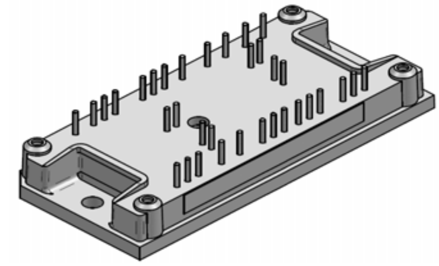
flowSOL 1 BI — 650 V/41 mOhm

Features

- Low inductive 12mm flow1 package
- Booster:
  - Dual boost topology
  - MOSFET 650V/37mOhm + SiC diode
  - Bypass rectifier
- Inverter:
  - Pseudo H-bridge topology
  - MOSFET 650V/41mOhm CFD + SiC diode
- Integrated DC-capacitors
- Temperature sensor

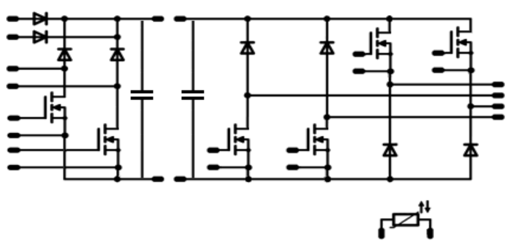
flow1 12mm housing



Target Applications

- Solar Inverter:
- High efficient transformer-less solar inverter with bipolar modulation

Schematic



Types

10-FY07BIA041MC-M528E58

Maximum Ratings

T_j=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Bypass Diode					
Repetitive peak reverse voltage	V_{RRM}			1600	V
Forward current per diode	I_{FAV}	DC current	T_h=80°C T_c=80°C	41 55	A
Surge forward current	I_{FSM}	t_p=10ms	T_j=25°C	370	A
I2t-value	I^2t			370	A^2s
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	50 76	W
Maximum Junction Temperature	$T_j$max			150	°C
Input Boost MOSFET					
Drain to source breakdown voltage	V_{DS}			650	V
DC drain current	I_D	T_j=$T_j$max	T_h=80°C T_c=80°C	35 43	A
Pulsed drain current	I_{Dpulse}	T_j=25°C		297	A
Power dissipation	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	105 159	W
Gate-source peak voltage	V_{GS}			±20	V
Maximum Junction Temperature	$T_j$max			150	°C

Maximum Ratings

Tj=25°C, unless otherwise specified

Parameter	Symbol	Condition		Value	Unit
Input Boost Diode					
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25°C		650	V
DC forward current	I_F	T_j=$T_j$max	T_h=80°C T_c=80°C	22 28	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		134	A
Power dissipation	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	48 73	W
Maximum Junction Temperature	$T_j$max			175	°C
Pseudo H-Bridge MOSFET					
Drain to source breakdown voltage	V_{DS}			650	V
DC drain current	I_D	T_j=$T_j$max	T_h=80°C T_c=80°C	34 42	A
Pulsed drain current	I_{Dpulse}	t_p limited by $T_j$max	Tc=25°C	255	A
Power dissipation	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	111 168	W
Gate-source peak voltage	Vgs			±20	V
Maximum Junction Temperature	$T_j$max			150	°C
Pseudo H-Bridge Diode					
Peak Repetitive Reverse Voltage	V_{RRM}	T_j=25°C		650	V
DC forward current	I_F	T_j=$T_j$max	T_h=80°C T_c=80°C	22 29	A
Repetitive peak forward current	I_{FRM}	t_p limited by $T_j$max		134	A
Power dissipation per Diode	P_{tot}	T_j=$T_j$max	T_h=80°C T_c=80°C	48 73	W
Maximum Junction Temperature	$T_j$max			175	°C
DC link Capacitor					
Max.DC voltage	V_{MAX}		Tc=25°C	630	V
Thermal Properties					
Storage temperature	T_{stg}			-40…+125	°C
Operation temperature under switching condition	T_{op}			-40…+(Tjmax - 25)	°C
Insulation Properties					
Insulation voltage	V_{is}	t=2s	DC voltage	4000	V
Creepage distance				min 12,7	mm
Clearance				min 12,7	mm

Characteristic Values

Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
Bypass Diode										
Forward voltage	solar inverte				35	Tj=25°C Tj=125°C		1.18 1.17	1.21	V
Threshold voltage (for power loss calc. only)	V_{to}				35	Tj=25°C Tj=125°C		0.91 0.80		V
Slope resistance (for power loss calc. only)	r_t				35	Tj=25°C Tj=125°C		0.01 0.01		Ω
Reverse current	I_r			1600		Tj=25°C Tj=125°C			0.05	mA
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1.40		K/W
Thermal resistance chip to case per chip	R_{thJC}							0.92		
Input Boost MOSFET										
Static drain to source ON resistance	$R_{DS(on)}$		10		50	Tj=25°C Tj=125°C		38 78		mΩ
Gate threshold voltage	$V_{(GS)th}$				0.0033	Tj=25°C Tj=125°C	2.5	3	3.5	V
Gate to Source Leakage Current	I_{gss}		20	0		Tj=25°C Tj=125°C			100	nA
Zero Gate Voltage Drain Current	I_{dss}		0	650		Tj=25°C Tj=125°C			2000	nA
Turn On Delay Time	$t_{d(ON)}$	Rgoff=2 Ω Rgon=2 Ω	10	400	30	Tj=25°C Tj=125°C		30 29		ns
Rise Time	t_r					Tj=25°C Tj=125°C		6 7		
Turn off delay time	$t_{d(OFF)}$					Tj=25°C Tj=125°C		173 186		
Fall time	t_f					Tj=25°C Tj=125°C		6 7		
Turn-on energy loss per pulse	E_{on}					Tj=25°C Tj=125°C		0.11 0.12		mWs
Turn-off energy loss per pulse	E_{off}					Tj=25°C Tj=125°C		0.04 0.06		
Total gate charge	Q_g	Rgon=2 Ω	10	480	49.6	Tj=25°C Tj=125°C		330		nC
Gate to source charge	Q_{gs}					Tj=25°C Tj=125°C		40		
Gate to drain charge	Q_{gd}					Tj=25°C Tj=125°C		170		
Input capacitance	C_{iss}	f=1MHz	0	100		Tj=25°C		7240		pF
Output capacitance	C_{oss}							380		
Reverse transfer capacitance	C_{rss}							tbd.		
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0.67		K/W
Thermal resistance chip to case per chip	R_{thJC}							0.44		
Input Boost Diode										
Forward voltage	V_F				20	Tj=25°C Tj=125°C		1.61 1.86	1.8	V
Reverse leakage current	I_{rm}		10	400	30	Tj=25°C Tj=125°C			60	μA
Peak recovery current	I_{RRM}	Rgon=2 Ω	10	400	30	Tj=25°C Tj=125°C		25 23		A
Reverse recovery time	t_{rr}					Tj=25°C Tj=125°C		9 11		ns
Reverse recovery charge	Q_{rr}					Tj=25°C Tj=125°C		0.19 0.26		μC
Reverse recovered energy	E_{rec}					Tj=25°C Tj=125°C		0.05 0.07		mWs
Peak rate of fall of recovery current	di(rec)max /dt					Tj=25°C Tj=125°C		6521 4908		A/μs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1.98		K/W
Thermal resistance chip to case per chip	R_{thJC}							1.31		

Characteristic Values

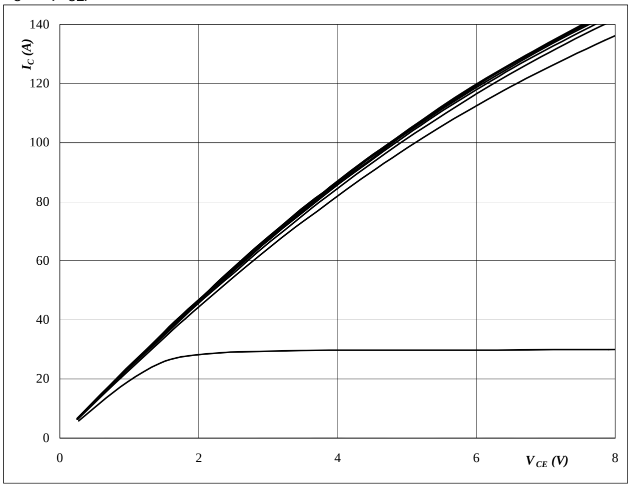
Parameter	Symbol	Conditions					Value			Unit
			V_{GE} [V] or V_{GS} [V]	V_r [V] or V_{CE} [V] or V_{DS} [V]	I_C [A] or I_F [A] or I_D [A]	T_j	Min	Typ	Max	
Pseudo H-Bridge MOSFET										
Static drain to source ON resistance	$R_{ds(on)}$		10		50	Tj=25°C Tj=125°C		43 80		mΩ
Gate threshold voltage	$V_{(GS)th}$			V_{DS}=V_{GS}	0.0033	Tj=25°C Tj=125°C	3.5	4	4.5	V
Gate to Source Leakage Current	I_{gss}		20	0		Tj=25°C Tj=125°C			100	nA
Zero Gate Voltage Drain Current	I_{dss}		0	650		Tj=25°C Tj=125°C			3500	nA
Turn On Delay Time	$t_{d(ON)}$	Rgoff=2 Ω Rgon=2 Ω	10	400	30	Tj=25°C Tj=125°C		37 36		ns
Rise Time	t_r	Rgoff=2 Ω Rgon=2 Ω	10	400	30	Tj=25°C Tj=125°C		6 7		ns
Turn off delay time	$t_{d(OFF)}$	Rgoff=2 Ω Rgon=2 Ω	10	400	30	Tj=25°C Tj=125°C		146 154		ns
Fall time	t_f	Rgoff=2 Ω Rgon=2 Ω	10	400	30	Tj=25°C Tj=125°C		7 4		ns
Turn-on energy loss per pulse	E_{on}	Rgoff=2 Ω Rgon=2 Ω	10	400	30	Tj=25°C Tj=125°C		0.12 0.14		mWs
Turn-off energy loss per pulse	E_{off}	Rgoff=2 Ω Rgon=2 Ω	10	400	30	Tj=25°C Tj=125°C		0.03 0.04		mWs
Total gate charge	Q_g		10	480	49.6	Tj=25°C		300		nC
Gate to source charge	Q_{gs}		10	480	49.6	Tj=25°C		54		nC
Gate to drain charge	Q_{gd}		10	480	49.6	Tj=25°C		165		nC
Input capacitance	C_{iss}	f=1MHz	0	100		Tj=25°C		8400		pF
Output capacitance	C_{oss}	f=1MHz	0	100		Tj=25°C		400		pF
Reverse transfer capacitance	C_{rss}	f=1MHz	0	100		Tj=25°C		tbd.		pF
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						0.63		K/W
Thermal resistance chip to case per chip	R_{thJC}	Thermal grease thickness≤50um λ = 1 W/mK						0.42		K/W
Pseudo H-Bridge Diode										
Diode forward voltage	V_F				50	Tj=25°C Tj=125°C		1.61 1.85	1.8	V
Peak reverse recovery current	I_{RRM}	Rgon=2 Ω	15	400	60	Tj=25°C Tj=125°C		27 24		A
Reverse recovery time	t_{rr}	Rgon=2 Ω	15	400	60	Tj=25°C Tj=125°C		10 10		ns
Reverse recovered charge	Q_{rr}	Rgon=2 Ω	15	400	60	Tj=25°C Tj=125°C		0.19 0.20		μC
Peak rate of fall of recovery current	di(rec)max /dt	Rgon=2 Ω	15	400	60	Tj=25°C Tj=125°C		7041 5575		A/μs
Reverse recovery energy	E_{rec}	Rgon=2 Ω	15	400	60	Tj=25°C Tj=125°C		0.04 0.05		mWs
Thermal resistance chip to heatsink per chip	R_{thJH}	Thermal grease thickness≤50um λ = 1 W/mK						1.98		K/W
Thermal resistance chip to case per chip	R_{thJC}	Thermal grease thickness≤50um λ = 1 W/mK						1.31		K/W
DC link Capacitor										
C value	C							47		nF
Thermistor										
Rated resistance	R					Tj=25°C		22000		Ω
Deviation of R25	ΔR/R	R100=1486 Ω				Tc=100°C	-5		+5	%
Power dissipation	P					Tc=100°C		200		mW
Power dissipation constant						Tj=25°C		2		mW/K
B-value	$B_{(25/50)}$	Tol. ±3%				Tj=25°C		3950		K
B-value	$B_{(25/100)}$	Tol. ±3%				Tj=25°C		3996		K
Vincotech NTC Reference						Tj=25°C			B	

