$Q_{rFWD} = 0,2 \mu C$ $Q_{rFWD} = 0,3 \mu C$ $Q_{rFWD} = 0,2 \mu C$			25 125 150		0,601 0,463 0,448			
Turn-off energy (per pulse)	E_{off}				25 125 150		0,189 0,149 0,181		mWs	



Vincotech

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Buck Diode										
Static										
Forward voltage	V_F				30	25 125 150		1,39 1,53 1,59	1.55	V
Reverse leakage current	I_r			650		25 150			6 90	μA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material $\lambda=3,4W/mK$						1,68		K/W
FWD Switching										
Peak recovery current	I_{RRM}					25 125 150		17 19 18		A
Reverse recovery time	t_{rr}					25 125 150		13 13 12		ns
Recovered charge	Q_r	$di/dt = 2580 A/\mu s$ $di/dt = 3640 A/\mu s$ $di/dt = 2520 A/\mu s$	±15	700	44	25 125 150		0,235 0,257 0,244		μC
Reverse recovered energy	E_{rec}					25 125 150		0,032 0,040 0,038		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		4300 3600 3780		A/μs



Vincotech

Parameter	Symbol	Conditions					Value			Unit
		V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max		
Boost Switch										
Static										
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{GE}=V_{CE}$			0,0008	25 125	3,3	4	4,7	V
Collector-emitter saturation voltage	V_{CEsat}		15		80	25 125 150		1,64 1,89 1,95	2,22	V
Collector-emitter cut-off current	I_{CES}		0	650		25 125			0,08	µA
Gate-emitter leakage current	I_{GES}		15	0		25 125			240	nA
Internal gate resistance	r_g							none		Ω
Input capacitance	C_{ies}	f=1MHz	0	25		25		5000		pF
Output capacitance	C_{oes}							80		
Reverse transfer capacitance	C_{res}							18		
Gate charge	Q_g		15	520	80	25		190		nC
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material $\lambda=3,4W/mK$						0,87		K/W
IGBT Switching										
Turn-on delay time	$t_{d(on)}$	$R_{goff} = 8 \Omega$ $R_{gon} = 8 \Omega$	±15	700	44	25		89		ns
Rise time	t_r					125		92		
						150		90		
Turn-off delay time	$t_{d(off)}$					25		80		
						125		101		
		150		104						
Fall time	t_f					25		13		
						125		11		
						150		11		
Turn-on energy (per pulse)	E_{on}	$Q_{rFWD} = 0,3 \mu C$ $Q_{rFWD} = 0,4 \mu C$ $Q_{rFWD} = 0,4 \mu C$				25		0,284		mWs
						125		0,347		
						150		0,353		
Turn-off energy (per pulse)	E_{off}					25		0,139		
						125		0,267		
						150		0,301		



Vincotech

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Boost Diode										
Static										
Forward voltage	V_F				10	25 125 150		1,37 1,66 1,78	1,6	V
Reverse leakage current	I_r			1200		25 150			10 80	μA

Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material $\lambda=3,4W/mK$						3,27		K/W

FWD Switching										
Peak recovery current	I_{RRM}					25 125 150		30 27 30		A
Reverse recovery time	t_{rr}					25 125 150		21 26 27		ns
Recovered charge	Q_r	$di/dt = 7701 A/\mu s$ $di/dt = 4480 A/\mu s$ $di/dt = 5440 A/\mu s$	±15	700	44	25 125 150		0,344 0,393 0,446		μC
Reverse recovered energy	E_{rec}					25 125 150		0,039 0,047 0,060		mWs
Peak rate of fall of recovery current	$(di_{rr}/dt)_{max}$					25 125 150		4675 5074 2825		A/μs

Parameter	Symbol	Conditions					Value			Unit
				V_r [V]	I_F [A]	T_j [°C]	Min	Typ	Max	
Boost Inverse Diode										
Static										
Forward voltage	V_F				6	25 125 150		1,73 1,59 1,54	1,95	V
Reverse leakage current	I_r			650		25 150			27	μA

Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Phase-Change Material $\lambda=3,4W/mK$						3,52		K/W



Vincotech

Parameter	Symbol	Conditions					Value			Unit
						T_j [°C]	Min	Typ	Max	
DC Link Capacitor										
Capacitance	C							270		nF
Tolerance							-20		20	%

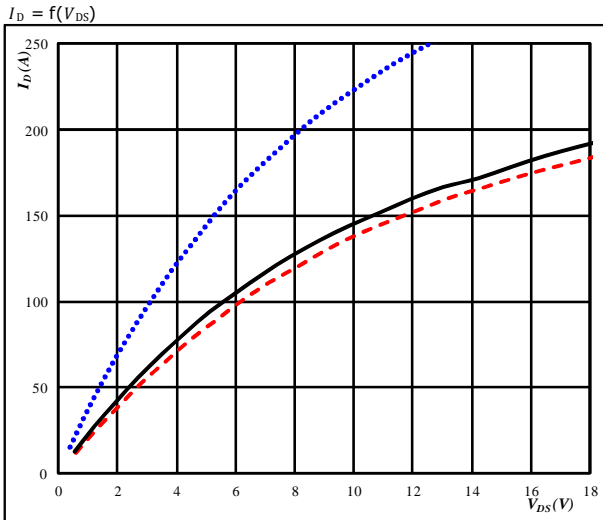
Thermistor

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V]	V_{CE} [V]	I_C [A]	T_j [°C]	Min	Typ	Max	
Rated resistance	R					25		22		k Ω
Deviation of R100	$\Delta_{R/R}$	R100=1486 Ω				100	-12		+12	%
Power dissipation	P					25		200		mW
Power dissipation constant						25		2		mW/K
B-value	$B_{(25/50)}$	Tol. $\pm 3\%$				25		3950		K
B-value	$B_{(25/100)}$	Tol. $\pm 3\%$				25		3998		K
Vincotech NTC Reference									B	



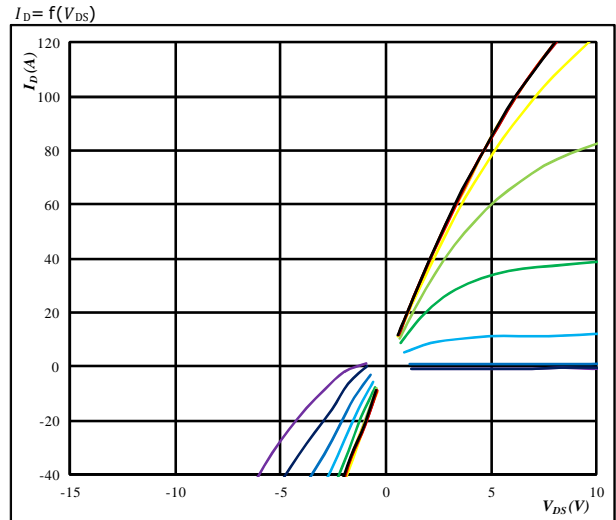
Buck Switch Characteristics

Typical output characteristics MOSFET



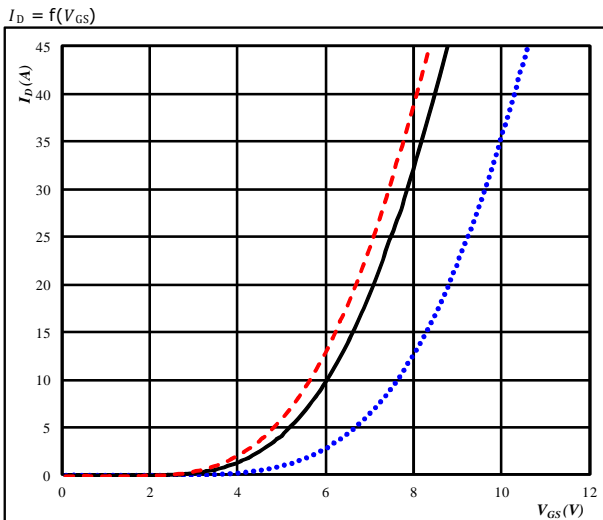
$t_p = 250 \mu s$
 $V_{GS} = 18 V$
 $T_j: 25 \text{ }^\circ C$ (dotted blue)
 $125 \text{ }^\circ C$ (solid black)
 $150 \text{ }^\circ C$ (dashed red)

Typical output characteristics MOSFET



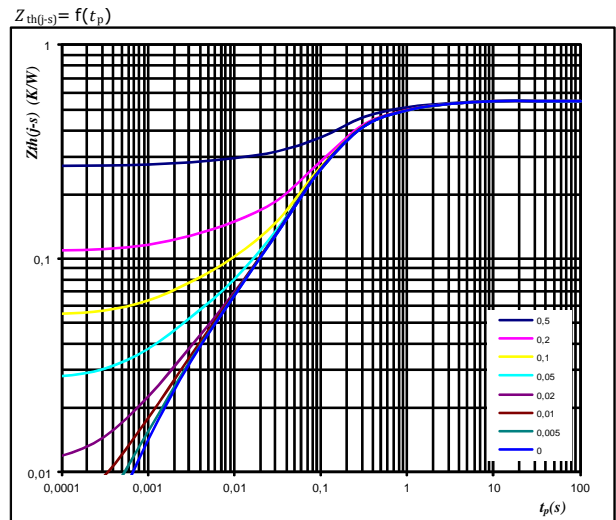
$t_p = 250 \mu s$
 $T_j = 150 \text{ }^\circ C$
 V_{GS} from 0 V to 20 V in steps of 2 V

Typical transfer characteristics MOSFET



$t_p = 100 \mu s$
 $V_{DS} = 1 V$
 $T_j: 25 \text{ }^\circ C$ (dotted blue)
 $125 \text{ }^\circ C$ (solid black)
 $150 \text{ }^\circ C$ (dashed red)

Transient thermal impedance as a function of pulse width MOSFET



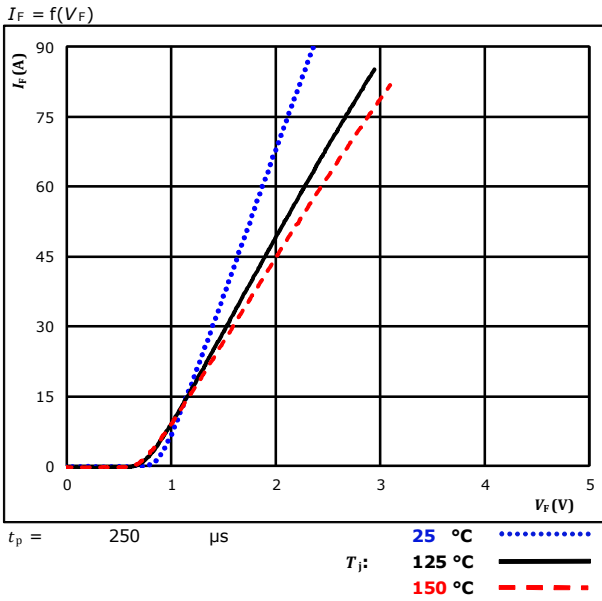
$D = t_p / T$
 $R_{th(f-s)} = 0,54 \text{ K/W}$

