N Channel Enhancement Types

suffix "F" = HiPerFET™ technology with fast reverse diode

Package style

Fig. 1 **TO-240AA**

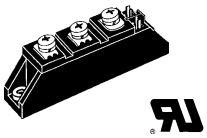


Fig. 2

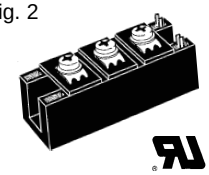


Fig. 3

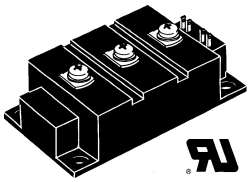


Fig. 4

Fig. 5

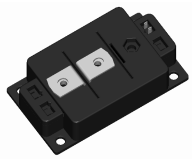
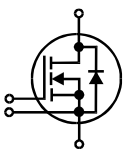


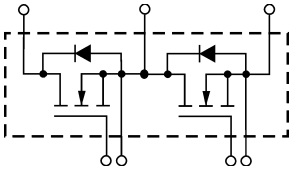
Fig. 6 ISOPLUS i4-PAC™

Type ➤ New	V_{DSS} V	I_{D25} A T_C = 25°C	I_{D80} A T_C = 80°C	R_{DSon} mΩ T_J = 25°C	t_f ns T_J = 125°C	t_{rr} ns T_J = 125°C	Fig. No.	Page
low voltage modules								
phase leg modules								
➤ FMM 75-01F	100	75	50	25	60	300	6	C3 - 4
➤ VMM 45-02F	200	45	34	39	25	200	1	C3 - 12
VMM 85-02F	200	84	63	20	100	200	2	C3 - 18
dual switch modules								
➤ VMK 165-007T	70	165	130	7	110	150	1	C3 - 2
VMK 90-02T1	200	83	62	20	100	400	1	C3 - 14
low voltage high current modules for automotive applications, industrial vehicles etc.								
single switch modules								
VMO 550-01F	100	590	440	2.1	200	300	3	C3 - 6
VMO 650-01F	100	690	520	1.8	200	300	3	C3 - 8
➤ VMO 580-02F	200	580	440	3.2	350	600	5	C3 - 22
phase leg modules								
VMM 650-01F	100	680	510	1.8	150	300	4	C3 - 10
➤ VMM 300-03F	300	290	220	7.4	150	300	3	C3 - 24
high voltage modules								
single switch modules								
➤ VMO 60-05F	500	60	44	65	30	250	1	C3 - 26
dual switch modules								
➤ VMM 90-09F	900	85	65	76	140	250	4	C3 - 28
chhopper								
➤ FMD 21-05QC	500	21	15	220	16	tbd	6	C3 - 30
➤ FDM 21-05QC	500	21	15	220	16	tbd	6	C3 - 30

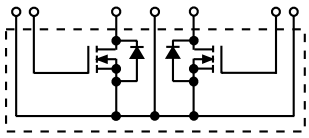
Circuit configuration:



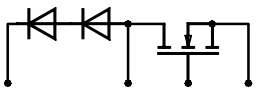
VMO
Single switch



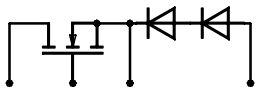
FMM / VMM
phase leg



VMK
dual switch



FMD
chopper



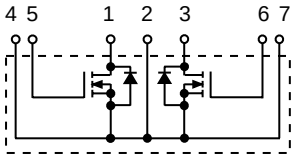
FDM
chopper

Dual Power MOSFET Module

VMK 165-007T

V_{DSS} = 70 V
I_{D25} = 165 A
$R_{DS(on)}$ = 7 mΩ

Common-Source connected
N-Channel Enhancement Mode



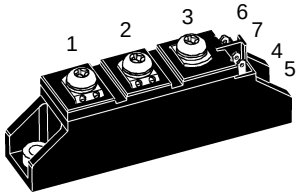
Symbol	Conditions		Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C		70	V
V_{DGR}	T_J = 25°C to 150°C; R_{GS} = 6.8 kΩ		70	V
V_{GS}	Continuous		±20	V
V_{GSM}	Transient		±30	V
I_{D25}	T_C = 25°C		165	A
I_D	T_C = 100°C		104	A
I_{DM}	T_C = 25°C, t_p = 10 µs, pulse width limited by T_{JM}		660	A
P_{tot}	T_C = 25°C, T_J = 150°C		390	W
T_J			-40 ... +150	°C
T_{JM}			150	°C
T_{stg}			-40 ... +125	°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 or 10-32 UNF)		2.5-4.0/22-35	Nm/lb.in.
	Terminal connection torque (M5)		2.5-4.0/22-35	Nm/lb.in.
Weight	Typical including screws		90	g

Symbol	Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
V_{DSS}	V_{GS} = 0 V, I_D = 1 mA	70			V
$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 8 mA	2		4	V
I_{GSS}	V_{GS} = ±20 V DC, V_{DS} = 0			500	nA
I_{DSS}	V_{DS} = V_{DSS}, V_{GS} = 0 V, T_J = 25°C			200	µA
	V_{DS} = 0.8 • V_{DSS}, V_{GS} = 0 V, T_J = 125°C			1	mA
$R_{DS(on)}$	V_{GS} = 10 V, I_D = 0.5 • I_{D25}		6	7	mΩ
	Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %				

Data per MOSFET unless otherwise stated.

TO-240 AA

E 72873



1, 3 = Drain, 2 = Common Source
5, 6 = Gate, 4, 7 = Kelvin Source

Features

- Two MOSFET with common source
- International standard package JEDEC TO-240 AA
- Direct copper bonded Al_2O_3 ceramic base plate
- Isolation voltage 3000 V~
- Low $R_{DS(on)}$ HDMOS™ process
- Low package inductance for high speed switching
- Kelvin source contact
- Keyed twin plugs

Applications

- Push-pull inverters
- Switched-mode and resonant-mode power supplies
- Uninterruptible power supplies (UPS)
- AC static switches

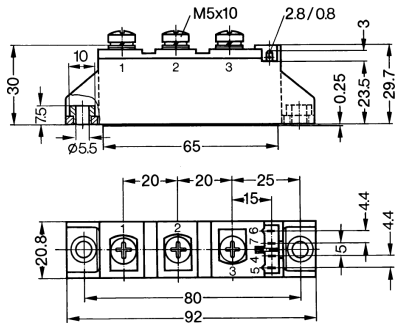
Advantages

- Easy to mount with two screws
- Space and weight savings
- High power density
- Low losses

023

Symbol	Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
g_{fs}	V_{DS} = 10 V; I_D = 0.5 • I_{D25} pulsed	60	80		S
C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		8.8		nF
C_{oss}			4.0		nF
C_{rss}			2.4		nF
$t_{d(on)}$	V_{GS} = 10 V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25} R_G = 1 Ω (External), resistive load		120		ns
t_r			280		ns
$t_{d(off)}$			390		ns
t_f			110		ns
Q_g	V_{GS} = 10 V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		480		nC
Q_{gs}			60		nC
Q_{gd}			240		nC
R_{thJC}				0.32	K/W
R_{thCH}	with heat transfer paste		0.2		K/W
d_S	Creepage distance on surface	12.7			mm
d_A	Strike distance through air	9.6			mm
a	Max. allowable acceleration		50		m/s^2

TO-240 AA Outline



Dimensions in mm (1 mm = 0.0394")

Source-Drain Diode

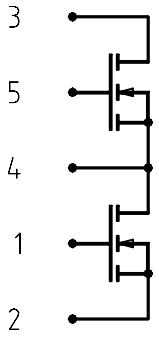
Symbol	Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
I_S	V_{GS} = 0 V			165	A
I_{SM}	Repetitive; pulse width limited by T_{JM}			660	A
V_{SD}	I_F = I_S; V_{GS} = 0 V, Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %			1.5	V
t_{rr}	I_F = 50 A, -di/dt = 200 A/µs, V_{DS} = 25 V, V_{GS} = 0 V		150		ns

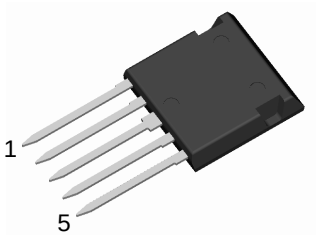
HiPerFET™ Power Mosfet

-Phaseleg Topology-
in ISOPLUS i4-PAC™

FMM 75-01F

I_{D25} = 75 A
V_{DSS} = 100 V
R_{DSon} = 25 mΩ





MOSFETs

Symbol	Conditions	Maximum Ratings	
V_{DSS}	T_{VJ} = 25°C to 150°C	100	V
V_{GS}		±20	V
I_{D25}	T_C = 25°C	75	A
I_{D90}	T_C = 90°C	50	A
I_{F25}	(diode) T_C = 25°C	100	A
I_{F90}	(diode) T_C = 90°C	60	A
dv/dt	$V_{DS} < V_{DSS}$; $I_F \le 300A$; $\lvert di_F/dt \rvert \le 100A/\mu s$; R_G = 2 Ω; T_{VJ} = 150°C	5	V/ns
E_{AR}	T_C = 25°C	30	mJ

Symbol	Conditions (T_{VJ} = 25°C, unless otherwise specified)	Characteristic Values min.	typ.	max.	
R_{DSon}	V_{GS} = 10 V; $I_D = I_{D90}$			25	mΩ
V_{GSth}	V_{DS} = 20 V; I_D = 4 mA;	2		4	V
I_{DSS}	$V_{DS} = V_{DSS}$; V_{GS} = 0 V; T_{VJ} = 25°C			0.3	mA
	T_{VJ} = 125°C		0.25		mA
I_{GSS}	V_{GS} = ±20 V; V_{DS} = 0 V			200	nA
Q_g	V_{GS} = 10 V; $V_{DS} = 0.5 \cdot V_{DSS}$; $I_D = I_{D90}$		180		nC
Q_{gs}			35		nC
Q_{gd}			85		nC
$t_{d(on)}$	V_{GS} = 10 V; $V_{DS} = 0.5 \cdot V_{DSS}$;		20		ns
t_r	$I_D = I_{D90}$; R_G = 2 Ω		60		ns
$t_{d(off)}$			80		ns
t_f			60		ns
V_F	(diode) I_F = 75 A; V_{GS} = 0 V		1.2	1.5	V
t_{rr}	(diode) I_F = 37.5 A; -di/dt = 100 A/µs; V_{DS} = 25 V		300		ns
R_{thJC}				0.5	K/W

Features

- HiPerFET™ technology
  - low R_{DSon}
  - low gate charge for high frequency operation
  - unclamped inductive switching (UIS) capability
  - dv/dt ruggedness
  - fast intrinsic reverse diode
- ISOPLUS i4-PAC™ package
  - isolated back surface
  - enlarged creepage towards heatsink
  - application friendly pinout
  - low inductive current path
  - high reliability
  - industry standard outline

Applications

- drives and power supplies
- battery or fuel cell powered
- automotive, industrial vehicle etc.
- secondary side of mains power supplies

IXYS reserves the right to change limits, test conditions and dimensions.