Pseudo H-Bridge

Figure 1 MOSFET

Typical output characteristics

$I_C = f(V_{CE})$



At

t_p =	250	μs
T_j =	25	°C
V_{GE} from	0 V to 20 V in steps of 2 V	

Figure 2 MOSFET

Typical output characteristics

$I_C = f(V_{CE})$

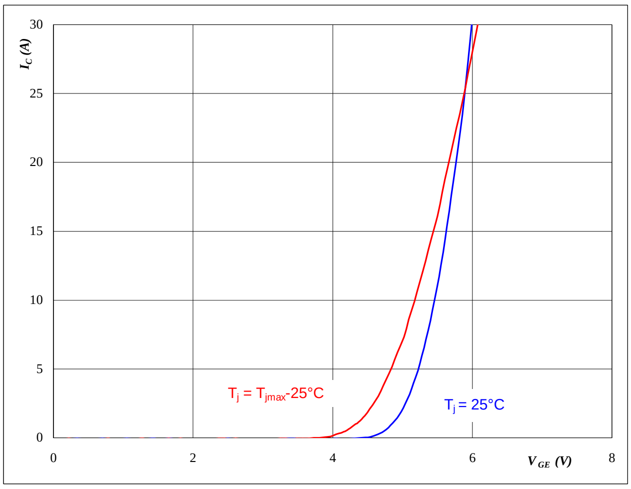
At

t_p =	250	μs
T_j =	125	°C
V_{GE} from	0 V to 20 V in steps of 2 V	

Figure 3 MOSFET

Typical transfer characteristics

$I_C = f(V_{GE})$



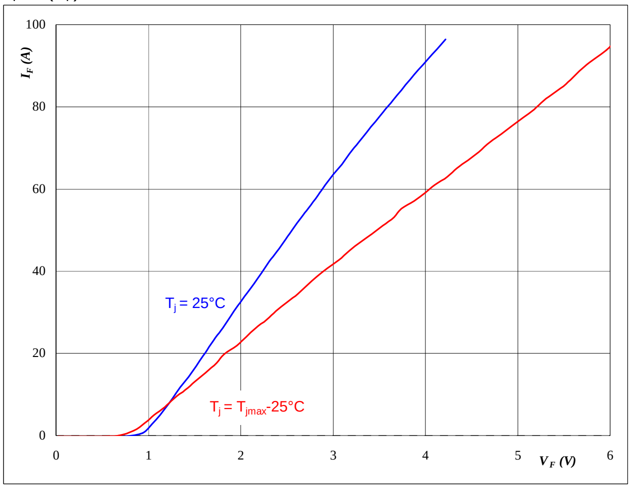
At

t_p =	250	μs
V_{CE} =	10	V

Figure 4 FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



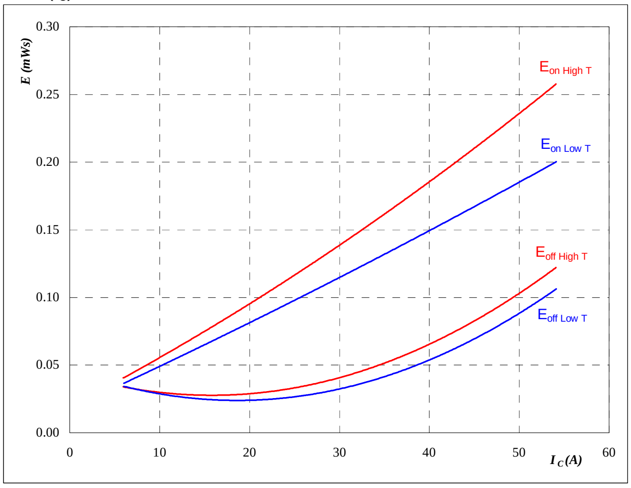
At

t_p =	250	μs

Pseudo H-Bridge

Figure 5 MOSFET

Typical switching energy losses
as a function of collector current
$E = f(I_C)$

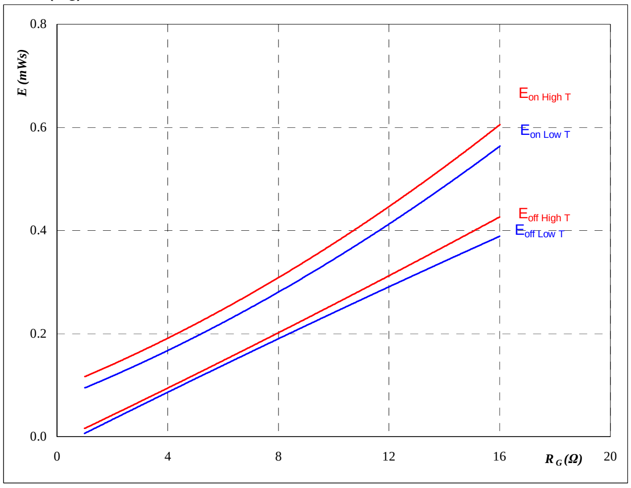


With an inductive load at

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	10	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Figure 6 MOSFET

Typical switching energy losses
as a function of gate resistor
$E = f(R_G)$

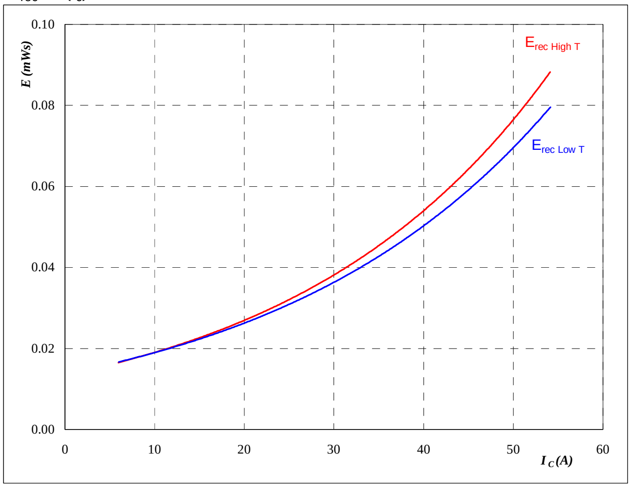


With an inductive load at

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	10	V
I_C =	30	A

Figure 7 FWD

Typical reverse recovery energy loss
as a function of collector current
$E_{rec} = f(I_c)$

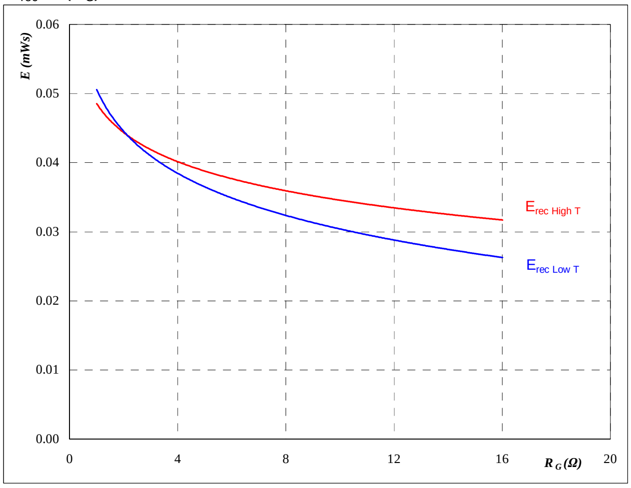


With an inductive load at

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	10	V
R_{gon} =	2	Ω

Figure 8 FWD

Typical reverse recovery energy loss
as a function of gate resistor
$E_{rec} = f(R_G)$



With an inductive load at

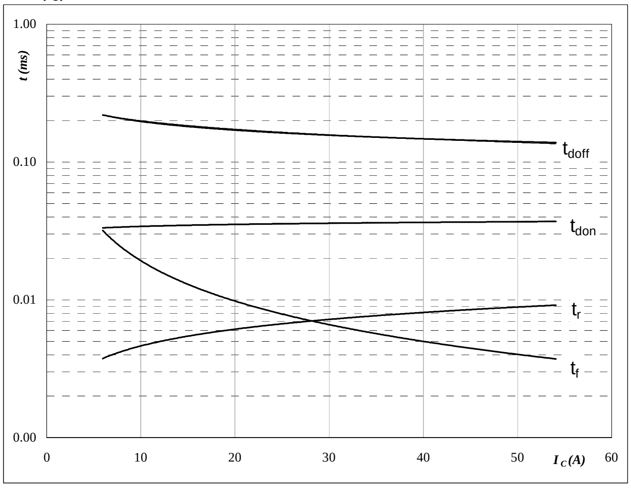
T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	10	V
I_C =	30	A

Pseudo H-Bridge

Figure 9 MOSFET

Typical switching times as a function of collector current

$t = f(I_C)$



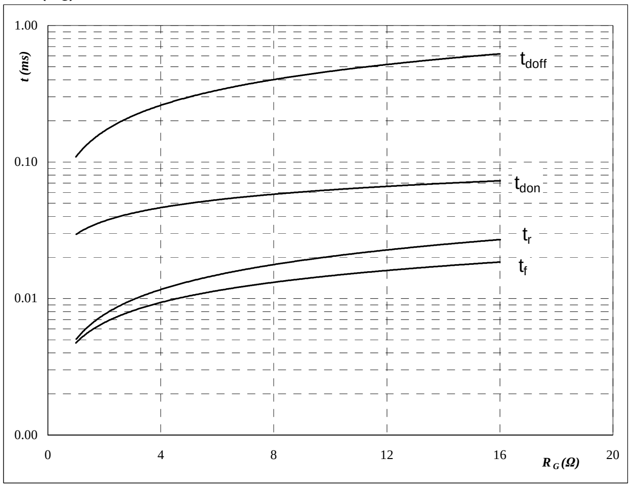
With an inductive load at

T_j =	125	°C
V_{CE} =	400	V
V_{GE} =	10	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Figure 10 MOSFET

Typical switching times as a function of gate resistor

$t = f(R_G)$



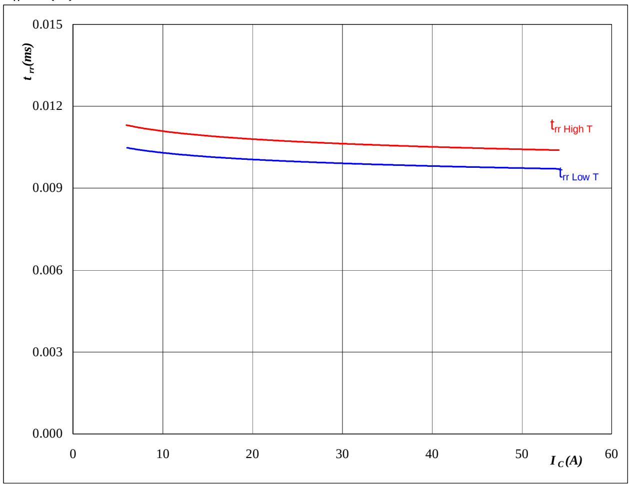
With an inductive load at

T_j =	125	°C
V_{CE} =	400	V
V_{GE} =	10	V
I_C =	30	A

Figure 11 FWD

Typical reverse recovery time as a function of collector current

$t_{rr} = f(Ic)$



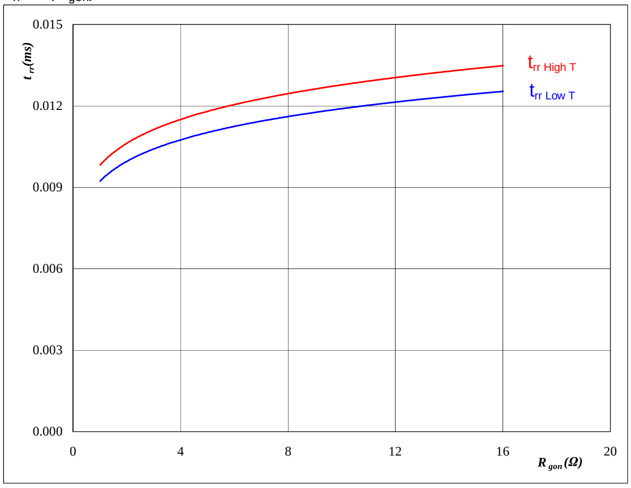
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	10	V
R_{gon} =	2	Ω

