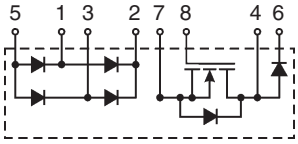
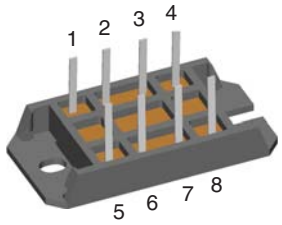
Power MOSFET Stage for Boost Converters

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}		T_{VJ} = 25°C to 150°C; R_{GS} = 10 kΩ	500	V
V_{GS}		Continuous	±20	V
I_D		T_S = 85°C	33	A
I_D		T_S = 25°C	47	A
I_{DM}		T_S = 25°C, t_p = ①	130	A
P_D		T_S = 85°C	310	W
I_S		V_{GS} = 0 V, T_S = 25°C	33	A
I_{SM}		V_{GS} = 0 V, T_S = 25°C, t_p = ①	130	A
V_{RRM}	Boost Diode		600	V
I_{FAV}		T_S = 85°C, rectangular δ = 0.5	33	A
I_{FSM}		T_{VJ} = 45°C, t = 10 ms (50 Hz)	300	A
		t = 8.3 ms (60 Hz)	320	A
		T_{VJ} = 150°C, t = 10 ms (50 Hz)	260	A
		t = 8.3 ms (60 Hz)	280	A
P		T_S = 85°C	59	W
V_{RRM}	Rectifier Diodes		1200	V
I_{dAV}		T_S = 85°C, sinus 180°	54	A
I_{FSM}		T_{VJ} = 45°C, t = 10 ms (50 Hz)	300	A
		t = 8.3 ms (60 Hz)	320	A
		T_{VJ} = 150°C, t = 10 ms (50 Hz)	260	A
		t = 8.3 ms (60 Hz)	280	A
P		T_S = 85°C	50	W
T_{VJ}	Module		-40...+150	°C
T_{JM}			150	°C
T_{stg}			-40...+150	°C
V_{ISOL}		50/60 Hz t = 1 min	3000	V~
		I_{ISOL} ≤ 1 mA t = 1 s	3600	V~
M_d		Mounting torque (M5)	2-2.5/18-22	Nm/lb.in.
Weight			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 (T_{VJ} = 25°C, unless otherwise specified)	Characteristic Values min.	typ.	max.	
V_{DSS}	MOSFET	V_{GS} = 0 V, I_D = 2 mA	500			V
$V_{GS(th)}$		V_{DS} = 20 V, I_D = 20 mA	2		5	V
I_{GSS}		V_{GS} = ±20 V, V_{DS} = 0 V			±500	nA
I_{DSS}		V_{DS} = 500 V, V_{GS} = 0 V			2	mA
$R_{DS(on)}$		T_{VJ} = 25°C			0.12	Ω
R_{Gint}		T_{VJ} = 25°C			1.5	Ω
g_{fs}		V_{DS} = 15 V, I_{DS} = 12 A	30			S
V_{DS}		I_{DS} = 24 A, V_{GS} = 0 V			1.5	V
$t_{d(on)}$		V_{DS} = 250 V, I_{DS} = 12 A, V_{GS} = 10 V			100	ns
$t_{d(off)}$		Zgen. = 1 Ω, L-load			220	ns
C_{iss}		V_{DS} = 25 V, f = 1 MHz, V_{GS} = 0 V		8.5		nF
C_{oss}				0.9		nF
C_{rss}				0.3		nF
Q_g		V_{DS} = 250 V, I_D = 12 A, V_{GS} = 10 V		350		nC
R_{thJH}		with heat transfer paste			0.21	K/W
V_F	Boost Diode	I_F = 33 A; T_{VJ} = 25°C			1.75	V
		T_{VJ} = 150°C			1.5	V
I_R		V_R = 600 V, T_{VJ} = 25°C			1.5	mA
		V_R = 480 V, T_{VJ} = 25°C			0.25	mA
		T_{VJ} = 125°C			7	mA
V_{T0}		For power-loss calculations only			1.21	V
r_T		T_{VJ} = 125°C			9	mΩ
I_{RM}		I_F = 30 A; $-di_F/dt$ = 240 A/µs				
		V_R = 350 V, T_{VJ} = 100°C		10	11	A
R_{thJH}		with heat transfer paste			1.1	K/W
V_F	Rectifier Diodes	I_F = 20 A, T_{VJ} = 25°C			1.5	V
		T_{VJ} = 125°C			1.5	V
I_R		V_R = 1200 V, T_{VJ} = 25°C			0.25	mA
		V_R = 0.8 • V_{RRM}, T_{VJ} = 125°C			2	mA
V_{T0}		For power-loss calculations only			1.18	V
r_T		T_{VJ} = 125°C			12	mΩ
R_{thJH}		with heat transfer paste			1.3	K/W