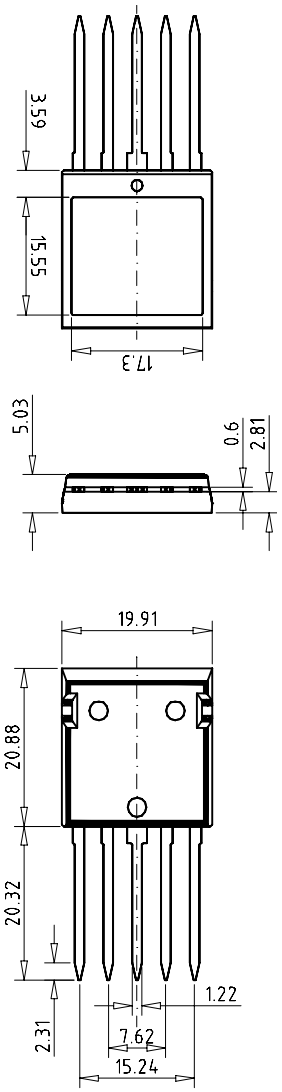
022

Component

Symbol	Conditions	Maximum Ratings	
T_{VJ}		-55...+150	°C
T_{stg}		-55...+125	°C
V_{ISOL}	$I_{ISOL} \leq 1$ mA; 50/60 Hz	2500	V~
F_C	mounting force with clip	20...120	N

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
d_S,d_A	pin - pin	1.7		mm
d_S,d_A	pin - backside metal	5.5		mm
R_{thCH}	with heatsink compound		0.15	K/W
Weight			9	g

Dimensions in mm (1 mm = 0.0394")



IXYS

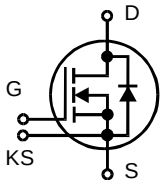
HiPerFET™ MOSFET Module

VMO 550-01F

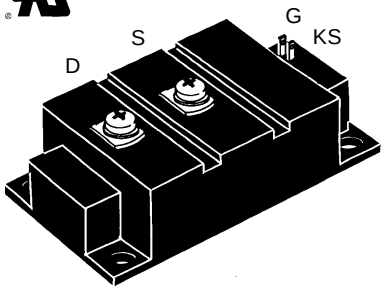
V_{DSS} = 100 V
I_{D25} = 590 A
$R_{DS(on)}$ = 2.1 mΩ

N-Channel Enhancement Mode

Preliminary Data



E 72873



D = Drain S = Source
KS = Kelvin Source G = Gate

Symbol	Test Conditions		Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C		100	V
V_{DGR}	T_J = 25°C to 150°C; R_{GS} = 10 kΩ		100	V
V_{GS}	Continuous		±20	V
V_{GSM}	Transient		±30	V
I_{D25}	T_S = 25°C		590	A
I_{D80}	T_S = 80°C		440	A
I_{DM}	T_S = 25°C	pulse width limited by T_{JM}	2360	A
P_D	T_C = 25°C		2200	W
	T_S = 25°C		1470	W
T_J			-40 ...+150	°C
T_{JM}			150	°C
T_{stg}			-40 ... +125	°C
V_{ISOL}	50/60 Hz	t = 1 min	3000	V~
	I_{ISOL} ≤ 1 mA	t = 1 s	3600	
M_d	Mounting torque (M6)		2.25-2.75/20-25	Nm/lb.in.
	Terminal connection torque (M5)		2.5-3.7/22-33	Nm/lb.in.
Weight	typical including screws		250	g

Symbol	Test Conditions		Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
V_{DSS}	V_{GS} = 0 V, I_D = 6 mA		100			V
$V_{GS(th)}$	V_{DS} = 20 V, I_D = 110 mA		3		6	V
I_{GSS}	V_{GS} = ±20 V DC, V_{DS} = 0				±500	nA
I_{DSS}	V_{DS} = 0.8 • V_{DSS}	T_J = 25°C			3	mA
	V_{GS} = 0 V	T_J = 125°C			12	mA
$R_{DS(on)}$	V_{GS} = 10 V, I_D = 0.5 • I_{D25} Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %				2.1	mΩ

Features

- International standard package
- **D**irect **C**opper **B**onded Al_2O_3 ceramic base plate
- Isolation voltage 3600 V~
- Low $R_{DS(on)}$ HDMOS™ process
- Low package inductance for high speed switching
- Kelvin Source contact for easy drive

Applications

- AC motor speed control for electric vehicles
- DC servo and robot drives
- Switched-mode and resonant-mode power supplies
- DC choppers

Advantages

- Easy to mount
- Space and weight savings
- High power density
- Low losses

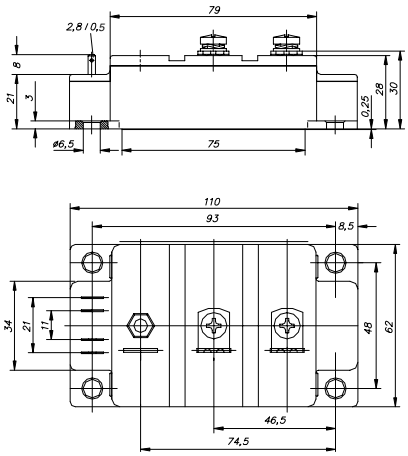
750

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
g_{fs}	V_{DS} = 10 V; I_D = 0.5 • I_{D25} pulsed		330		S
C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		50		nF
C_{oss}			17.6		nF
C_{rss}			8.8		nF
$t_{d(on)}$	V_{GS} = 10 V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}; R_G = 2 Ω (external)		250		ns
t_r			500		ns
$t_{d(off)}$			800		ns
t_f			200		ns
Q_g	V_{GS} = 10 V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		2000		nC
Q_{gs}			385		nC
Q_{gd}			940		nC
R_{thJC}				0.057	K/W
R_{thJS}	with 30 µm heat transfer paste			0.085	K/W

Source-Drain Diode

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
I_S	V_{GS} = 0 V			590	A
I_{SM}	Repetitive; pulse width limited by T_{JM}			2360	A
V_{SD}	I_F = I_S; V_{GS} = 0 V, Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %		0.9	1.2	V
t_{rr}	I_F = I_S, -di/dt = 1000 A/µs, V_{DS} = 0.5 • V_{DSS}		300		ns

Dimensions in mm (1 mm = 0.0394")



IXYS

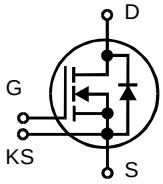
HiPerFET™ MOSFET Module

VMO 650-01F

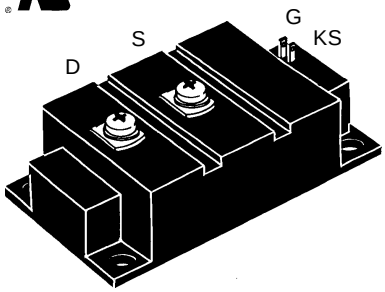
V_{DSS} = 100 V
I_{D25} = 690 A
$R_{DS(on)}$ = 1.8 mΩ

N-Channel Enhancement Mode

Preliminary Data



E 72873



D = Drain S = Source
KS = Kelvin Source G = Gate

Symbol	Test Conditions		Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C		100	V
V_{DGR}	T_J = 25°C to 150°C; R_{GS} = 10 kΩ		100	V
V_{GS}	Continuous		±20	V
V_{GSM}	Transient		±30	V
I_{D25}	T_S = 25°C		690	A
I_{D80}	T_S = 80°C		520	A
I_{DM}	T_S = 25°C	pulse width limited by T_{JM}	2780	A
P_D	T_C = 25°C		2500	W
	T_S = 25°C		1740	W
T_J			-40 ...+150	°C
T_{JM}			150	°C
T_{stg}			-40 ... +125	°C
V_{ISOL}	50/60 Hz	t = 1 min	3000	V~
	I_{ISOL} ≤ 1 mA	t = 1 s	3600	
M_d	Mounting torque (M6)		2.25-2.75/20-25	Nm/lb.in.
	Terminal connection torque (M5)		2.5-3.7/22-33	Nm/lb.in.
Weight	typical including screws		250	g

Symbol	Test Conditions		Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
V_{DSS}	V_{GS} = 0 V, I_D = 7 mA		100			V
$V_{GS(th)}$	V_{DS} = 20 V, I_D = 130 mA		3		6	V
I_{GSS}	V_{GS} = ±20 V DC, V_{DS} = 0				±500	nA
I_{DSS}	V_{DS} = 0.8 • V_{DSS}	T_J = 25°C			3.5	mA
	V_{GS} = 0 V	T_J = 125°C			14	mA
$R_{DS(on)}$	V_{GS} = 10 V, I_D = 0.5 • I_{D25}				1.8	mΩ
	Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %					

Features

- International standard package
- **D**irect **C**opper **B**onded Al_2O_3 ceramic base plate
- Isolation voltage 3600 V~
- Low $R_{DS(on)}$ HDMOS™ process
- Low package inductance for high speed switching
- Kelvin Source contact for easy drive

Applications

- AC motor speed control for electric vehicles
- DC servo and robot drives
- Switched-mode and resonant-mode power supplies
- DC choppers

Advantages

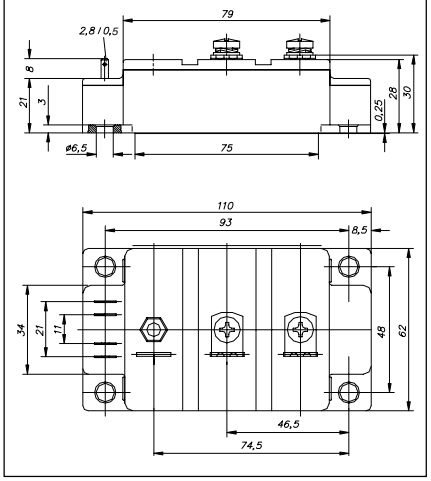
- Easy to mount
- Space and weight savings
- High power density
- Low losses

IXYS reserves the right to change limits, test conditions and dimensions.

750

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
g_{fs}	V_{DS} = 10 V; I_D = 0.5 • I_{D25} pulsed		390		S
C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		59		nF
C_{oss}			20.8		nF
C_{rss}			10.4		nF
$t_{d(on)}$	V_{GS} = 10 V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}; R_G = 2 Ω (external)		250		ns
t_r			500		ns
$t_{d(off)}$			800		ns
t_f			200		ns
Q_g	V_{GS} = 10 V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		2300		nC
Q_{gs}			455		nC
Q_{gd}			1110		nC
R_{thJC}				0.048	K/W
R_{thJS}	with 30 µm heat transfer paste			0.072	K/W

Dimensions in mm (1 mm = 0.0394")



Source-Drain Diode

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
I_S	V_{GS} = 0 V			690	A
I_{SM}	Repetitive; pulse width limited by T_{JM}			2760	A
V_{SD}	I_F = I_S; V_{GS} = 0 V, Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %		0.9	1.2	V
t_{rr}	I_F = I_S, -di/dt = 1000 A/µs, V_{DS} = 0.5 • V_{DSS}		300		ns

IXYS

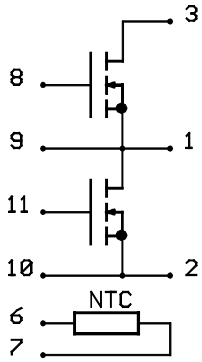
Dual Power HiPerFET™ Module

VMM 650-01F

V_{DSS} = 100 V
I_{D25} = 680 A
$R_{DS(on)}$ = 1.8 mΩ

Phaseleg Configuration

Preliminary Data



MOSFET T1 + T2

Symbol	Conditions		Maximum Ratings	
V_{DSS}	T_{VJ} = 25°C to 150°C		100	V
V_{GS}			±20	V
I_{D25}	T_C = 25°C	①	680	A
I_{D80}	T_C = 80°C	①	500	A
I_{F25}	(diode) T_C = 25°C	①	680	A
I_{F80}	(diode) T_C = 80°C	①	500	A