Figure 12 FWD

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

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



At

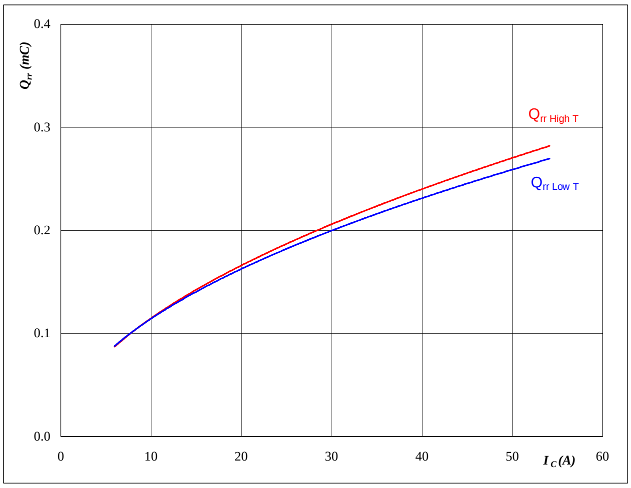
T_j =	25/125	°C
V_R =	400	V
I_F =	30	A
V_{GE} =	10	V

Pseudo H-Bridge

Figure 13 FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



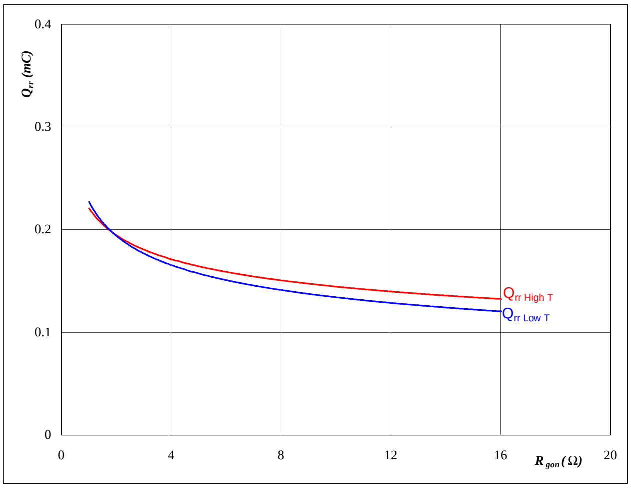
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	10	V
R_{gon} =	2	Ω

Figure 14 FWD

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

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



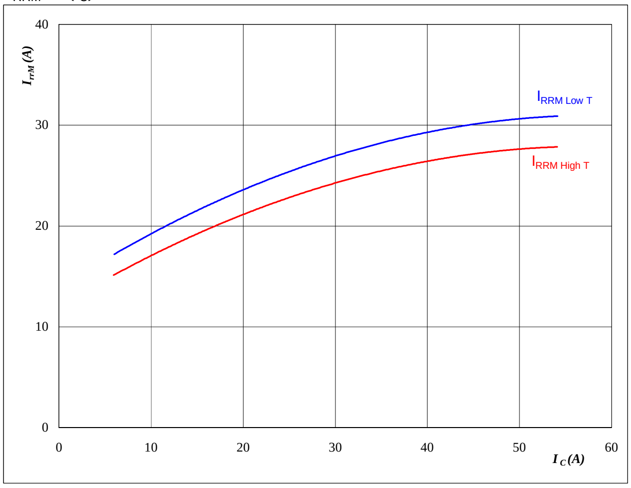
At

T_j =	25/125	°C
V_R =	400	V
I_F =	30	A
V_{GE} =	10	V

Figure 15 FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



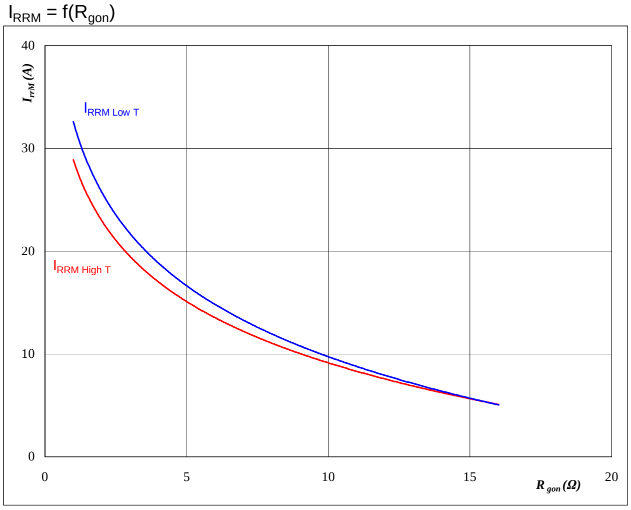
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	10	V
R_{gon} =	2	Ω

Figure 16 FWD

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

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



At

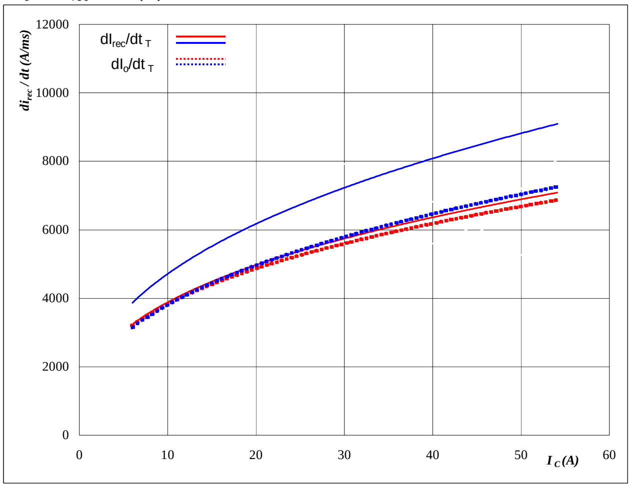
T_j =	25/125	°C
V_R =	400	V
I_F =	30	A
V_{GE} =	10	V

Pseudo H-Bridge

Figure 17 FWD

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

$dI_0/dt, dI_{rec}/dt = f(Ic)$



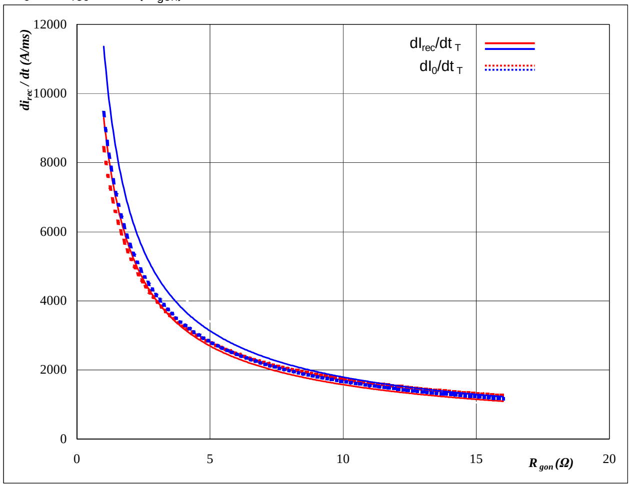
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	10	V
R_{gon} =	2	Ω

Figure 18 FWD

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

$dI_0/dt, dI_{rec}/dt = f(R_{gon})$



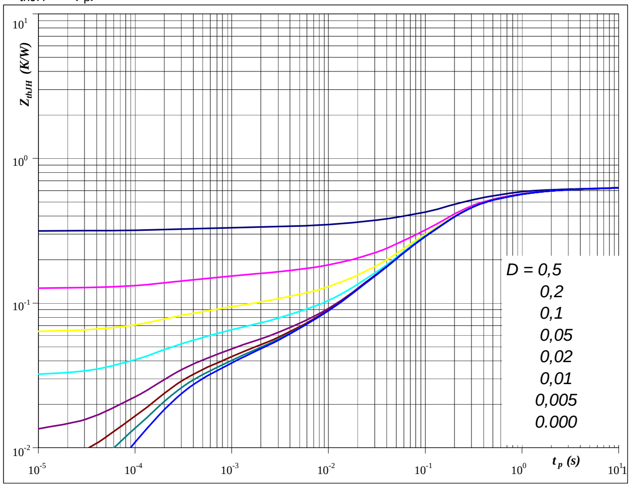
At

T_j =	25/125	°C
V_R =	400	V
I_F =	30	A
V_{GE} =	10	V

Figure 19 MOSFET

IGBT transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	0.63	K/W

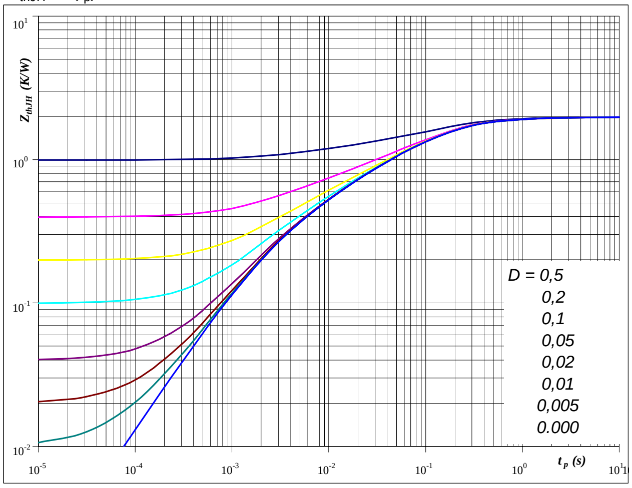
IGBT thermal model values

R (C/W)	Tau (s)
0.04	5.1E+00
0.08	1.0E+00
0.30	2.1E-01
0.14	8.6E-02
0.03	1.3E-02
0.02	1.4E-03

Figure 20 FWD

FWD transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	1.98	K/W

FWD thermal model values

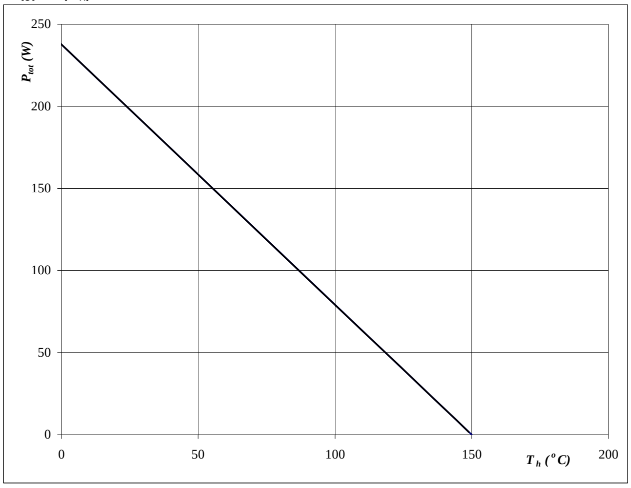
R (C/W)	Tau (s)
0.06	3.9E+00
0.15	7.0E-01
0.84	1.5E-01
0.44	4.4E-02
0.33	9.5E-03
0.17	2.0E-03