R (K/W)	Tau(s)
6,67E-02	2,13E+00
1,21E-01	3,98E-01
3,14E-01	1,09E-01
2,90E-02	7,15E-03
1,43E-02	1,48E-03

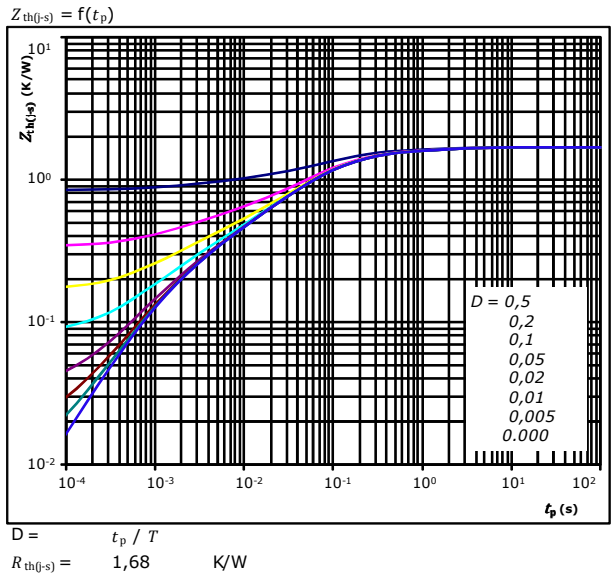


Buck Diode Characteristics

Typical forward characteristics FWD



Transient thermal impedance as a function of pulse width FWD



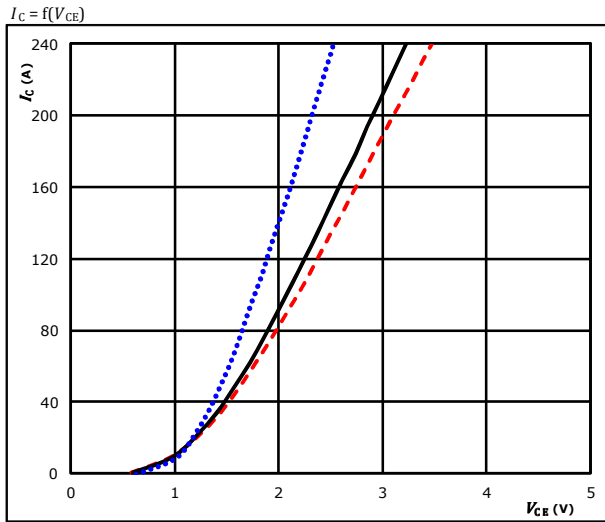
FWD thermal model values

R (K/W)	τ (s)
8,42E-02	3,42E+00
2,22E-01	5,14E-01
7,39E-01	9,06E-02
3,21E-01	2,76E-02
1,85E-01	5,81E-03
1,30E-01	1,14E-03



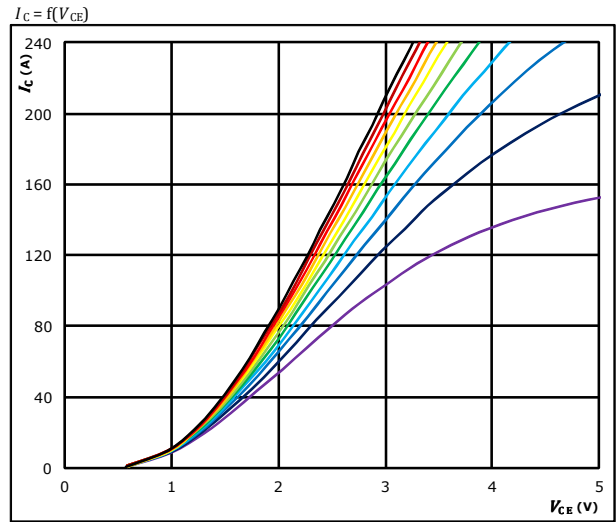
Boost Switch Characteristics

Typical output characteristics IGBT



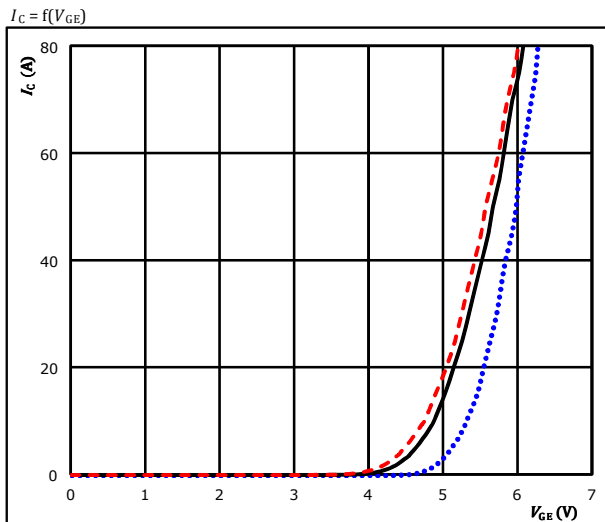
$t_p = 250 \mu s$
 $V_{GE} = 15 V$
 $25^\circ C$ (dotted blue)
 $125^\circ C$ (solid black)
 $150^\circ C$ (dashed red)

Typical output characteristics IGBT



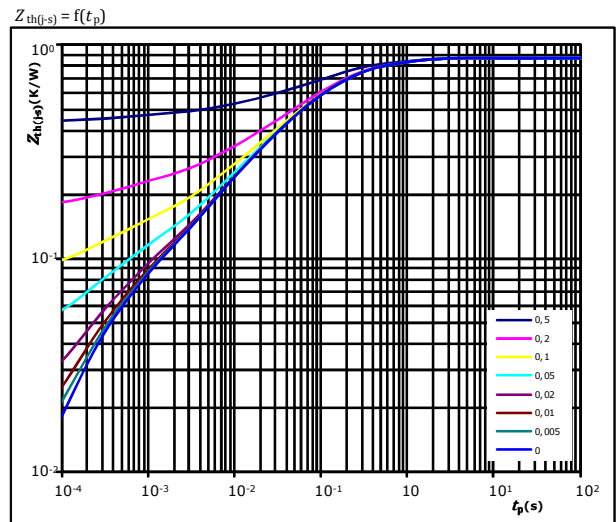
$t_p = 250 \mu s$
 $T_j = 150^\circ C$
 V_{GE} from 7 V to 17 V in steps of 1 V

Typical transfer characteristics IGBT



$t_p = 100 \mu s$
 $V_{CE} = 10 V$
 $25^\circ C$ (dotted blue)
 $125^\circ C$ (solid black)
 $150^\circ C$ (dashed red)

Transient Thermal Impedance as function of Pulse duration IGBT



$D = t_p / T$
 $R_{th(j-s)} = 0,87 K/W$

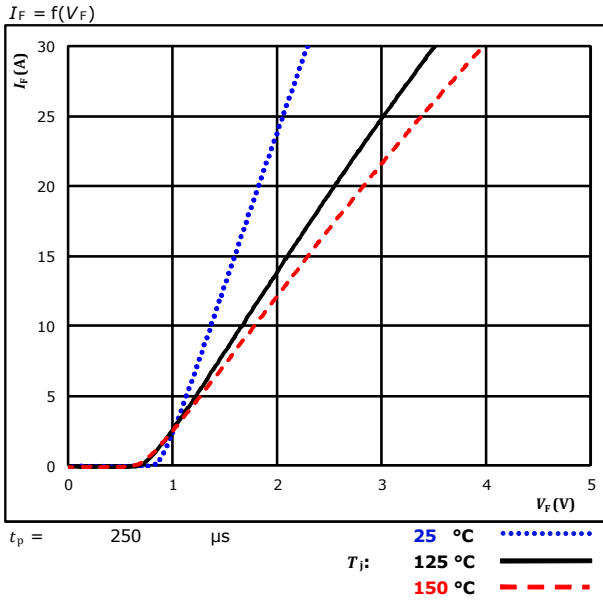
IGBT thermal model values

R_{th} (K/W)	τ (s)
1,42E-01	7,24E-01
3,44E-01	1,23E-01
1,79E-01	3,69E-02
1,18E-01	9,05E-03
3,80E-02	2,24E-03
5,36E-02	3,22E-04