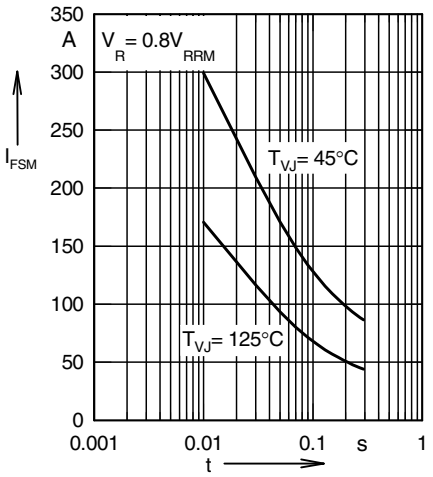


Fig. 1 Non-repetitive peak surge current (Rectifier Diodes)

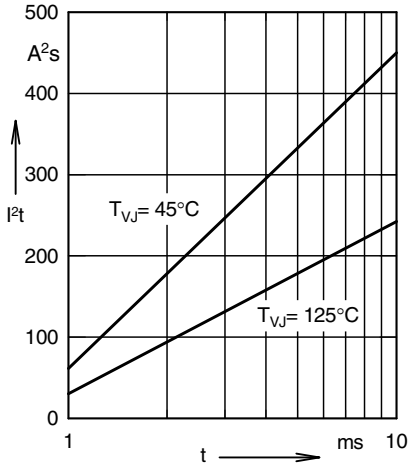
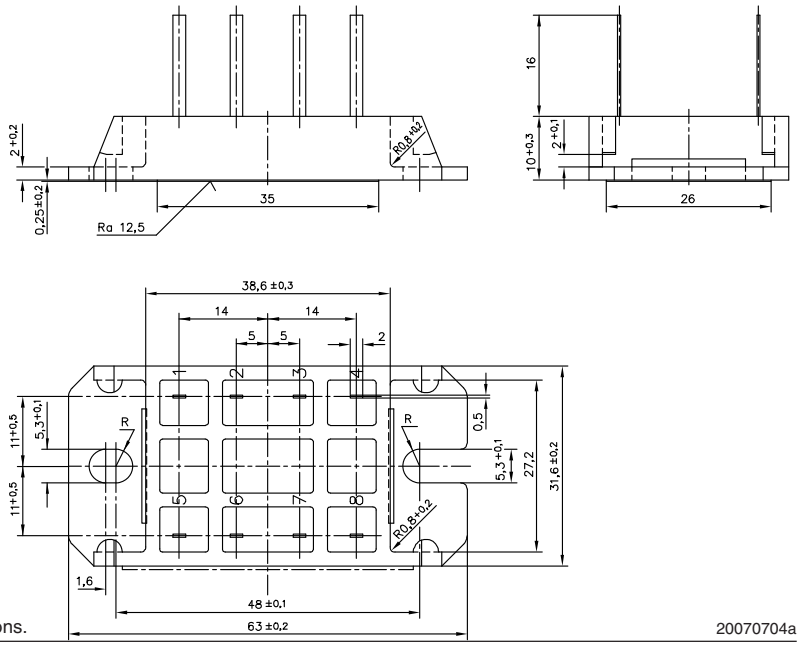


Fig. 2 I^2t for fusing (Rectifier Diodes)

Dimensions in mm (1 mm = 0.0394")



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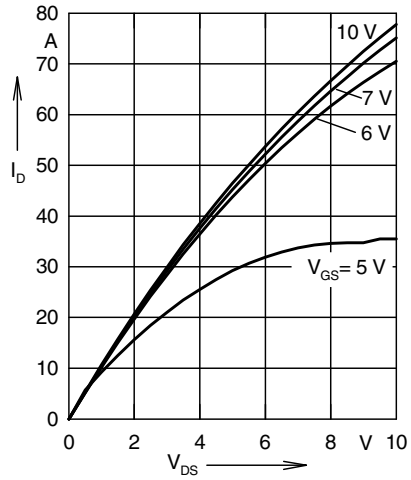

