

FM400TU-2A

HIGH POWER SWITCHING USE
INSULATED PACKAGE

FM400TU-2A



- $I_D(\text{rms})$ 200A
- V_{DS} 100V
- Insulated Type
- 6-elements in a pack
- Thermistor inside
- UL Recognized

Yellow Card No.E80276

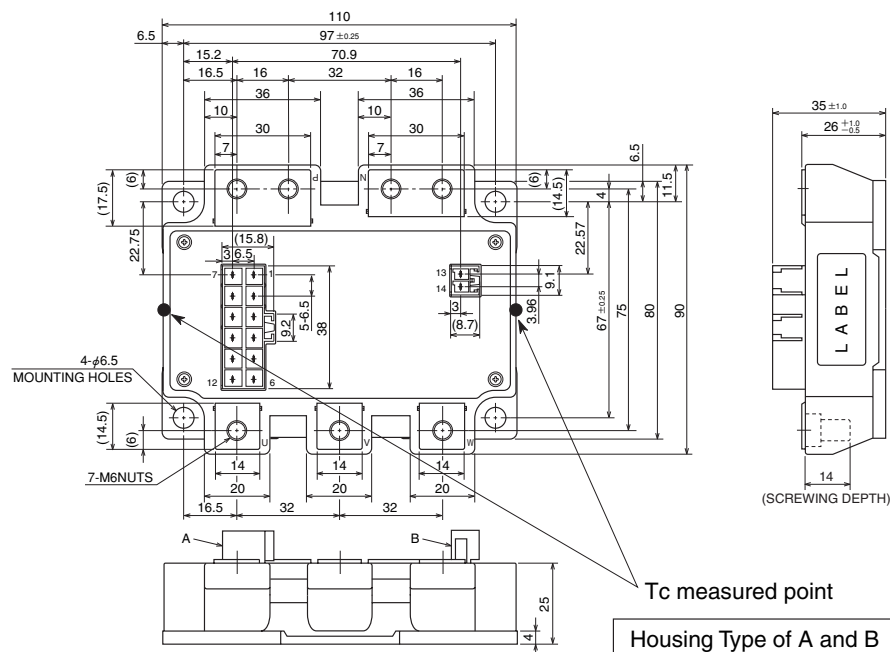
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APPLICATION

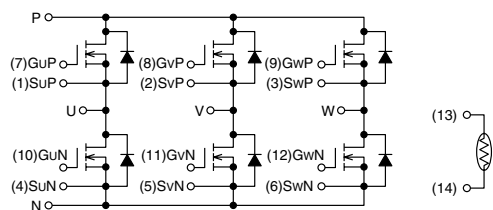
AC motor control of forklift (battery power source), UPS

OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



CIRCUIT DIAGRAM



(1)SuP	(2)SvP	(3)SwP	(4)SuN	(5)SvN	(6)SwN	A
(7)GuP	(8)GvP	(9)GwP	(10)GuN	(11)GvN	(12)GwN	A
(13)TH1	(14)TH2					B

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HIGH POWER SWITCHING USE
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Symbol	Item	Conditions	Ratings	Unit
V _{DSS}	Drain-source voltage	G-S Short	100	V
V _{GSS}	Gate-source voltage	D-S Short	±20	V
I _D	Drain current	T _c ' = 130°C*3	200	A
I _{DM}		Pulse*2	400	A
I _{DA}	Avalanche current	L = 10μH Pulse*2	200	A
I _S *1	Source current		200	A
I _{SM} *1		Pulse*2	400	A
P _D *4	Maximum power dissipation	T _c = 25°C	650	W
P _D *4		T _c ' = 25°C*3	880	W
T _{ch}	Channel temperature		−40 ~ +150	°C
T _{stg}	Storage temperature		−40 ~ +125	°C
V _{iso}	Isolation voltage	Main terminal to base plate, AC 1 min.	2500	V
—	Mounting torque	Main Terminal M6	3.5 ~ 4.5	N • m
—		Mounting M6	3.5 ~ 4.5	N • m
—	Weight	Typical value	600	g

ELECTRICAL CHARACTERISTICS (T_{ch} = 25°C unless otherwise specified.)

