

# FM200TU-3A

HIGH POWER SWITCHING USE  
INSULATED PACKAGE

## FM200TU-3A



- $I_D(\text{rms})$  ..... 100A
- $V_{DSS}$  ..... 150V
- Insulated Type
- 6-elements in a pack
- Thermistor inside
- UL Recognized

Yellow Card No.E80276

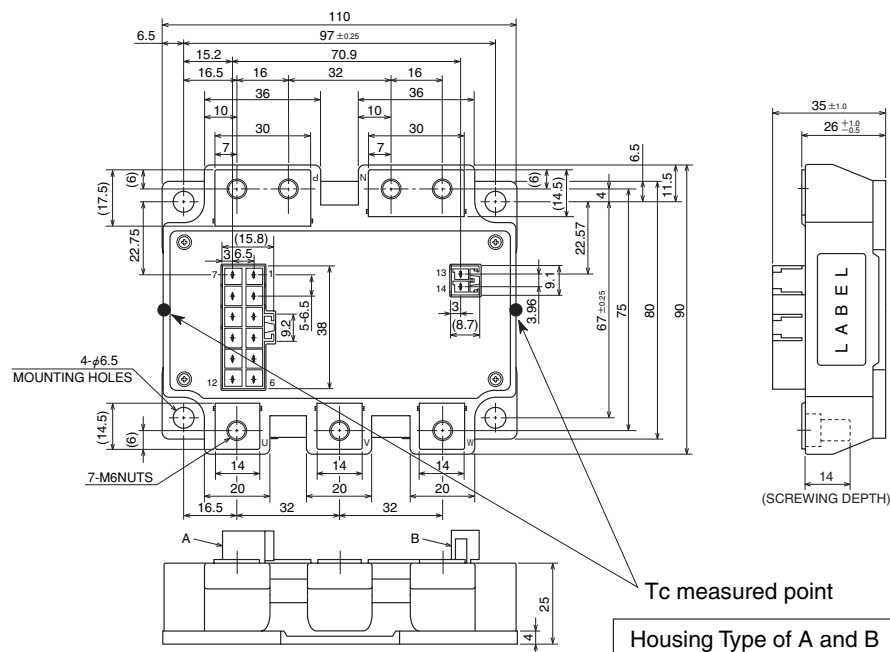
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## APPLICATION

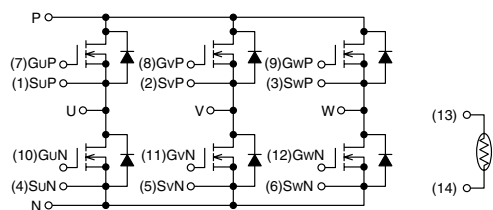
AC motor control of forklift (battery power source), UPS

## 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  
INSULATED PACKAGEABSOLUTE MAXIMUM RATINGS (T<sub>ch</sub> = 25°C unless otherwise specified.)

Symbol	Item	Conditions	Ratings	Unit
V <sub>DSS</sub>	Drain-source voltage	G-S Short	150	V
V <sub>GSS</sub>	Gate-source voltage	D-S Short	±20	V
I <sub>D</sub>	Drain current	T <sub>C</sub> ' = 122°C*3	100	A
I <sub>DM</sub>		Pulse*2	200	A
I <sub>DA</sub>	Avalanche current	L = 10μH Pulse*2	100	A
I <sub>S</sub> *1	Source current		100	A
I <sub>SM</sub> *1		Pulse*2	200	A
P <sub>D</sub> *4	Maximum power dissipation	T <sub>C</sub> = 25°C	410	W
P <sub>D</sub> *4		T <sub>C</sub> ' = 25°C*3	560	W
T <sub>ch</sub>	Channel temperature		−40 ~ +150	°C
T <sub>stg</sub>	Storage temperature		−40 ~ +125	°C
V <sub>iso</sub>	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<sub>ch</sub> = 25°C unless otherwise specified.)

