Vincotech

10-LY12B2B027ME01-LB88L08
10-EY12B2B027ME01-LB88L08T
datasheet

flow **2xBOOST E2 SiC** **1200 V / 27 mΩ**

Features

- Full SiC Dual Boost
- Low inductive package
- High switching frequency

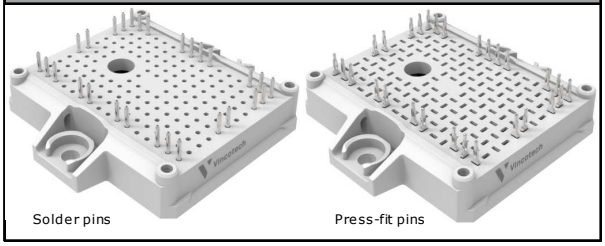
Target applications

- Solar Inverters

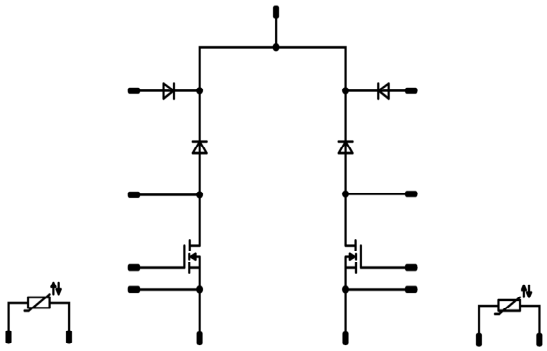
Types

- 10-LY12B2B027ME01-LB88L08
- 10-EY12B2B027ME01-LB88L08T

flow E2 12 mm housing



Schematic



Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Boost Switch				
Drain-source voltage	V_{DSS}		1200	V
Drain current	I_D	$T_j = T_{jmax}$ T_S = 80 °C	56	A
Peak drain current	I_{DM}	t_p limited by T_{jmax}	240	A
Avalanche energy, single pulse	E_{AS}	I_D = 60 A V_{DD} = 50 V	3000	mJ
Avalanche current, repetitive	I_{AR}	t_p limited by T_{jmax} $P_{AV} = E_{AR}$*f	20	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_S = 80 °C	153	W
Gate-source voltage	V_{GSS}	Dynamic*	-10/+25	V
Maximum Junction Temperature	T_{jmax}		175	°C

* See figure 6. at page 7

Maximum Ratings

T_j = 25 °C, unless otherwise specified

Parameter	Symbol	Condition	Value	Unit
Boost Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1200	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80°C	53	A
Repetitive peak forward current	I_{FRM}		184	A
Surge (non-repetitive) forward current	I_{FSM}	60 Hz Single Half Sine Wave t_p = 8,3 ms T_j = 150°C	176	A
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80°C	129	W
Maximum Junction Temperature	T_{jmax}		175	°C
ByPass Diode				
Peak Repetitive Reverse Voltage	V_{RRM}		1600	V
Continuous (direct) forward current	I_F	$T_j = T_{jmax}$ T_s = 80 °C	71	A
Surge (non-repetitive) forward current	I_{FSM}	50 Hz Single Half Sine Wave t_p = 10 ms T_j = 150 °C	490	A
Surge current capability	I^2t		1200	A^2s
Total power dissipation	P_{tot}	$T_j = T_{jmax}$ T_s = 80 °C	77	W
Maximum Junction Temperature	T_{jmax}		150	°C
Module Properties				
Thermal Properties				
Storage temperature	T_{stg}		-40…+125	°C
Operation temperature under switching condition	T_{jop}		-40…(T_{jmax} - 25)	°C
Isolation Properties				
Isolation voltage	V_{isol}	DC test Voltage* t_p = 2 s	6000	V
		AC Voltage t_p = 1 min	2500	V
Creepage distance			min. 12,7	mm
Clearance		Solder	8,65	mm
		Press-fit	8,83	mm
Comparative Tracking Index	CTI		≥ 600	

* 100 % tested in production

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Boost Switch										
Static										
Drain-source on-state resistance	$r_{DS(on)}$		20		60	25 125 150		25 37 42	32,7	mΩ
Gate-source threshold voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}$			0,015	25	2,1	2,6	4	V
Gate to Source Leakage Current	I_{GSS}		20	0		25			750	nA
Zero Gate Voltage Drain Current	I_{DSS}		0	1200		25			300	µA
Internal gate resistance	Rg							1,53		Ω
Gate charge	Q_g		-5/20	800	60	25		186		nC
Gate to source charge	Q_{GS}							45		
Gate to drain charge	Q_{GD}							69		
Short-circuit input capacitance	C_{iss}	f = 1MHz	0	1000		25		2850		pF
Short-circuit output capacitance	C_{oss}							240		
Reverse transfer capacitance	C_{rss}							22,8		
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50 µm λ = 1 W/mK						0,62		K/W
Dynamic										
Turn-on delay time	$t_{d(on)}$	R_{goff} = 2 Ω R_{gon} = 2 Ω	+16/-5	700	50	25 125 150		26 24 23		ns
Rise time	t_r					25 125 150		7 7 6		
Turn-off delay time	$t_{d(off)}$					25 125 150		58 62 62		
Fall time	t_f					25 125 150		13 15 16		
Turn-on energy (per pulse)	E_{on}	Q_{rFWD} = 0,2 µC Q_{rFWD} = 0,2 µC Q_{rFWD} = 0,2 µC				25 125 150		0,303 0,245 0,230		mWs
Turn-off energy (per pulse)	E_{off}					25 125 150		0,324 0,298 0,312		

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Boost Diode										
Static										
Forward voltage	V_F				40	25 150		1,49 1,91	1,6	V
Reverse leakage current	I_r			1200		25			800	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50 µm λ = 1 W/mK						0,74		K/W
Dynamic										
Peak recovery current	I_{RRM}	di/dt = 8553 A/µs di/dt = 10070 A/µs di/dt = 9341 A/µs	+16/-5	700	50	25 125 150		56 60 62		A
Reverse recovery time	t_{rr}					25 125 150		11 11 11		ns
Recovered charge	Q_r					25 125 150		0,230 0,214 0,215		µC
Reverse recovered energy	E_{rec}					25 125 150		0,073 0,078 0,046		mWs
Peak rate of fall of recovery current	$(di_{rf}/dt)_{max}$					25 125 150		15875 15875 16086		A/µs
ByPass Diode										
Static										
Forward voltage	V_F				50	25 125		1,07 1,01	1,35	V
Reverse leakage current	I_r			1600		25 145			50 1100	µA
Thermal										
Thermal resistance junction to sink	$R_{th(j-s)}$	Thermal grease thickness ≤ 50 µm λ = 1 W/mK						0,91		K/W