Fig. 3 Typ. output characteristic $I_D = f(V_{DS})$ (MOSFET)

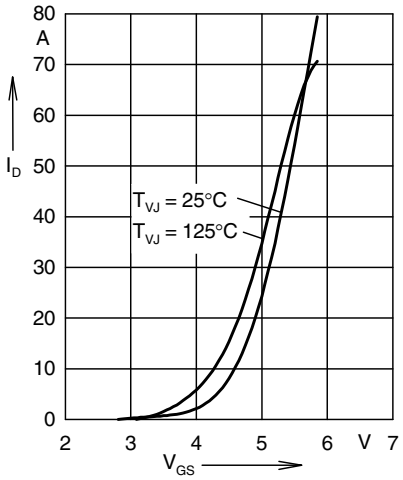

Fig. 4 Typ. transfer characteristics $I_D = f(V_{GS})$ (MOSFET)

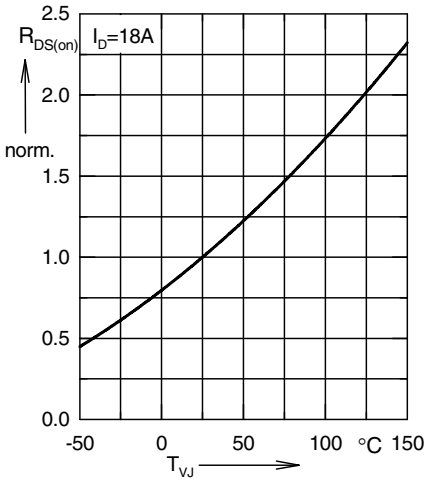

Fig. 5 Typ. normalized $R_{DS(on)} = f(T_{VJ})$ (MOSFET)

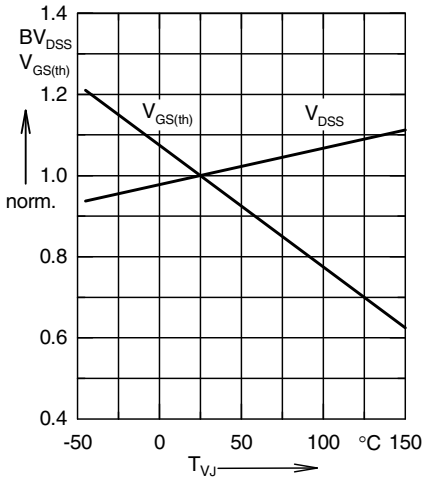

Fig. 6 Typ. normalized $BV_{DSS} = f(T_{VJ})$ $V_{GS(th)} = f(T_{VJ})$ (MOSFET)

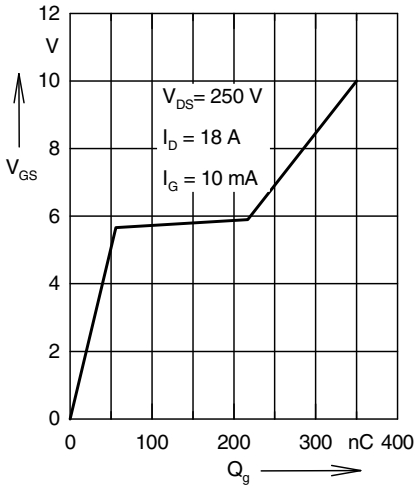

Fig. 7 Typ. turn-on gate charge characteristics, $V_{GS} = f(Q_g)$ (MOSFET)

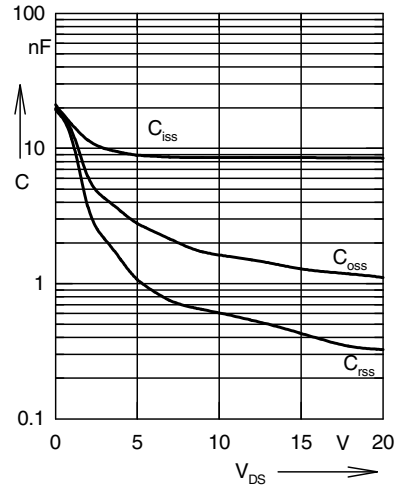

Fig. 8 Typ. capacitances $C = f(V_{DS})$, f = 1 MHz (MOSFET)