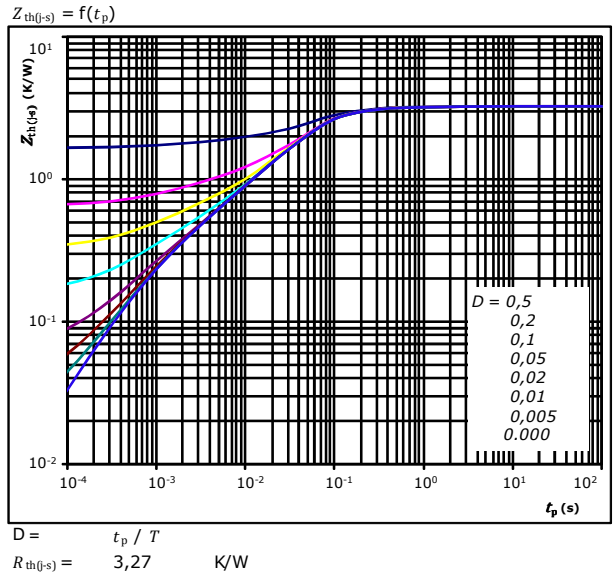


Boost Diode Characteristics

Typical forward characteristics FWD



Transient thermal impedance as a function of pulse width FWD



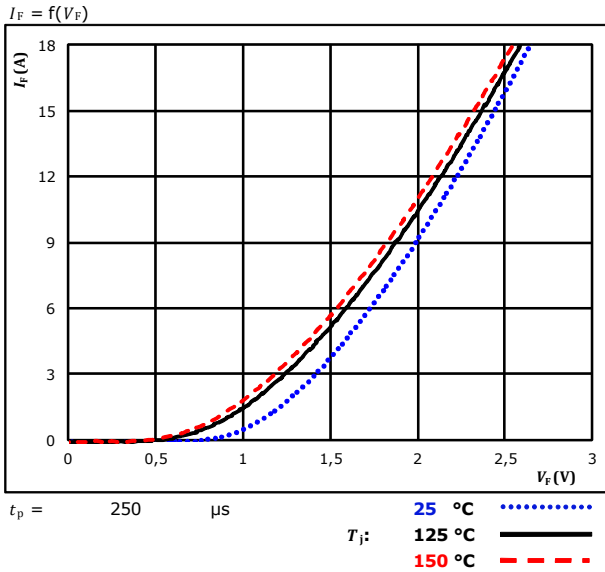
FWD thermal model values

R (K/W)	τ (s)
7,61E-02	2,29E+00
4,56E-01	1,98E-01
2,28E+00	4,66E-02
3,22E-01	3,65E-03
1,34E-01	6,58E-04

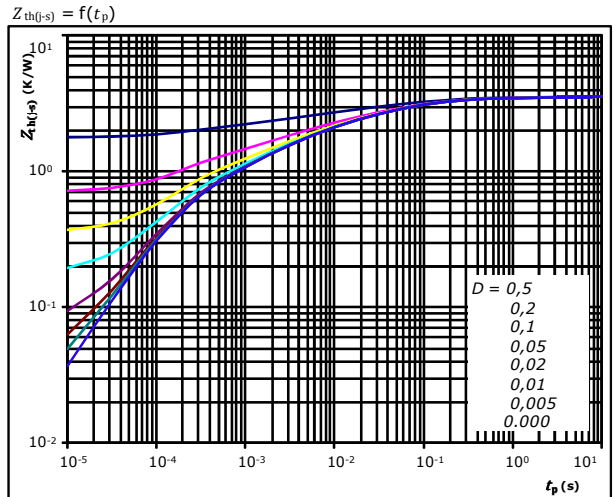


Boost Inverse Diode Characteristics

Typical forward characteristics FWD



Transient thermal impedance as a function of pulse width FWD



$D = t_p / T$
 $R_{th(j-s)} = 3,52 \text{ K/W}$

FWD thermal model values

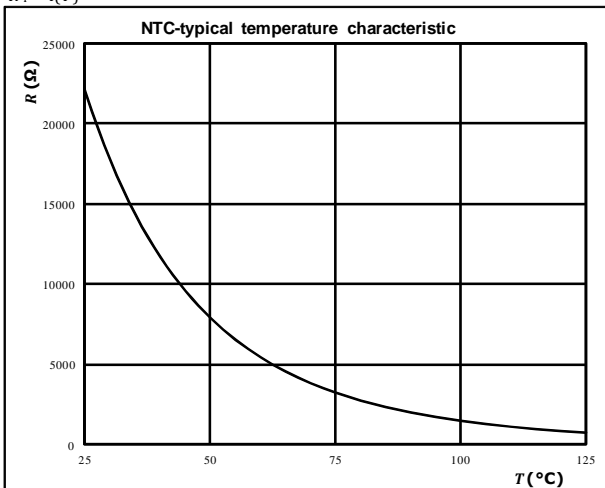
R (K/W)	τ (s)
1,33E-01	2,28E+00
5,44E-01	1,47E-01
8,05E-01	3,33E-02
8,36E-01	6,52E-03
6,02E-01	1,27E-03
6,01E-01	1,89E-04

Thermistor

Thermistor typical temperature characteristic

Typical NTC characteristic
as a function of temperature

$R_T = f(T)$

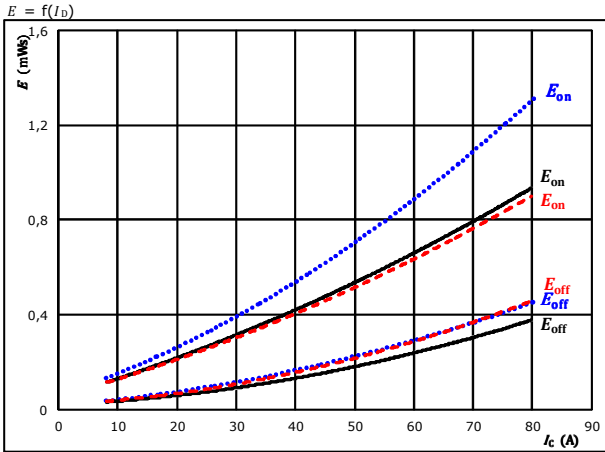




Buck Switching Characteristics

Figure 1. MOSFET

Typical switching energy losses as a function of collector current

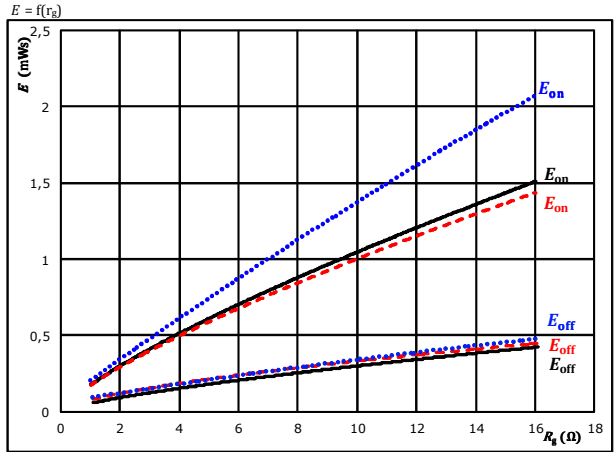


With an inductive load at

$V_{DS} = 700$ V	$T_j:$ 25 °C
$V_{GS} = \pm 15$ V	125 °C	————
$R_{g\text{on}} = 4$ Ω	150 °C	-----
$R_{g\text{off}} = 4$ Ω		

Figure 2. MOSFET

Typical switching energy losses as a function of gate resistor

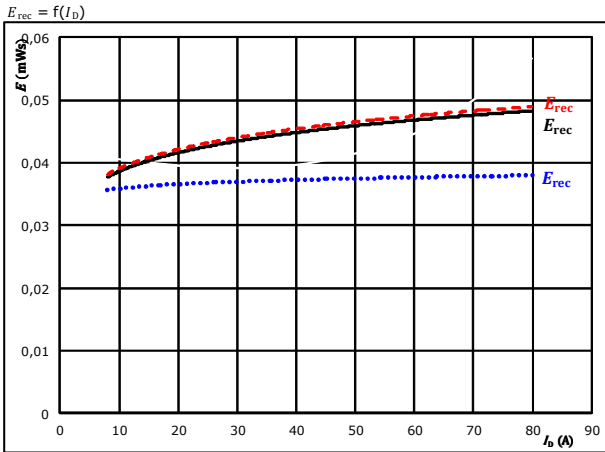


With an inductive load at

$V_{DS} = 700$ V	$T_j:$ 25 °C
$V_{GS} = \pm 15$ V	125 °C	————
$I_D = 44$ A	150 °C	-----

Figure 3. FWD

Typical reverse recovered energy loss as a function of collector current

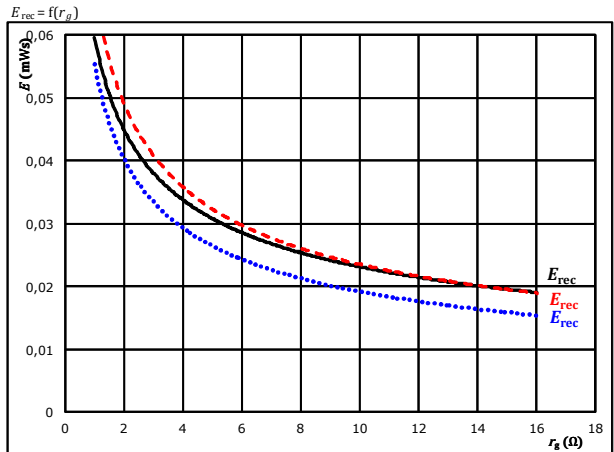


With an inductive load at

$V_{DS} = 700$ V	$T_j:$ 25 °C
$V_{GS} = \pm 15$ V	125 °C	————
$R_{g\text{on}} = 4$ Ω	150 °C	-----

Figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor



With an inductive load at

$V_{DS} = 700$ V	$T_j:$ 25 °C
$V_{GS} = \pm 15$ V	125 °C	————
$I_D = 44$ A	150 °C	-----

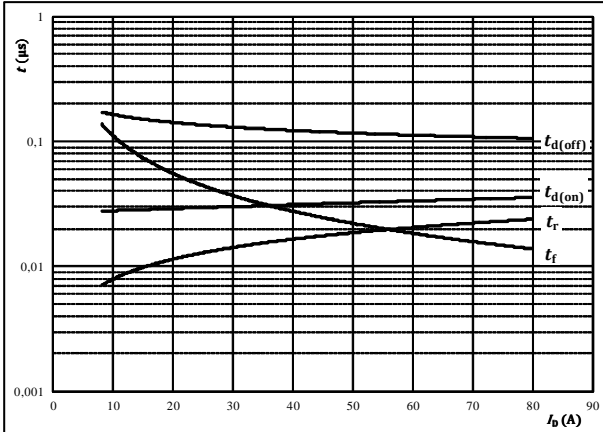


Buck Switching Characteristics

Figure 5. MOSFET

Typical switching times as a function of collector current

$$t = f(I_D)$$



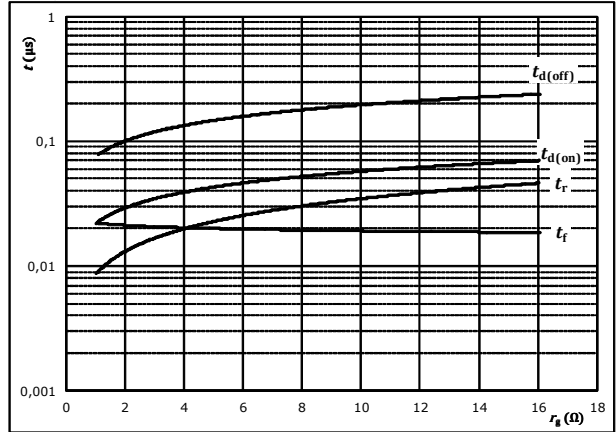
With an inductive load at

$T_j =$	150	°C
$V_{DS} =$	700	V
$V_{GS} =$	±15	V
$R_{g(on)} =$	4	Ω
$R_{g(off)} =$	4	Ω

Figure 6. MOSFET

Typical switching times as a function of gate resistor

$$t = f(r_g)$$



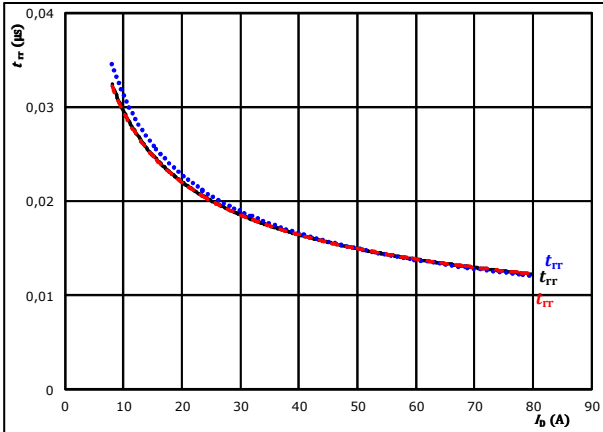
With an inductive load at

$T_j =$	150	°C
$V_{DS} =$	700	V
$V_{GS} =$	±15	V
$I_D =$	44	A

Figure 7. FWD

Typical reverse recovery time as a function of collector current

$$t_{rr} = f(I_D)$$



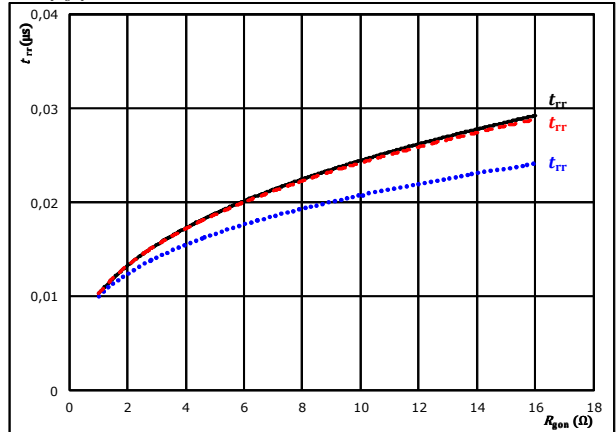
At

$V_{DS} =$	700	V	$T_j:$	25 °C
$V_{GS} =$	±15	V		125 °C	————
$R_{g(on)} =$	4	Ω		150 °C	-----