Characteristic Values

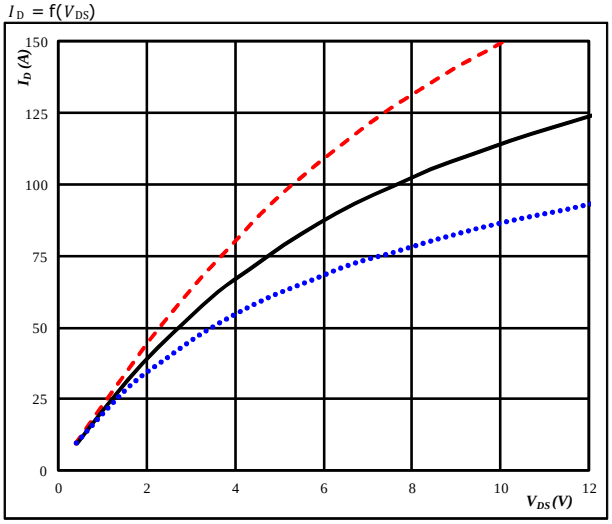
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] V_{GS} [V]	V_{CE} [V] V_{DS} [V] V_F [V]	I_C [A] I_D [A] I_F [A]	T_j [°C]	Min	Typ	Max	
Thermistor										
Rated resistance	R					25		22		kΩ
Deviation of R_{100}	$\Delta_{R/R}$	R_{100} = 1484 Ω				100	-5		5	%
Power dissipation	P					25		5		mW
Power dissipation constant						25		1,5		mW/K
B-value	$B_{(25/50)}$	Tol. ±1 %				25		3962		K
B-value	$B_{(25/100)}$	Tol. ±1 %				25		4000		K
Vincotech NTC Reference									I	

Boost Switch Characteristics

figure 1. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

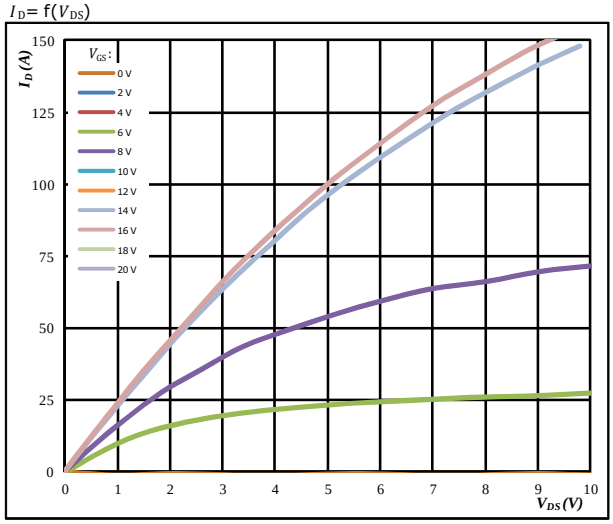


t_p =	250	µs		25 °C	
V_{GS}=	20	V	T_j:	125 °C	
				150 °C	

figure 2. **MOSFET**

Typical output characteristics

$I_D = f(V_{DS})$

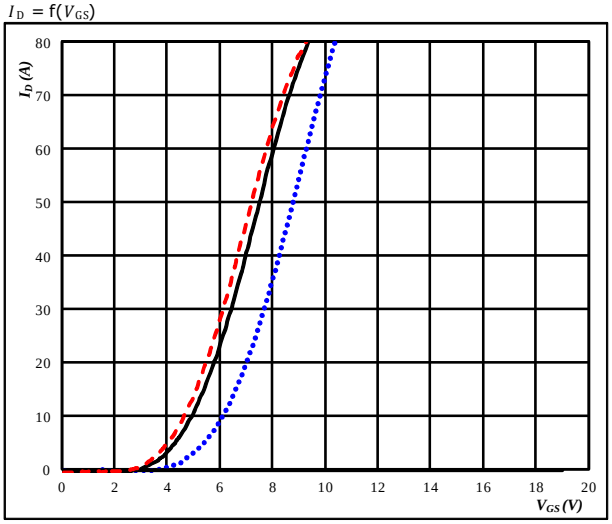


t_p =	250	µs
T_j =	150	°C
V_{GS} from	0 V to 20 V in steps of 2 V	

figure 3. **MOSFET**

Typical transfer characteristics

$I_D = f(V_{GS})$

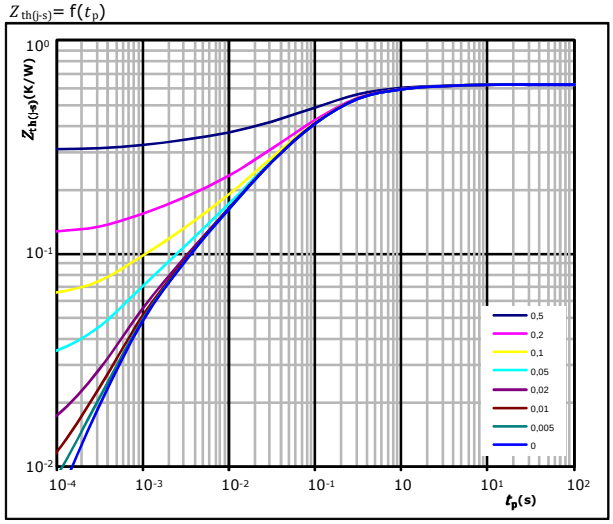


t_p =	100	µs		25 °C	
V_{DS} =	10	V	T_j:	125 °C	
				150 °C	

figure 4. **MOSFET**

Transient thermal impedance as a function of pulse width

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



D =	t_p / T	
$R_{th(j-s)}$ =	0,62	K/W

MOSFET thermal model values

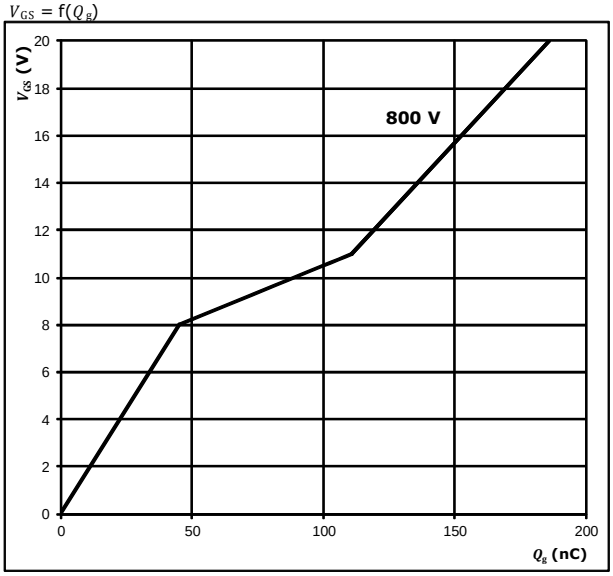
R (K/W)	τ (s)
1,23E-01	9,22E-01
3,61E-01	1,32E-01
8,99E-02	4,36E-02
6,32E-02	6,10E-03
7,67E-02	7,13E-04

