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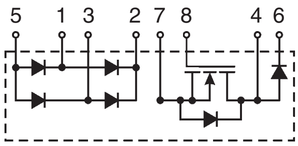
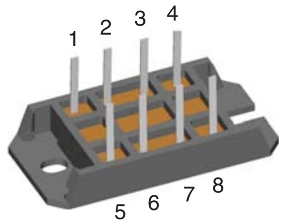
Power MOSFET Stage for Boost Converters

Module for Power Factor Correction

I_{D25} = 47 A
V_{DSS} = 500 V
$R_{DS(on)}$ = 0.12 Ω

$V_{RRM\,(Diode)}$ V	V_{DSS} V	Type
600	500	VUM 33-05N





Symbol		Conditions	Maximum Ratings	
V_{DSS}	MOSFET	T_{VJ} = 25°C to 150°C	500	V
V_{DGR}	MOSFET	T_{VJ} = 25°C to 150°C; R_{GS} = 10 kΩ	500	V
V_{GS}	MOSFET	Continuous	±20	V
I_D	MOSFET	T_S = 85°C	33	A
I_D	MOSFET	T_S = 25°C	47	A
I_{DM}	MOSFET	T_S = 25°C, t_p = ①	130	A
P_D	MOSFET	T_S = 85°C	310	W
I_S	MOSFET	V_{GS} = 0 V, T_S = 25°C	33	A
I_{SM}	MOSFET	V_{GS} = 0 V, T_S = 25°C, t_p = ①	130	A
V_{RRM}	Boost Diode		600	V
I_{FAV}	Boost Diode	T_S = 85°C, rectangular δ = 0.5	33	A
I_{FSM}	Boost Diode	T_{VJ} = 45°C, t = 10 ms (50 Hz)	300	A
	Boost Diode	t = 8.3 ms (60 Hz)	320	A
	Boost Diode	T_{VJ} = 150°C, t = 10 ms (50 Hz)	260	A
	Boost Diode	t = 8.3 ms (60 Hz)	280	A
P	Boost Diode	T_S = 85°C	59	W
V_{RRM}	Rectifier Diodes		1200	V
I_{dAV}	Rectifier Diodes	T_S = 85°C, sinus 180°	54	A
I_{FSM}	Rectifier Diodes	T_{VJ} = 45°C, t = 10 ms (50 Hz)	300	A
	Rectifier Diodes	t = 8.3 ms (60 Hz)	320	A
	Rectifier Diodes	T_{VJ} = 150°C, t = 10 ms (50 Hz)	260	A
	Rectifier Diodes	t = 8.3 ms (60 Hz)	280	A
P	Rectifier Diodes	T_S = 85°C	50	W
T_{VJ}	Module		-40...+150	°C
T_{JM}	Module		150	°C
T_{stg}	Module		-40...+150	°C
V_{ISOL}	Module	50/60 Hz, t = 1 min	3000	V~
	Module	I_{ISOL} ≤ 1 mA, t = 1 s	3600	V~
M_d	Module	Mounting torque (M5)	2-2.5/18-22	Nm/lb.in.
Weight	Module		28	g

① Pulse width limited by T_{VJ}

Features

- Package with DCB ceramic base plate
- Soldering connections for PCB mounting
- Isolation voltage 3600 V~
- Low $R_{DS(on)}$ HDMOS™ process
- Low package inductance for high speed switching
- Ultrafast boost diode
- Kelvin source for easy drive

Applications

- Power factor pre-conditioner for SMPS, UPS, battery chargers and inverters
- Boost topology for SMPS including 1~ rectifier bridge
- Power supply for welding equipment

Advantages

- 3 functions in one package
- Output power up to 8 kW
- No external isolation
- Easy to mount with two screws
- Suitable for wave soldering
- High temperature and power cycling capability
- Fits easiliy to all available PFC controller ICs

