

Rectifier Module for Three Phase Power Factor Correction

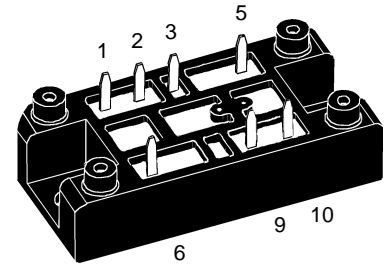
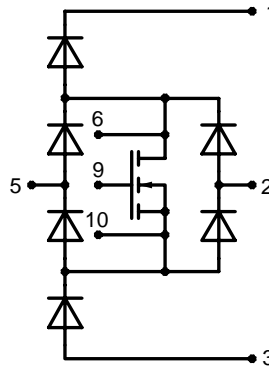
Using fast recovery epitaxial diodes and MOSFET

$$V_{DSS} = 500 \text{ V}$$

$$I_{D25} = 35 \text{ A}$$

$$R_{DS(on)} = 0.12 \Omega$$

V_{RRM} (Diode)	V_{DSS}	Type
V	V	
600	500	VUM 25-05E



Symbol	Test Conditions	Maximum Ratings		
V_{DSS}	$T_{VJ} = 25^{\circ}\text{C}$ to 150°C	500	V	
V_{DGR}	$T_{VJ} = 25^{\circ}\text{C}$ to 150°C ; $R_{GS} = 10 \text{ k}\Omega$	500	V	
V_{GS}	Continuous	± 20	V	
I_D	MOSFET $T_s = 85^{\circ}\text{C}$	24	A	
I_D		$T_s = 25^{\circ}\text{C}$	35	
I_{DM}		$T_s = 25^{\circ}\text{C}$, $t_p = \text{①}$	95	
P_D	$T_s = 85^{\circ}\text{C}$	170	W	
I_S	$V_{GS} = 0 \text{ V}$, $T_s = 25^{\circ}\text{C}$	24	A	
I_{SM}		$V_{GS} = 0 \text{ V}$, $T_s = 25^{\circ}\text{C}$, $t_p = \text{①}$	95	
V_{RRM}	Diodes $T_s = 85^{\circ}\text{C}$, rectangular $\delta = 0.5$	600	V	
I_{dAV}		40	A	
I_{FSM}	$T_{VJ} = 45^{\circ}\text{C}$, $t = 10 \text{ ms}$ (50 Hz) $t = 8.3 \text{ ms}$ (60 Hz)	300	A	
		320	A	
I_{FSM}	$T_{VJ} = 150^{\circ}\text{C}$, $t = 10 \text{ ms}$ (50 Hz) $t = 8.3 \text{ ms}$ (60 Hz)	260	A	
		280	A	
P	$T_s = 85^{\circ}\text{C}$	36	W	
T_{VJ}	Module	-40...+150	$^{\circ}\text{C}$	
T_{JM}		150	$^{\circ}\text{C}$	
T_{stg}		-40...+150	$^{\circ}\text{C}$	
V_{ISOL}	50/60 Hz	$t = 1 \text{ min}$	3000	V~
	$I_{ISOL} \leq 1 \text{ mA}$	$t = 1 \text{ s}$	3600	V~
M_d Weight	Mounting torque (M5)	2-2.5/18-22	Nm/lb.in. 35	g

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 diodes
- Kelvin source for easy drive

Applications

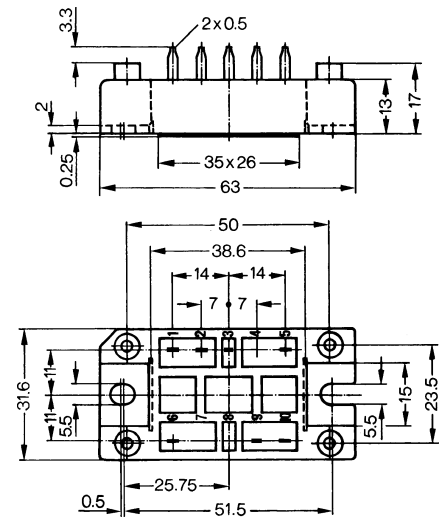
- Three phase input rectifier with power factor correction consisting of three modules VUM 25-05
- For power supplies, UPS, SMPS, drives, welding etc.