Boost Switch Characteristics

figure 5. **MOSFET**

Gate voltage vs Gate charge

$V_{GS} = f(Q_g)$



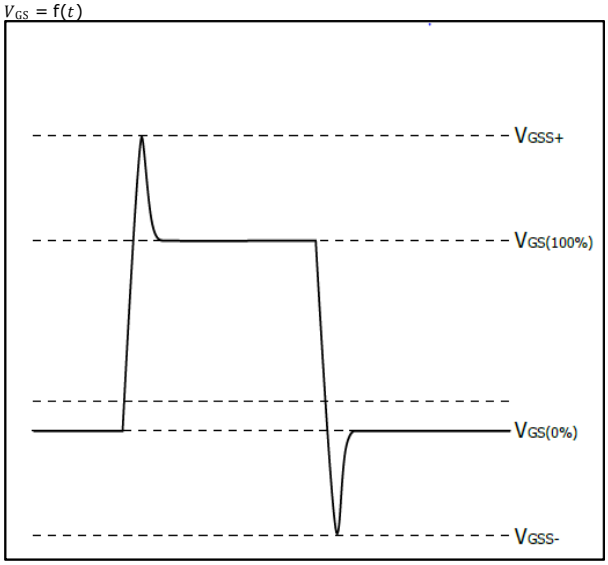
At

I_C= 60 A

figure 6. **MOSFET**

Gate maximum operating boundaries

$V_{GS} = f(t)$



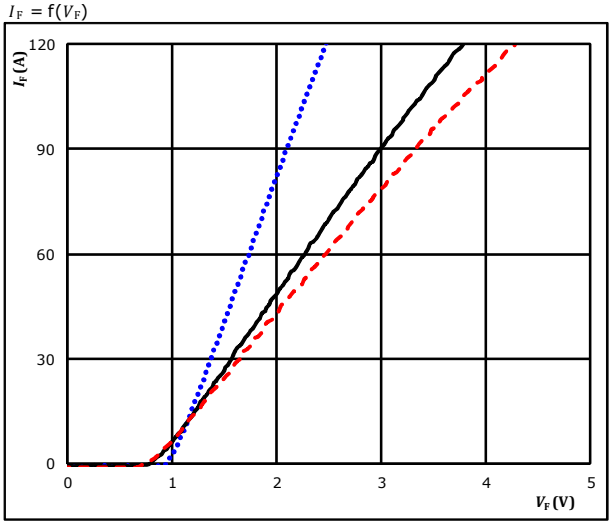
At

V_{GSS+} = 25 V
$V_{GS}(100\%)$ = 20 V
$V_{GS}(0\%)$ = -5 V
V_{GSS-} = -10 V

Boost Diode Characteristics

Typical forward characteristics **FWD**

$I_F = f(V_F)$

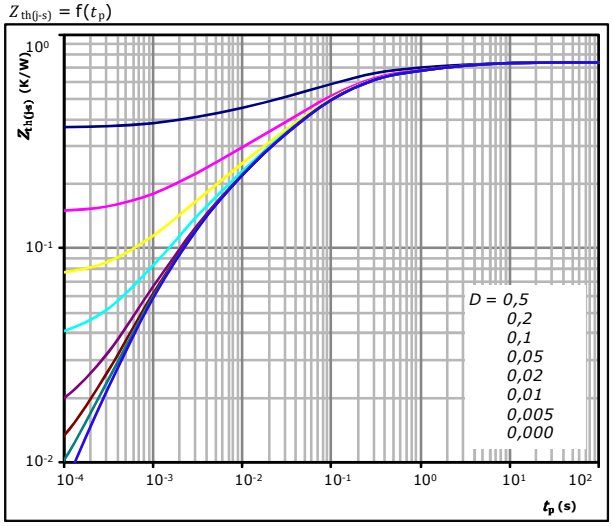


t_p = 250 µs

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

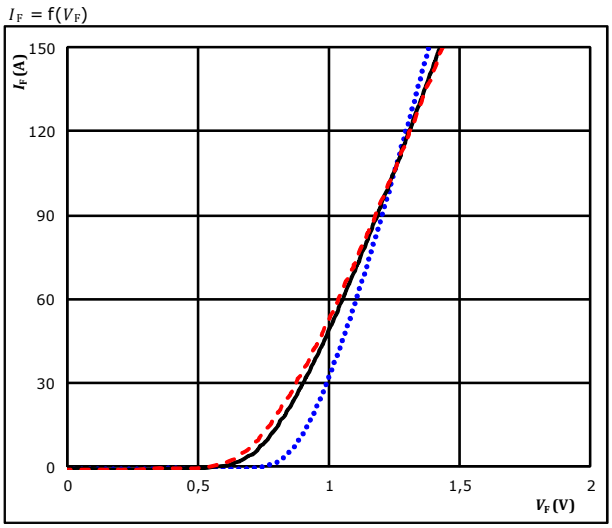
$R_{th(j-s)}$ = 0,74 K/W

FWD thermal model values

R (K/W)	τ (s)
4,15E-02	4,93E+00
7,65E-02	9,84E-01
1,94E-01	1,65E-01
2,16E-01	5,02E-02
1,38E-01	8,45E-03
6,05E-02	1,57E-03
1,02E-02	5,93E-04

ByPass Diode Characteristics

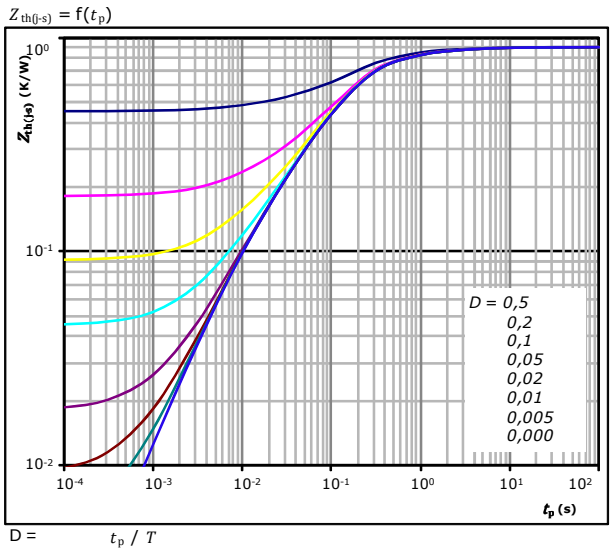
figure 1. **Rectifier Diode**
Typical forward characteristics



t_p = 250 µs

T_j: 25 °C, 125 °C, 150 °C

figure 2. **Rectifier Diode**
Transient thermal impedance as a function of pulse width



D = t_p / T

$R_{th(j-s)}$ = 0,91 K/W

Diode thermal model values

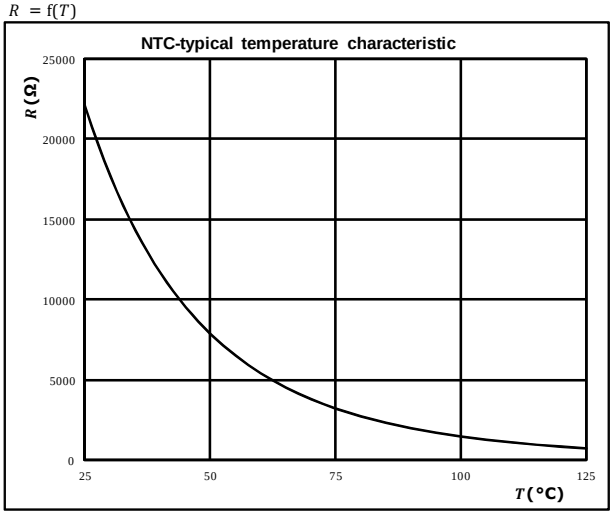
R (K/W)	τ (s)
4,21E-02	4,90E+00
1,41E-01	7,58E-01
5,62E-01	1,53E-01
1,09E-01	3,94E-02
5,19E-02	8,36E-03