Figure 8. FWD

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

$$t_{rr} = f(R_{g(on)})$$



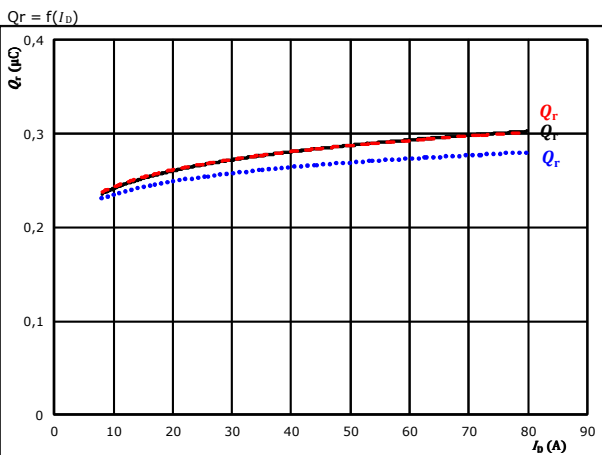
At

$V_{DS} =$	700	V	$T_j:$	25 °C
$V_{GS} =$	±15	V		125 °C	————
$I_D =$	44	A		150 °C	-----



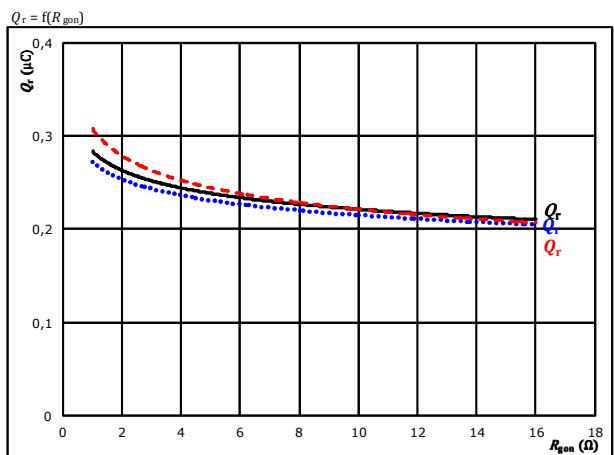
Buck Switching Characteristics

Figure 9. FWD
Typical recovered charge as a function of collector current



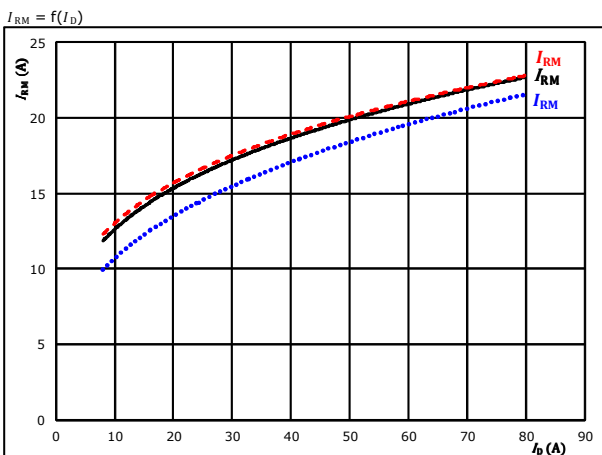
A $V_{DS} = 700$ V $T_j: 25$ °C
 $V_{GS} = \pm 15$ V 125 °C ———
 $R_{ggn} = 4$ Ω 150 °C - - - - -

Figure 10. FWD
Typical recovered charge as a function of MOSFET turn on gate resistor



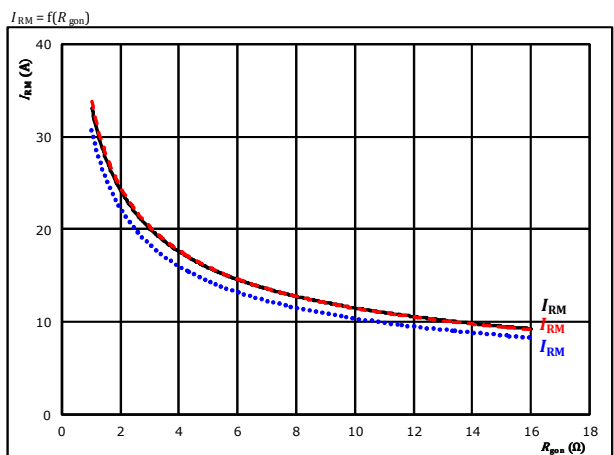
At $V_{DS} = 700$ V $T_j: 25$ °C
 $V_{GS} = \pm 15$ V 125 °C ———
 $I_D = 44$ A 150 °C - - - - -

Figure 11. FWD
Typical peak reverse recovery current as a function of collector current



At $V_{DS} = 700$ V $T_j: 25$ °C
 $V_{GS} = \pm 15$ V 125 °C ———
 $R_{ggn} = 4$ Ω 150 °C - - - - -

Figure 12. FWD
Typical peak reverse recovery current as a function of MOSFET turn on gate resistor



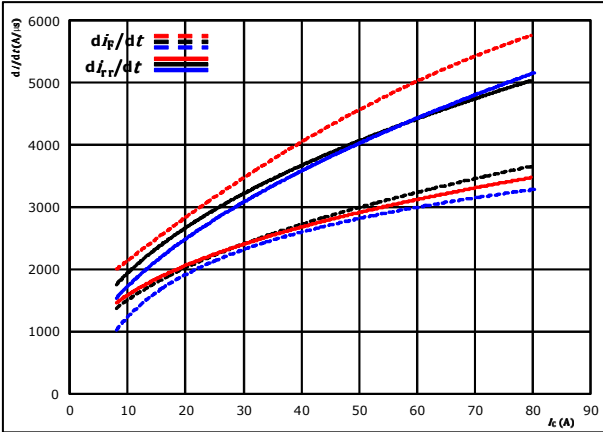
At $V_{DS} = 700$ V $T_j: 25$ °C
 $V_{GS} = \pm 15$ V 125 °C ———
 $I_D = 44$ A 150 °C - - - - -



Buck Switching Characteristics

Figure 13. FWD

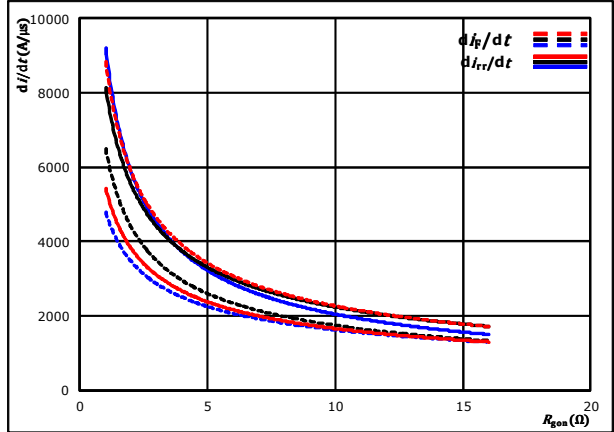
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_F/dt, di_{rr}/dt = f(I_c)$



At $V_{DS} = 700$ V
 $V_{GS} = \pm 15$ V
 $R_{gon} = 4$ Ω
 $T_j: 25$ °C (dotted blue)
 125 °C (solid black)
 150 °C (dashed red)

Figure 14. FWD

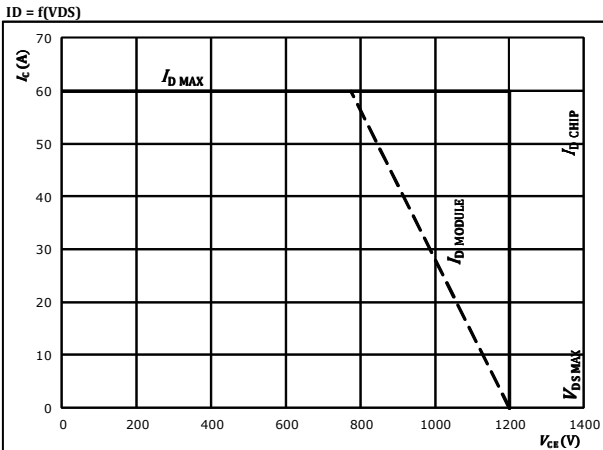
Typical rate of fall of forward and reverse recovery current as a function of MOSFET turn on gate resistor
 $di_F/dt, di_{rr}/dt = f(R_g)$



At $V_{DS} = 700$ V
 $V_{GS} = \pm 15$ V
 $I_D = 44$ A

Figure 15. MOSFET

Reverse bias safe operating area



At $T_j = 175$ °C
 $R_{gon} = 4$ Ω
 $R_{goff} = 4$ Ω

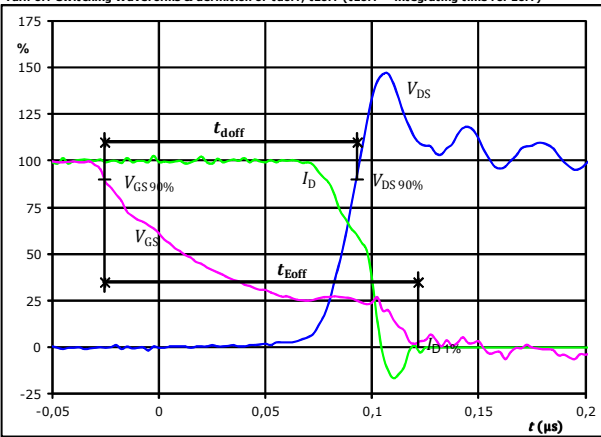


Buck Switching Definition

General conditions

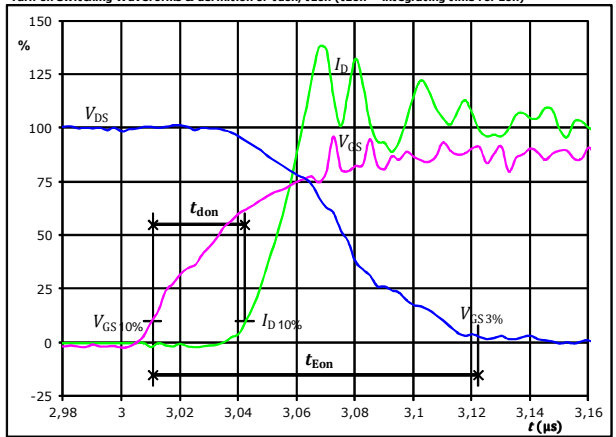
T_j	=	125 °C
R_{gon}	=	4 Ω
R_{goff}	=	4 Ω