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
I _{DSS}	Drain cutoff current	V _D = V _{DSS} , V _G = 0V	—	—	1	mA
V _{GS(th)}	Gate-source threshold voltage	I _D = 20mA, V _D = 10V	4.7	6	7.3	V
I _{GSS}	Gate leakage current	V _G = V _{GSS} , V _D = 0V	—	—	1.5	μA
r _{DS(ON)}	Static drain-source	I _D = 200A	—	1.45	2.0	mΩ
(chip)	On-state resistance	V _G = 15V		2.5	—	
V _{DS(ON)}	Static drain-source	I _D = 200A	—	0.29	0.40	V
(chip)	On-state voltage	V _G = 15V		0.50	—	
R _(lead)	Lead resistance	I _D = 200A	—	0.8	—	mΩ
		terminal-chip		1.12	—	
C _{iss}	Input capacitance	V _D = 10V	—	—	75	nF
C _{oss}	Output capacitance	V _G = 0V	—	—	10	
C _{rss}	Reverse transfer capacitance		—	—	6	
Q _G	Total gate charge	V _{DD} = 48V, I _D = 200A, V _G = 15V	—	1200	—	nC
t _{d(on)}	Turn-on delay time	V _{DD} = 48V, I _D = 200A, V _G 1 = V _G 2 = 15V R _G = 6.3Ω, Inductive load switching operation I _S = 200A	—	—	400	ns
t _r	Turn-on rise time		—	—	400	
t _{d(off)}	Turn-off delay time		—	—	450	
t _f	Turn-off fall time		—	—	300	
t _{rr} *1	Reverse recovery time		—	—	250	ns
Q _{rr} *1	Reverse recovery charge		—	6.0	—	μC
V _{SD} *1	Source-drain voltage	I _S = 200A, V _G = 0V	—	—	1.3	V
R _{th(ch-c)}	Thermal resistance	MOSFET part (1/6 module)*7	—	—	0.19	°C/W
R _{th(ch-c')}		MOSFET part (1/6 module)*3	—	—	0.142	
R _{th(c-f)}	Contact thermal resistance	Case to fin, Thermal grease Applied*8 (1/6 module)	—	0.1	—	
R _{th(c'-f)}		Case to fin, Thermal grease Applied*3, *8 (1/6 module)	—	0.09	—	

THERMISTOR PART

Symbol	Parameter	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R _{TH} *6	Resistance	T _{TH} = 25°C*5	—	100	—	kΩ
B*6	B Constant	Resistance at T _{TH} = 25°C, 50°C*5	—	4000	—	K

*1: It is characteristics of the anti-parallel, source to drain free-wheel diode (FWDi).

*2: Pulse width and repetition rate should be such that the device channel temperature (T_{ch}) does not exceed T_{ch} max rating.*3: T_c' measured point is just under the chips. If use this value, R_{th(f-a)} should be measured just under the chips.

*4: Pulse width and repetition rate should be such as to cause negligible temperature rise.