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
R_{DSon}	V_{GS} = 10 V; I_D = I_{D80}		1.8	2.2	mΩ
V_{GSth}	V_{DS} = 20 V; I_D = 30 mA	2		4	V
I_{DSS}	V_{DS} = 0.8 • V_{DSS}; V_{GS} = 0 V; T_{VJ} = 25°C			1	mA
	T_{VJ} = 125°C		1.5		mA
I_{GSS}	V_{GS} = ±20 V; V_{DS} = 0 V			1	µA
Q_g	V_{GS}= 10 V; V_{DS} = 75 V; I_D = I_{D80}		1440		nC
Q_{gs}			200		nC
Q_{gd}			680		nC
$t_{d(on)}$	V_{GS}= 10 V; V_{DS} = 0.5 • V_{DSS}; I_D = I_{D80}; R_G = 0.47 Ω		150		ns
t_r			250		ns
$t_{d(off)}$			400		ns
t_f			200		ns
V_F	(diode) I_F = 650 A; V_{GS} = 0 V		1.2	1.5	V
t_{rr}	(diode) I_F = 650 A; -di/dt = 500 A/µs; V_{DS} = ½ V_{DSS}		300		ns
R_{thJC}				0.08	K/W
R_{thJS}	with heat transfer paste		0.12		K/W

① additional current limitation by external leads

Features

- HiPerFET ™ technology
  - low R_{DSon}
  - unclamped inductive switching (UIS) capability
  - dv/dt ruggedness
  - fast intrinsic reverse diode
  - low gate charge
- thermistor for internal temperature measurement
- package
  - low inductive current path
  - screw connection to high current main terminals
  - use of non interchangeable connectors for auxiliary terminals possible
  - Kelvin source terminals for easy drive
  - isolated DCB ceramic base plate

Applications

- converters with high power density for
  - main and auxiliary AC drives of electric vehicles
  - 4 quadrant DC drives
  - power supplies

001

Temperature Sensor NTC

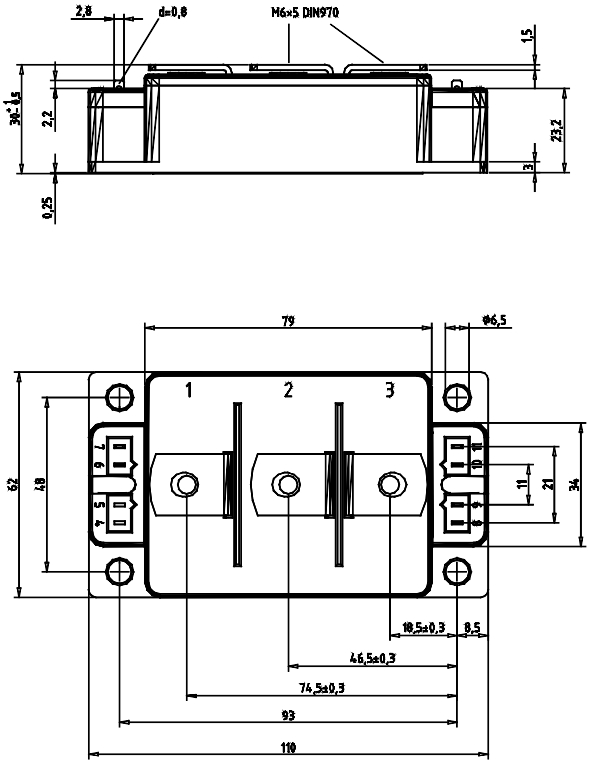
Symbol	Conditions	Characteristic Values min.	typ.	max.	
R_{25}	T = 25°C	1950	2057	2170	Ω
$B_{25/100}$			3560		K

Module

Symbol	Conditions	Maximum Ratings	
T_{VJ}		-40...+150	°C
T_{stg}		-40...+125	°C
V_{ISOL}	$I_{ISOL} \leq 1$ mA; 50/60 Hz	3600	V~
M_d	Mounting torque (M6)	2.25 - 2.75	Nm
	Terminal connection torque (M6)	4.5 - 5.5	Nm

Symbol	Conditions	Characteristic Values min.	typ.	max.	
Weight			250		g

Dimensions in mm (1 mm = 0.0394")



Optional accessories for modules

keyed twin plugs
(UL758, style 1385, CSA class 5851, guide 460-1-1)

- Type ZY180L with wire length 350mm
  – for pins 4 (yellow wire) and 5 (red wire)
  – for pins 11 (yellow wire) and 10 (red wire)
- Type ZY180R with wire length 350mm
  – for pins 7 (yellow wire) and 6 (red wire)
  – for pins 8 (yellow wire) and 9 (red wire)

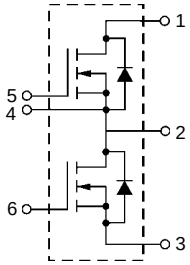
IXYS

Dual Power HiPerFET™ Module

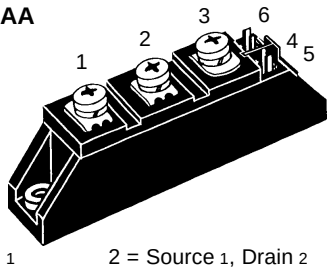
VMM 45-02F

V_{DSS} = 200 V
I_{D25} = 45 A
$R_{DS(on)}$ = 45 mΩ

Phaseleg Configuration
High dv/dt, Low t_{rr}, HDMOS™ Family



TO-240 AA



1 = Drain 1
2 = Source 1, Drain 2
3 = Source 2
4 = Kelvin Source 1
5 = Gate 1
6 = Gate 2

Preliminary Data

Symbol	Conditions		Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C		200	V
V_{DGR}	T_J = 25°C to 150°C; R_{GS} = 10 kΩ		200	V
V_{GS}	Continuous		±20	V
V_{GSM}	Transient		±30	V
I_{D25}	T_C = 25°C		45	A
I_{D80}	T_C = 80°C		34	A
I_{DM}	T_C = 25°C, t_p = 10 µs, pulse width limited by T_{JM}		180	A
P_{tot}	T_C = 25°C		190	W
T_J			-40 ... +150	°C
T_{JM}			150	°C
T_{stg}			-40 ... +125	°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 or 10-32 UNF)		2.5-4.0/22-35	Nm/lb.in.
	Terminal connection torque (M5)		2.5-4.0/22-35	Nm/lb.in.
Weight	Typical including screws		90	g

Symbol	Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
V_{DSS}	V_{GS} = 0 V, I_D = 1 mA	200			V
$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 4 mA	2		4	V
I_{GSS}	V_{GS} = ±20 V DC, V_{DS} = 0			500	nA
I_{DSS}	V_{DS} = V_{DSS}, V_{GS} = 0 V, T_J = 25°C			15	µA
	V_{DS} = 0.8 • V_{DSS}, V_{GS} = 0 V, T_J = 125°C			1	mA
$R_{DS(on)}$	V_{GS} = 10 V, I_D = 0.5 • I_{D25} Pulse test, t ≤ 300 µs, duty cycle d ≤ 2%		39	45	mΩ

Data per MOSFET unless otherwise stated.

Features

- Two MOSFET's in phaseleg config.
- International standard package
- Direct copper bonded Al_2O_3 ceramic base plate
- Isolation voltage 3600 V~
- Low $R_{DS(on)}$ HDMOS™ process

Applications

- Switched-mode and resonant-mode power supplies
- Uninterruptible power supplies (UPS)

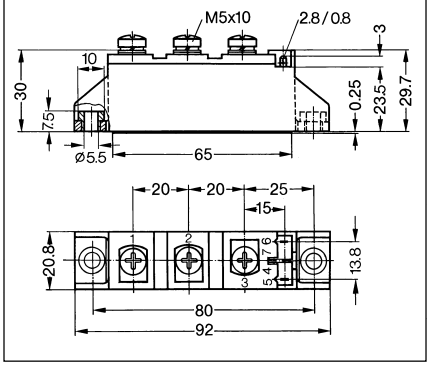
Advantages

- Easy to mount with two screws
- Space and weight savings
- High power density
- Low losses

948

Symbol	Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
g_{fs}	V_{DS} = 10 V; I_D = 0.5 • I_{D25} pulsed	20	30		S
C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		4800	7500	pF
C_{oss}			900	2250	pF
C_{rss}			310	750	pF
$t_{d(on)}$	V_{GS} = 10 V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}; R_G = 1 Ω (External), resistive load		40		ns
t_r			45		ns
$t_{d(off)}$			300		ns
t_f			45		ns
Q_g	V_{GS} = 10 V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		190	225	nC
Q_{gs}			35	55	nC
Q_{gd}			95	115	nC
R_{thJC}				0.63	K/W
R_{thCH}	heatsink compound applied		0.3		K/W
d_S	Creepage distance on surface	12.7			mm
d_A	Strike distance through air	9.6			mm
a	Allowable acceleration			50	m/s^2

Dimensions in mm (1 mm = 0.0394")



Source-Drain Diode

Symbol	Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
I_S	V_{GS} = 0 V			45	A
I_{SM}	Repetitive; pulse width limited by T_{JM}			180	A
V_{SD}	I_F = I_S; V_{GS} = 0 V, Pulse test, t ≤ 300 µs, duty cycle d ≤ 2%		0.9	1.2	V
t_{rr}	I_F = I_S, -di/dt = 100 A/µs, V_{DS} = 100 V, V_{GS} = 0 V		200	400	ns

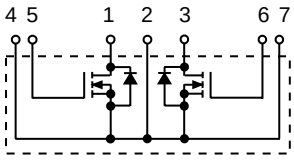
IXYS

Dual Power MOSFET Module

VMK 90-02T2

V_{DSS} = 200 V
I_{D25} = 83 A
$R_{DS(on)}$ = 25 mΩ

Common-Source connected
N-Channel Enhancement Mode

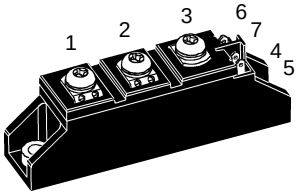


Symbol	Test Conditions		Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C		200	V
V_{DGR}	T_J = 25°C to 150°C; R_{GS} = 6.8 kΩ		200	V
V_{GS}	Continuous		±20	V
V_{GSM}	Transient		±30	V
I_{D25}	T_C = 25°C		83	A
I_{D80}	T_C = 80°C		62	A
I_{DM}	T_C = 25°C, t_p = 10 µs, pulse width limited by T_{JM}		330	A
P_D	T_C = 25°C, T_J = 150°C,		380	W
T_J			-40 ... +150	°C
T_{JM}			150	°C
T_{stg}			-40 ... +125	°C
V_{ISOL}	50/60 Hz	t = 1 min	2500	V~
	I_{ISOL} ≤ 1 mA	t = 1 s	3000	V~
M_d	Mounting torque(M5 or 10-32 UNF)		2.5-4.0/22-35	Nm/lb.in.
	Terminal connection torque (M5)		2.5-4.0/22-35	Nm/lb.in.
Weight	Typical including screws		90	g

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
V_{DSS}	V_{GS} = 0 V, I_D = 1 mA	200			V
$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 3 mA	2		4	V
I_{GSS}	V_{GS} = ±20 V DC, V_{DS} = 0			500	nA
I_{DSS}	V_{DS} = 0.8 • V_{DSS}, V_{GS} = 0 V, T_J = 25°C			400	µA
	V_{GS} = 0 V, T_J = 125°C			2	mA
$R_{DS(on)}$	V_{GS} = 10 V, I_D = 0.5 • I_{D25} Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %			25	mΩ