Symbol		Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
V_{DSS} $V_{GS(th)}$	MOSFET	V_{GS} = 0 V, I_D = 2 mA V_{DS} = 20 V, I_D = 20 mA	500 2		 5	V V
I_{GSS}	MOSFET	V_{GS} = ±20 V, V_{DS} = 0 V			±500	nA
I_{DSS}	MOSFET	V_{DS} = 500 V, V_{GS} = 0 V			2	mA
$R_{DS(on)}$ R_{Gint}	MOSFET	T_{VJ} = 25°C T_{VJ} = 25°C			0.12 1.5	Ω Ω
g_{fs} V_{DS}	MOSFET	V_{DS} = 15 V, I_{DS} = 12 A I_{DS} = 24 A, V_{GS} = 0 V		30	 1.5	S V
$t_{d(on)}$ $t_{d(off)}$	MOSFET	V_{DS} = 250 V, I_{DS} = 12 A, V_{GS} = 10 V Zgen. = 1 Ω, L-load			100 220	ns ns
C_{iss} C_{oss} C_{rss}	MOSFET	V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0 V		8.5 0.9 0.3		nF nF nF
Q_g R_{thJH}	MOSFET	V_{DS} = 250 V, I_D = 12 A, V_{GS} = 10 V with heat transfer paste		350	 0.21	nC K/W
V_F	Boost Diode	I_F = 33 A; T_{VJ} = 25°C T_{VJ} =150°C			1.75 1.5	V V
I_R	Boost Diode	V_R = 600 V, T_{VJ} = 25°C V_R = 480 V, T_{VJ} = 25°C T_{VJ} =125°C			1.5 0.25 7	mA mA mA
V_{T0} r_T	Boost Diode	For power-loss calculations only T_{VJ} = 125°C			1.21 9	V mΩ
I_{RM}	Boost Diode	I_F = 30 A; $-di_F/dt$ = 240 A/µs V_R = 350 V, T_{VJ} = 100°C		10	11	A
R_{thJH}	Boost Diode	with heat transfer paste			1.1	K/W
V_F	Rectifier Diodes	I_F = 20 A, T_{VJ} = 25°C T_{VJ} = 125°C			1.5 1.5	V V
I_R	Rectifier Diodes	V_R = 1200 V, T_{VJ} = 25°C V_R = 0.8 •V_{RRM}, T_{VJ} = 125°C			0.25 2	mA mA
V_{T0} r_T	Rectifier Diodes	For power-loss calculations only T_{VJ} = 125°C			1.18 12	V mΩ
R_{thJH}	Rectifier Diodes	with heat transfer paste			1.3	K/W

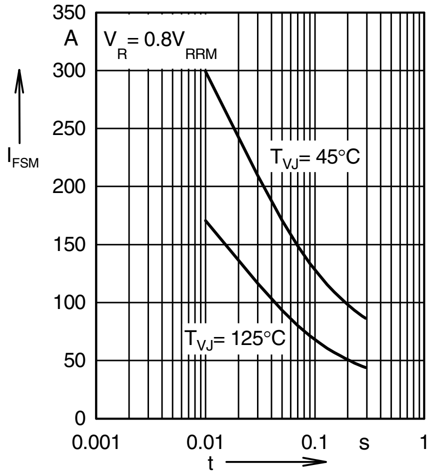


Fig. 1 Non-repetitive peak surge current (Rectifier Diodes)