Figure 1. MOSFET
Turn-off Switching Waveforms & definition of t_{doff} , t_{Eoff} (t_{Eoff} = integrating time for E_{off})



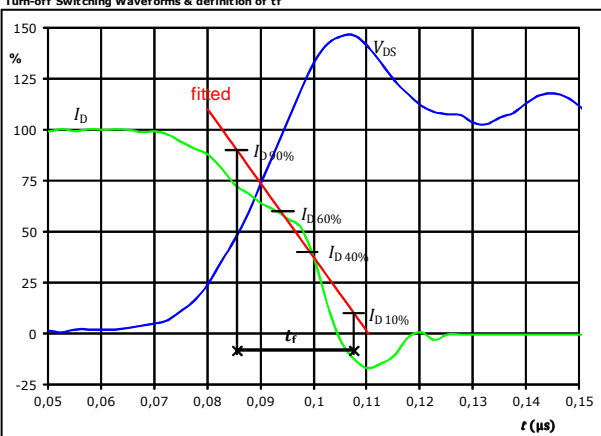
V_{GS} (0%) =	0	V
V_{GS} (100%) =	24	V
V_{DS} (100%) =	700	V
I_D (100%) =	44	A
t_{doff} =	0,118	μ s
t_{Eoff} =	0,147	μ s

Figure 2. MOSFET
Turn-on Switching Waveforms & definition of t_{don} , t_{Eon} (t_{Eon} = integrating time for E_{on})



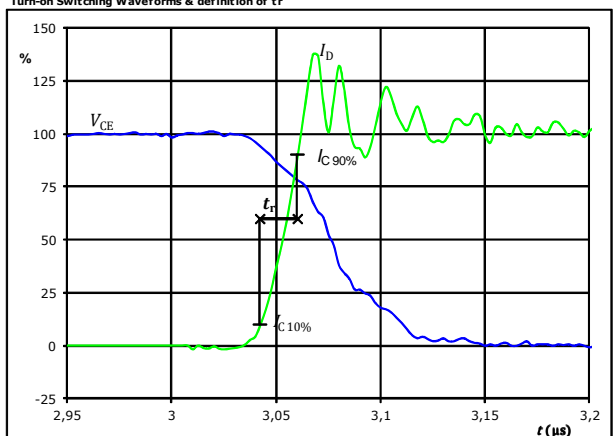
V_{GS} (0%) =	0	V
V_{GS} (100%) =	24	V
V_{DS} (100%) =	700	V
I_D (100%) =	44	A
t_{don} =	0,032	μ s
t_{Eon} =	0,111	μ s

Figure 3. MOSFET
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	700	V
I_D (100%) =	44	A
t_f =	0,023	μ s

Figure 4. MOSFET
Turn-on Switching Waveforms & definition of t_r



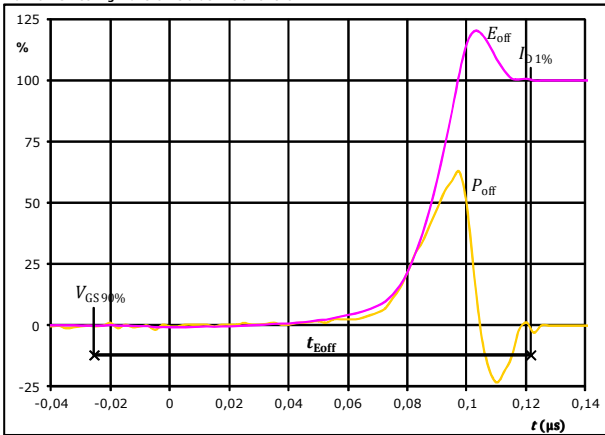
V_C (100%) =	700	V
I_D (100%) =	44	A
t_r =	0,018	μ s



Buck Switching Definition

Figure 5. MOSFET

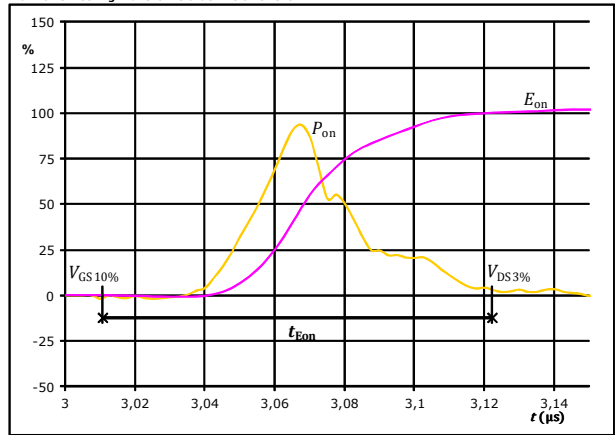
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) = 30,63 kW
 E_{off} (100%) = 0,15 mJ
 t_{Eoff} = 0,15 μs

Figure 6. MOSFET

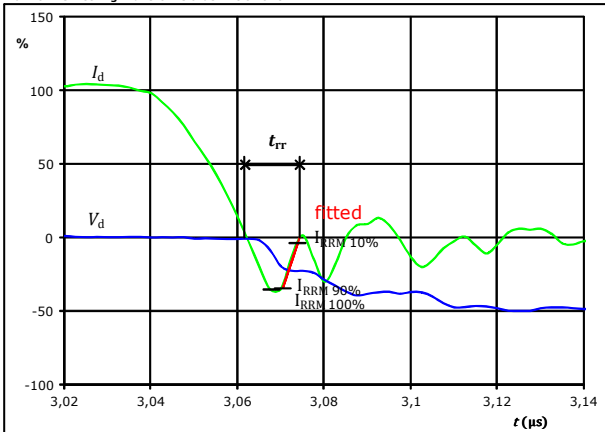
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) = 30,63 kW
 E_{on} (100%) = 0,46 mJ
 t_{Eon} = 0,11 μs

Figure 7. FWD

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

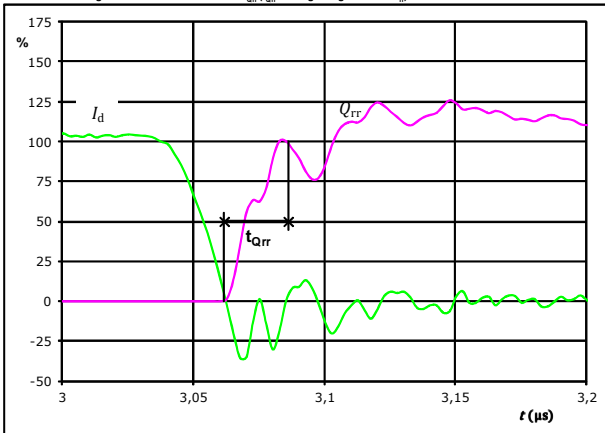


V_d (100%) = 700 V
 I_d (100%) = 44 A
 I_{RRM} (100%) = -19 A
 t_{rr} = 0,013 μs



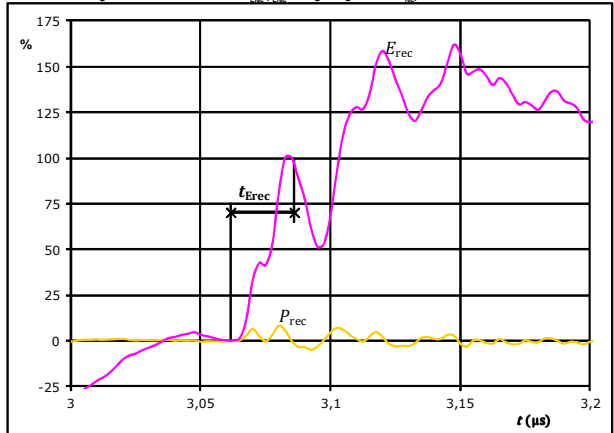
Buck Switching Definition

Figure 8. FWD
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	44	A
Q_{rr} (100%) =	0,26	μC
t_{Qrr} =	0,02	μs

Figure 9. FWD
Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec} = integrating time for E_{rec})

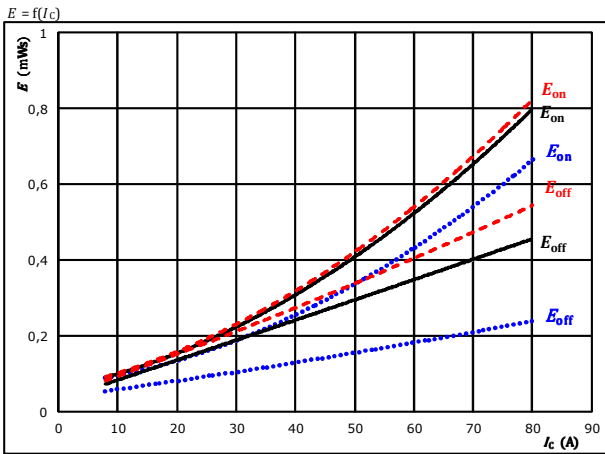


P_{rec} (100%) =	30,63	kW
E_{rec} (100%) =	0,04	mJ
t_{Erec} =	0,02	μs



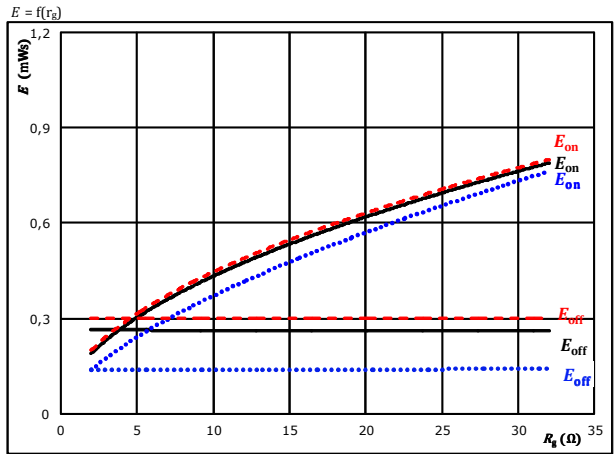
Boost Switching Characteristics

Figure 1. IGBT
Typical switching energy losses as a function of collector current



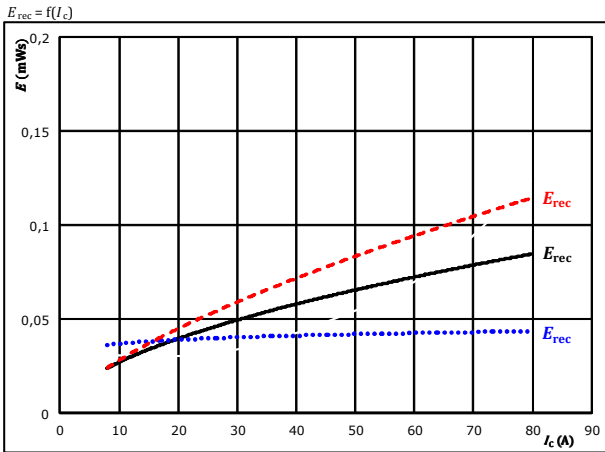
With an inductive load at
 $V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{g\text{on}} = 8 \text{ }\Omega$
 $R_{g\text{off}} = 8 \text{ }\Omega$
 $T_j:$ 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