TO-240 AA

E 72873



1, 3 = Drain, 2 = Common Source
5, 6 = Gate, 4, 7 = Kelvin Source

Features

- Two MOSFET with common source
- International standard package JEDEC TO-240 AA
- Direct copper bonded Al_2O_3 ceramic base plate
- Isolation voltage 3000 V~
- Low $R_{DS(on)}$ HDMOS™ process
- Low package inductance for high speed switching
- Kelvin source contact
- Keyed twin plugs

Applications

- Push-pull inverters
- Switched-mode and resonant-mode power supplies
- Uninterruptible power supplies (UPS)
- AC static switches

Advantages

- Easy to mount with two screws
- Space and weight savings
- High power density
- Low losses

Data per MOSFET unless otherwise stated.
IXYS reserves the right to change limits, test conditions and dimensions

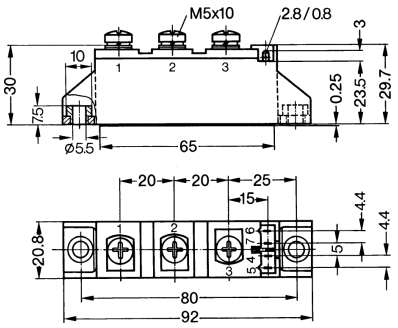
750

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
g_{fs}	V_{DS} = 10 V; I_D = 0.5 • I_{D25} pulsed		60		S
C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		9000	15000	pF
C_{oss}			1600	4500	pF
C_{rss}			600	1500	pF
$t_{d(on)}$	V_{GS} = 10 V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25} R_G = 1 Ω (External), resistive load			70	ns
t_r				80	ns
$t_{d(off)}$				200	ns
t_f				100	ns
Q_g	V_{GS} = 10 V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		380	450	nC
Q_{gs}			70	110	nC
Q_{gd}			190	230	nC
R_{thJC}				0.33	K/W
R_{thJK}	with heat transfer paste			0.53	K/W
d_S	Creepage distance on surface	12.7			mm
d_A	Strike distance through air	9.6			mm
a	Max. allowable acceleration		50		m/s^2

Source-Drain Diode

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
I_S	V_{GS} = 0 V			83	A
I_{SM}	Repetitive; pulse width limited by T_{JM}			330	A
V_{SD}	I_F = I_S; V_{GS} = 0 V, Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %		1.0	1.2	V
t_{rr}	I_F = I_S, -di/dt = 100 A/µs, V_{DS} = 100 V, V_{GS} = 0 V		400	750	ns

TO-240 AA Outline



Dimensions in mm (1 mm = 0.0394")