Advantages

- Reduced harmonic content of input currents corresponding to standards
- Rectifier generates maximum DC power with a given AC fuse
- Wide input voltage range
- No external isolation
- Easy to mount with two screws
- Suitable for wave soldering
- High temperature and power cycling capability

① Pulse width limited by T_{VJ}
IXYS reserves the right to change limits, test conditions and dimensions.

Symbol	Test Conditions	Characteristic Values ($T_{VJ} = 25^{\circ}\text{C}$, unless otherwise specified)		
		min.	typ.	max.
V_{DSS}	$V_{GS} = 0\text{ V}, I_D = 2\text{ mA}$	500		V
$V_{GS(th)}$	$V_{DS} = 20\text{ V}, I_D = 20\text{ mA}$	2		V
I_{GSS}	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$			$\pm 500\text{ nA}$
I_{DSS}	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$			2 mA
$R_{DS(on)}$	$T_{VJ} = 25^{\circ}\text{C}$			0.12 Ω
R_{Gint}	$T_{VJ} = 25^{\circ}\text{C}$			1.5 Ω
g_{fs}	$V_{DS} = 15\text{ V}, I_{DS} = 12\text{ A}$		30	S
V_{DS}	$I_{DS} = 24\text{ A}, V_{GS} = 0\text{ V}$			1.5 V
$t_{d(on)}$	$V_{DS} = 250\text{ V}, I_{DS} = 12\text{ A}, V_{GS} = 10\text{ V}$ $Z_{gen.} = 1\ \Omega, \text{ L-load}$			100 ns
$t_{d(off)}$				220 ns
C_{iss}	$V_{DS} = 25\text{ V}, f = 1\text{ MHz}, V_{GS} = 0\text{ V}$		8.5	nF
C_{oss}			0.9	nF
C_{rss}			0.3	nF
Q_g	$V_{DS} = 250\text{ V}, I_D = 12\text{ A}, V_{GS} = 10\text{ V}$		350	nC
R_{thJS}				0.38 K/W
V_F	$I_F = 22\text{ A}; T_{VJ} = 25^{\circ}\text{C}$			1.65 V
	$T_{VJ} = 150^{\circ}\text{C}$			1.4 V
I_R	$V_R = 600\text{ V}, T_{VJ} = 25^{\circ}\text{C}$			1.5 mA
	$V_R = 480\text{ V}, T_{VJ} = 25^{\circ}\text{C}$			0.25 mA
	$T_{VJ} = 125^{\circ}\text{C}$			7 mA
V_{T0}	For power-loss calculations only			1.14 V
r_T	$T_{VJ} = 125^{\circ}\text{C}$			10 m Ω
I_{RM}	$I_F = 30\text{ A}; -di_F/dt = 240\text{ A}/\mu\text{s}$		10	11 A
	$V_R = 350\text{ V}, T_{VJ} = 100^{\circ}\text{C}$			
R_{thJS}				1.8 K/W

Dimensions in mm (1 mm = 0.0394")


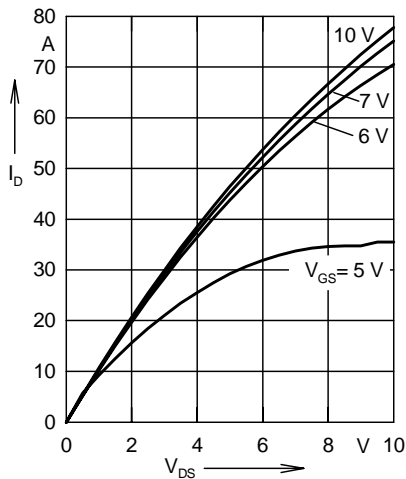


Fig. 1 Typ. output characteristic $I_D = f(V_{DS})$ (MOSFET)