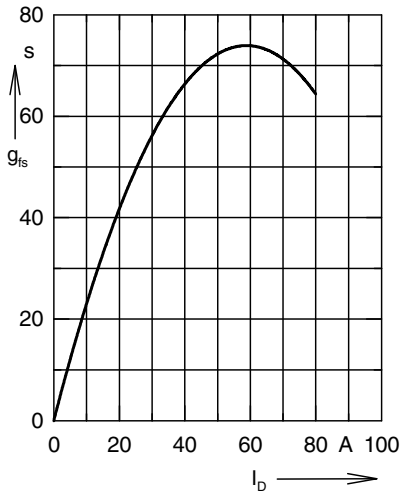

Fig. 9 Typ. transconductance, $g_{fs} = f(I_D)$ (MOSFET)

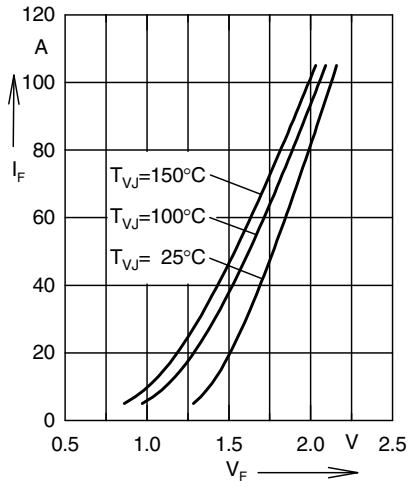

Fig. 10 Forward current versus voltage drop (Boost Diode)

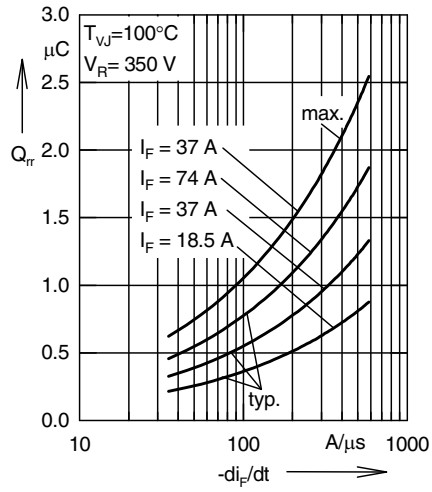

Fig. 11 Recovery charge versus $-di_F/dt$ (Boost Diode)

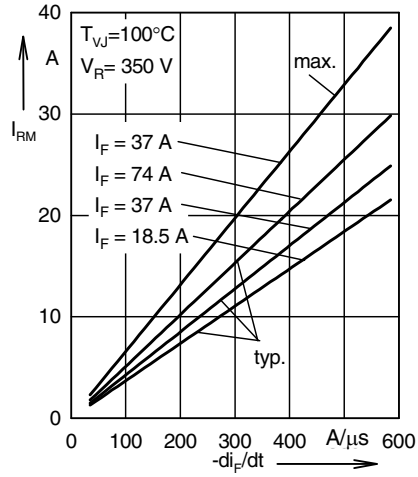

Fig. 12 Peak reverse current versus $-di_F/dt$ (Boost Diode)

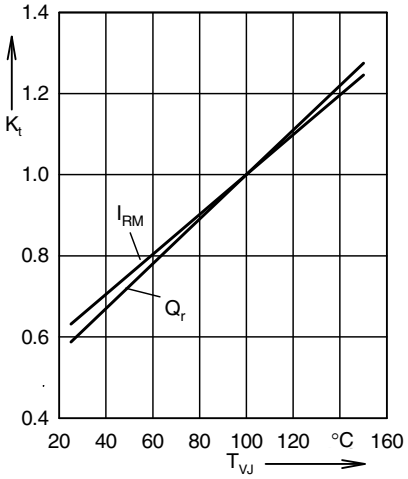

Fig. 13 Dynamic parameters versus junction temperature (Boost Diode)

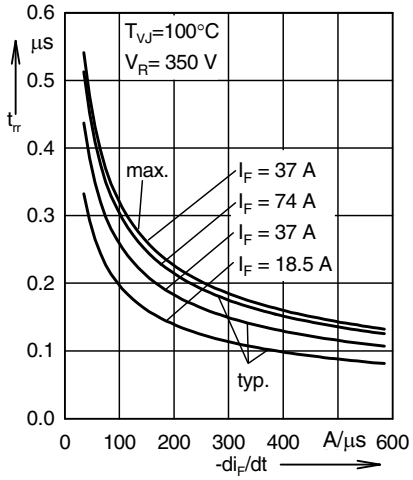

Fig. 14 Recovery time versus $-di_F/dt$ (Boost Diode)