Thermistor Characteristics

figure 1. **Thermistor**

Typical NTC characteristic as a function of temperature

$R = f(T)$

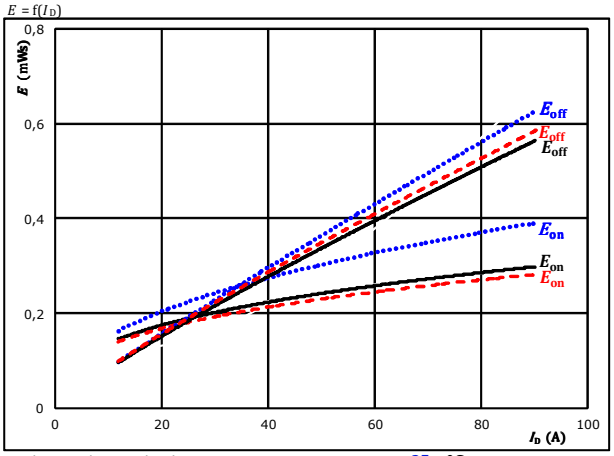


Boost Switching Characteristics

figure 1. MOSFET

Typical switching energy losses as a function of drain current

$E = f(I_D)$



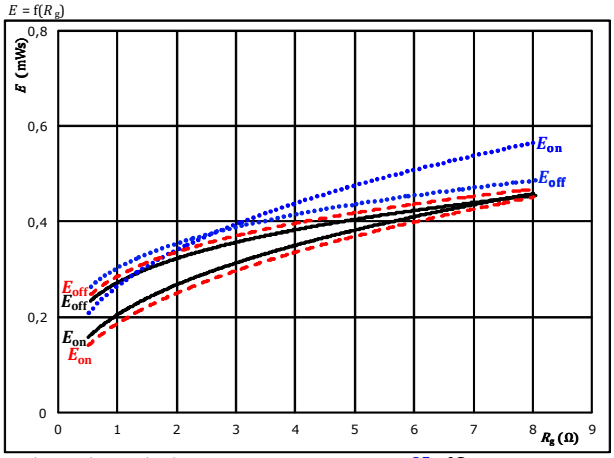
With an inductive load at

V_{DS} =	700	V	T_J:	25 °C	·····
V_{GS} =	+16/-5	V		125 °C	———
R_{gon} =	2	Ω		150 °C	- - -
R_{goff} =	2	Ω			

figure 2. MOSFET

Typical switching energy losses as a function of gate resistor

$E = f(R_g)$



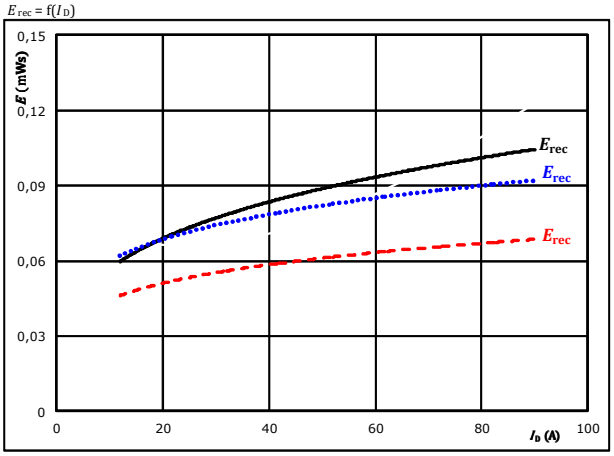
With an inductive load at

V_{DS} =	700	V	T_J:	25 °C	·····
V_{GS} =	+16/-5	V		125 °C	———
I_D =	50	A		150 °C	- - -

figure 3. FWD

Typical reverse recovered energy loss as a function of drain current

$E_{rec} = f(I_D)$



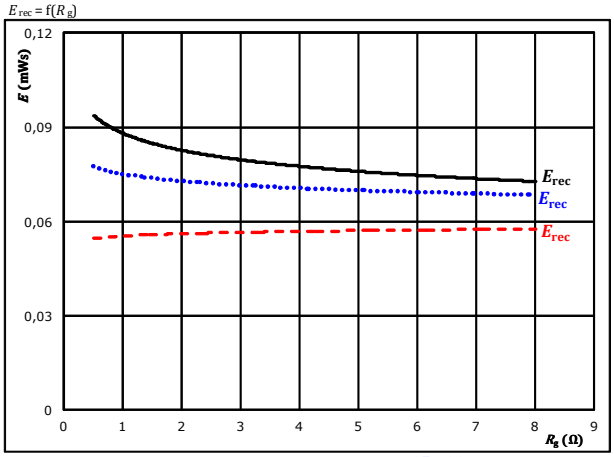
With an inductive load at

V_{DS} =	700	V	T_J:	25 °C	·····
V_{GS} =	+16/-5	V		125 °C	———
R_{gon} =	2	Ω		150 °C	- - -

figure 4. FWD

Typical reverse recovered energy loss as a function of gate resistor

$E_{rec} = f(R_g)$



With an inductive load at

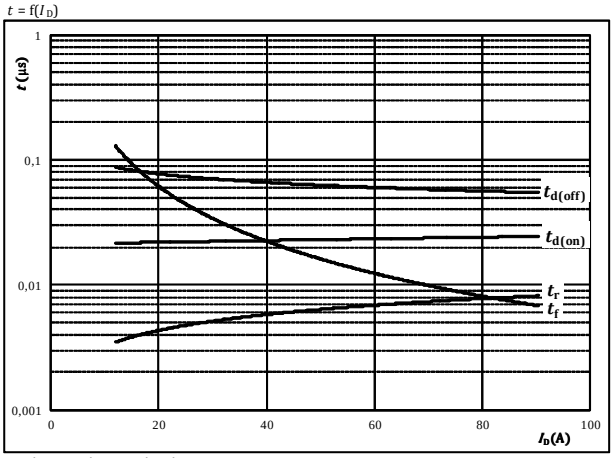
V_{DS} =	700	V	T_J:	25 °C	·····
V_{GS} =	+16/-5	V		125 °C	———
I_D =	50	A		150 °C	- - -

Boost Switching Characteristics

figure 5. MOSFET

Typical switching times as a function of drain current

$t = f(I_D)$



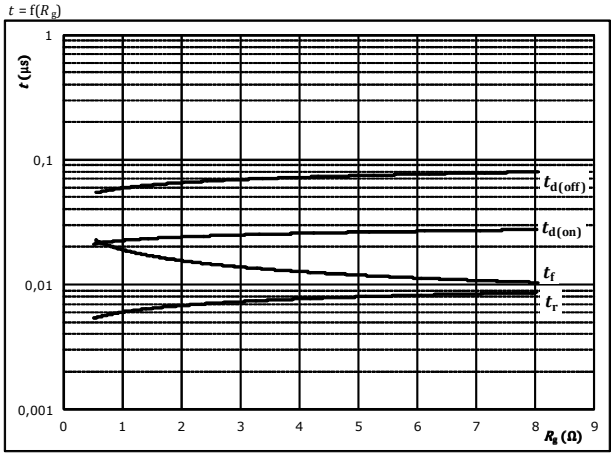
With an inductive load at

T_j =	150	°C
V_{DS} =	700	V
V_{GS} =	+16/-5	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