Pseudo H-Bridge

Figure 21 MOSFET

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



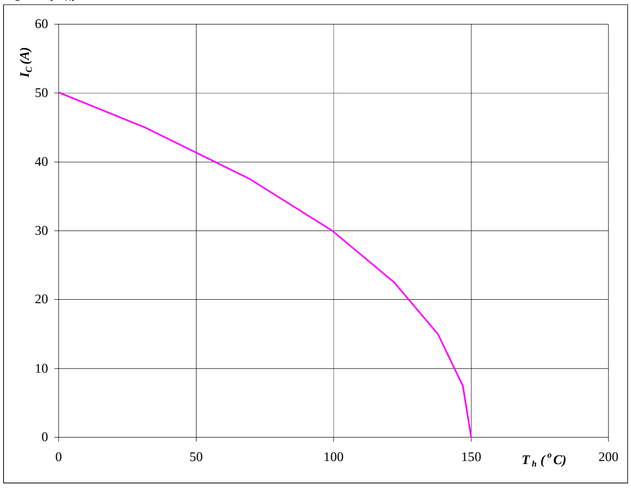
At

T_j = 150 °C

Figure 22 MOSFET

Collector current as a function of heatsink temperature

$I_C = f(T_h)$



At

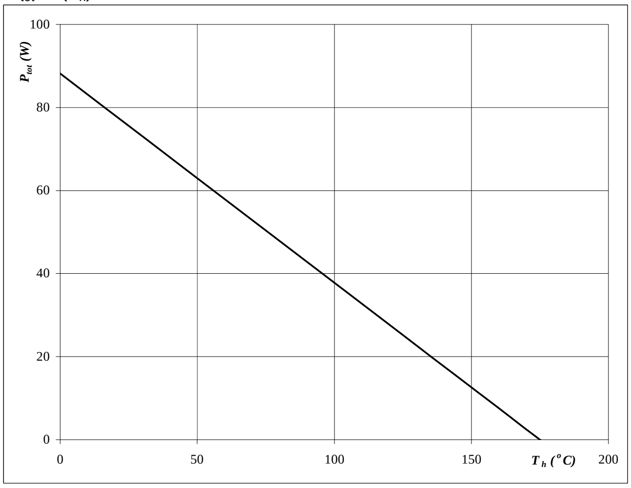
T_j = 150 °C

V_{GE} = 15 V

Figure 23 FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



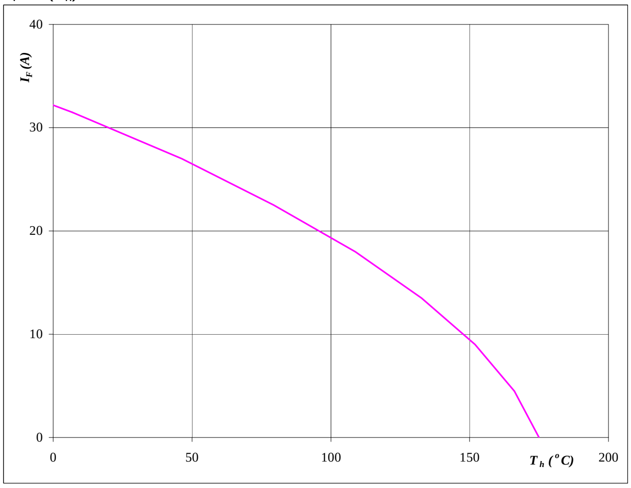
At

T_j = 175 °C

Figure 24 FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

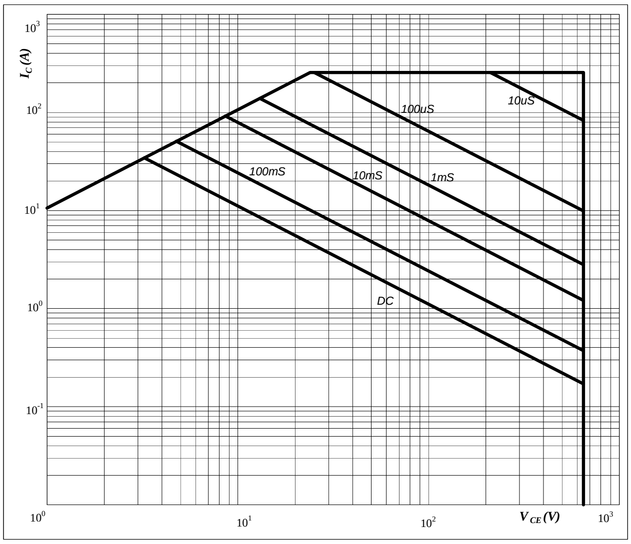
T_j = 175 °C

Pseudo H-Bridge

Figure 25	MOSFET

Safe operating area as a function of collector-emitter voltage

$I_C = f(V_{CE})$



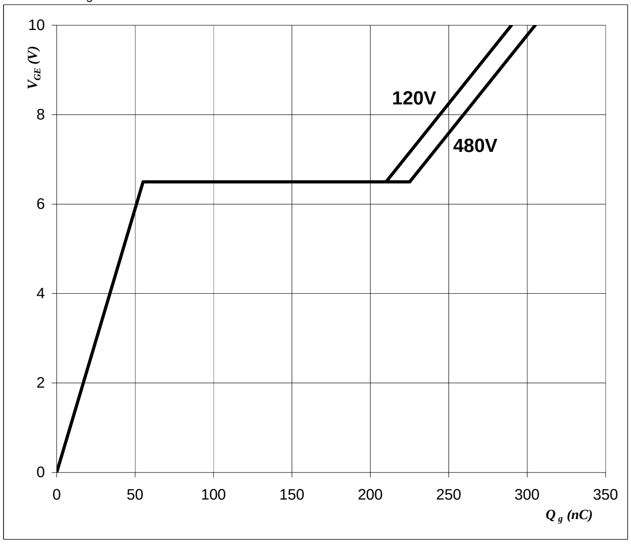
At

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

Figure 26	MOSFET

Gate voltage vs Gate charge

$V_{GE} = f(Q_g)$



At

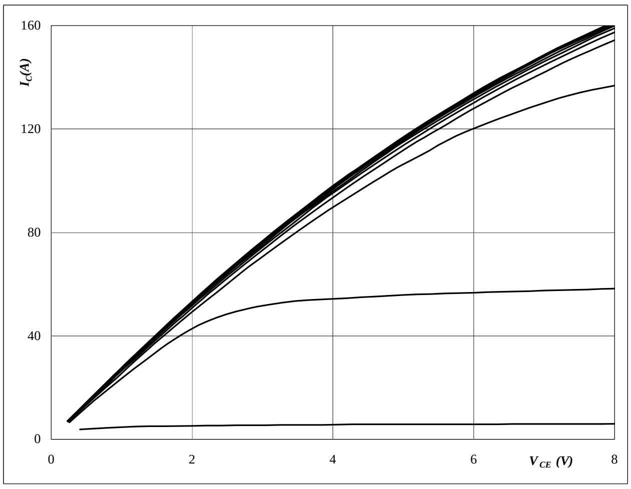
I_C =	50	A

INPUT BOOST

Figure 1 BOOST MOSFET

Typical output characteristics

$I_D = f(V_{DS})$



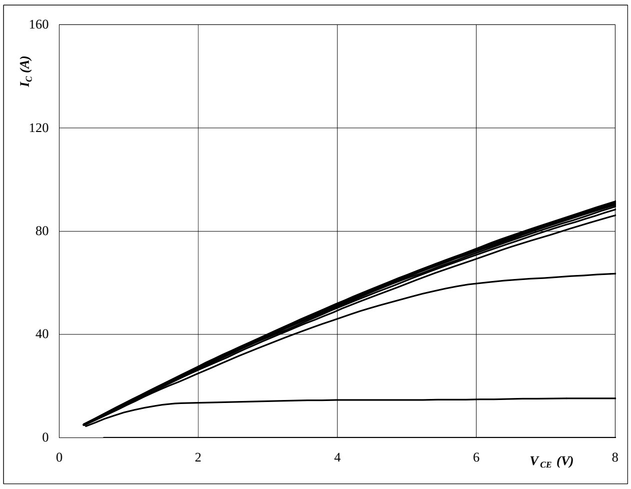
At

t_p =	250	μs
T_j =	25	°C
V_{GS} from	3 V to 13 V in steps of 1 V	

Figure 2 BOOST MOSFET

Typical output characteristics

$I_D = f(V_{DS})$



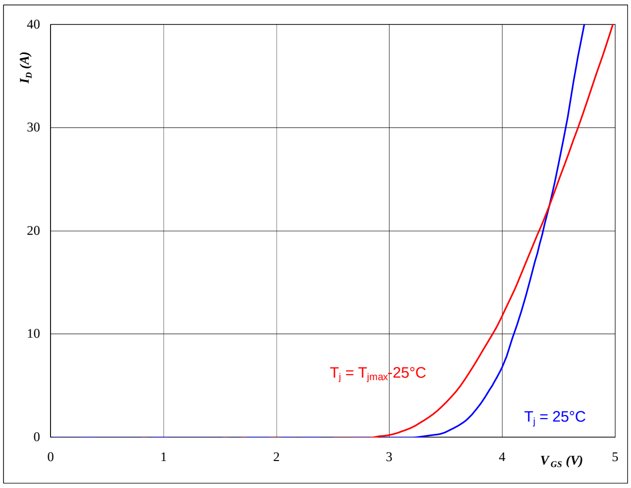
At

t_p =	250	μs
T_j =	125	°C
V_{GS} from	3 V to 13 V in steps of 1 V	

Figure 3 BOOST MOSFET

Typical transfer characteristics

$I_D = f(V_{GS})$



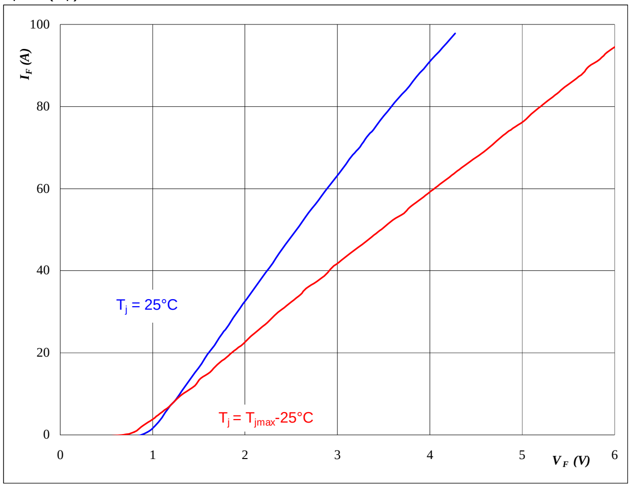
At

t_p =	250	μs
V_{DS} =	10	V

Figure 4 BOOST FWD

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



At

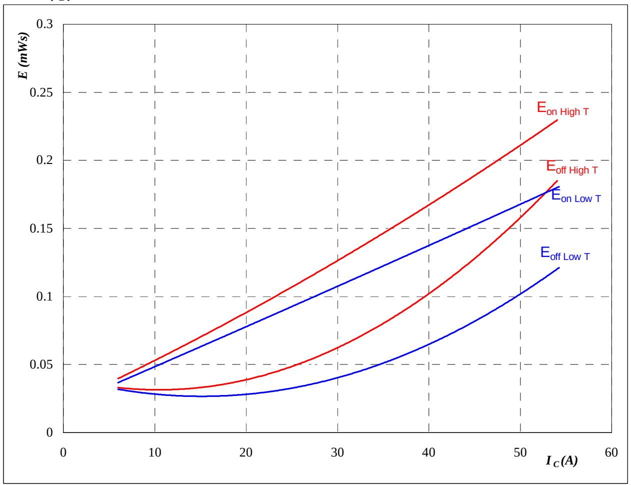
t_p =	250	μs

INPUT BOOST

Figure 5 BOOST MOSFET

**Typical switching energy losses
as a function of collector current**

$E = f(I_D)$



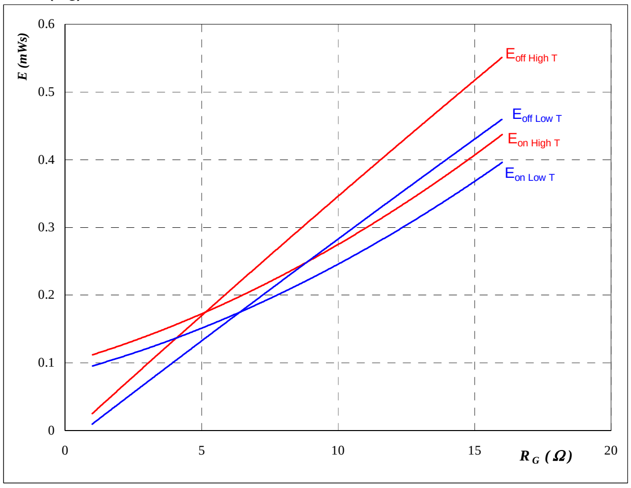
With an inductive load at

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	10	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Figure 6 BOOST MOSFET