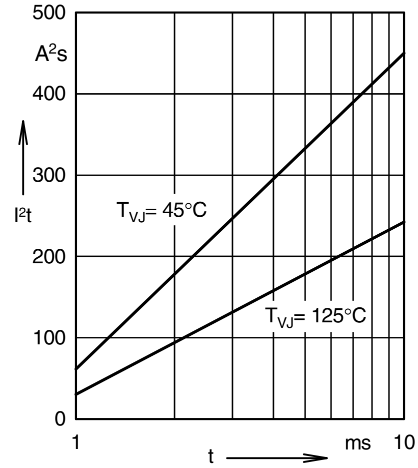
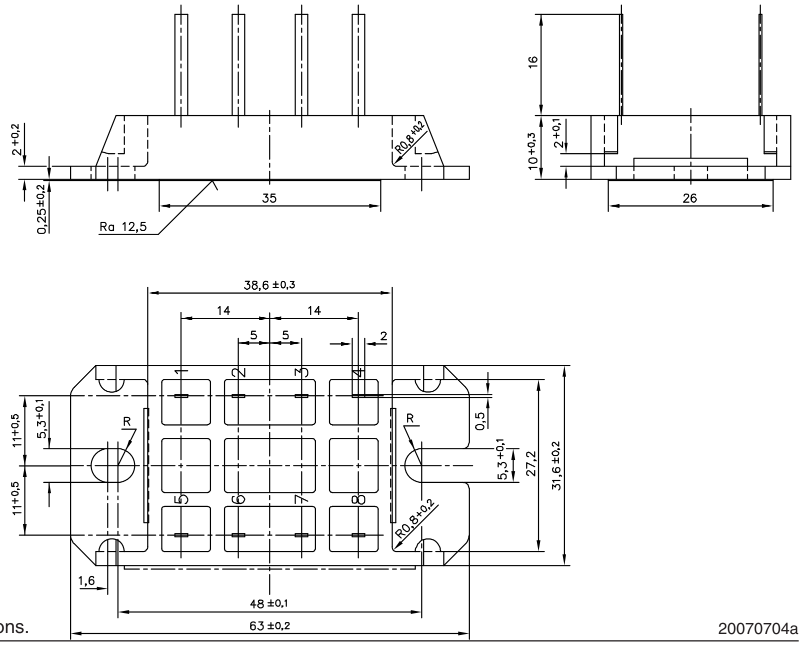


Fig. 2 I^2t for fusing (Rectifier Diodes)

Dimensions in mm (1 mm = 0.0394")



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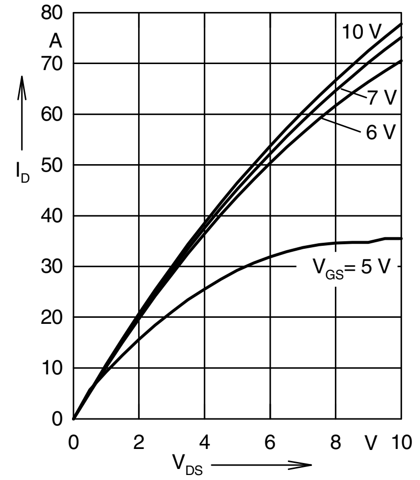

Fig. 3 Typ. output characteristic
$I_D = f(V_{DS})$ (MOSFET)

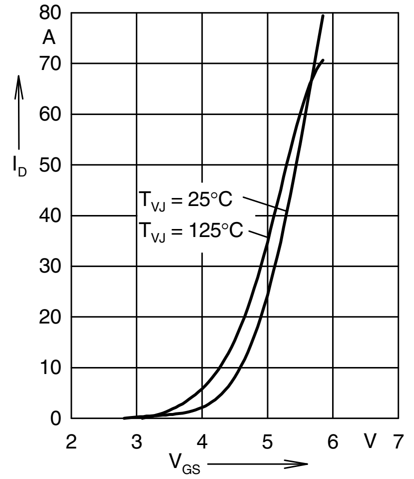

Fig. 4 Typ. transfer characteristics
$I_D = f(V_{GS})$ (MOSFET)

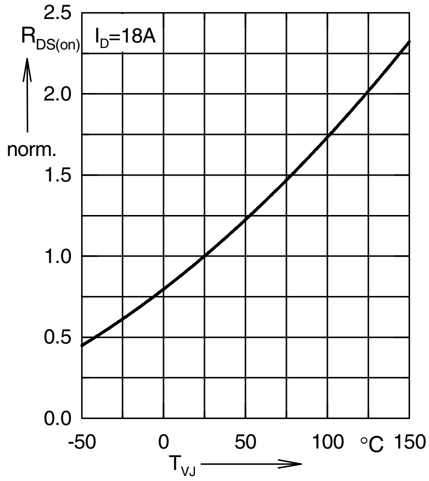

Fig. 5 Typ. normalized
$R_{DS(on)} = f(T_{VJ})$ (MOSFET)