figure 6. MOSFET

Typical switching times as a function of gate resistor

$t = f(R_g)$



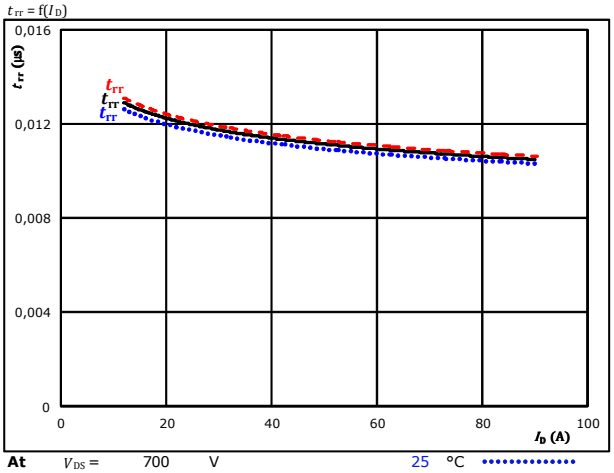
With an inductive load at

T_j =	150	°C
V_{DS} =	700	V
V_{GS} =	+16/-5	V
I_D =	50	A

figure 7. FWD

Typical reverse recovery time as a function of drain current

$t_{rr} = f(I_D)$

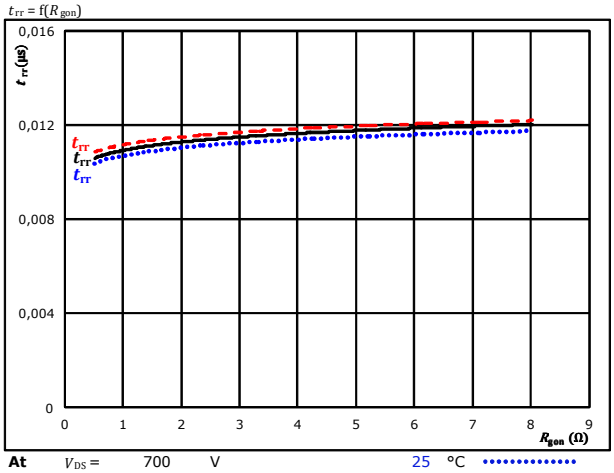


At					
V_{DS} =	700	V		25	°C
V_{GS} =	+16/-5	V	T_j:	125	°C
R_{gon} =	2	Ω		150	°C

figure 8. FWD

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

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



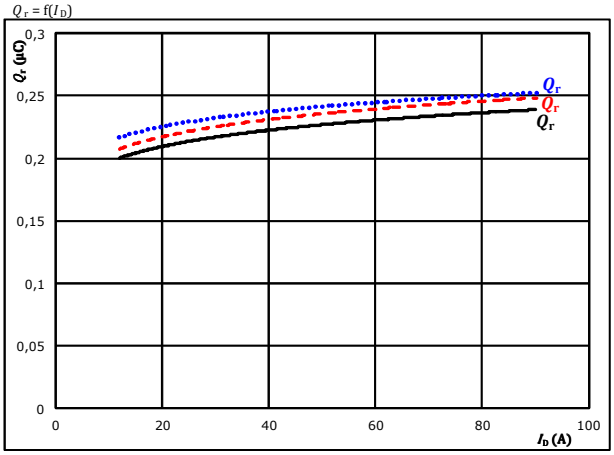
At					
V_{DS} =	700	V		25	°C
V_{GS} =	+16/-5	V	T_j:	125	°C
I_D =	50	A		150	°C

Boost Switching Characteristics

figure 9. FWD

Typical recovered charge as a function of drain current

$Q_r = f(I_D)$

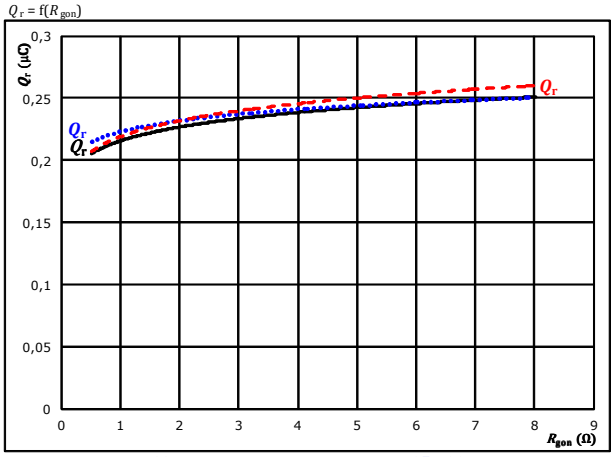


At	V_{DS} =	700	V		25 °C	
	V_{GS} =	+16/-5	V	T_j:	125 °C	
	R_{gon} =	2	Ω		150 °C	

figure 10. FWD

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

$Q_r = f(R_{gon})$

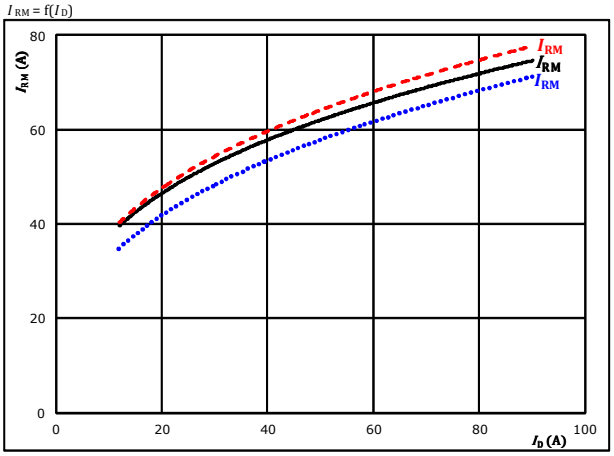


At	V_{DS} =	700	V		25 °C	
	V_{GS} =	+16/-5	V	T_j:	125 °C	
	I_D =	50	A		150 °C	

figure 11. FWD

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

$I_{RM} = f(I_D)$

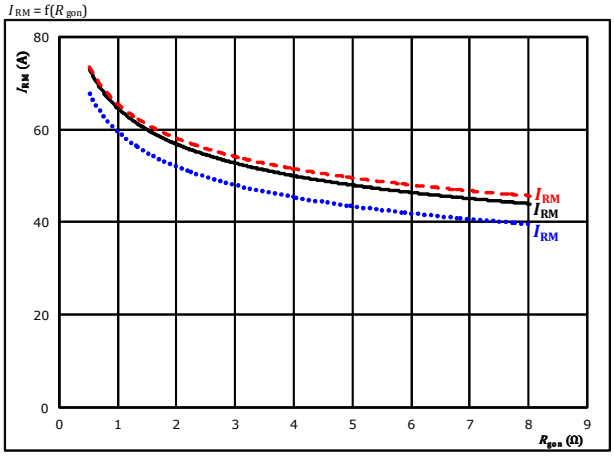


At	V_{DS} =	700	V		25 °C	
	V_{GS} =	+16/-5	V	T_j:	125 °C	
	R_{gon} =	2	Ω		150 °C	

figure 12. FWD

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

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



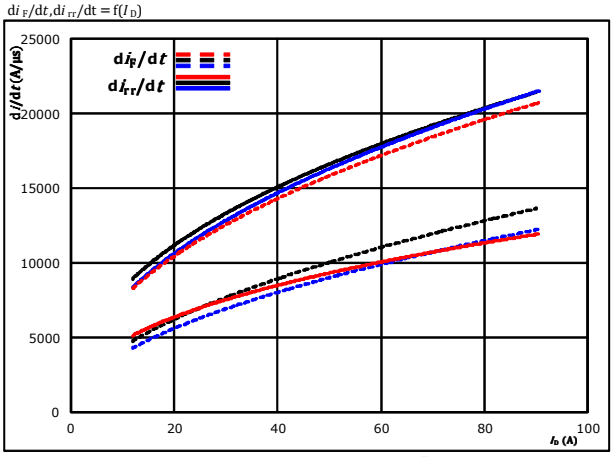
At	V_{DS} =	700	V		25 °C	
	V_{GS} =	+16/-5	V	T_j:	125 °C	
	I_D =	50	A		150 °C	