**Typical switching energy losses
as a function of gate resistor**

$E = f(R_G)$



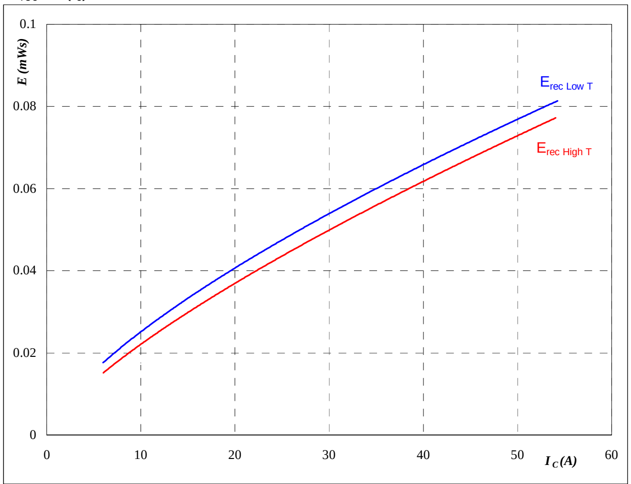
With an inductive load at

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	10	V
I_D =	30	A

Figure 7 BOOST FWD

**Typical reverse recovery energy loss
as a function of collector (drain) current**

$E_{rec} = f(I_c)$



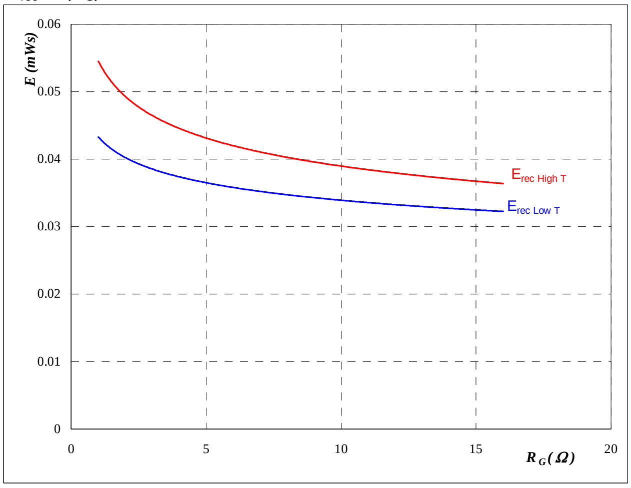
With an inductive load at

T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	10	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Figure 8 BOOST FWD

**Typical reverse recovery energy loss
as a function of gate resistor**

$E_{rec} = f(R_G)$



With an inductive load at

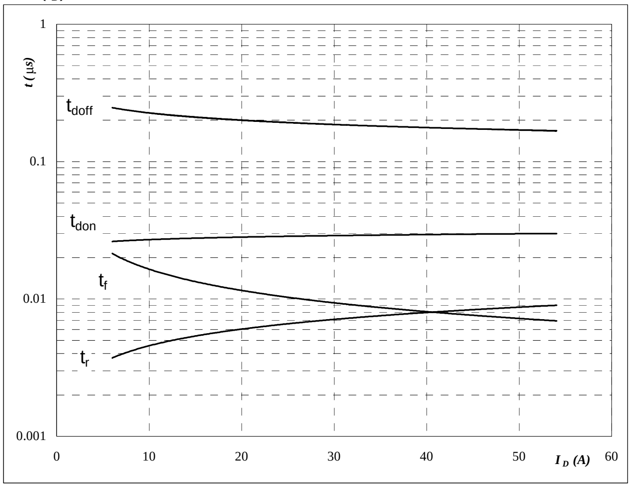
T_j =	25/125	°C
V_{DS} =	400	V
V_{GS} =	10	V
I_D =	30	A

INPUT BOOST

Figure 9 BOOST MOSFET

Typical switching times as a function of collector current

t = f(I_D)



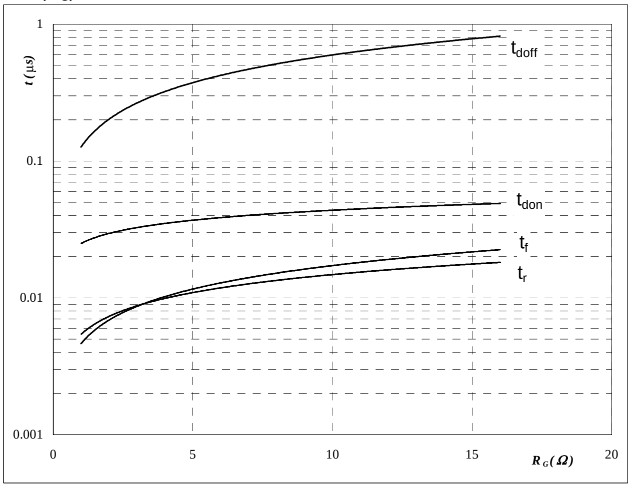
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	10	V
R_{gon} =	2	Ω
R_{goff} =	2	Ω

Figure 10 BOOST MOSFET

Typical switching times as a function of gate resistor

t = f(R_G)



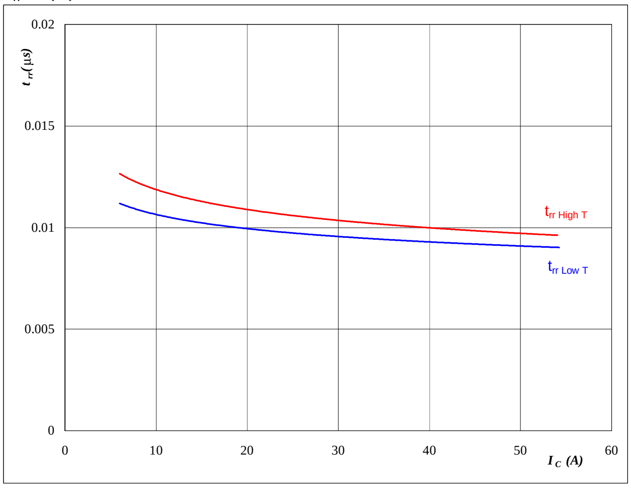
With an inductive load at

T_j =	125	°C
V_{DS} =	400	V
V_{GS} =	10	V
I_C =	30	A

Figure 11 BOOST FWD

Typical reverse recovery time as a function of collector current

t_{rr} = f(Ic)



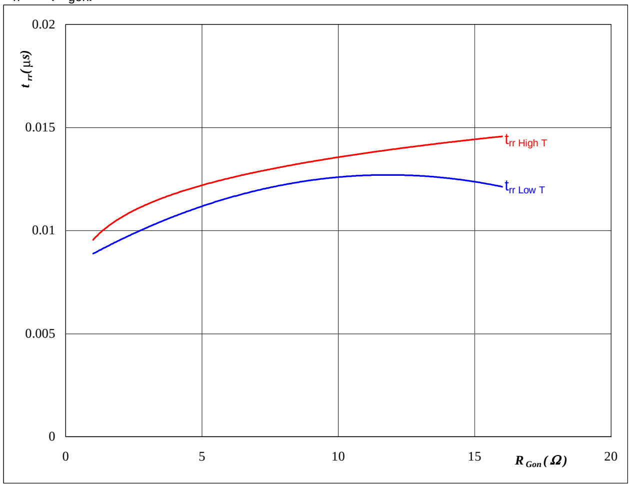
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	10	V
R_{gon} =	2	Ω

Figure 12 BOOST FWD

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

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



At

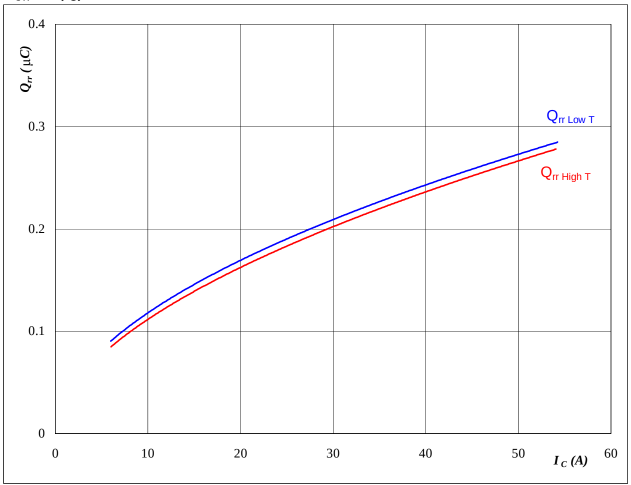
T_j =	25/125	°C
V_R =	400	V
I_F =	30	A
V_{GS} =	10	V

INPUT BOOST

Figure 13 BOOST FWD

Typical reverse recovery charge as a function of collector current

$Q_{rr} = f(I_C)$



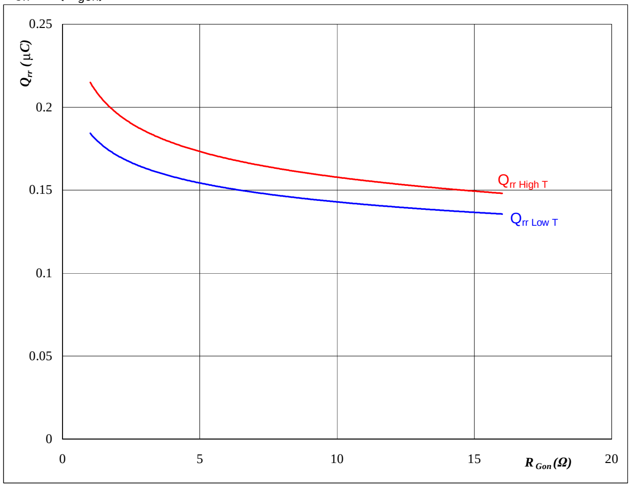
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	10	V
R_{gon} =	2	Ω

Figure 14 BOOST FWD

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

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



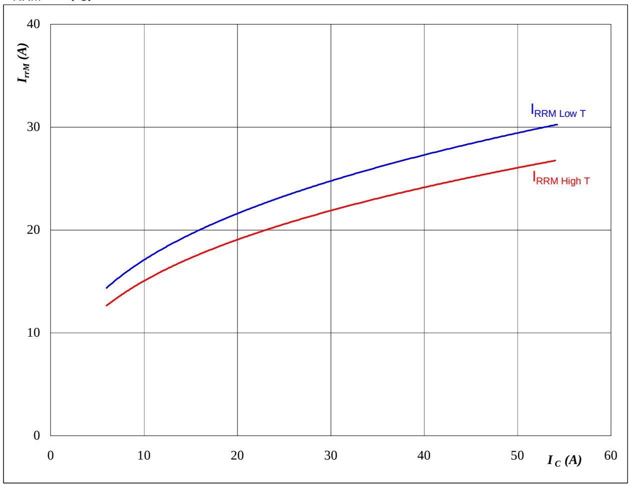
At

Tj =	25/125	°C
V_R =	400	V
I_F =	30	A
V_{GS} =	10	V

Figure 15 BOOST FWD

Typical reverse recovery current as a function of collector current

$I_{RRM} = f(I_C)$



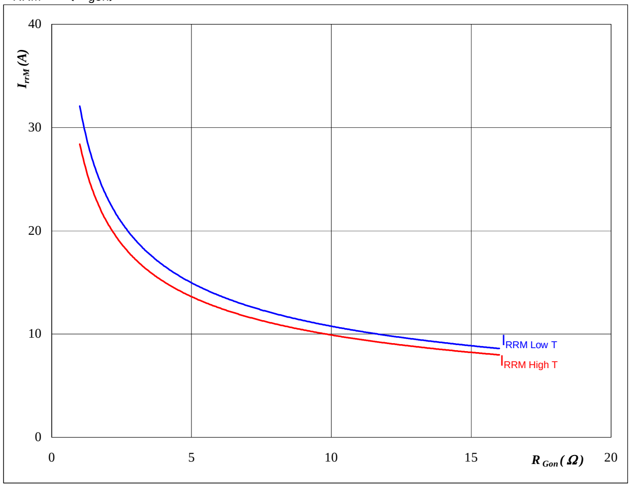
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	10	V
R_{gon} =	2	Ω