Figure 2. IGBT
Typical switching energy losses as a function of gate resistor



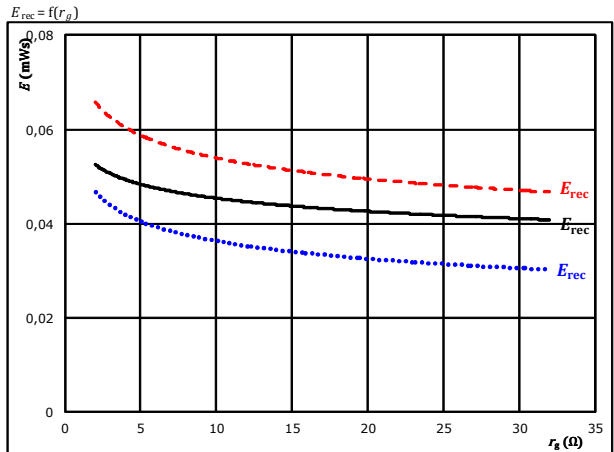
With an inductive load at
 $V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 44 \text{ A}$
 $T_j:$ 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

Figure 3. FWD
Typical reverse recovered energy loss as a function of collector current



With an inductive load at
 $V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $R_{g\text{on}} = 8 \text{ }\Omega$
 $T_j:$ 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)

Figure 4. FWD
Typical reverse recovered energy loss as a function of gate resistor

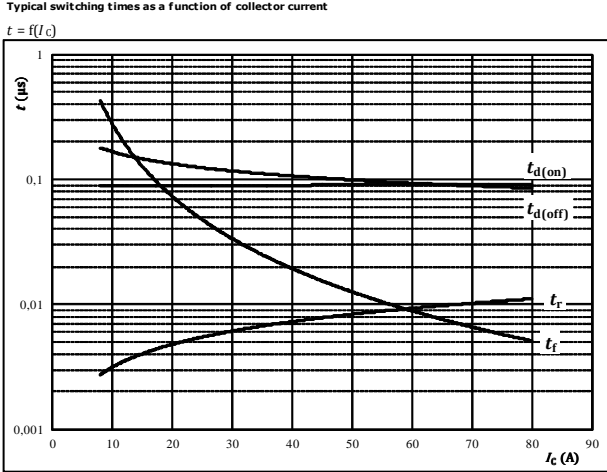


With an inductive load at
 $V_{CE} = 700 \text{ V}$
 $V_{GE} = \pm 15 \text{ V}$
 $I_C = 44 \text{ A}$
 $T_j:$ 25 °C (blue dotted), 125 °C (black solid), 150 °C (red dashed)



Boost Switching Characteristics

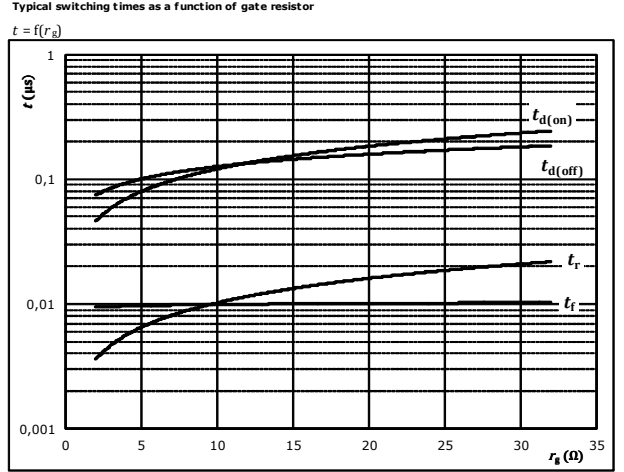
Figure 5. IGBT
Typical switching times as a function of collector current



With an inductive load at

- $T_j = 150$ °C
- $V_{CE} = 700$ V
- $V_{GE} = \pm 15$ V
- $R_{g(on)} = 8$ Ω
- $R_{g(off)} = 8$ Ω

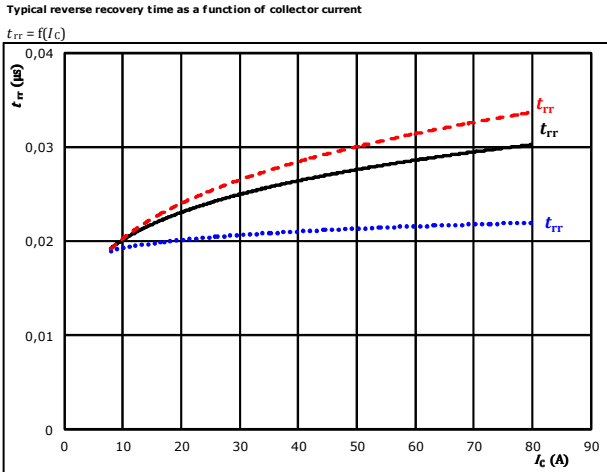
Figure 6. IGBT
Typical switching times as a function of gate resistor



With an inductive load at

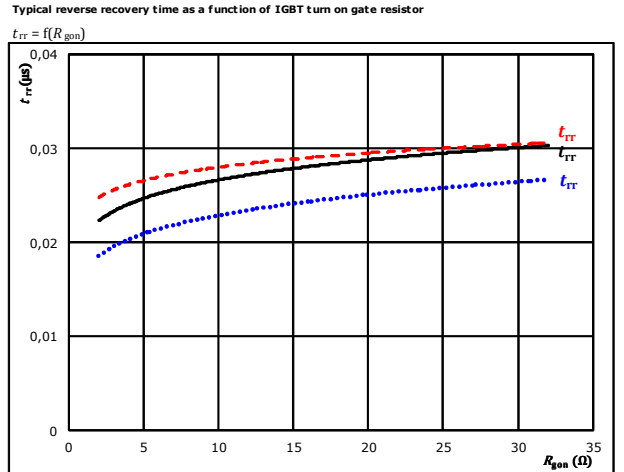
- $T_j = 150$ °C
- $V_{CE} = 700$ V
- $V_{GE} = \pm 15$ V
- $I_C = 44$ A

Figure 7. FWD
Typical reverse recovery time as a function of collector current



- At $V_{CE} = 700$ V, $V_{GE} = \pm 15$ V, $R_{g(on)} = 8$ Ω
- T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)

Figure 8. FWD
Typical reverse recovery time as a function of IGBT turn on gate resistor



- At $V_{CE} = 700$ V, $V_{GE} = \pm 15$ V, $I_C = 44$ A
- T_j : 25 °C (dotted blue), 125 °C (solid black), 150 °C (dashed red)



Boost Switching Characteristics

Figure 9. FWD
Typical recovered charge as a function of collector current

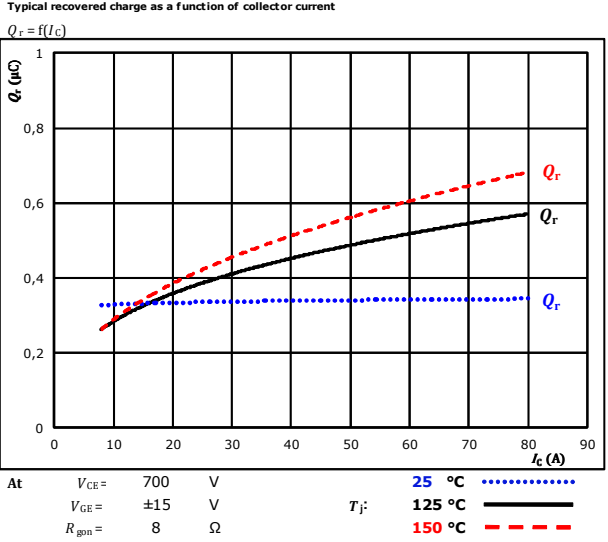


Figure 10. FWD
Typical recovered charge as a function of IGBT turn on gate resistor

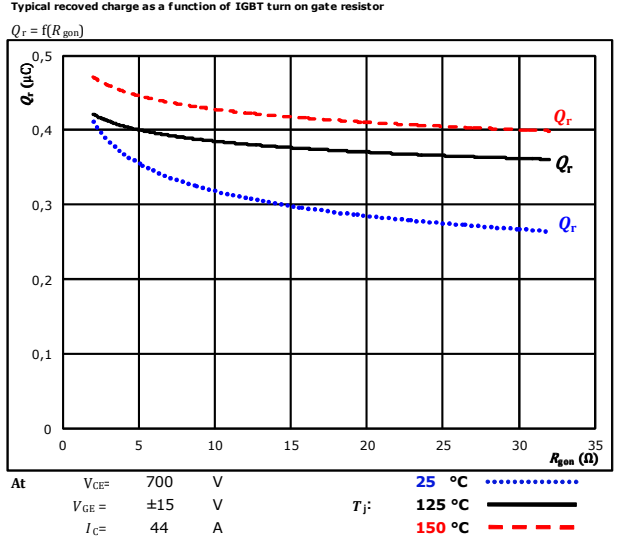


Figure 11. FWD
Typical peak reverse recovery current as a function of collector current

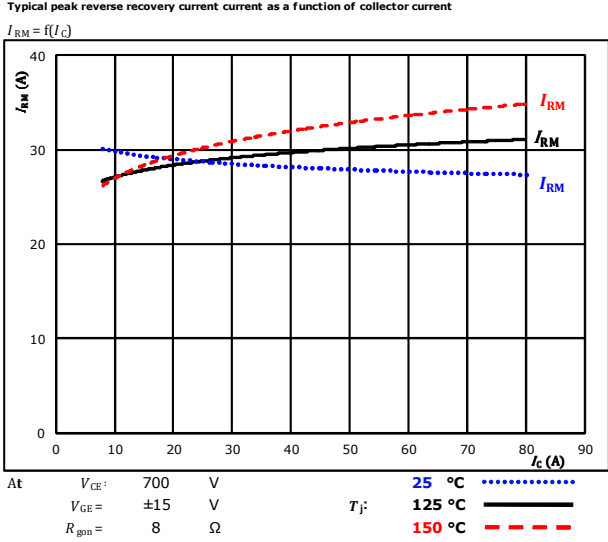
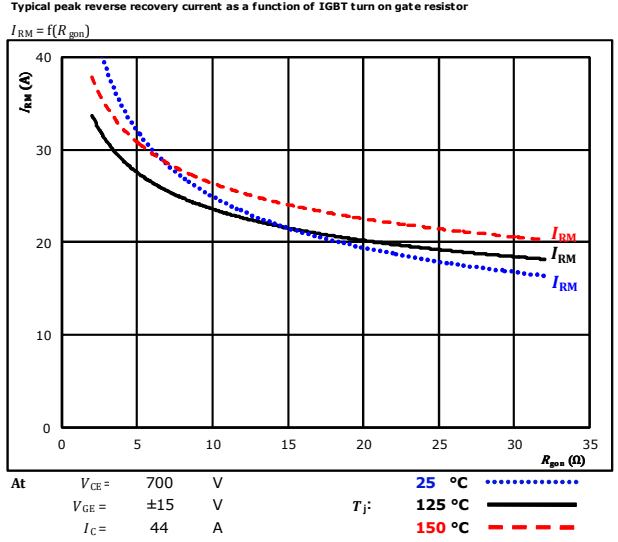