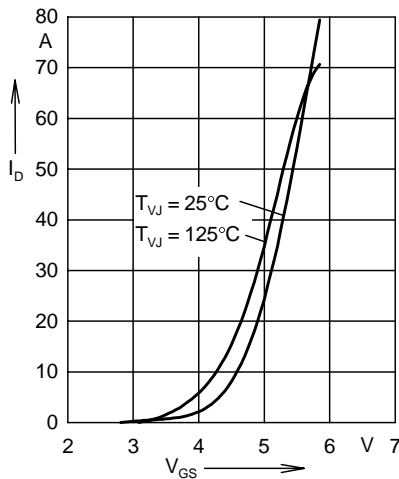


Fig. 2 Typ. transfer characteristics $I_D = f(V_{GS})$ (MOSFET)

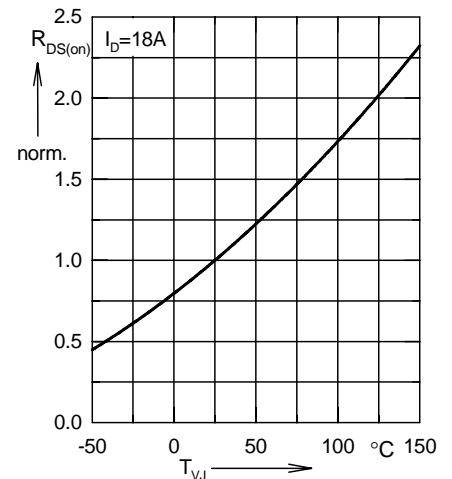


Fig. 3 Typ. normalized $R_{DS(on)} = f(T_{VJ})$ (MOSFET)

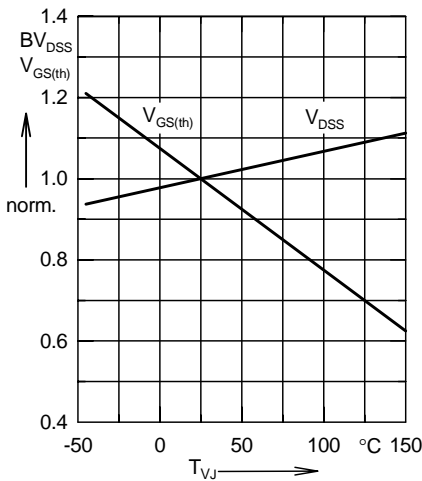


Fig. 4 Typ. normalized $BV_{DSS} = f(T_{VJ})$
 $V_{GS(th)} = f(T_{VJ})$ (MOSFET)

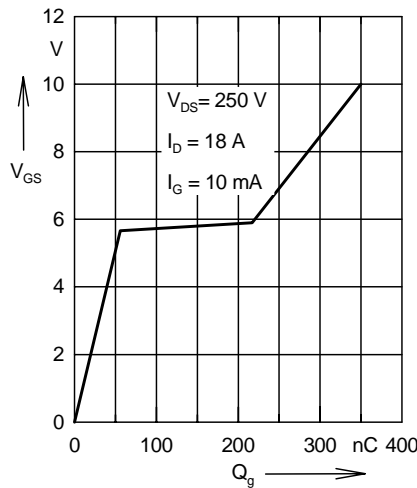


Fig. 5 Typ. turn-on gate charge characteristics, $V_{GS} = f(Q_g)$ (MOSFET)