Figure 16 BOOST FWD

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

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



At

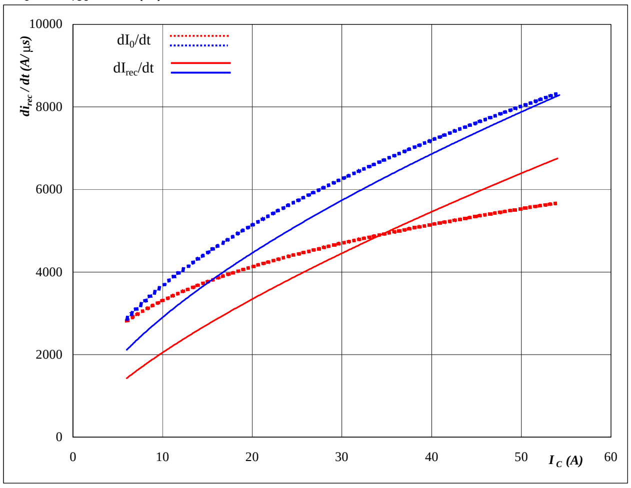
T_j =	25/125	°C
V_R =	400	V
I_F =	30	A
V_{GS} =	10	V

INPUT BOOST

Figure 17 BOOST FWD

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

$dI_0/dt, dI_{rec}/dt = f(Ic)$



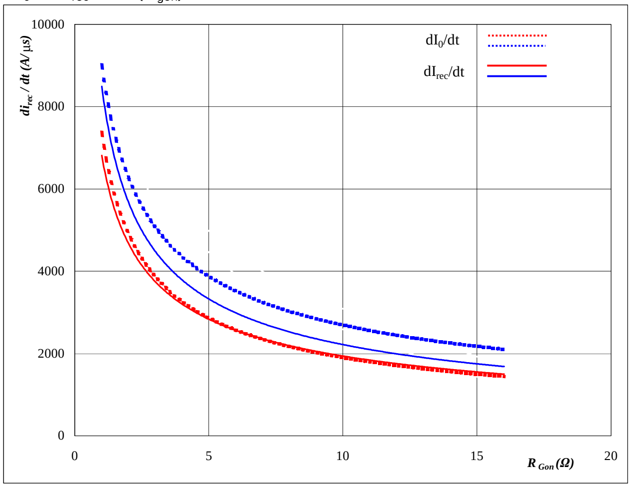
At

T_j =	25/125	°C
V_{CE} =	400	V
V_{GE} =	10	V
R_{gon} =	2	Ω

Figure 18 BOOST FWD

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

$dI_0/dt, dI_{rec}/dt = f(R_{gon})$



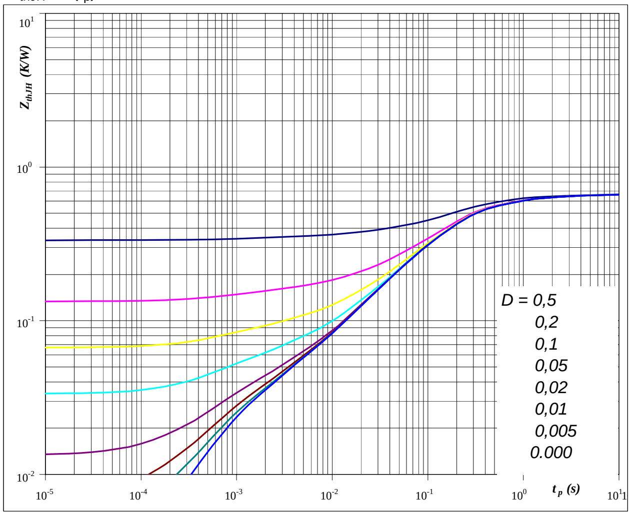
At

Tj =	25/125	°C
VR =	400	V
IF =	30	A
VGS =	10	V

Figure 19 BOOST MOSFET

IGBT/MOSFET transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	0.67	K/W

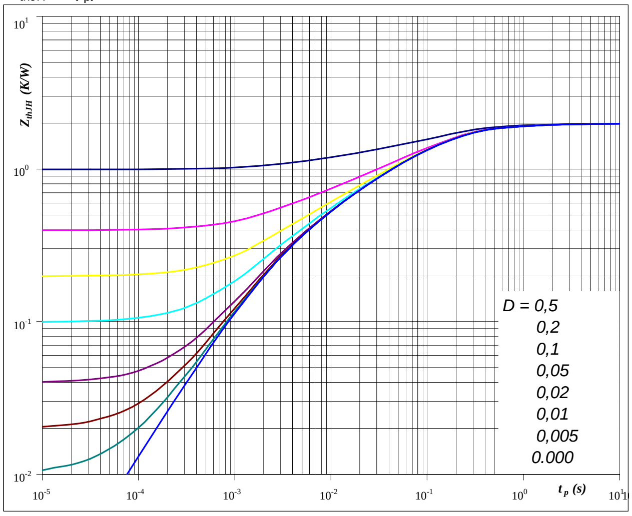
IGBT thermal model values

R (C/W)	Tau (s)
3.56E-02	5.26E+00
8.98E-02	9.94E-01
3.76E-01	1.88E-01
1.04E-01	6.08E-02
3.74E-02	1.20E-02
2.56E-02	9.33E-04

Figure 20 BOOST FWD

FWD transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

D =	t_p / T	
R_{thJH} =	1.98	K/W

FWD thermal model values

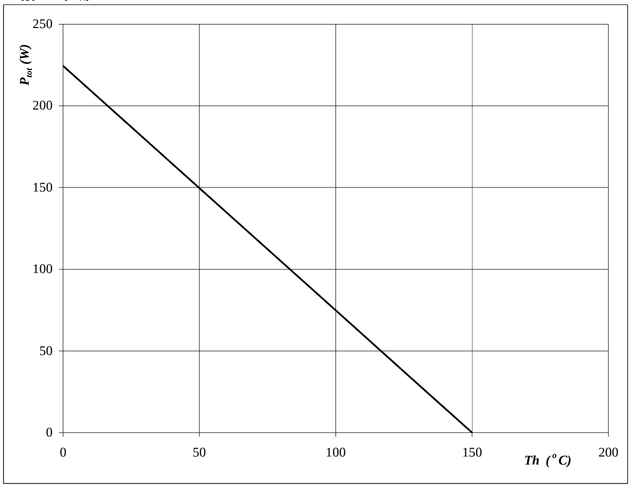
R (C/W)	Tau (s)
5.95E-02	3.91E+00
1.47E-01	7.03E-01
8.44E-01	1.45E-01
4.42E-01	4.35E-02
3.26E-01	9.54E-03
1.67E-01	2.01E-03