Figure 12. FWD
Typical peak reverse recovery current as a function of IGBT turn on gate resistor

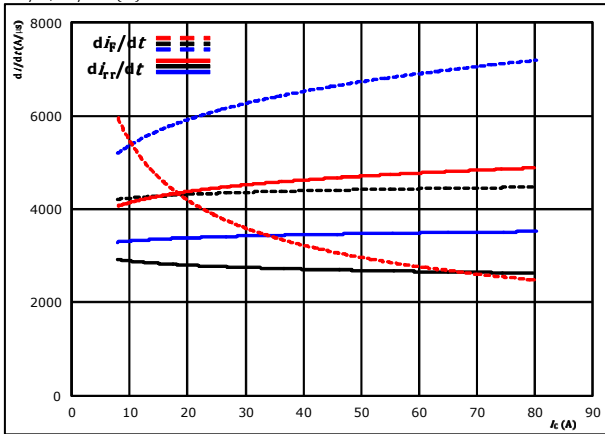




Boost Switching Characteristics

Figure 13. FWD

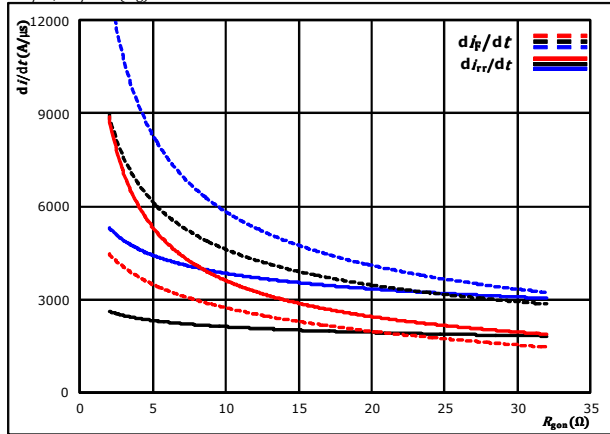
Typical rate of fall of forward and reverse recovery current as a function of collector current
 $di_F/dt, di_{rr}/dt = f(I_C)$



At $V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $R_{gon} = 8$ Ω
 $T_j: 25$ °C
 125 °C ———
 150 °C - - - -

Figure 14. FWD

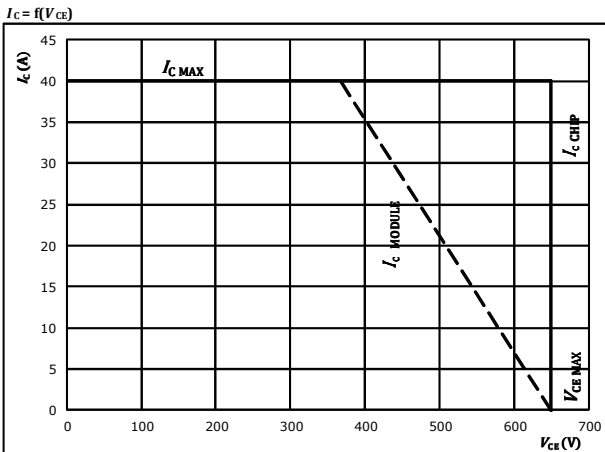
Typical rate of fall of forward and reverse recovery current as a function of IGBT turn on gate resistor
 $di_F/dt, di_{rr}/dt = f(R_g)$



At $V_{CE} = 700$ V
 $V_{GE} = \pm 15$ V
 $I_C = 44$ A
 $T_j: 25$ °C
 125 °C ———
 150 °C - - - -

Figure 15. IGBT

Reverse bias safe operating area



At $T_j = 175$ °C
 $R_{gon} = 8$ Ω
 $R_{goff} = 8$ Ω

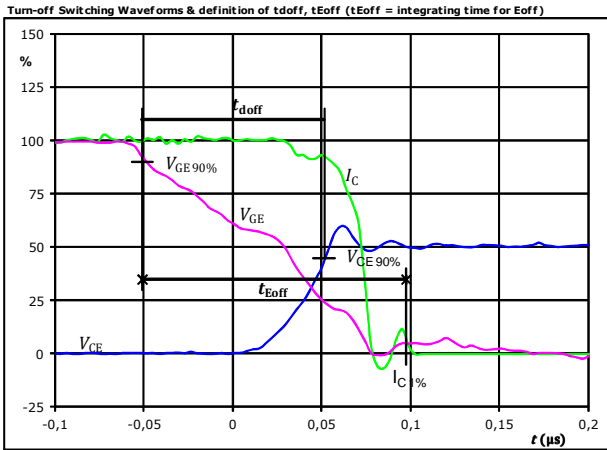


Boost Switching Definition

General conditions

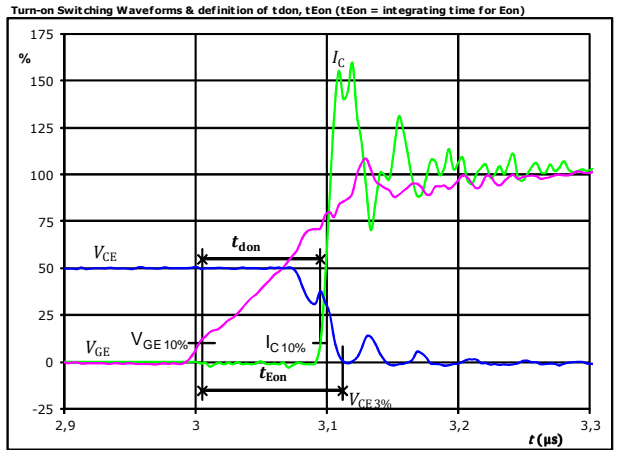
T_j	=	125 °C
R_{gon}	=	8 Ω
R_{goff}	=	8 Ω

Figure 1. IGBT



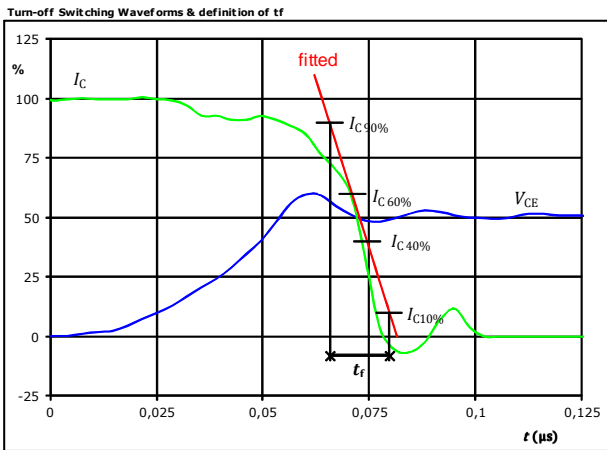
$V_{CE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	700	V
$I_C(100\%) =$	44	A
$t_{doff} =$	0,101	μs
$t_{Eoff} =$	0,148	μs

Figure 2. IGBT



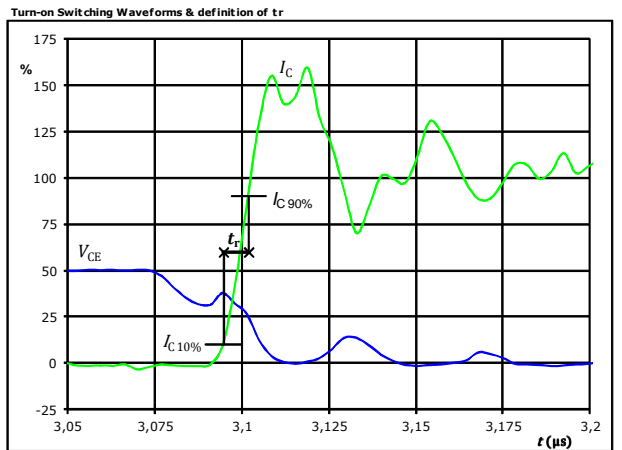
$V_{CE}(0\%) =$	-15	V
$V_{GE}(100\%) =$	15	V
$V_C(100\%) =$	700	V
$I_C(100\%) =$	44	A
$t_{don} =$	0,092	μs
$t_{Eon} =$	0,107	μs

Figure 3. IGBT



$V_C(100\%) =$	700	V
$I_C(100\%) =$	44	A
$t_f =$	0,011	μs

Figure 4. IGBT



$V_C(100\%) =$	700	V
$I_C(100\%) =$	44	A
$t_r =$	0,007	μs

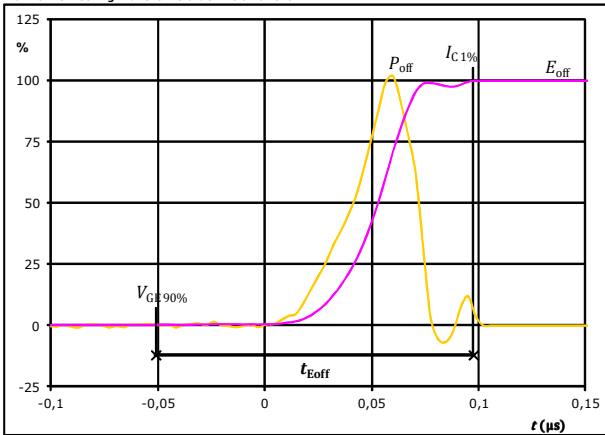


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Boost Switching Definition

Figure 5. IGBT

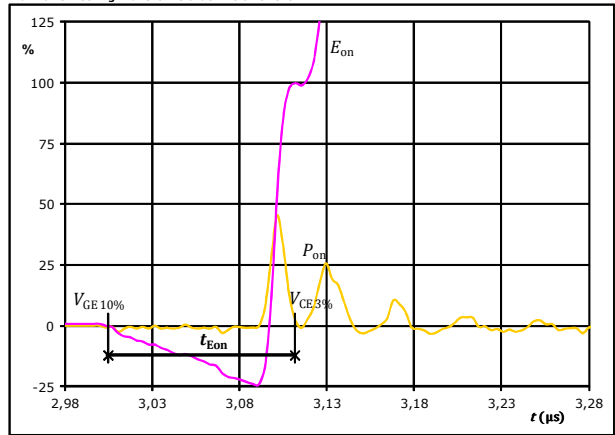
Turn-off Switching Waveforms & definition of t_{Eoff}



$P_{off}(100\%) = 30,78$ kW
 $E_{off}(100\%) = 0,27$ mJ
 $t_{Eoff} = 0,15$ μs

Figure 6. IGBT

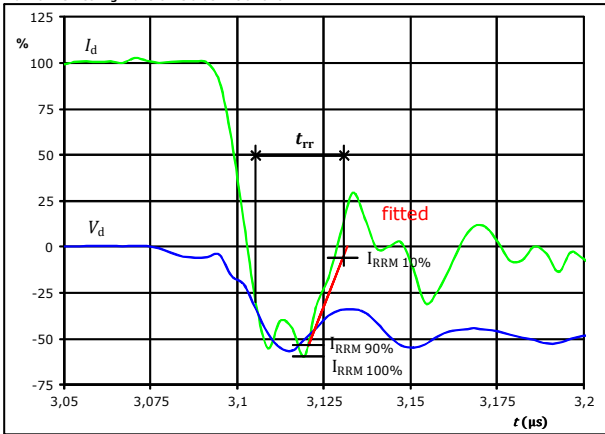
Turn-on Switching Waveforms & definition of t_{Eon}