Boost Switching Characteristics

figure 13. **FWD**

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

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

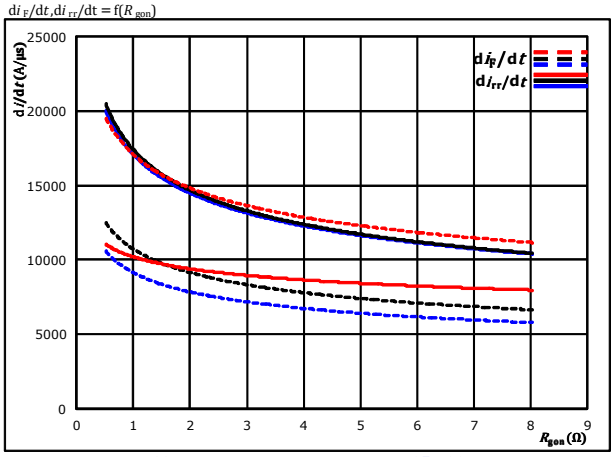


At	V_{DS} =	700	V		
	V_{GS} =	+16/-5	V	T_j:	25 °C, 125 °C, 150 °C
	R_{gon} =	2	Ω		

figure 14. **FWD**

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

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



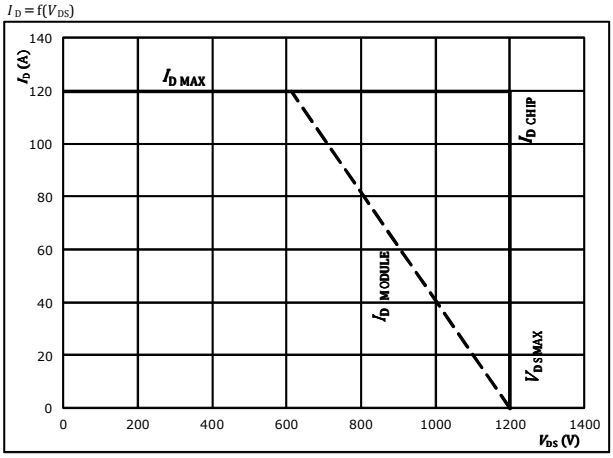
At	V_{DS} =	700	V		
	V_{GS} =	+16/-5	V	T_j:	25 °C, 125 °C, 150 °C
	I_D =	50	A		

Boost Switching Characteristics

figure 15. **MOSFET**

Reverse bias safe operating area

$I_D = f(V_{DS})$



At

T_j =	175	°C
R_{gon} =	2	Ω
R_{goff} =	2	Ω

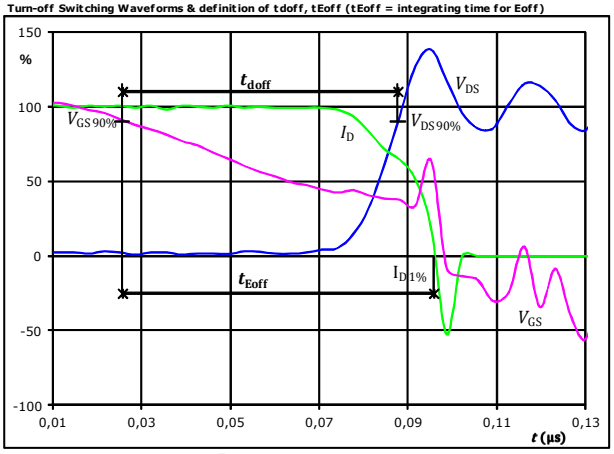
Boost Switching Characteristics

General conditions

T_j	=	**125 °C**
R_{gon}	=	**2 Ω**
R_{goff}	=	**2 Ω**

figure 1. **MOSFET**

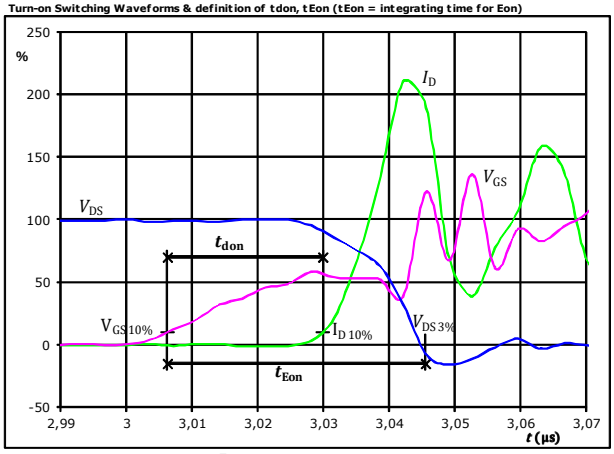
Turn-off Switching Waveforms & definition of tdoff, tEoff (tEoff = integrating time for Eoff)



$V_{GS}(0\%)$ =	-5	V
$V_{GS}(100\%)$ =	+16	V
$V_{DS}(100\%)$ =	700	V
$I_D(100\%)$ =	50	A
t_{doff} =	0,062	µs
t_{Eoff} =	0,070	µs

figure 2. **MOSFET**

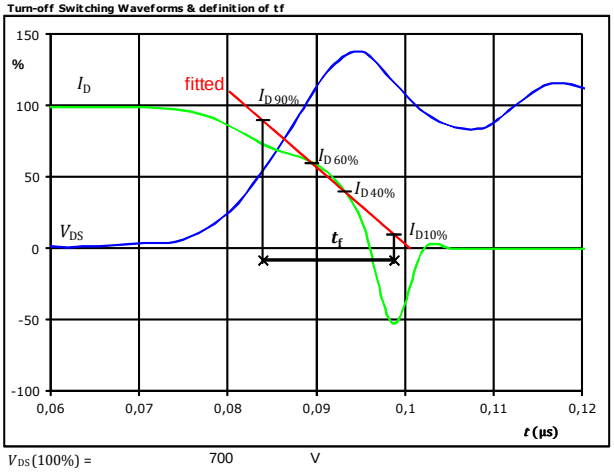
Turn-on Switching Waveforms & definition of tdon, tEon (tEon = integrating time for Eon)



$V_{GS}(0\%)$ =	-5	V
$V_{GS}(100\%)$ =	+16	V
$V_{DS}(100\%)$ =	700	V
$I_D(100\%)$ =	50	A
t_{don} =	0,024	µs
t_{Eon} =	0,039	µs

figure 3. **MOSFET**

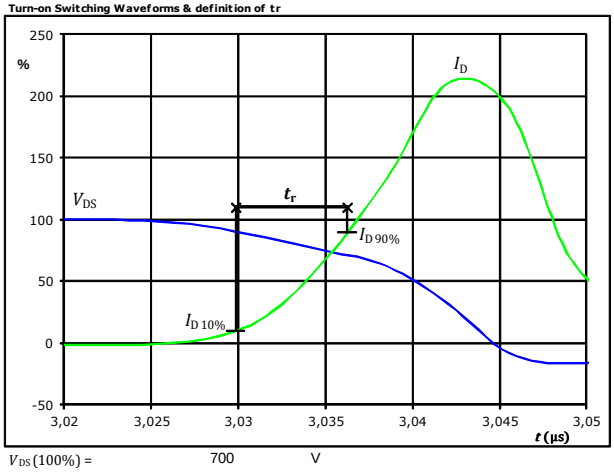
Turn-off Switching Waveforms & definition of tf