INPUT BOOST

Figure 21 BOOST MOSFET

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



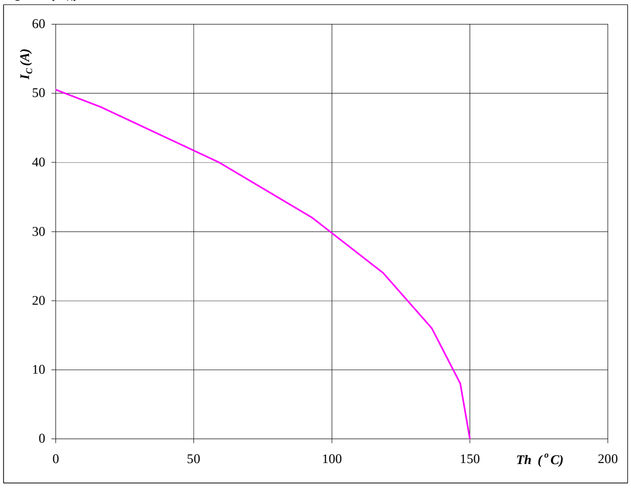
At

T_j = 150 ºC

Figure 22 BOOST MOSFET

Collector/Drain current as a function of heatsink temperature

$I_C = f(T_h)$



At

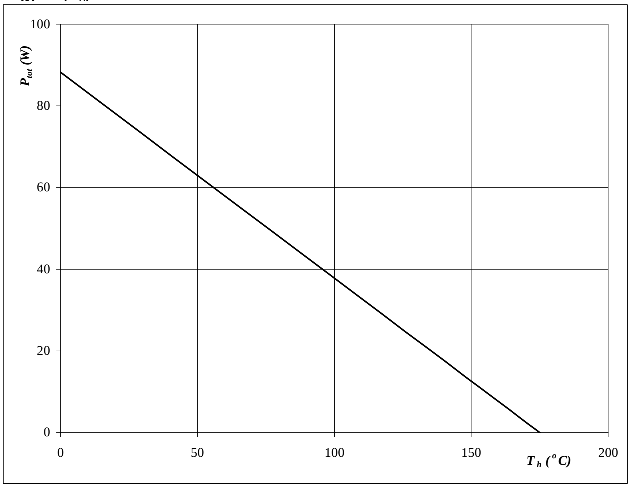
T_j = 150 ºC

V_{GS} = 10 V

Figure 23 BOOST FWD

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



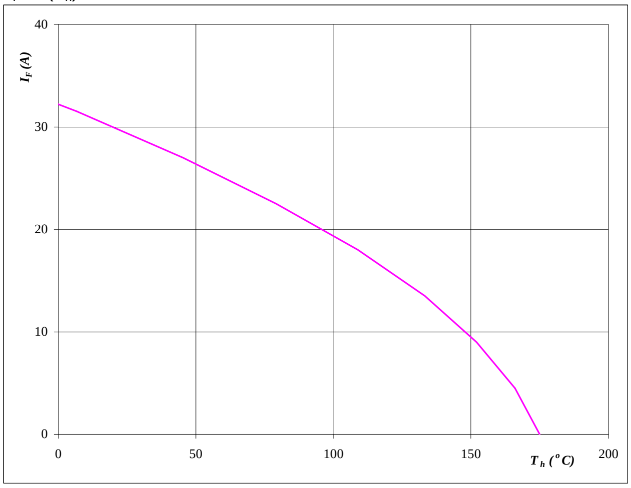
At

T_j = 175 ºC

Figure 24 BOOST FWD

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



At

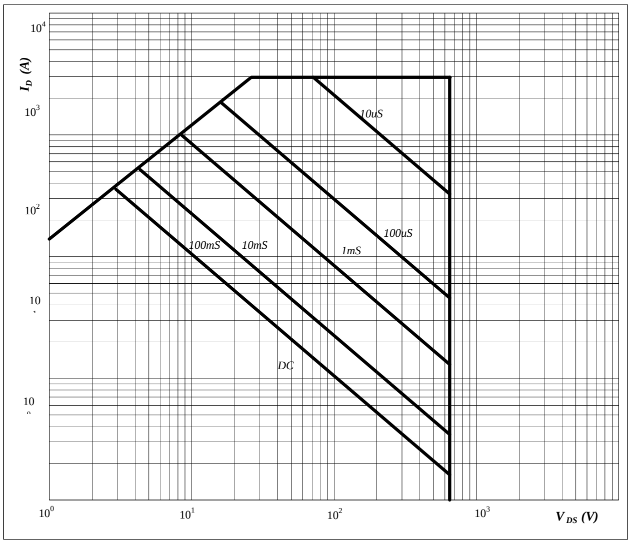
T_j = 175 ºC

INPUT BOOST

Figure 25 BOOST MOSFET

Safe operating area as a function of drain-source voltage

$I_D = f(V_{DS})$



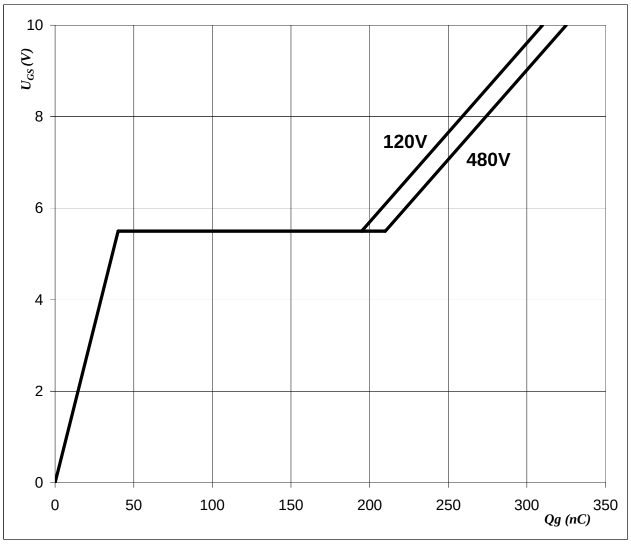
At

D =	single pulse	
T_h =	80	ºC
V_{GS} =	10	V
T_j =	T_{jmax}	ºC

Figure 26 BOOST MOSFET

Gate voltage vs Gate charge

$V_{GS} = f(Qg)$



At

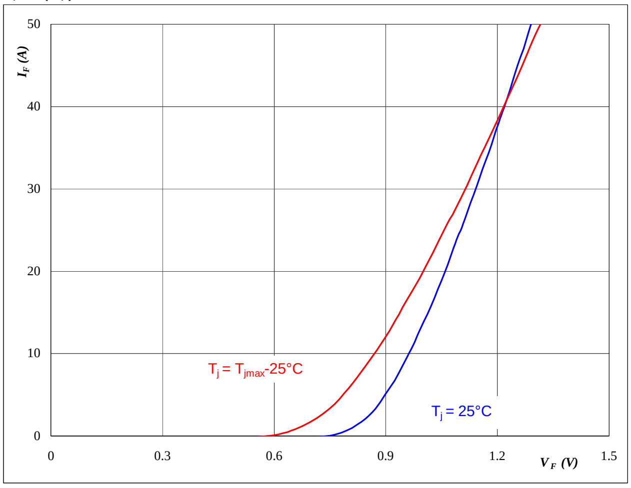
I_D =	50	A

Bypass Diode

Figure 1 Bypass diode

Typical diode forward current as a function of forward voltage

$I_F = f(V_F)$



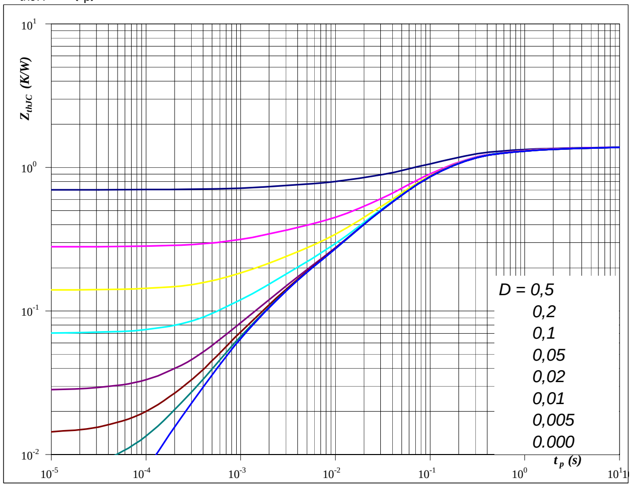
At

t_p = 250 µs

Figure 2 Bypass diode

Diode transient thermal impedance as a function of pulse width

$Z_{thJH} = f(t_p)$



At

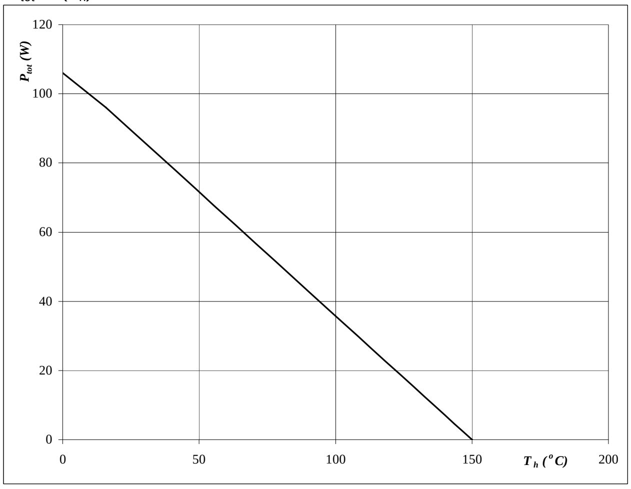
D = t_p / T

R_{thJH} = 1.397 K/W

Figure 3 Bypass diode

Power dissipation as a function of heatsink temperature

$P_{tot} = f(T_h)$



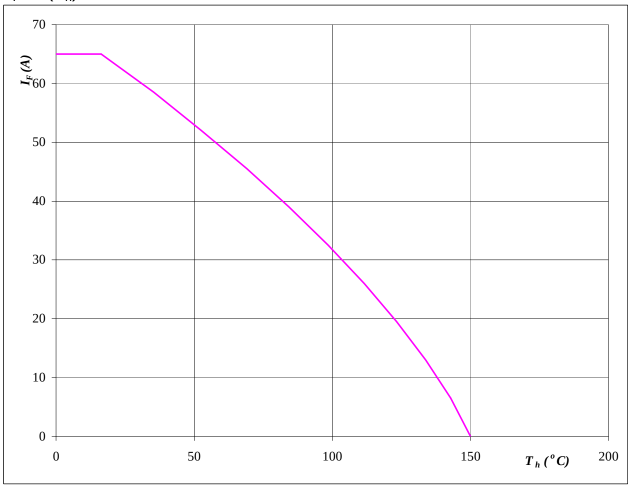
At

T_j = 150 ºC

Figure 4 Bypass diode

Forward current as a function of heatsink temperature

$I_F = f(T_h)$



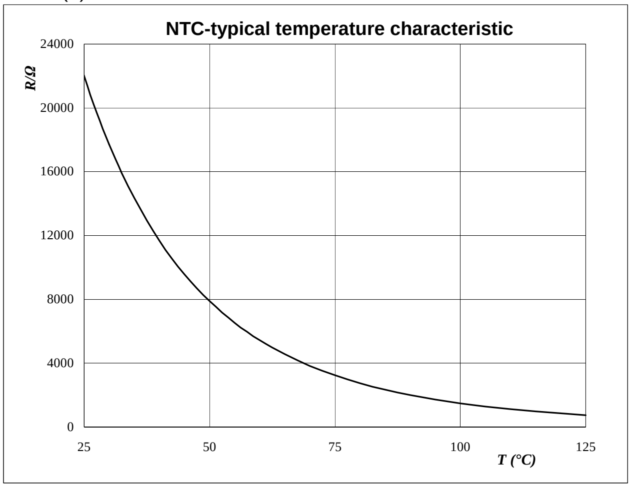
At

T_j = 150 ºC

Thermistor

Figure 1	Thermistor

Typical NTC characteristic
as a function of temperature
$R_T = f(T)$



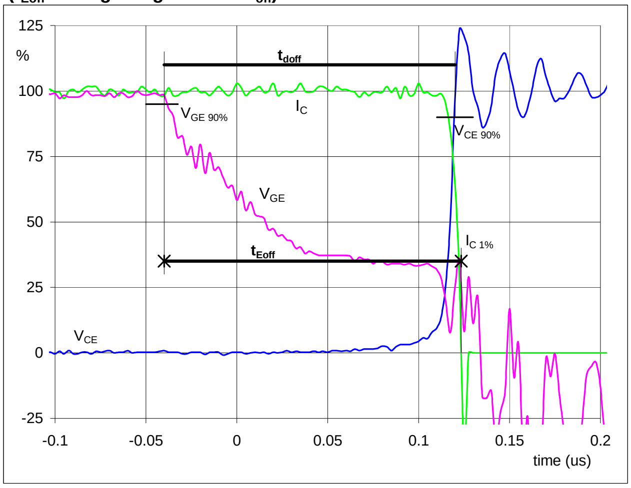
Switching Definitions H-Bridge MOSFET

General conditions

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

Figure 1 H-Bridge MOSFET

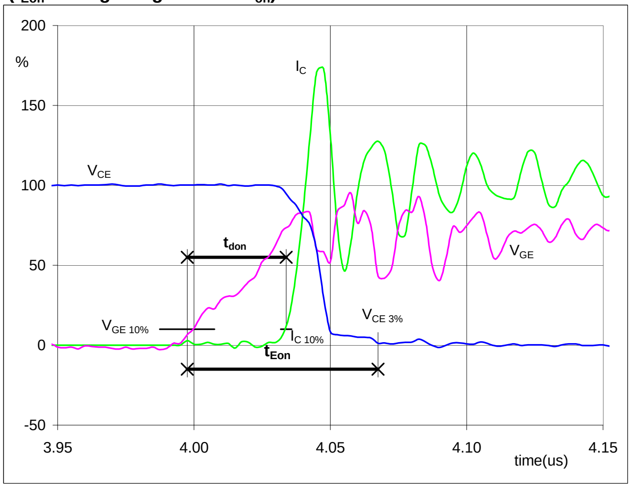
Turn-off Switching Waveforms & definition of t_{doff}, t_{Eoff}
(t_{Eoff} = integrating time for E_{off})



V_{GE} (0%) =	0	V
V_{GE} (100%) =	10	V
V_C (100%) =	400	V
I_C (100%) =	30	A
t_{doff} =	0.15	μs
t_{Eoff} =	0.16	μs

Figure 2 H-Bridge MOSFET

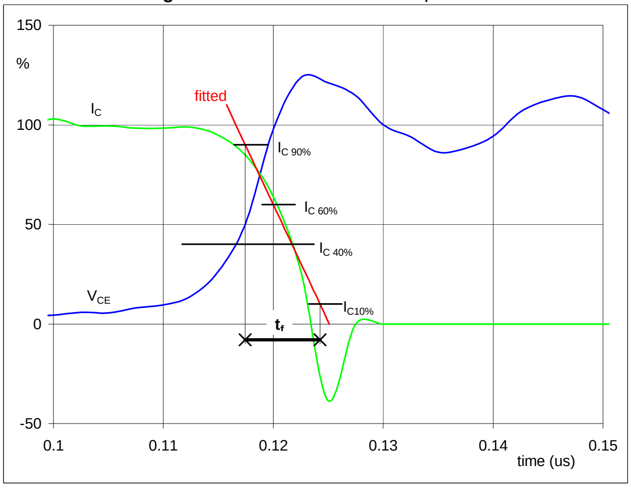
Turn-on Switching Waveforms & definition of t_{don}, t_{Eon}
(t_{Eon} = integrating time for E_{on})



V_{GE} (0%) =	0	V
V_{GE} (100%) =	10	V
V_C (100%) =	400	V
I_C (100%) =	30	A
t_{don} =	0.04	μs
t_{Eon} =	0.07	μs

Figure 3 H-Bridge MOSFET

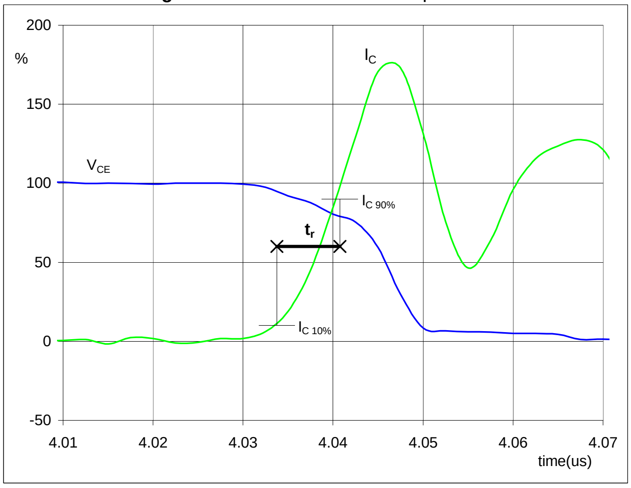
Turn-off Switching Waveforms & definition of t_f