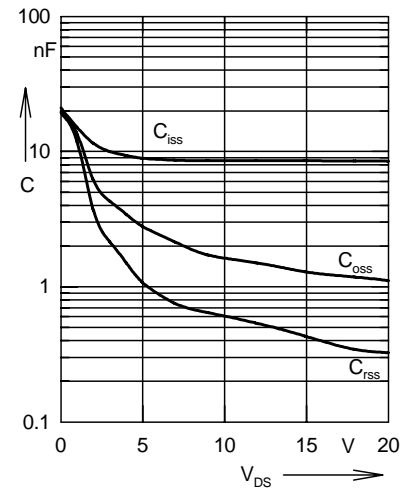


Fig. 6 Typ. capacitances $C = f(V_{DS})$, $f = 1 \text{ MHz}$ (MOSFET)

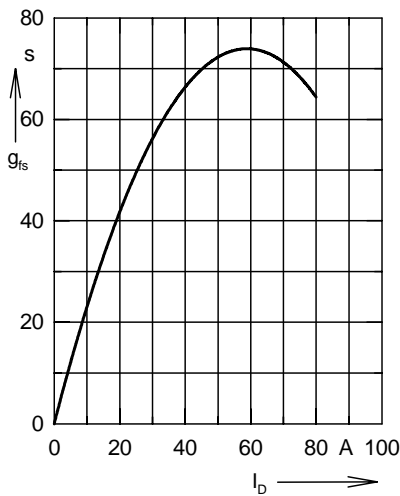


Fig. 7 Typ. transconductance, $g_{fs} = f(I_D)$ (MOSFET)

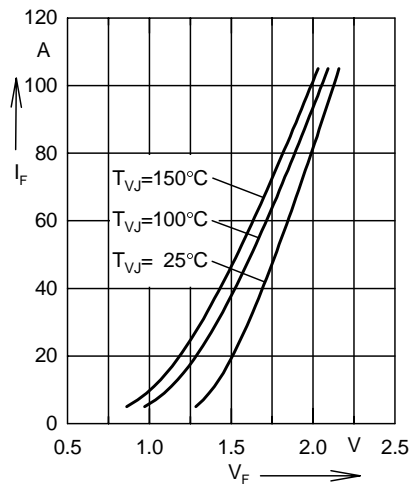


Fig. 8 Forward current versus voltage drop (Diodes)

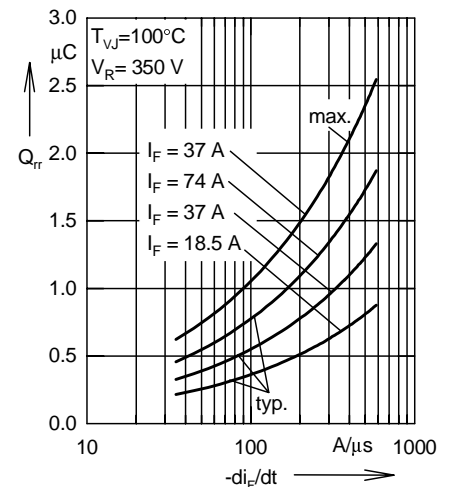


Fig. 9 Recovery charge versus $-di_F/dt$ (Diodes)

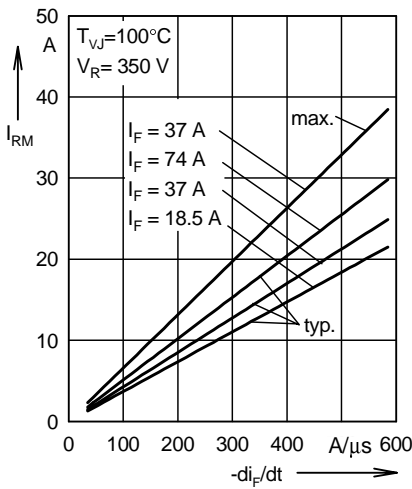


Fig. 10 Peak reverse current versus $-di_F/dt$ (Diodes)