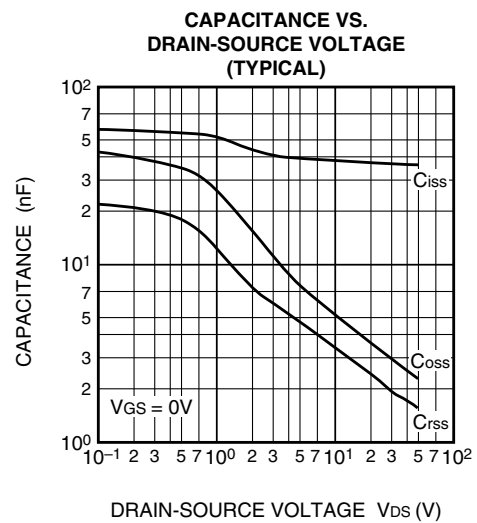
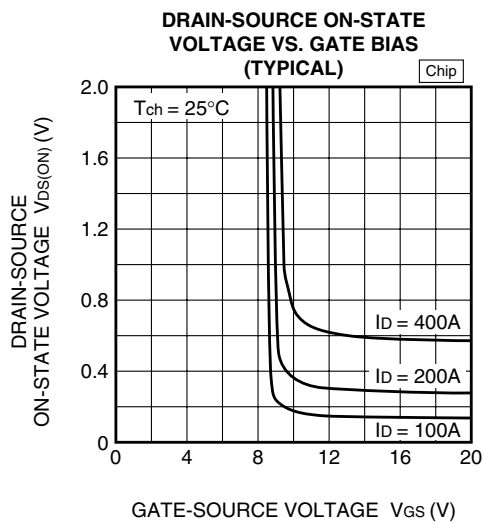
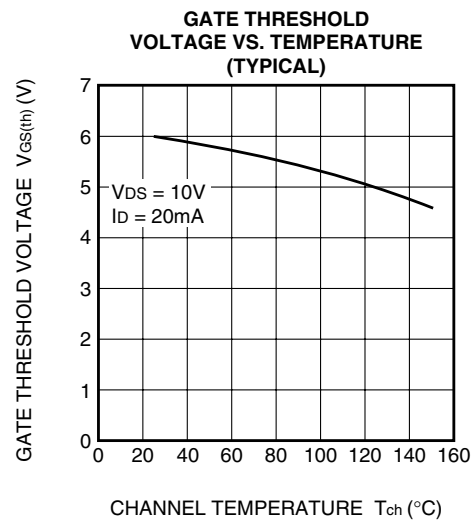
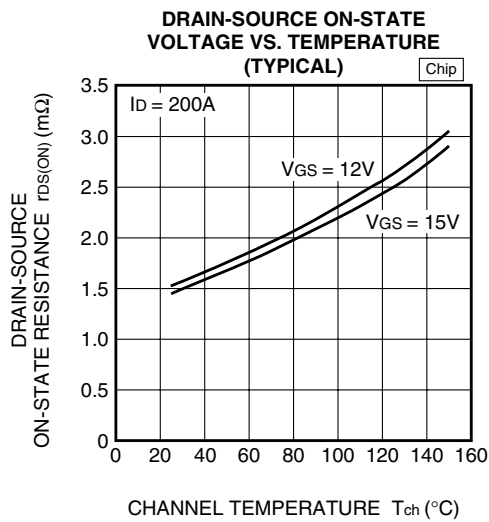
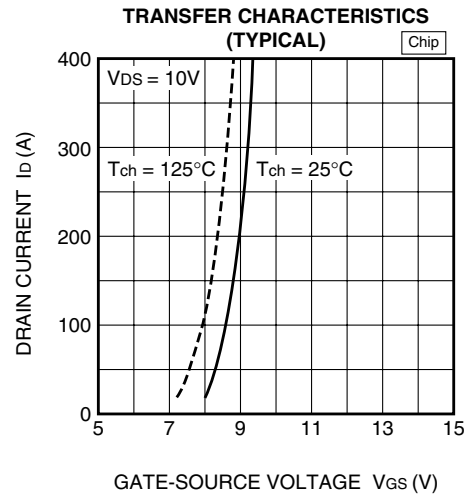
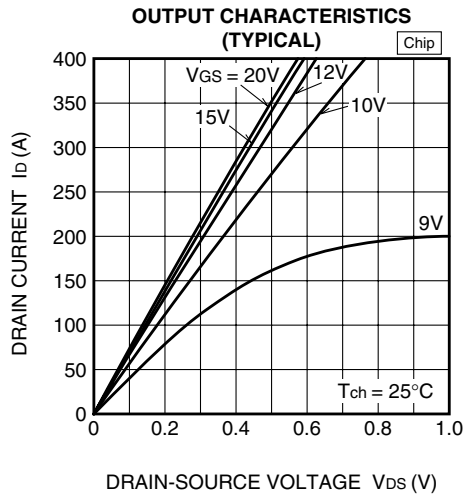
*5: T_{TH} is thermistor temperature.*6: B = (lnR₁ - lnR₂) / (1/T₁ - 1/T₂) R₁: Resistance at T₁(K), R₂: Resistance at T₂(K)*7: T_c measured point is shown in page OUTLINE DRAWING.

*8: Typical value is measured by using Shin-Etsu Chemical Co., Ltd "G-746".

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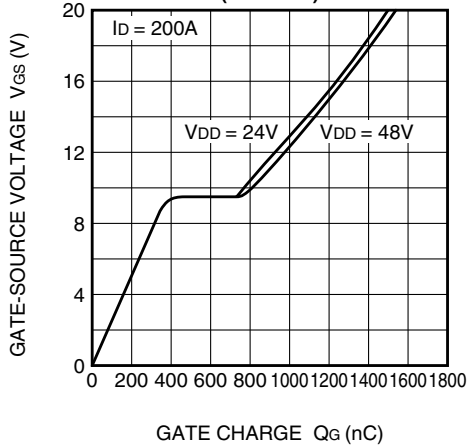
PERFORMANCE CURVES



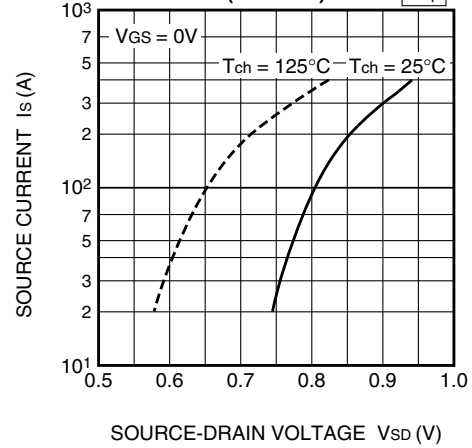
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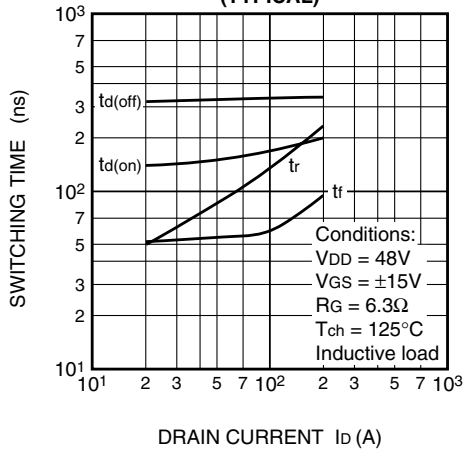
**GATE CHARGE CHARACTERISTICS
(TYPICAL)**