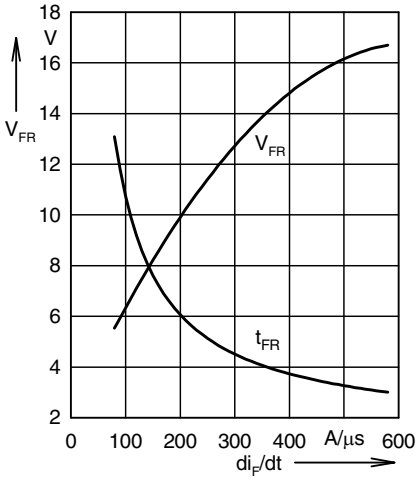

Fig. 15 Peak forward voltage versus $-di_F/dt$ (Boost Diode)

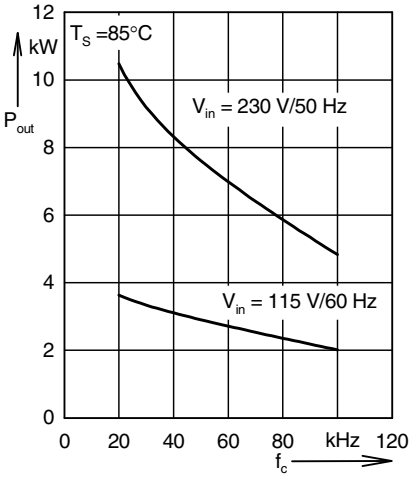

Fig. 16 Output power versus carrier frequency (Module)

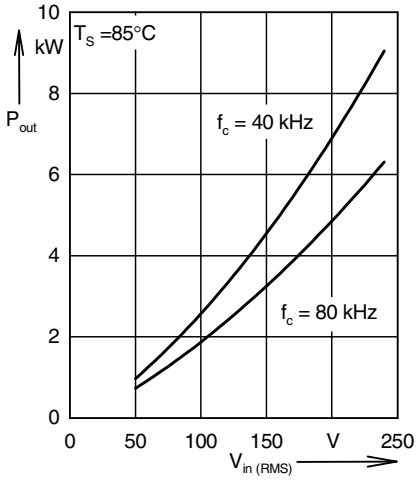

Fig. 17 Output power versus mains voltage

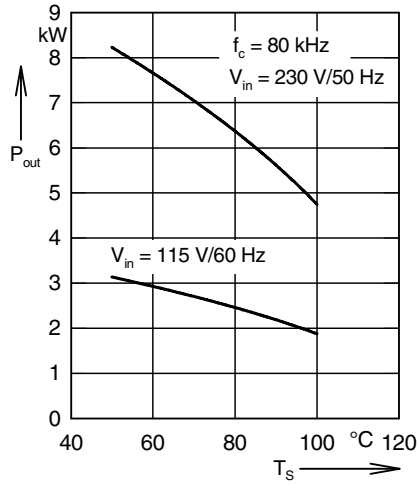

Fig. 18 Output power versus heatsink temperature (Module)

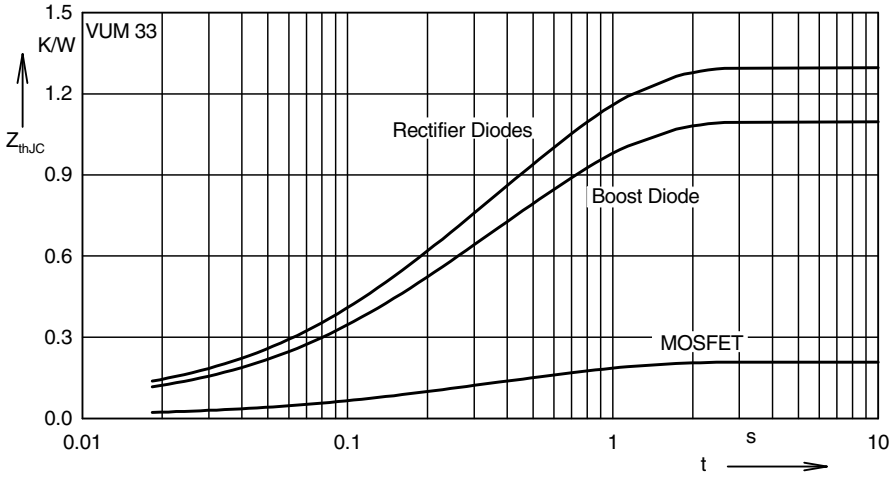

Fig. 19 Transient thermal impedance junction to case for all devices