V_C (100%) =	400	V
I_C (100%) =	30	A
t_f =	0.01	μs

Figure 4 H-Bridge MOSFET

Turn-on Switching Waveforms & definition of t_r

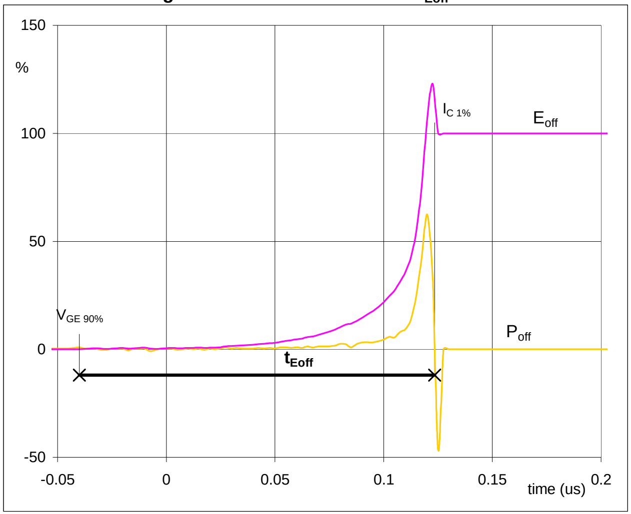


V_C (100%) =	400	V
I_C (100%) =	30	A
t_r =	0.01	μs

Switching Definitions H-Bridge MOSFET

Figure 5 H-Bridge MOSFET

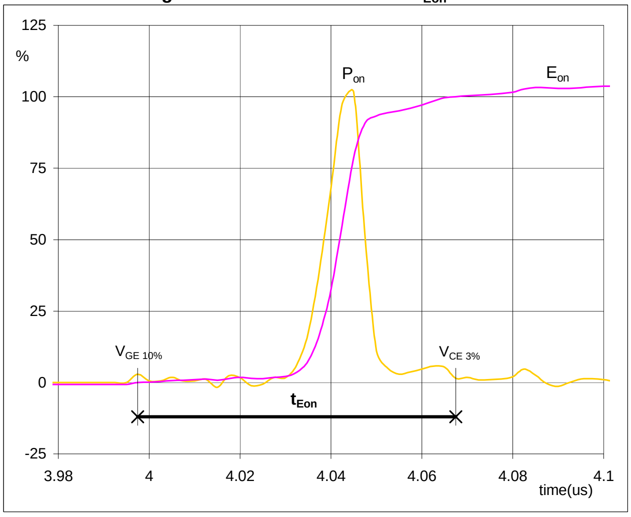
Turn-off Switching Waveforms & definition of t_{Eoff}



P_{off} (100%) =	12.04	kW
E_{off} (100%) =	0.03	mJ
t_{Eoff} =	0.16	μs

Figure 6 H-Bridge MOSFET

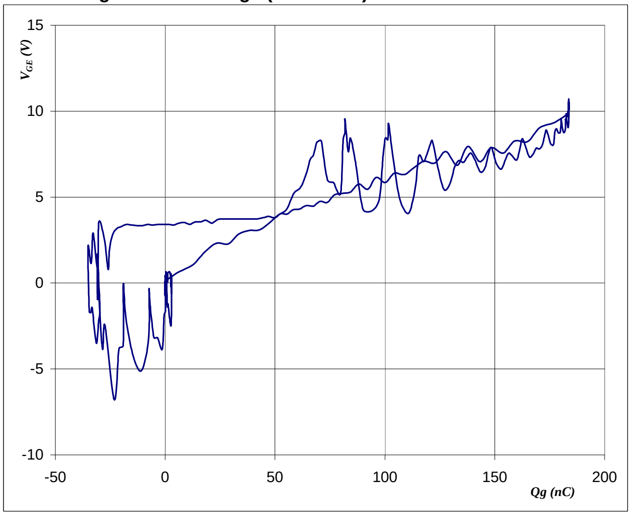
Turn-on Switching Waveforms & definition of t_{Eon}



P_{on} (100%) =	12.04	kW
E_{on} (100%) =	0.14	mJ
t_{Eon} =	0.07	μs

Figure 7 H-Bridge MOSFET

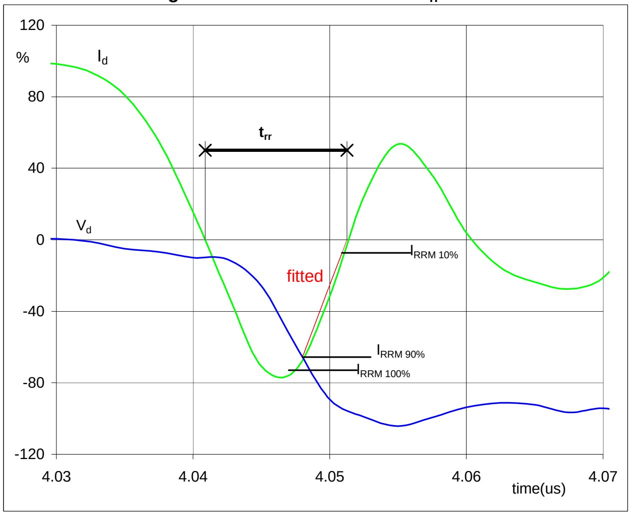
Gate voltage vs Gate charge (measured)



V_{GEoff} =	0	V
V_{GEon} =	10	V
V_C (100%) =	400	V
I_C (100%) =	30	A
Q_g =	183.73	nC

Figure 8 H-Bridge FWD

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

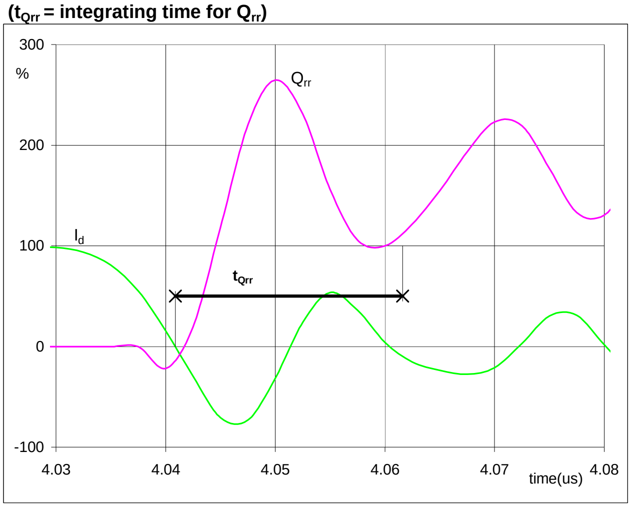


V_d (100%) =	400	V
I_d (100%) =	30	A
I_{RRM} (100%) =	-24	A
t_{rr} =	0.01	μs

Switching Definitions H-Bridge MOSFET

Figure 9 H-Bridge FWD

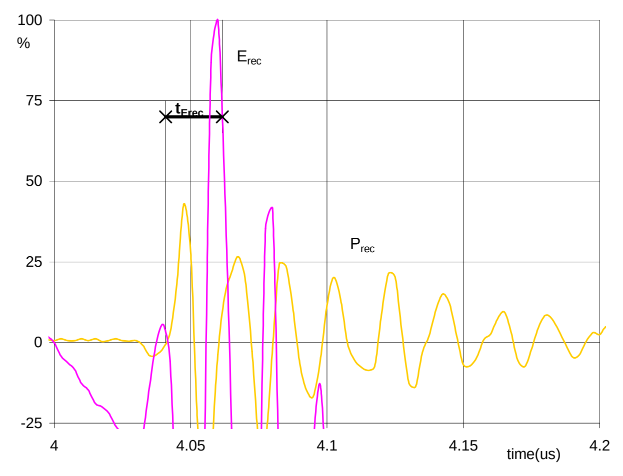
Turn-on Switching Waveforms & definition of t_{Qrr}
(t_{Qrr} = integrating time for Q_{rr})



I_d (100%) =	30	A
Q_{rr} (100%) =	0.12	μC
t_{Qrr} =	0.02	μs

Figure 10 H-Bridge FWD

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



P_{rec} (100%) =	12.04	kW
E_{rec} (100%) =	0.02	mJ
t_{Erec} =	0.02	μs

Ordering Code and Marking - Outline - Pinout

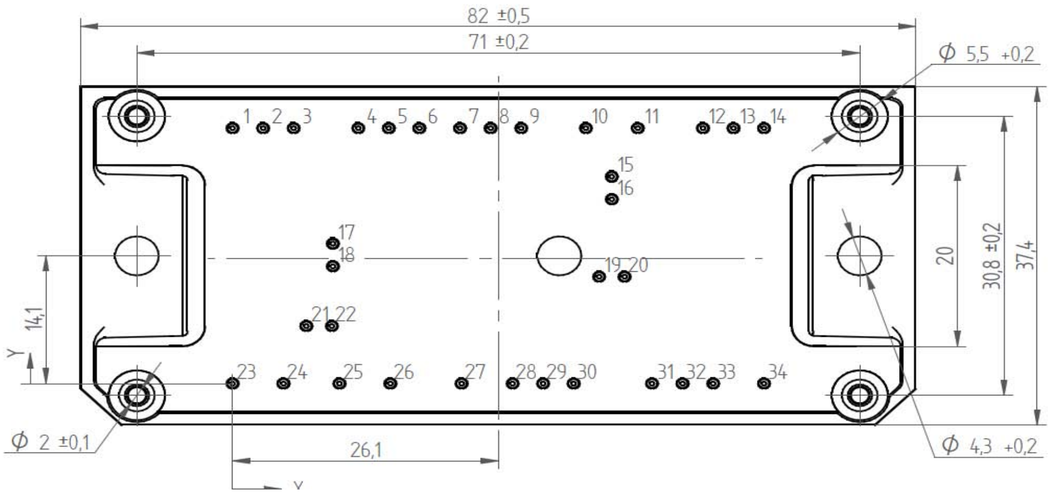
Ordering Code & Marking

Version	Ordering Code	in DataMatrix as	in packaging barcode as
without thermal paste 12mm housing	10-FY07BIA041MC-M528E58	M528E58	M528E58

Outline

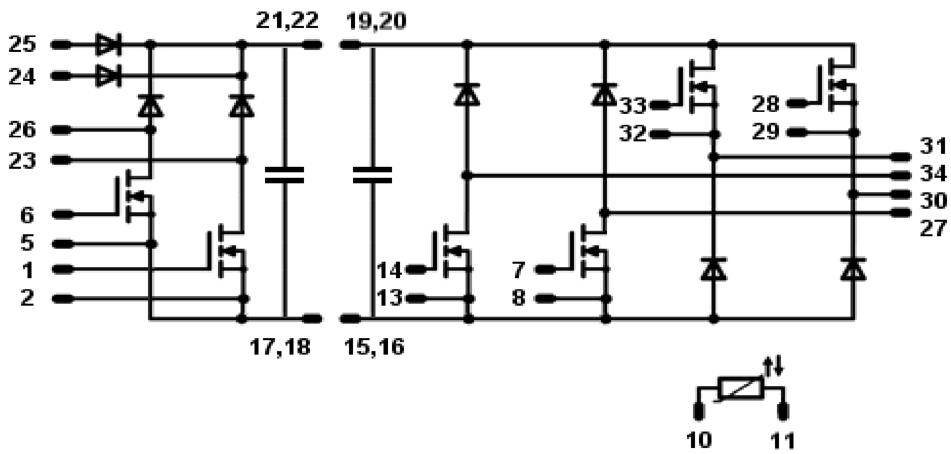
Pin table

Pin	X	Y
1	0	28,2
2	3	28,2
3	6	28,2
4	12,35	28,2
5	15,35	28,2
6	18,35	28,2
7	22,35	28,2
8	25,35	28,2
9	28,35	28,2
10	34,7	28,2
11	39,8	28,2
12	46,2	28,2
13	49,2	28,2
14	52,2	28,2
15	37,25	22,85
16	37,25	20,35
17	9,85	15,45
18	9,85	12,95
19	36	11,8
20	38,5	11,8
21	7,25	6,35
22	9,75	6,35
23	0	0
24	5	0
25	10,5	0
26	15,5	0
27	22,5	0
28	27,5	0
29	30,5	0
30	33,5	0
31	41,2	0
32	44,2	0
33	47,2	0
34	52,2	0



Tolerance of pinpositions: ±0,5mm at the end of pins
Dimension of coordinate axis is only offset without tolerance
PCB cutouts and holes see in handling instructions document

Pinout



Pins 3,4,9,12 are not connected.

PRODUCT STATUS DEFINITIONS

Datasheet Status	Product Status	Definition
Target	Formative or In Design	This datasheet contains the design specifications for product development. Specifications may change in any manner without notice. The data contained is exclusively intended for technically trained staff.
Preliminary	First Production	This datasheet contains preliminary data, and supplementary data may be published at a later date. Vincotech reserves the right to make changes at any time without notice in order to improve design. The data contained is exclusively intended for technically trained staff.
Final	Full Production	This datasheet contains final specifications. Vincotech reserves the right to make changes at any time without notice in order to improve design. The data contained is exclusively intended for technically trained staff.

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