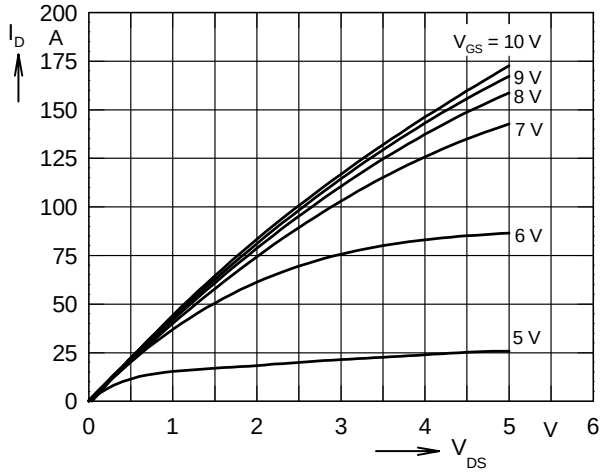


Fig. 1 Typical output characteristics $I_D = f(V_{DS})$

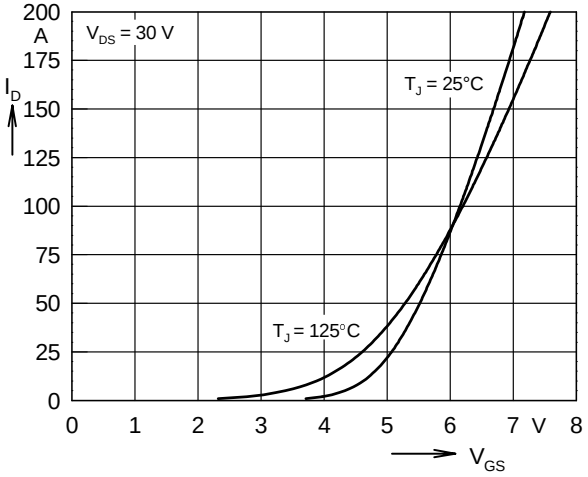


Fig. 2 Typical transfer characteristics $I_D = f(V_{GS})$

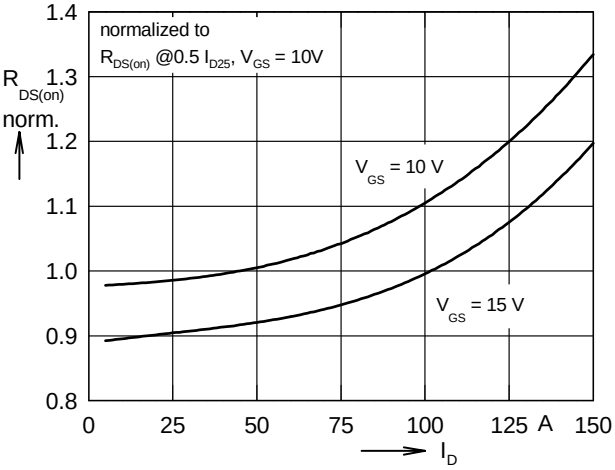


Fig. 3 Typical normalized $R_{DS(on)} = f(I_D)$

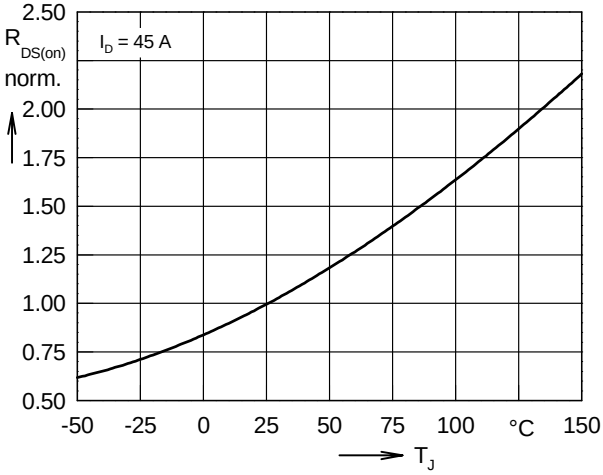


Fig. 4 Typical normalized $R_{DS(on)} = f(T_J)$

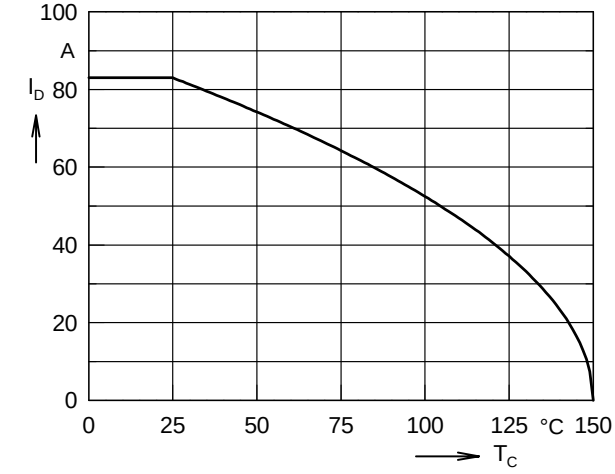


Fig. 5 Continuous drain current $I_D = f(T_C)$

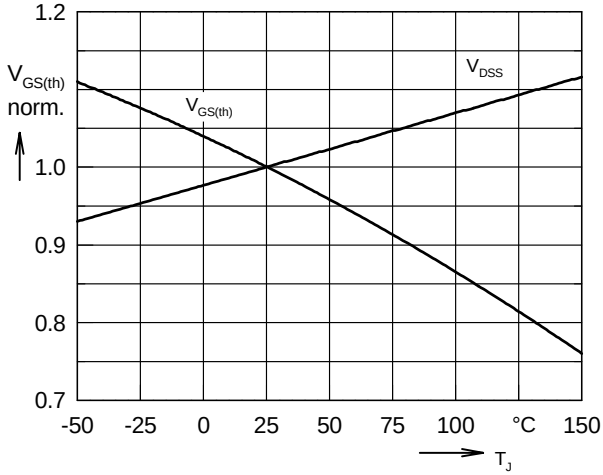


Fig. 6 Typical normalized $V_{DSS} = f(T_J)$, $V_{GS(th)} = f(T_J)$

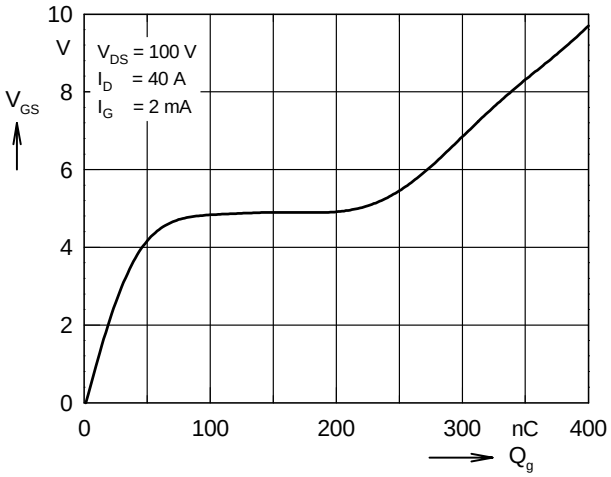


Fig. 7 Typical turn-on gate charge characteristics

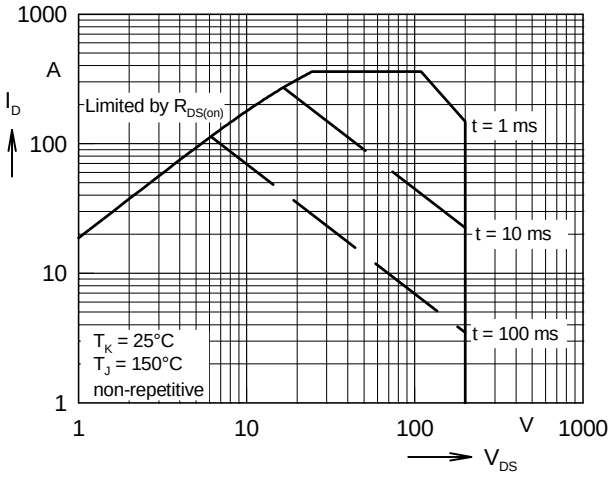


Fig. 8 Forward Safe Operating Area, $I_D = f(V_{DS})$

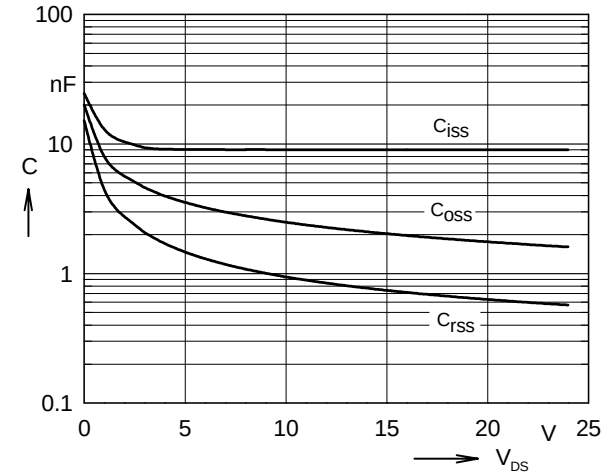


Fig. 9 Typical capacitances $C = f(V_{DS})$, f = 1 MHz

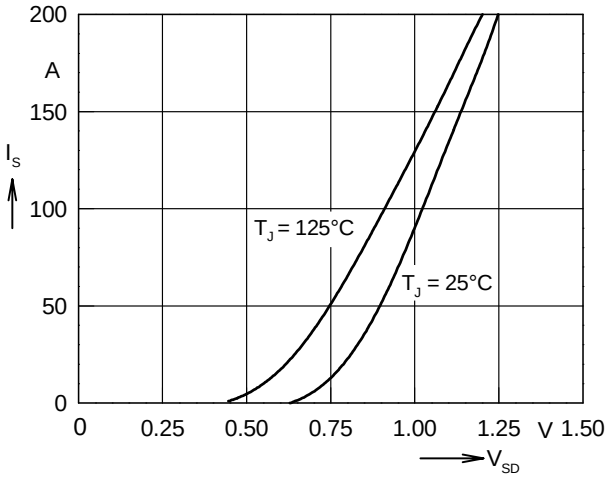


Fig. 10 Typical forward characteristics of reverse diode, $I_S = f(V_{SD})$

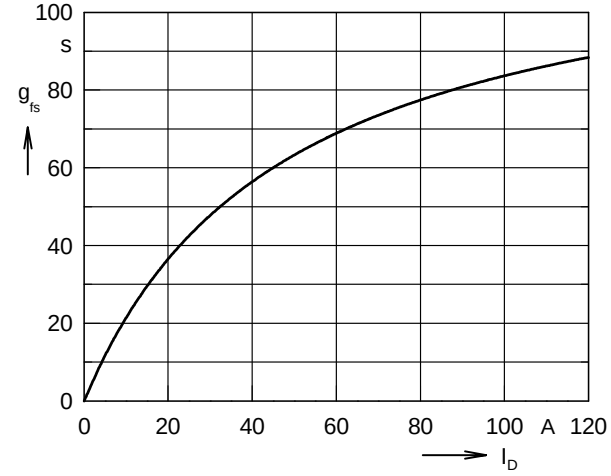


Fig. 11 Typical transconductance $g_{fs} = f(I_D)$

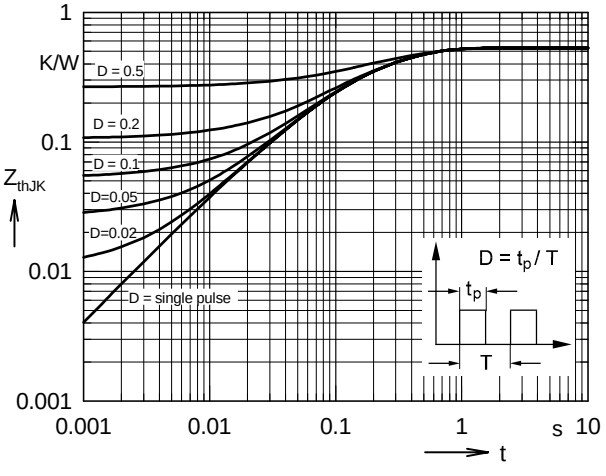


Fig. 12 Transient thermal resistance $Z_{thJK} = f(t_p)$

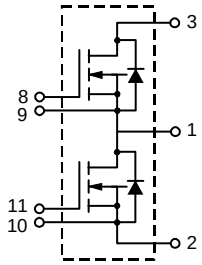
IXYS

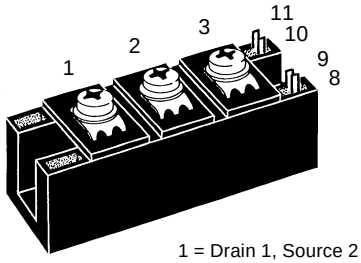
Dual Power HiPerFET™ Module

VMM 85-02F

V_{DSS} = 200 V
I_{D25} = 84 A
$R_{DS(on)}$ = 25 mΩ

Phaseleg Configuration
High dv/dt, Low t_{rr}, HDMOS™ Family





1 = Drain 1, Source 2
2 = Source 1
3 = Drain 2
8 = Gate 2
9 = Kelvin Source 2
10 = Kelvin Source 1
11 = Gate 1

Symbol	Conditions		Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C		200	V
V_{DGR}	T_J = 25°C to 150°C; R_{GS} = 10 kΩ		200	V
V_{GS}	Continuous		±20	V
V_{GSM}	Transient		±30	V
I_{D25}	T_C = 25°C		84	A
I_{D80}	T_C = 80°C		63	A
I_{DM}	T_C = 25°C, t_p = 10 µs, pulse width limited by T_{JM}		335	A
P_{tot}	T_C = 25°C		370	W
T_J			-40 ... +150	°C
T_{JM}			150	°C
T_{stg}			-40 ... +125	°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 or 10-32 UNF)		2.25-2.75/20-25	Nm/lb.in.
	Terminal connection torque (M5)		2.5-4/22-35	Nm/lb.in.
Weight	Typical including screws		130	g

Symbol	Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
V_{DSS}	V_{GS} = 0 V	200			V
$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 8 mA	2		4	V
I_{GSS}	V_{GS} = ±20 V DC, V_{DS} = 0			500	nA
I_{DSS}	V_{DS} = V_{DSS}, V_{GS} = 0 V, T_J = 25°C			400	µA
	V_{DS} = 0.8 • V_{DSS}, V_{GS} = 0 V, T_J = 125°C			2	mA
$R_{DS(on)}$	V_{GS} = 10 V, I_D = 0.5 • I_{D25}		20	25	mΩ
	Pulse test, t ≤ 300 µs, duty cycle d ≤ 2%				

Features

- Two MOSFET's in phaseleg config.
- International standard package
- Direct copper bonded Al_2O_3 ceramic base plate
- Isolation voltage 3600 V~
- Low $R_{DS(on)}$ HDMOS™ process
- Low package inductance for high speed switching
- Kelvin source contact

Applications

- Switched-mode and resonant-mode power supplies
- Uninterruptible power supplies (UPS)

Advantages

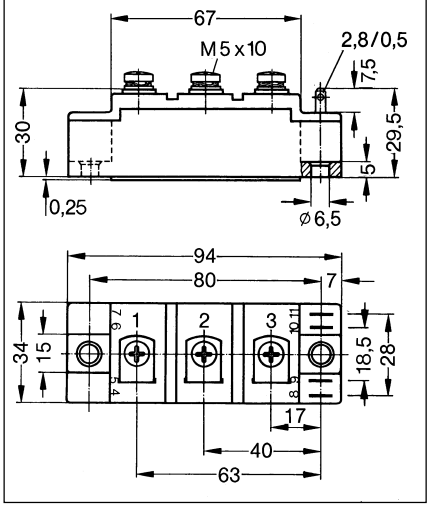
- Easy to mount with two screws
- Space and weight savings
- High power density
- Low losses

Data per MOSFET unless otherwise stated.
IXYS reserves the right to change limits, test conditions and dimensions

943

Symbol	Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
g_{fs}	V_{DS} = 10 V; I_D = 0.5 • I_{D25} pulsed	40	60		S
C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		9600	15000	pF
C_{oss}			1800	4500	pF
C_{rss}			620	1500	pF
$t_{d(on)}$	V_{GS} = 10 V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25} R_G = 1 Ω (External), resistive load		70		ns
t_r			80		ns
$t_{d(off)}$			200		ns
t_f			100		ns
Q_g	V_{GS} = 10 V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		380	450	nC
Q_{gs}			70	110	nC
Q_{gd}			190	230	nC
R_{thJC}				0.33	K/W
R_{thCH}	heatsink compound applied		0.2		K/W
d_S	Creepage distance on surface	12.7			mm
d_A	Strike distance through air	9.6			mm
a	Allowable acceleration			50	m/s^2

Dimensions in mm (1 mm = 0.0394")



Source-Drain Diode

Symbol	Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
I_S	V_{GS} = 0 V			84	A
I_{SM}	Repetitive; pulse width limited by T_{JM}			335	A
V_{SD}	I_F = I_S; V_{GS} = 0 V, Pulse test, t ≤ 300 µs, duty cycle d ≤ 2%		0.9	1.2	V
t_{rr}	I_F = I_S, -di/dt = 100 A/µs, V_{DS} = 100 V, V_{GS} = 0 V		200	400	ns