$V_{DS}(100\%)$ =	700	V
$I_D(100\%)$ =	50	A
t_f =	0,015	µs

figure 4. **MOSFET**

Turn-on Switching Waveforms & definition of tr

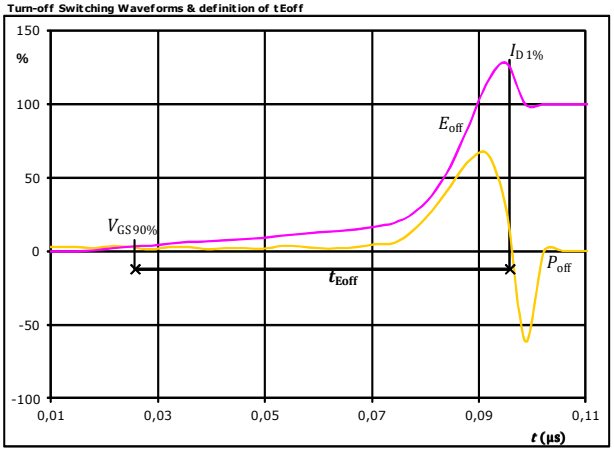


$V_{DS}(100\%)$ =	700	V
$I_D(100\%)$ =	50	A
t_r =	0,007	µs

Boost Switching Characteristics

figure 5. **MOSFET**

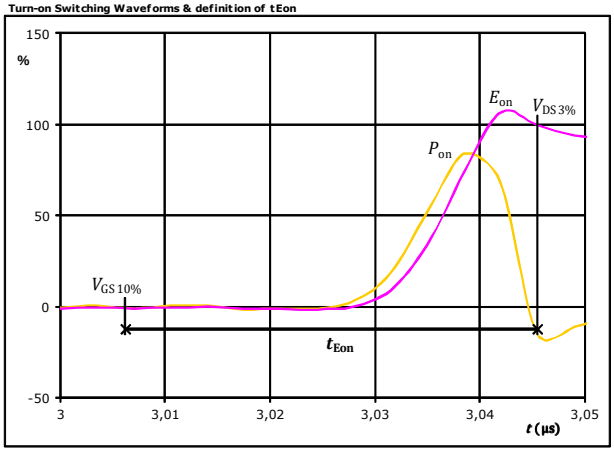
Turn-off Switching Waveforms & definition of tEoff



$P_{off}(100\%)$ =	35,11	kW
$E_{off}(100\%)$ =	0,30	mJ
t_{Eoff} =	0,07	µs

figure 6. **MOSFET**

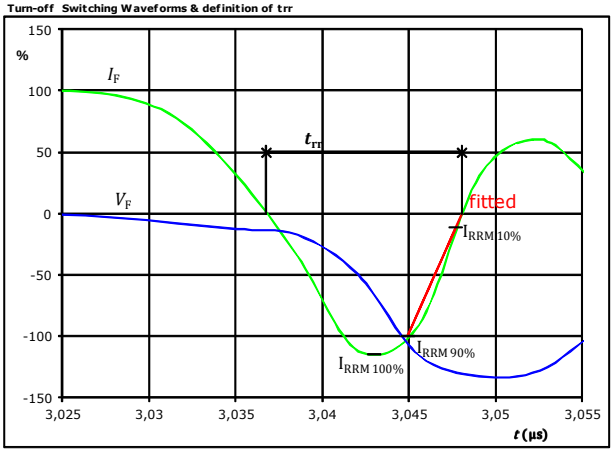
Turn-on Switching Waveforms & definition of tEon



$P_{on}(100\%)$ =	35,11	kW
$E_{on}(100\%)$ =	0,25	mJ
t_{Eon} =	0,04	µs

figure 7. **FWD**

Turn-off Switching Waveforms & definition of trr

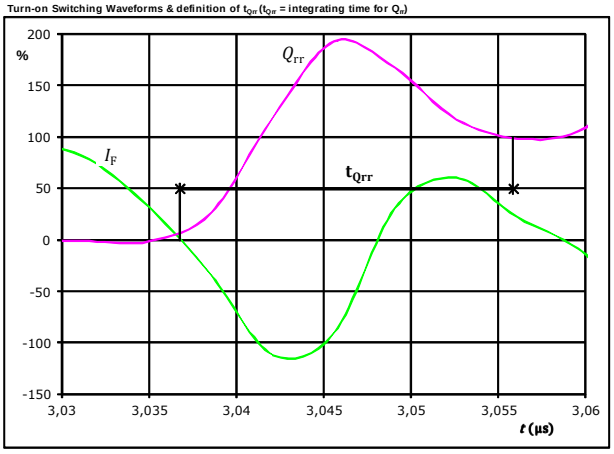


$V_F(100\%)$ =	700	V
$I_F(100\%)$ =	50	A
$I_{RRM}(100\%)$ =	-60	A
t_{rr} =	0,011	µs

Boost Switching Characteristics

figure 8. **FWD**

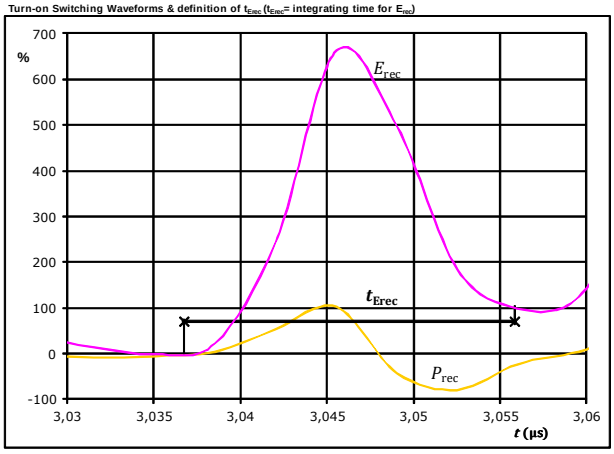
Turn-on Switching Waveforms & definition of t_{Qrr} (t_{Qrr} = integrating time for Q_{rr})



I_F (100%) =	50	A
Q_{rr} (100%) =	0,21	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%) =	35,11	kW
E_{rec} (100%) =	0,08	mJ
t_{Erec} =	0,02	µs