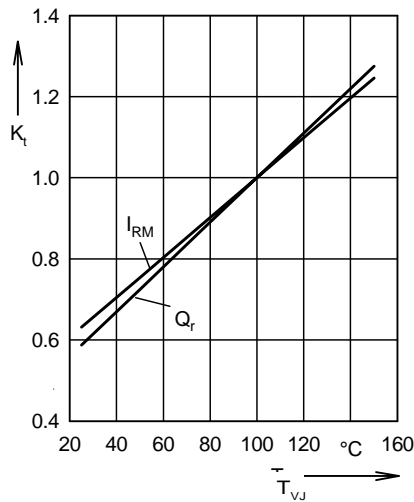


Fig. 11 Dynamic parameters versus junction temperature (Diodes)

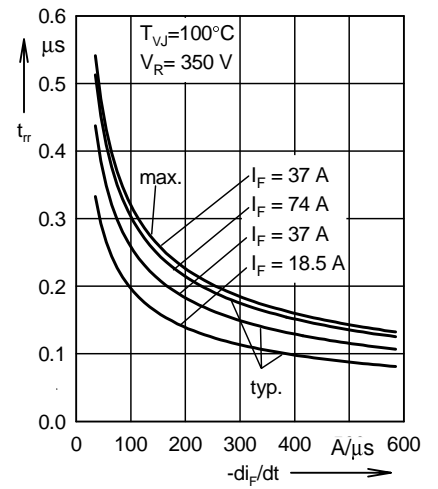


Fig. 12 Recovery time versus $-di_F/dt$ (Diodes)

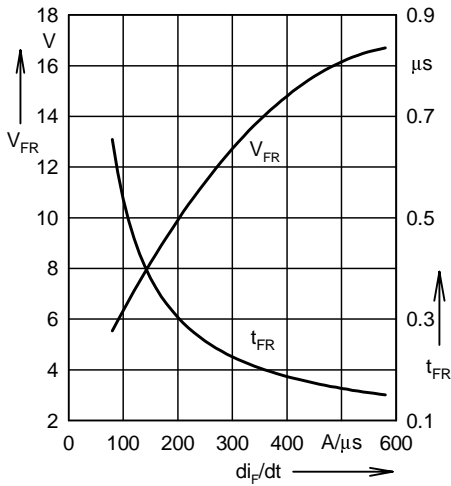


Fig. 13 Peak forward voltage versus $-di_F/dt$ (Diodes)

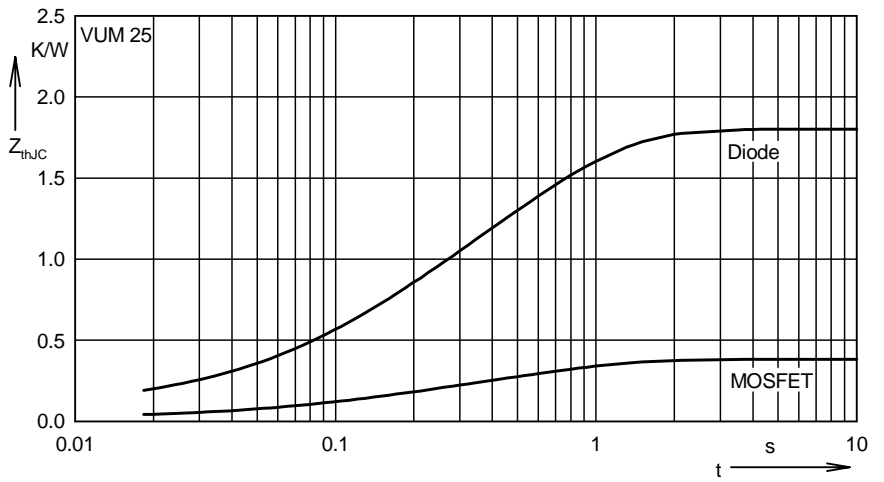


Fig. 14 Transient thermal impedance junction to case for all devices