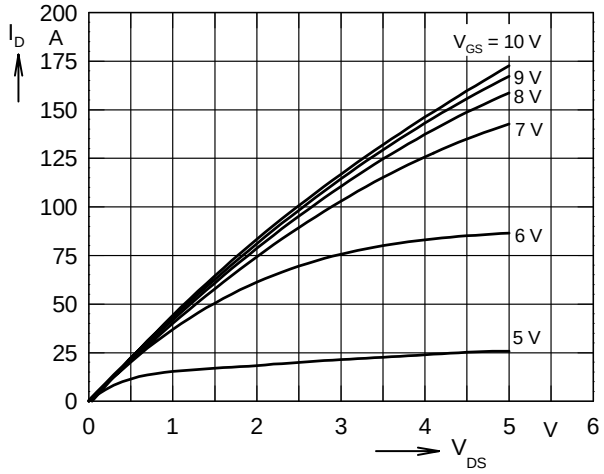


Fig. 1 Typical output characteristics $I_D = f(V_{DS})$

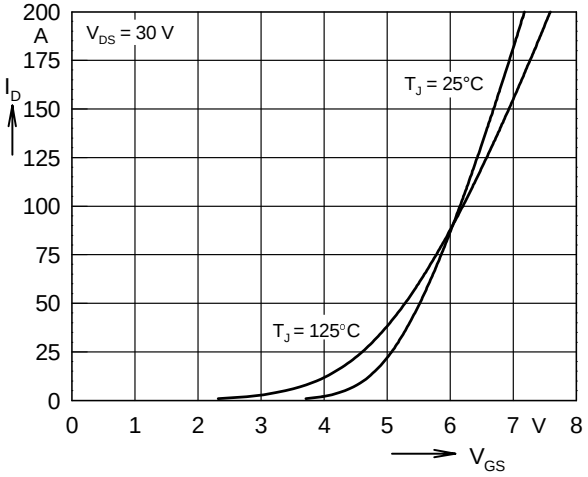


Fig. 2 Typical transfer characteristics $I_D = f(V_{GS})$

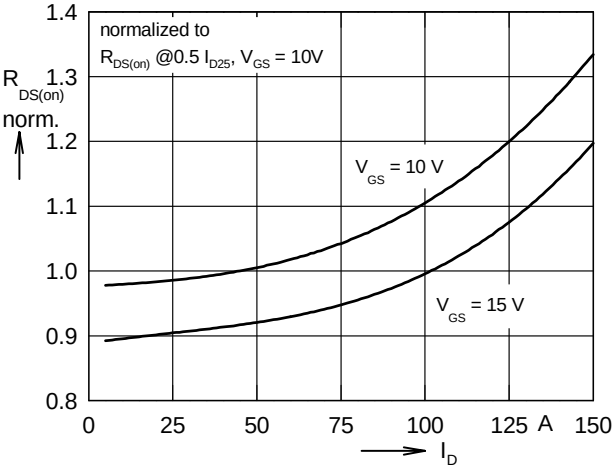


Fig. 3 Typical normalized $R_{DS(on)} = f(I_D)$

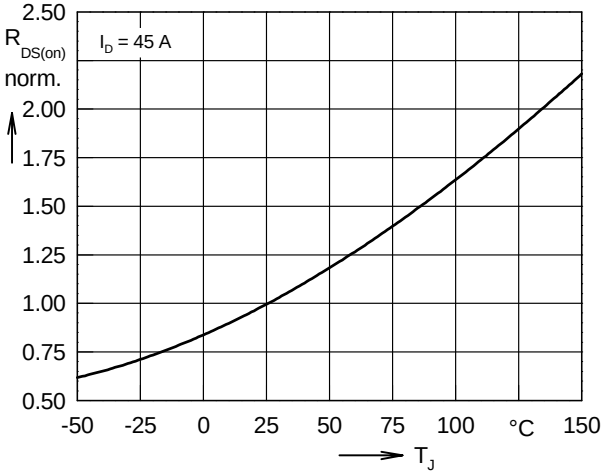


Fig. 4 Typical normalized $R_{DS(on)} = f(T_J)$

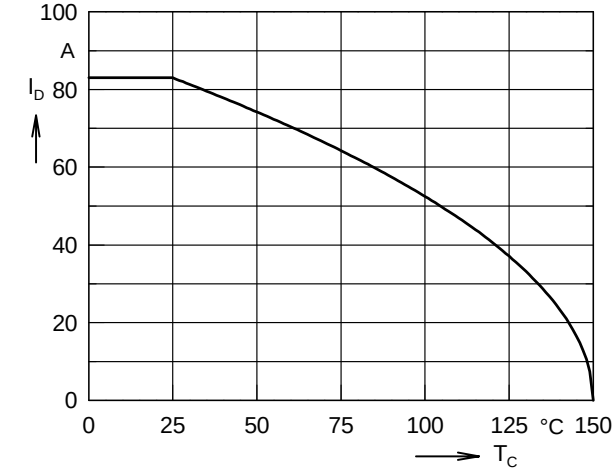


Fig. 5 Continuous drain current $I_D = f(T_C)$

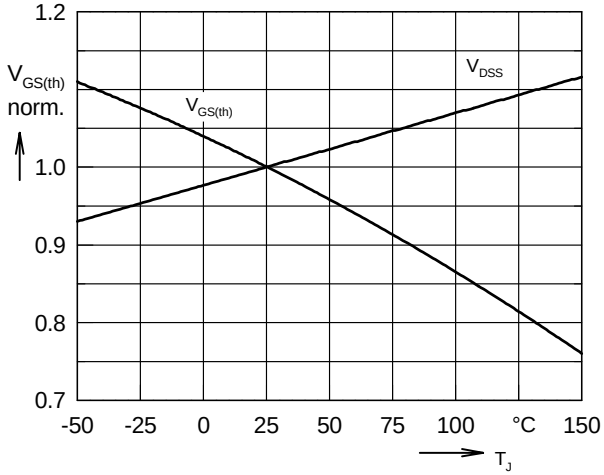


Fig. 6 Typical normalized $V_{DSS} = f(T_J)$, $V_{GS(th)} = f(T_J)$

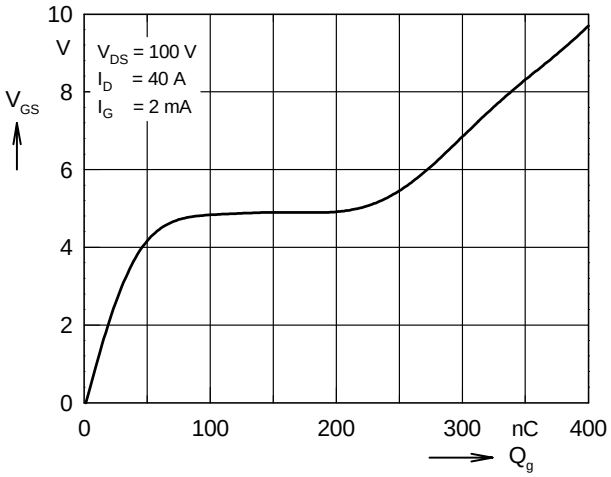


Fig. 7 Typical turn-on gate charge characteristics

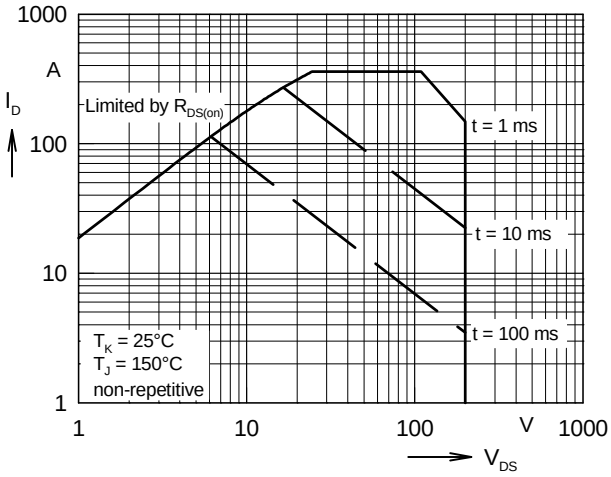


Fig. 8 Forward Safe Operating Area, $I_D = f(V_{DS})$

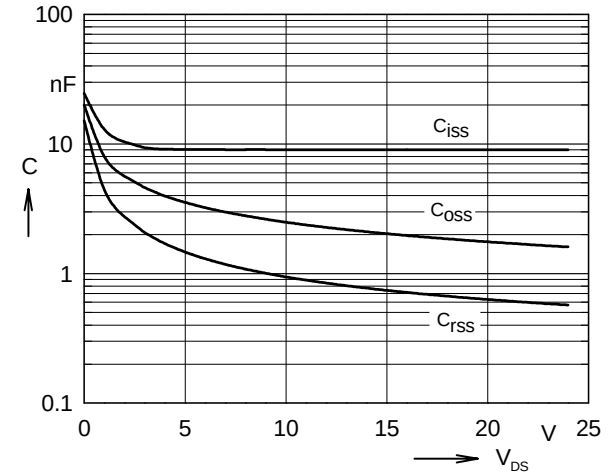


Fig. 9 Typical capacitances $C = f(V_{DS})$, f = 1 MHz

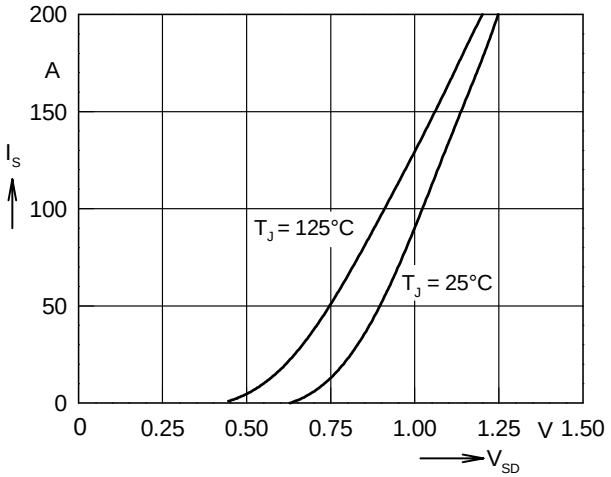


Fig. 10 Typical forward characteristics of reverse diode, $I_S = f(V_{SD})$

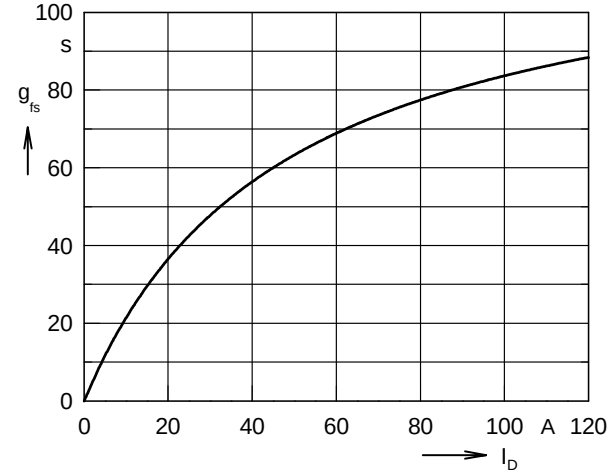


Fig. 11 Typical transconductance $g_{fs} = f(I_D)$

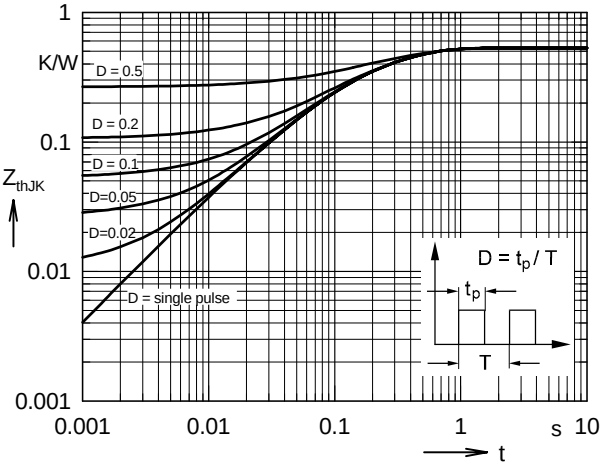


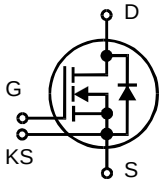
Fig. 12 Transient thermal resistance $Z_{thJK} = f(t_p)$

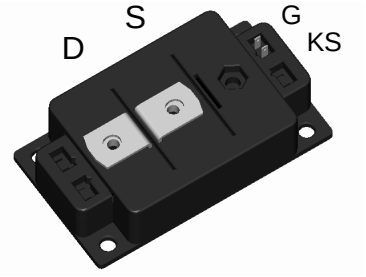
MegaMOS™FET Module

VMO 580-02F

V_{DSS} = 200 V
I_{D25} = 580 A
$R_{DS(on)}$ = 3.8 mΩ

N-Channel Enhancement Mode





MOSFET

Symbol	Conditions	Maximum Ratings	
V_{DSS}	T_{VJ} = 25°C to 150°C	200	V
V_{GS}		±20	V
I_{D25}	T_C = 25°C	580	A
I_{D80}	T_C = 80°C	430	A
I_{F25}	(diode) T_C = 25°C	580	A
I_{F80}	(diode) T_C = 80°C	430	A

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
R_{DSon}	V_{GS} = 10 V; I_D = I_{D80}		3.2	3.8	mΩ
V_{GSth}	V_{DS} = 20 V; I_D = 50 mA	2		4	V
I_{DSS}	V_{DS} = 0.8 • V_{DSS}; V_{GS} = 0 V; T_{VJ} = 25°C			2.6	mA
	T_{VJ} = 125°C		3		mA
I_{GSS}	V_{GS} = ±20 V; V_{DS} = 0 V			1	µA
Q_g	V_{GS}= 10 V; V_{DS} = 0.5 • V_{DSS}; I_D = I_{D80}		2750		nC
Q_{gs}			500		nC
Q_{gd}			1350		nC
$t_{d(on)}$	V_{GS}= 10 V; V_{DS} = 0.5 • V_{DSS}; I_D = I_{D80}; R_G = 1 Ω		210		ns
t_r			500		ns
$t_{d(off)}$			900		ns
t_f			350		ns
V_F	(diode) I_F = 300 A; V_{GS} = 0 V		0.9	1.1	V
t_{rr}	(diode) I_F = 300 A; -di/dt = 500 A/µs; V_{DS} = ½ V_{DSS}		300		ns
R_{thJC}				0.05	K/W
R_{thJS}	with heat transfer paste		0.07		K/W