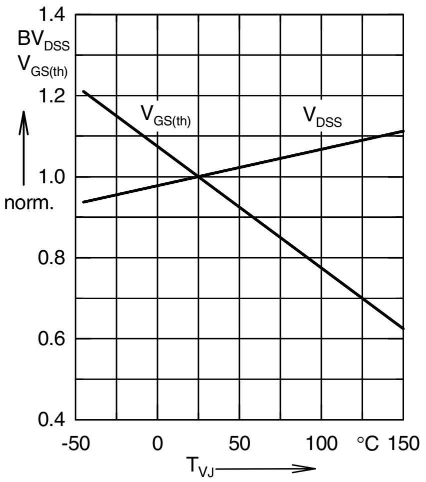

Fig. 6 Typ. normalized $BV_{DSS} = f(T_{VJ})$
$V_{GS(th)} = f(T_{VJ})$ (MOSFET)

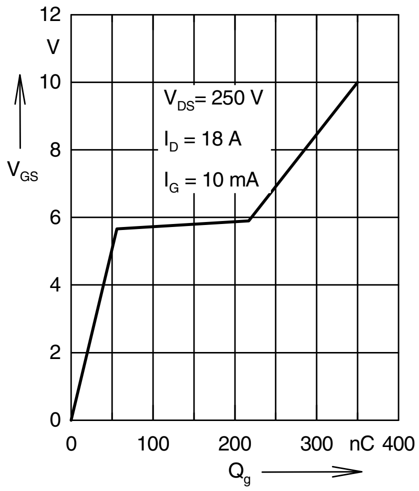

Fig. 7 Typ. turn-on gate charge
characteristics, $V_{GS} = f(Q_g)$ (MOSFET)

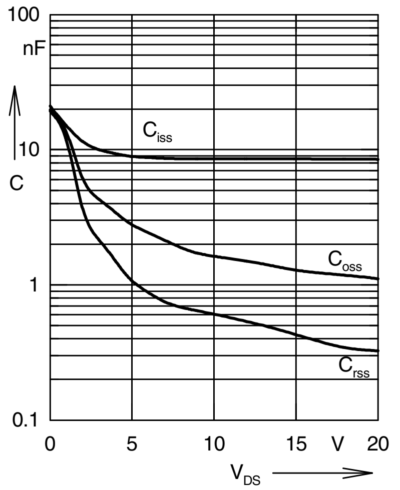

Fig. 8 Typ. capacitances $C = f(V_{DS})$,
f = 1 MHz (MOSFET)

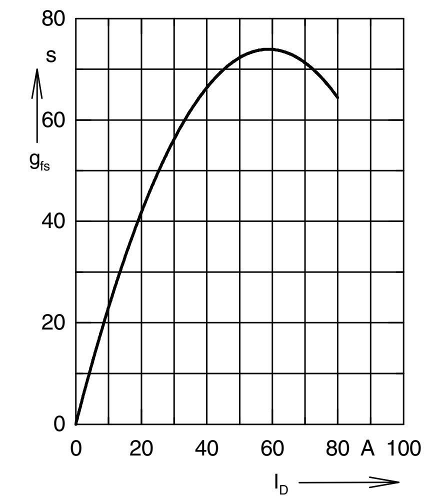

Fig. 9 Typ. transconductance,
$g_{fs} = f(I_D)$ (MOSFET)

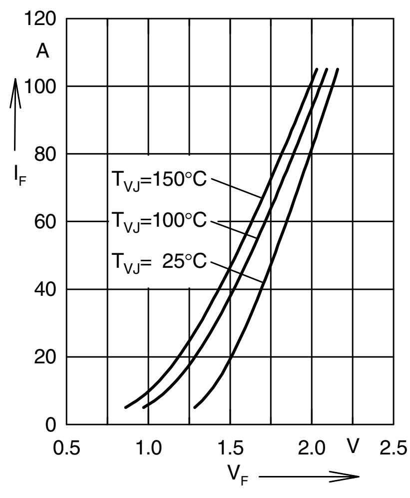

Fig. 10 Forward current versus
voltage drop (Boost Diode)