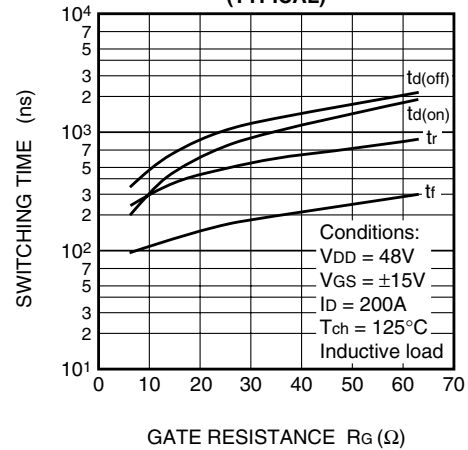
**FREE-WHEEL DIODE
FORWARD CHARACTERISTICS
(TYPICAL)**



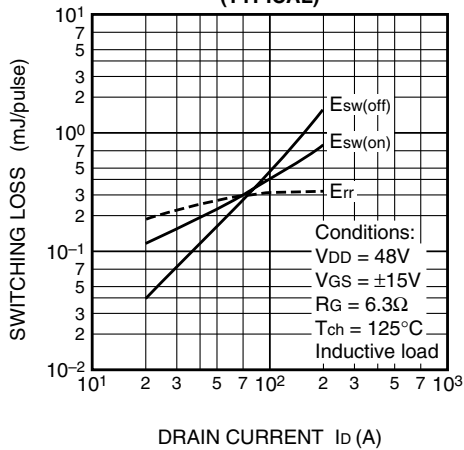
**HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)**



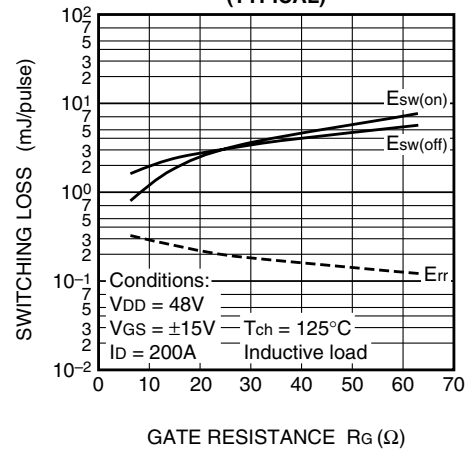
**HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)**



**HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)**



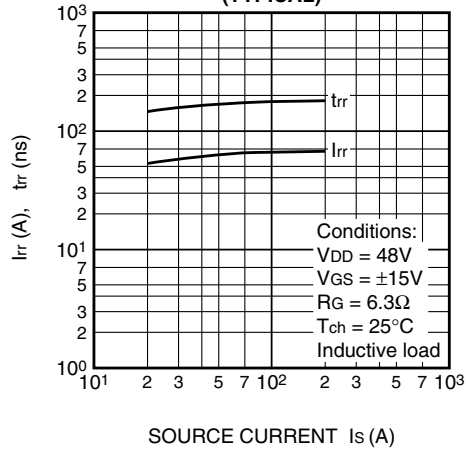
**HALF-BRIDGE
SWITCHING CHARACTERISTICS
(TYPICAL)**



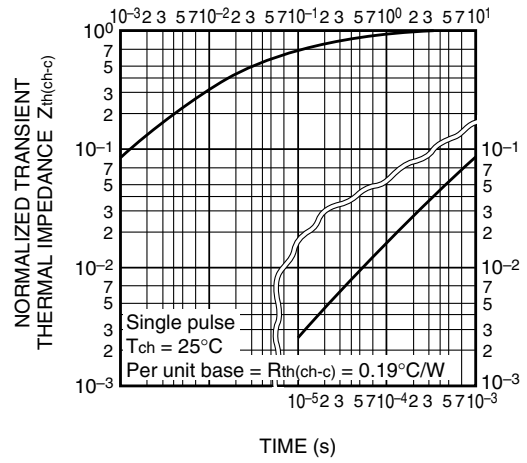
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HIGH POWER SWITCHING USE
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REVERSE RECOVERY CHARACTERISTICS
OF FREE-WHEEL DIODE
(TYPICAL)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS



CHIP LAYOUT