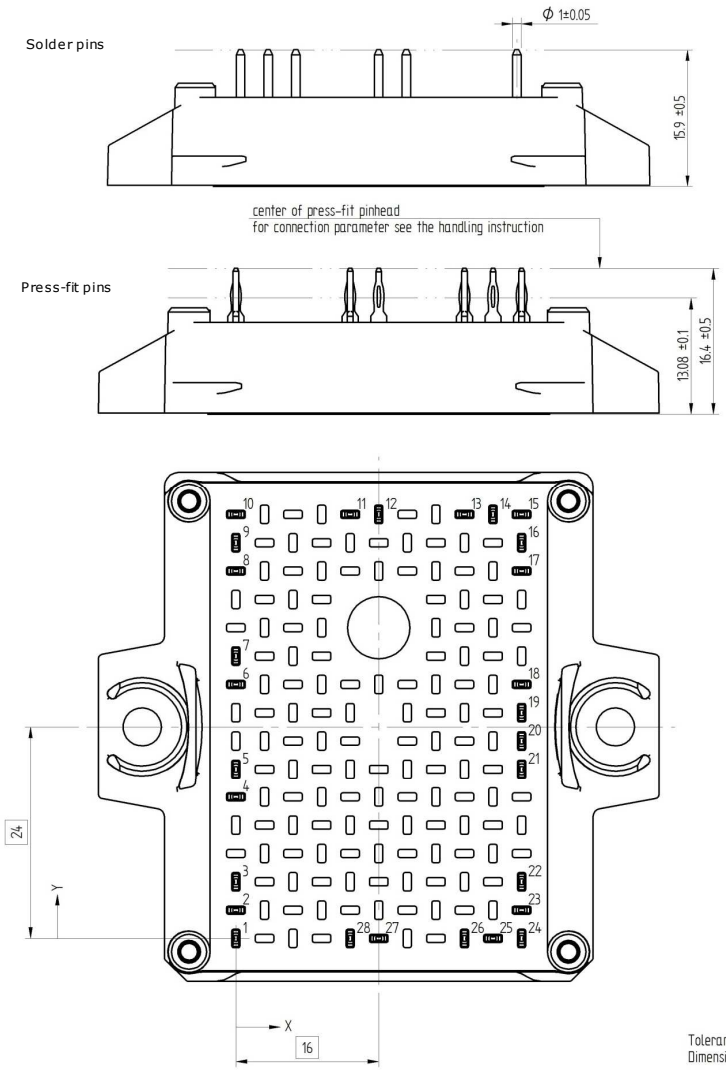
Ordering Code & Marking

Version	Ordering Code
without thermal paste 12 mm housing with solder pins	10-LY12B2B027ME01-LB88L08
without thermal paste 12 mm housing with press-fit pins	10-EY12B2B027ME01-LB88L08T

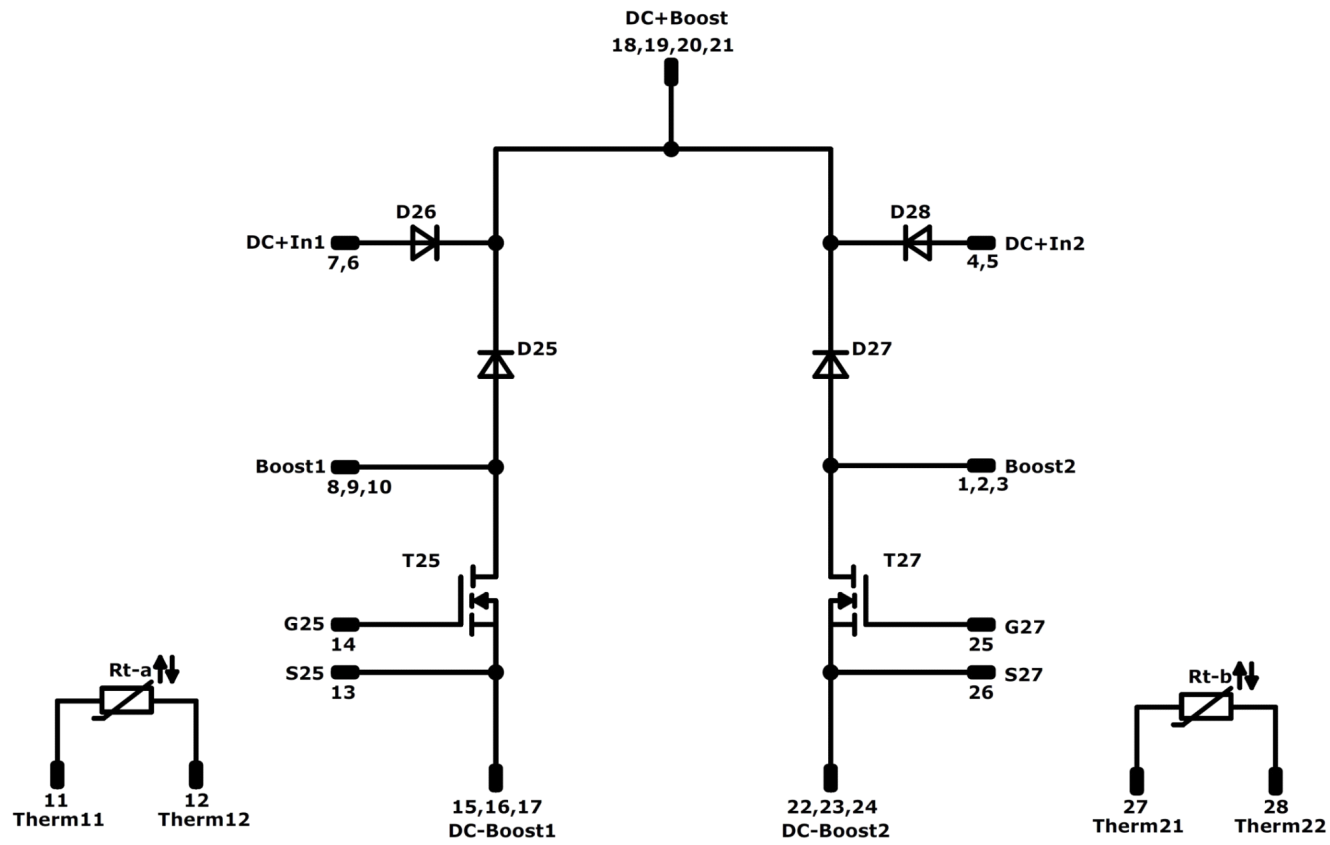
Text	**Name**		**Date code**	**UL & VIN**	**Lot**	**Serial**
	NN-NNNNNNNNNNNNN-TTTTTTVV		WWYY	UL VIN	LLLLL	SSSS
Datamatrix	**Type&Ver**	**Lot number**	**Serial**	**Date code**		
	TTTTTTVV	LLLLL	SSSS	WWYY		

Outline

Pin table			
Pin	X	Y	Function
1	0	0	Boost2
2	0	3,2	Boost2
3	0	6,4	Boost2
4	0	16	DC+In2
5	0	19,2	DC+In2
6	0	28,8	DC+In1
7	0	32	DC+In1
8	0	41,6	Boost1
9	0	44,8	Boost1
10	0	48	Boost1
11	12,8	48	Therm11
12	16	48	Therm12
13	25,6	48	S25
14	28,8	48	G25
15	32	48	DC-Boost1
16	32	44,8	DC-Boost1
17	32	41,6	DC-Boost1
18	32	28,8	DC+Boost
19	32	25,6	DC+Boost
20	32	22,4	DC+Boost
21	32	19,2	DC+Boost
22	32	6,4	DC-Boost2
23	32	3,2	DC-Boost2
24	32	0	DC-Boost2
25	28,8	0	G27
26	25,6	0	S27
27	16	0	Therm22
28	12,8	0	Therm21



Pinout



Identification

ID	Component	Voltage	Current	Function	Comment
T25, T27	MOSFET	1200 V	27 mΩ	Boost Switch	
D25, D27	FWD	1200 V	40 A	Boost Diode	
D26, D28	FWD	1600 V	50 A	ByPass Diode	
Rt-a, Rt-b	NTC			Thermistor	

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

Handling instruction
Handling instructions for *flow*E 2 packages see vincotech.com website.

Package data
Package data for *flow*E 2 packages see vincotech.com website.

UL recognition and file number
This device is certified according to UL 1557 standard, UL file number E192116. For more information see vincotech.com website.

Document No.:	Date:	Modification:	Pages
10-xY12B2B027ME01-LB88L08x-D4-14	04 Apr. 2018		