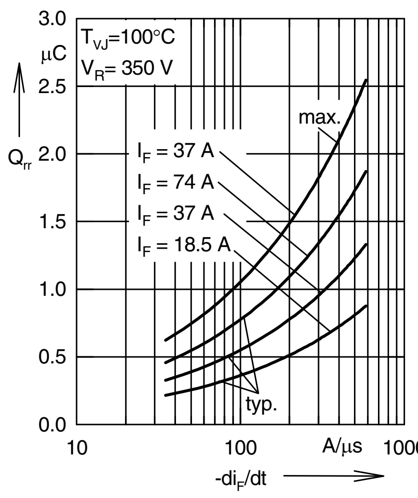

Fig. 11 Recovery charge versus $-di_F/dt$
(Boost Diode)

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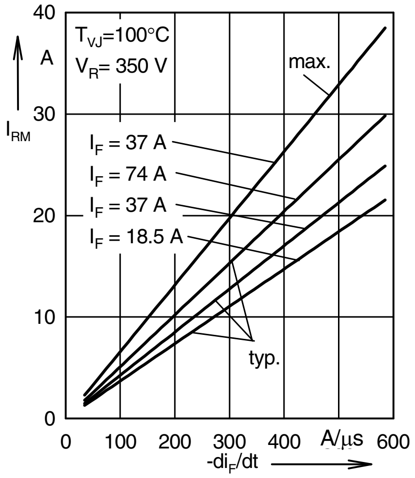

Fig. 12 Peak reverse current versus -di_F/dt (Boost Diode)

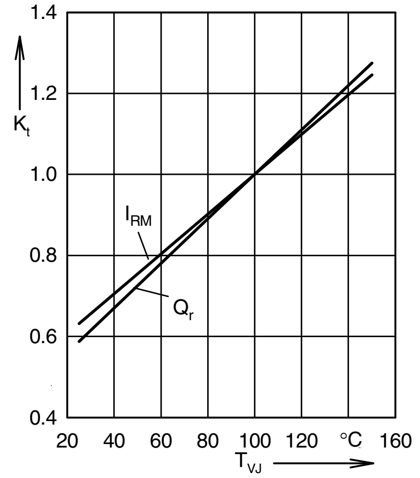

Fig. 13 Dynamic parameters versus junction temperature (Boost Diode)

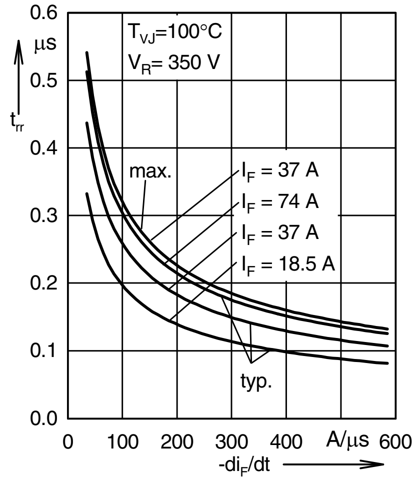

Fig. 14 Recovery time versus -di_F/dt (Boost Diode)

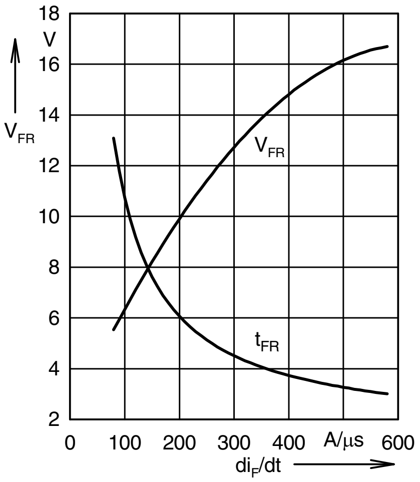

Fig. 15 Peak forward voltage versus -di_F/dt (Boost Diode)