$P_{on}(100\%) = 30,78$ kW
 $E_{on}(100\%) = 0,35$ mJ
 $t_{Eon} = 0,11$ μs

Figure 7. FWD

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

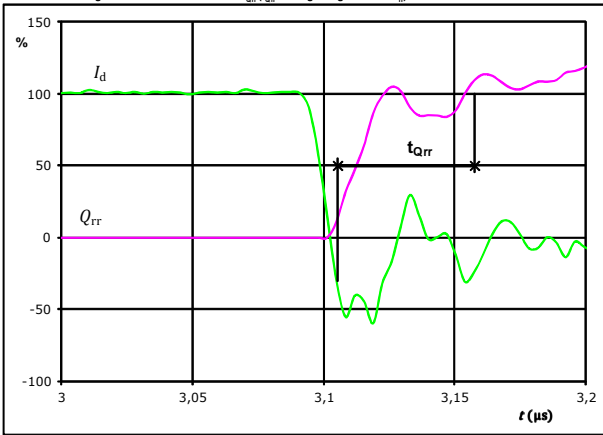


$V_d(100\%) = 700$ V
 $I_d(100\%) = 44$ A
 $I_{RRM}(100\%) = -27$ A
 $t_{rr} = 0,026$ μs



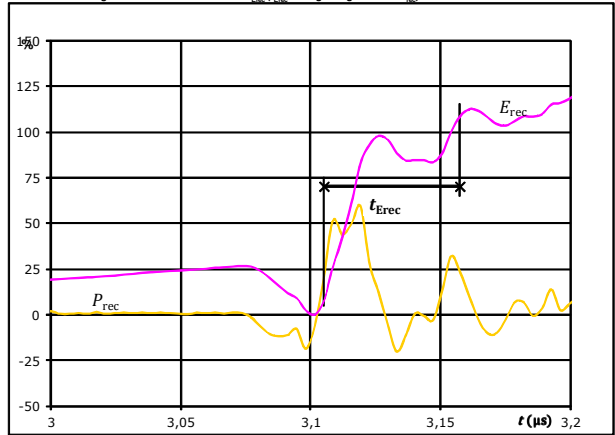
Boost Switching Definition

Figure 8. FWD
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_r)



I_d (100%) =	44	A
Q_{rr} (100%) =	0,39	μC
t_{Qrr} =	0,05	μs

Figure 9. FWD
Turn-on Switching Waveforms & definition of t_{Erec} (t_{Erec} = integrating time for E_{rec})



P_{rec} (100%) =	30,78	kW
E_{rec} (100%) =	0,05	mJ
t_{Erec} =	0,05	μs



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Ordering Code & Marking

Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 12mm housing	10-PZ12NMA027MR-M340F68Y	M340F68Y	M340F68Y

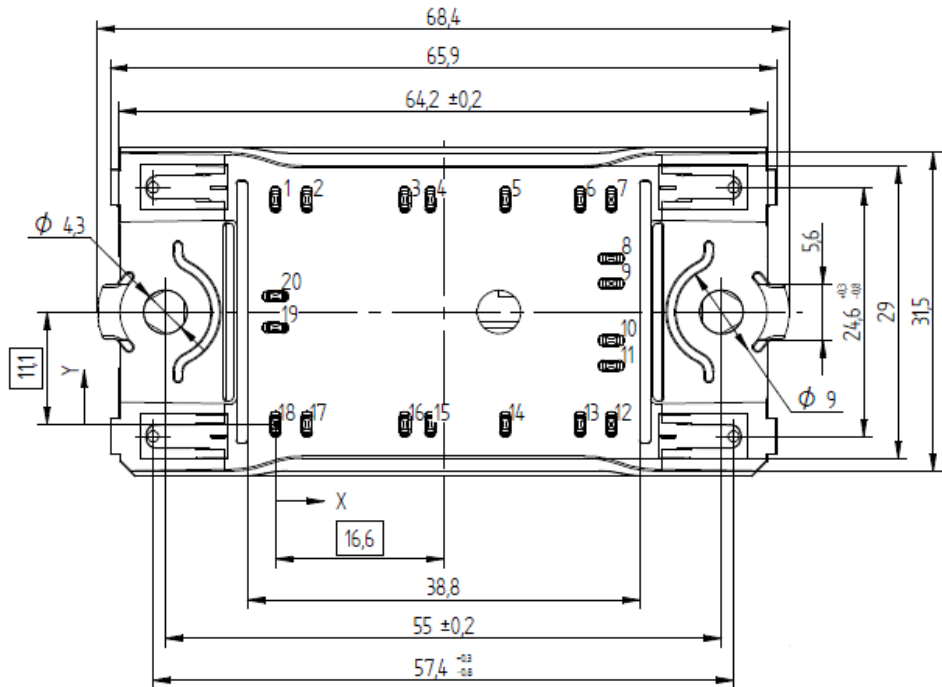
Text	Name		Date code	UL & Vinco	Lot	Serial
	Datamatrix	Type&Ver	Lot number	Serial	Date code	

NN-NNNNNNNNNNNNNN
 NNNNNNNN WWYY UL
 Vinco LLLLL SSSS

TTTTTTVV LLLLL SSSS WWYY

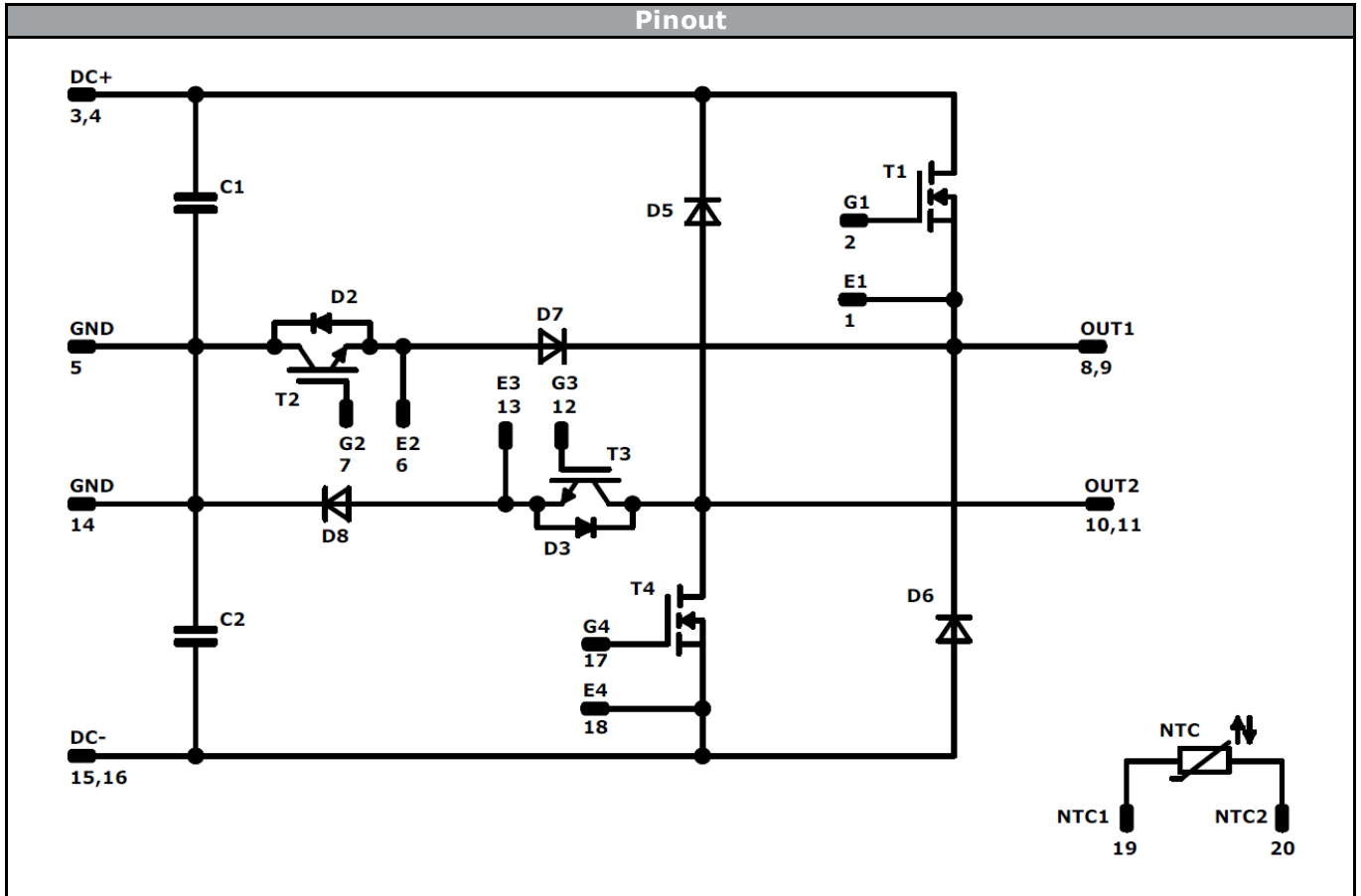
Outline

Pin table [mm]			
Pin	X	Y	Function
1	0	22,2	E1
2	3,1	22,2	G1
3	12,8	22,2	DC+
4	15,3	22,2	DC+
5	22,7	22,2	GND
6	30,1	22,2	E2
7	33,2	22,2	G2
8	33,2	16,4	OUT1
9	33,2	13,9	OUT1
10	33,2	8,3	OUT2
11	33,2	5,8	OUT2
12	33,2	0	G3
13	30,1	0	E3
14	22,7	0	GND
15	15,3	0	DC-
16	12,8	0	DC-
17	3,1	0	G4
18	0	0	E4
19	0	9,55	NTC1
20	0	12,65	NTC2





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Identification						
ID	Component	Voltage	Current	Function	Comment	
T1,T4	MOSFET	1200V	27mΩ	Buck Switch	3*S2303TCST	
D7,D8	FWD	650V	30A	Buck Diode	3*S6202TCSF	
T2,T3	IGBT	650V	80A	Boost Switch	2*IGC13T65U8Q	
D5,D6	FWD	1200V	10A	Boost Diode	S6302TCS	
D2,D3	FWD	650V	6A	Boost Inverse Diode	SIDC02D65C(6,8)	
C1,C2	Capacitor	500V	-	DC Link		
NTC	NTC	-	-	Thermistor		



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

Handling instruction	
Handling instructions for <i>flow</i> 0 packages see vincotech.com website.	

Document No.:	Date:	Modification:	Pages
10-PZ12NMA027MR-M340F68Y-D1-14	17 Jul. 2015		

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.