Features

- HiPerFET™ technology
  - low R_{DSon}
  - unclamped inductive switching (UIS) capability
  - dv/dt ruggedness
  - fast intrinsic reverse diode
- package
  - low inductive current path
  - screw connection to high current main terminals
  - use of non interchangeable connectors for auxiliary terminals possible
  - Kelvin source terminals for easy drive
  - isolated ceramic base plate

Applications

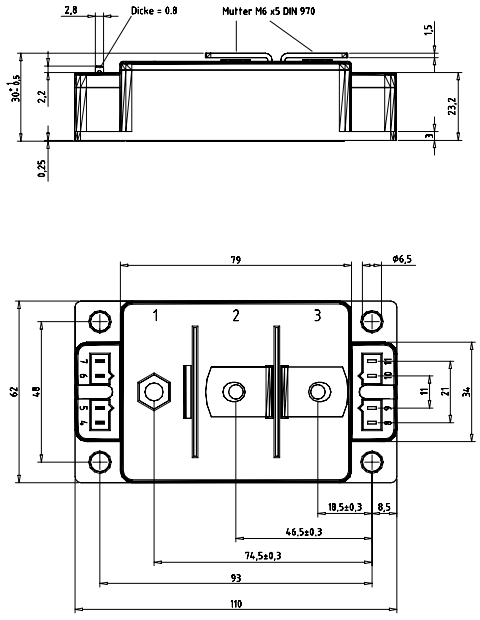
- converters with high power density for
  - main and auxiliary AC drives of electric vehicles
  - DC drives
  - power supplies

023

Module			
Symbol	**Conditions**	**Maximum Ratings**	
T_{VJ}		-40...+150	°C
T_{stg}		-40...+125	°C
V_{ISOL}	$I_{ISOL} \leq 1$ mA; 50/60 Hz	3600	V~
M_d	Mounting torque (M6)	2.25 - 2.75	Nm
	Terminal connection torque (M6)	4.5 - 5.5	Nm

Symbol	Conditions	Characteristic Values		
		min.	typ.	max.
Weight			250	g

Dimensions in mm (1 mm = 0.0394")



Optional accessories for modules

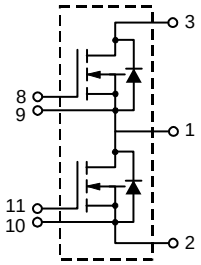
keyed twin plugs
(UL758, style 1385, CSA class 5851, guide 460-1-1)

- Type ZY180L with wire length 350mm
  – for pins 4 (yellow wire) and 5 (red wire)
  – for pins 11 (yellow wire) and 10 (red wire)
- Type ZY180R with wire length 350mm
  – for pins 7 (yellow wire) and 6 (red wire)
  – for pins 8 (yellow wire) and 9 (red wire)

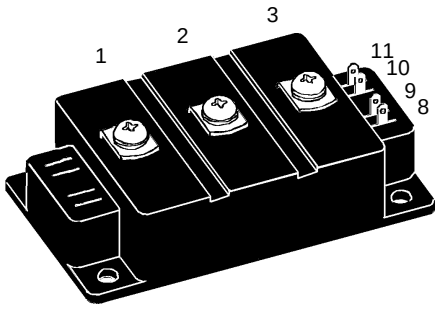
Dual Power HiPerFET™ Module

VMM 300-03F

V_{DSS} = 300 V
I_{D25} = 290 A
$R_{DS(on)}$ typ. = 7.4 mΩ



Phaseleg Configuration
High dv/dt, Low t_{rr}, HDMOS™ Family



Symbol	Conditions		Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C		300	V
V_{DGR}	T_J = 25°C to 150°C; R_{GS} = 10 kΩ		300	V
V_{GS}	Continuous		±20	V
V_{GSM}	Transient		±30	V
I_{D25}	T_C = 25°C		290	A
I_{D80}	T_C = 80°C		220	A
I_{DM}	T_C = 25°C; t_p = 10 µs ①		1160	A
P_D	T_C = 25°C		1500	W
T_J			-40 ...+150	°C
T_{JM}			150	°C
T_{stg}			-40 ... +125	°C
V_{ISOL}	50/60 Hz I_{ISOL} ≤ 1 mA	t = 1 min t = 1 s	3000 3600	V~
M_d	Mounting torque (M6) Terminal connection torque (M5)		2.25-2.75/20-25 2.5-3.7/22-33	Nm/lb.in. Nm/lb.in.
Weight	typical including screws		250	g

Symbol	Conditions		Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
V_{DSS}	V_{GS} = 0 V, I_D = 12 mA		300			V
$V_{GS(th)}$	V_{DS} = 20 V, I_D = 30 mA		2		4	V
I_{GSS}	V_{GS} = ±20 V DC, V_{DS} = 0				±500	nA
I_{DSS}	V_{DS} = V_{DSS} V_{GS} = 0 V	T_J = 25°C T_J = 125°C			0.5 8	mA mA
$R_{DS(on)}$	V_{GS} = 10 V, I_D = 0.5 • I_{D25} Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %			7.4	8.6	mΩ

① Additional current limitation by external leads

Features

- Low $R_{DS(on)}$ HDMOS™ process
- International standard package
- Low package inductance for high speed switching
- Kelvin Source contact for easy drive
- **D**irect **C**opper **B**onded Al_2O_3 ceramic base plate

Applications

- AC motor speed control for electric vehicles
- DC servo and robot drives
- Switched-mode and resonant-mode power supplies
- DC choppers

Advantages

- Easy to mount
- Space and weight savings
- High power density
- Low losses

IXYS reserves the right to change limits, test conditions and dimensions.

031

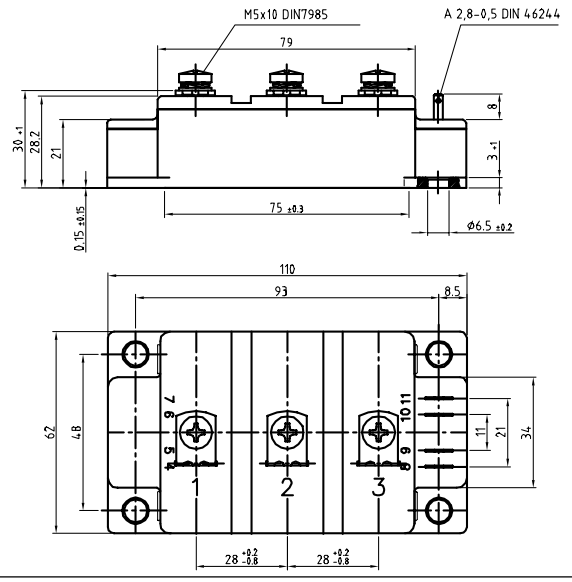
Symbol	Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.
g_{fs}	V_{DS} = 10 V; I_D = 0.5 • I_{D25} pulsed		280	S
C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		40	nF
C_{oss}			7.2	nF
C_{rss}			2.8	nF
$t_{d(on)}$	V_{GS} = 10 V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25} R_G = 1 Ω		200	ns
t_r			400	ns
$t_{d(off)}$			400	ns
t_f			150	ns
Q_g	V_{GS} = 10 V, V_{DS} = 150 V, I_D = 150 A		1440	nC
Q_{gs}			240	nC
Q_{gd}			720	nC
R_{thJC}				0.08 K/W
R_{thJS}	with heat transfer paste		0.12	K/W

Source-Drain Diode

Symbol	Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.
I_S	V_{GS} = 0 V, T_C = 25°C, T_J = T_{JM}			290 A
I_{SM}	②			1160 A
V_{SD}	I_F = 300 A, V_{GS} = 0 V, Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %		0.9	1.1 V
t_{rr}	I_F = 300 A, -di/dt = 400 A/µs, V_{DS} = 0.5 • V_{DSS}		300	ns

② Additional current limitation by external leads

Dimensions in mm (1 mm = 0.0394")



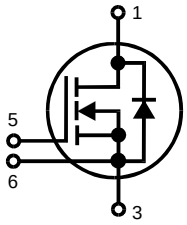
HiPerFET™ Power Module

VMO 60-05F

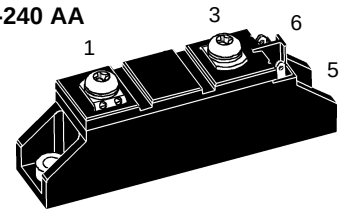
V_{DSS} = 500 V
I_{D25} = 60 A
$R_{DS(on)}$ = 65 mΩ

High dv/dt, Low t_{rr}, HDMOS™ Family

Preliminary Data



TO-240 AA



1 = Drain
3 = Source
5 = Gate
6 = Kelvin Source

Symbol	Conditions	Maximum Ratings	
V_{DSS}	T_J = 25°C to 150°C	500	V
V_{DGR}	T_J = 25°C to 150°C; R_{GS} = 10 kΩ	500	V
V_{GS}	Continuous	±20	V
V_{GSM}	Transient	±30	V
I_{D25}	T_C = 25°C	60	A
I_{D100}	T_C = 100°C	37	A
I_{DM}	T_C = 25°C, t_p = 10 µs, pulse width limited by T_{JM}	240	A
P_{tot}	T_C = 25°C	590	W
T_J		-40 ... +150	°C
T_{JM}		150	°C
T_{stg}		-40 ... +125	°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 or 10-32 UNF)	2.5-4.0/22-35	Nm/lb.in.
	Terminal connection torque (M5)	2.5-4.0/22-35	Nm/lb.in.
Weight	Typical including screws	90	g

Symbol	Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
V_{DSS}	V_{GS} = 0 V	500			V
$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 24 mA	2		4	V
I_{GSS}	V_{GS} = ±20 V DC, V_{DS} = 0			500	nA
I_{DSS}	V_{DS} = V_{DSS}, V_{GS} = 0 V, T_J = 25°C			600	µA
	V_{DS} = 0.8 • V_{DSS}, V_{GS} = 0 V, T_J = 125°C			3	mA
$R_{DS(on)}$	V_{GS} = 10 V, I_D = 0.5 • I_{D25}		65	75	mΩ
	Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %				

Data per MOSFET unless otherwise stated.

Features

- International standard package
- Direct copper bonded Al_2O_3 ceramic base plate
- Isolation voltage 3600 V~
- Low $R_{DS(on)}$ HDMOS™ process

Applications

- Switched-mode and resonant-mode power supplies
- Uninterruptible power supplies (UPS)
- DC servo and robot drives
- DC choppers

Advantages

- Easy to mount with two screws
- Space and weight savings
- High power density
- Low losses

IXYS reserves the right to change limits, test conditions and dimensions.