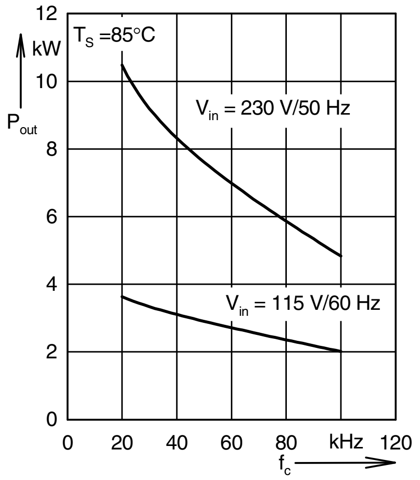

Fig. 16 Output power versus carrier frequency (Module)

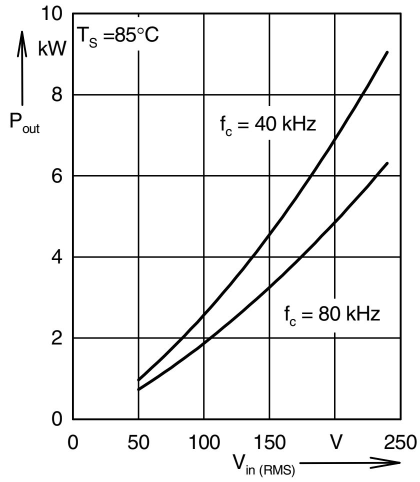

Fig. 17 Output power versus mains voltage

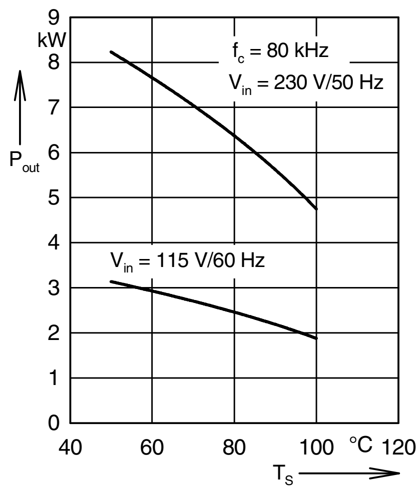

Fig. 18 Output power versus heatsink temperature (Module)

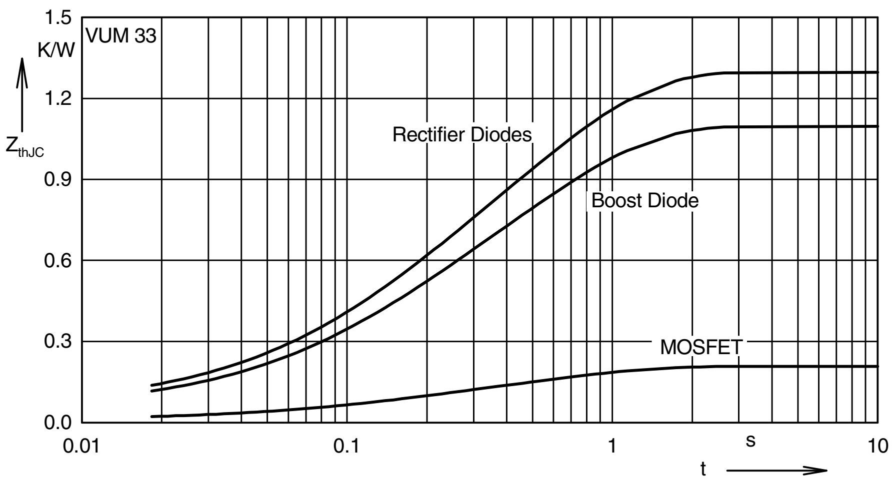

Fig. 19 Transient thermal impedance junction to case for all devices