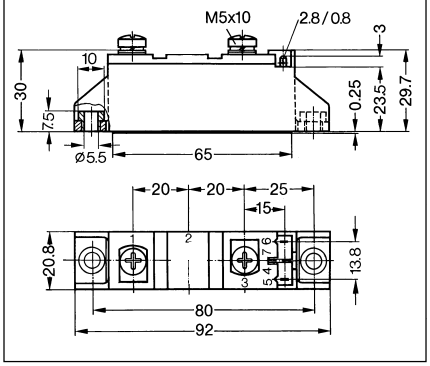
943

Symbol	Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
g_{fs}	V_{DS} = 10 V; I_D = 0.5 • I_{D25} pulsed	30	60		S
C_{iss}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz		12.6		nF
C_{oss}			1.35		nF
C_{rss}			0.405		nF
$t_{d(on)}$	V_{GS} = 10 V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25} R_G = 1 Ω (External), resistive load		50		ns
t_r			45		ns
$t_{d(off)}$			250		ns
t_f			30		ns
Q_g	V_{GS} = 10 V, V_{DS} = 0.5 • V_{DSS}, I_D = 0.5 • I_{D25}		405		nC
Q_{gs}			90		nC
Q_{gd}			180		nC
R_{thJC}				0.21	K/W
R_{thCH}	heatsink compound applied		0.2		K/W
d_S	Creepage distance on surface	12.7			mm
d_A	Strike distance through air	9.6			mm
a	Allowable acceleration			50	m/s^2

Source-Drain Diode

Symbol	Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
I_S	V_{GS} = 0 V			60	A
I_{SM}	Repetitive; pulse width limited by T_{JM}			240	A
V_{SD}	I_F = I_S; V_{GS} = 0 V, Pulse test, t ≤ 300 µs, duty cycle d ≤ 2%			1.5	V
t_{rr}	I_F = I_S, -di/dt = 100 A/µs, V_{DS} = 100 V, V_{GS} = 0 V			250	ns

Dimensions in mm (1 mm = 0.0394")

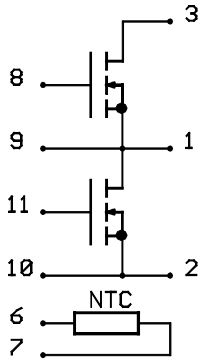


Dual Power HiPerFET™ Module

VMM 90-09F

V_{DSS} = 900 V
I_{D25} = 85 A
$R_{DS(on)}$ = 76 mΩ

Phaseleg Configuration



MOSFET T1 + T2

Symbol	Conditions	Maximum Ratings	
V_{DSS}	T_{VJ} = 25°C to 150°C	900	V
V_{GS}		±20	V
I_{D25}	T_C = 25°C	85	A
I_{D80}	T_C = 80°C	65	A
I_{F25}	(diode) T_C = 25°C	85	A
I_{F80}	(diode) T_C = 80°C	65	A

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
R_{DSon}	V_{GS} = 10 V; I_D = I_{D80}			76	mΩ
V_{GSth}	V_{DS} = 20 V; I_D = 30 mA	3		5	V
I_{DSS}	V_{DS} = 0.8 • V_{DSS}; V_{GS} = 0 V; T_{VJ} = 25°C			0.4	mA
	T_{VJ} = 125°C		1.5		mA
I_{GSS}	V_{GS} = ±20 V; V_{DS} = 0 V			1	µA
Q_g	V_{GS}= 10 V; V_{DS} = 450 V; I_D = 50 A		960		nC
Q_{gs}			225		nC
Q_{gd}			430		nC
$t_{d(on)}$	V_{GS}= 10 V; V_{DS} = 0.5 • V_{DSS}; I_D = I_{D80}; R_G = 0.47 Ω		150		ns
t_r			180		ns
$t_{d(off)}$			330		ns
t_f			140		ns
V_F	(diode) I_F = 90 A; V_{GS} = 0 V		1.1	1.6	V
t_{rr}	(diode) I_F = 90 A; -di/dt = 400 A/µs; V_{DS} = 100 V		250		ns
R_{thJC}				0.08	K/W
R_{thJS}	with heat transfer paste		0.12		K/W

Features

- HiPerFET ™ technology
  - low R_{DSon}
  - unclamped inductive switching (UIS) capability
  - dv/dt ruggedness
  - fast intrinsic reverse diode
  - low gate charge
- thermistor for internal temperature measurement
- package
  - low inductive current path
  - screw connection to high current main terminals
  - use of non interchangeable connectors for auxiliary terminals possible
  - Kelvin source terminals for easy drive
  - isolated DCB ceramic base plate

Applications

- converters with high power density and high switching speed for
  - power supplies
  - induction heating

001

Temperature Sensor NTC

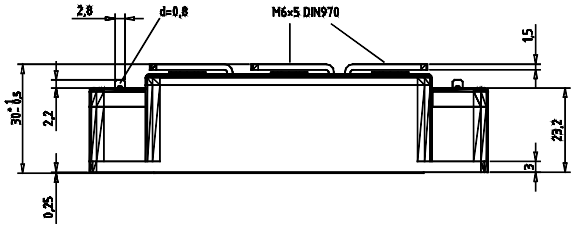
Symbol	Conditions	Characteristic Values min.	typ.	max.	
R_{25}	T = 25°C	1950	2057	2170	Ω
$B_{25/100}$			3560		K

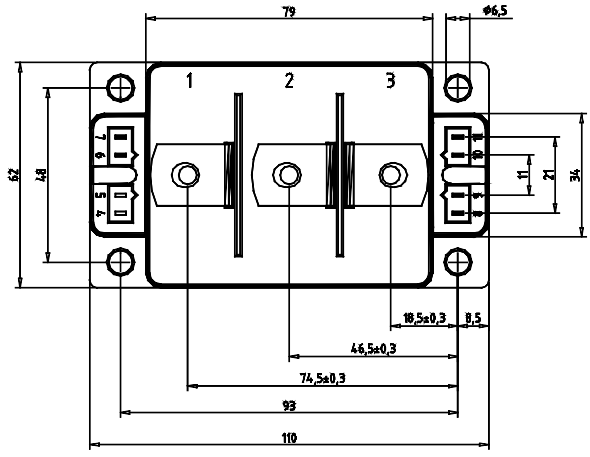
Module

Symbol	Conditions	Maximum Ratings	
T_{VJ}		-40...+150	°C
T_{stg}		-40...+125	°C
V_{ISOL}	$I_{ISOL} \leq 1$ mA; 50/60 Hz	3600	V~
M_d	Mounting torque (M6)	2.25 - 2.75	Nm
	Terminal connection torque (M6)	4.5 - 5.5	Nm

Symbol	Conditions	Characteristic Values min.	typ.	max.	
Weight			250		g

Dimensions in mm (1 mm = 0.0394")





Optional accessories for modules

keyed twin plugs
(UL758, style 1385, CSA class 5851, guide 460-1-1)

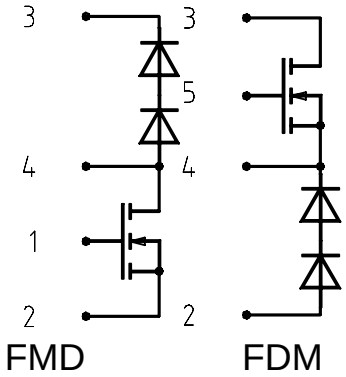
- Type ZY180L with wire length 350mm
  - for pins 4 (yellow wire) and 5 (red wire)
  - for pins 11 (yellow wire) and 10 (red wire)
- Type ZY180R with wire length 350mm
  - for pins 7 (yellow wire) and 6 (red wire)
  - for pins 8 (yellow wire) and 9 (red wire)

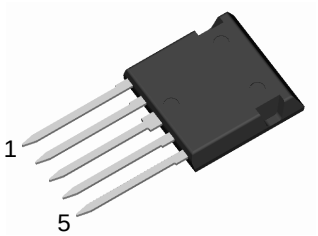
HiPerFET™ Power Mosfets

-Chopper Topologies-
in ISOPLUS i4-PAC™

FMD 21-05QC
FDM 21-05QC

I_{D25} = 21 A
V_{DSS} = 500 V
R_{DSon} = 220 mΩ





MOSFET

Symbol	Conditions	Maximum Ratings	
V_{DSS}	T_{VJ} = 25°C to 150°C	500	V
V_{GS}		±20	V
I_{D25}	T_C = 25°C	21	A
I_{D90}	T_C = 90°C	15	A

Symbol	Conditions	Characteristic Values (T_{VJ} = 25°C, unless otherwise specified) min.	typ.	max.	
R_{DSon}	V_{GS} = 10 V; I_D = I_{D90}			220	mΩ
V_{GSth}	V_{DS} = 20 V; I_D = 4 mA	2		4	V
I_{DSS}	V_{DS} = V_{DSS}; V_{GS} = 0 V; T_{VJ} = 25°C			25	µA
	T_{VJ} = 125°C		250		µA
I_{GSS}	V_{GS} = ±20 V; V_{DS} = 0 V			200	nA
Q_g	V_{GS} = 10 V; V_{DS} = 0.5 • V_{DSS}; I_D = I_{D90}		95		nC
Q_{gs}			27		nC
Q_{gd}			40		nC
$t_{d(on)}$	V_{GS} = 10 V; V_{DS} = 0.5 • V_{DSS}; I_D = I_{D90}; R_G = 2 Ω		28		ns
t_r			30		ns
$t_{d(off)}$			55		ns
t_f			16		ns
V_F	(MOSFET diode) I_F = 15 A; V_{GS} = 0 V		0.9		V
R_{thJC}				0.5	K/W

Features

- HiPerFET™ technology
  - low R_{DSon}
  - low gate charge for high frequency operation
  - unclamped inductive switching (UIS) capability
  - dv/dt ruggedness
  - fast intrinsic reverse diode
- HiPerDyn™ FRED
  - consisting of series connected diodes
  - enhanced dynamic behaviour for high frequency operation
- ISOPLUS i4-PAC™ package
  - isolated back surface
  - enlarged creepage towards heatsink
  - application friendly pinout
  - low inductive current path
  - high reliability
  - industry standard outline

Applications

- chopper for power factor correction
- supply of high frequency transformer
  - switched mode power supplies
  - welding converters

IXYS reserves the right to change limits, test conditions and dimensions.

022

Free Wheeling Diode (data for series connection)

Symbol	Conditions	Maximum Ratings	
V_{RRM}	T_{VJ} = 25°C to 150°C	600	V
I_{F25}	T_C = 25°C	60	A
I_{F90}	T_C = 90°C	35	A

Symbol	Conditions	Characteristic Values min.	typ.	max.	
V_F	I_F = 15 A; T_{VJ} = 25°C		2.2	3.2	V
	T_{VJ} = 125°C		1.7		V
I_R	$V_R = V_{RRM}$; T_{VJ} = 25°C			0.25	mA
	T_{VJ} = 125°C		0.25		mA
I_{RM}	I_F = 30 A; di_F/dt = -500 A/µs; T_{VJ} = 125°C		tbd		A
t_{rr}	V_R = 300 V	tbd		ns	
R_{thJC}	(per diode)			0.65	K/W

Component

Symbol	Conditions	Maximum Ratings	
T_{VJ}		-55...+150	°C
T_{stg}		-55...+125	°C
V_{ISOL}	$I_{ISOL} \leq$ 1 mA; 50/60 Hz	2500	V~
F_C	mounting force with clip	20...120	N

Symbol	Conditions	Characteristic Values min.	typ.	max.	
d_S,d_A	pin - pin	1.7			mm
d_S,d_A	pin - backside metal	5.5			mm
R_{thCH}	with heatsink compound		0.15		K/W
Weight			9		g

Dimensions in mm (1 mm = 0.0394")