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
I <sub>DSS</sub>	Drain cutoff current	V <sub>D</sub> S = V <sub>DSS</sub> , V <sub>G</sub> S = 0V	—	—	1	mA
V <sub>G</sub> S(th)	Gate-source threshold voltage	I <sub>D</sub> = 10mA, V <sub>D</sub> S = 10V	4.7	6	7.3	V
I <sub>GSS</sub>	Gate leakage current	V <sub>G</sub> S = V <sub>GSS</sub> , V <sub>D</sub> S = 0V	—	—	1.5	μA
r <sub>D</sub> S(ON)	Static drain-source (chip) On-state resistance	I <sub>D</sub> = 100A V <sub>G</sub> S = 15V	T <sub>ch</sub> = 25°C	4.8	6.6	mΩ
			T <sub>ch</sub> = 125°C	9.1	—	
V <sub>D</sub> S(ON)	Static drain-source (chip) On-state voltage	I <sub>D</sub> = 100A V <sub>G</sub> S = 15V	T <sub>ch</sub> = 25°C	0.48	0.66	V
			T <sub>ch</sub> = 125°C	0.91	—	
R <sub>(lead)</sub>	Lead resistance	I <sub>D</sub> = 100A terminal-chip	T <sub>ch</sub> = 25°C	1.2	—	mΩ
			T <sub>ch</sub> = 125°C	1.68	—	
C <sub>iss</sub>	Input capacitance	V <sub>D</sub> S = 10V V <sub>G</sub> S = 0V	—	—	50	nF
C <sub>oss</sub>	Output capacitance		—	—	7	
C <sub>rss</sub>	Reverse transfer capacitance		—	—	4	
Q <sub>G</sub>	Total gate charge	V <sub>DD</sub> = 80V, I <sub>D</sub> = 100A, V <sub>G</sub> S = 15V	—	820	—	nC
t <sub>d(on)</sub>	Turn-on delay time	V <sub>DD</sub> = 80V, I <sub>D</sub> = 100A, V <sub>G</sub> S1 = V <sub>G</sub> S2 = 15V R <sub>G</sub> = 13Ω, Inductive load switching operation I <sub>S</sub> = 100A	—	—	400	ns
t <sub>r</sub>	Turn-on rise time		—	—	250	
t <sub>d(off)</sub>	Turn-off delay time		—	—	450	
t <sub>f</sub>	Turn-off fall time		—	—	200	
t <sub>rr</sub> *1	Reverse recovery time		—	—	200	ns
Q <sub>rr</sub> *1	Reverse recovery charge		—	6.5	—	
V <sub>SD</sub> *1	Source-drain voltage	I <sub>S</sub> = 100A, V <sub>G</sub> S = 0V	—	—	1.3	V
R <sub>th(ch-c)</sub>	Thermal resistance	MOSFET part (1/6 module)*7	—	—	0.30	°C/W
R <sub>th(ch-c')</sub>		MOSFET part (1/6 module)*3	—	—	0.22	
R <sub>th(c-f)</sub>	Contact thermal resistance	Case to fin, Thermal grease Applied*8 (1/6 module)	—	0.1	—	
R <sub>th(c'-f)</sub>		Case to fin, Thermal grease Applied*3, *8 (1/6 module)	—	0.09	—	

## THERMISTOR PART

Symbol	Parameter	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R <sub>TH</sub> *6	Resistance	T <sub>TH</sub> = 25°C*5	—	100	—	kΩ
B*6	B Constant	Resistance at T <sub>TH</sub> = 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<sub>ch</sub>) does not exceed T<sub>ch</sub> max rating.\*3: T<sub>C</sub>' measured point is just under the chips. If use this value, R<sub>th(f-a)</sub> should be measured just under the chips.

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

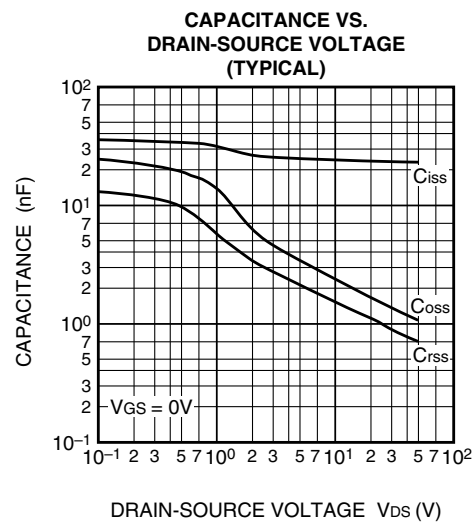
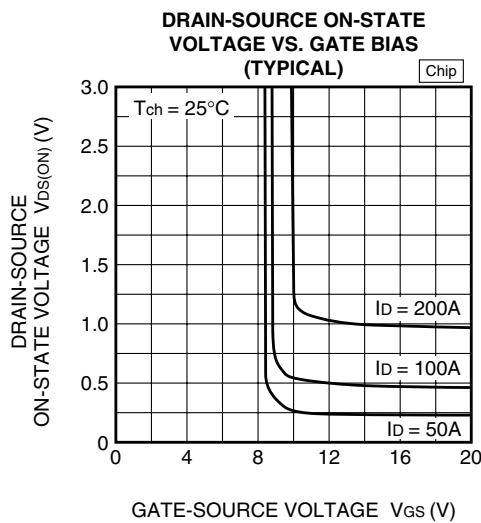
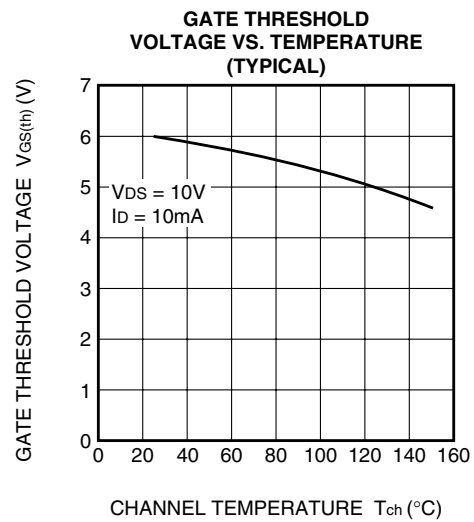
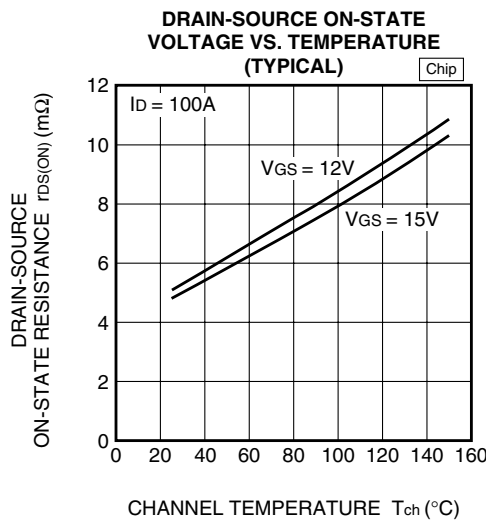
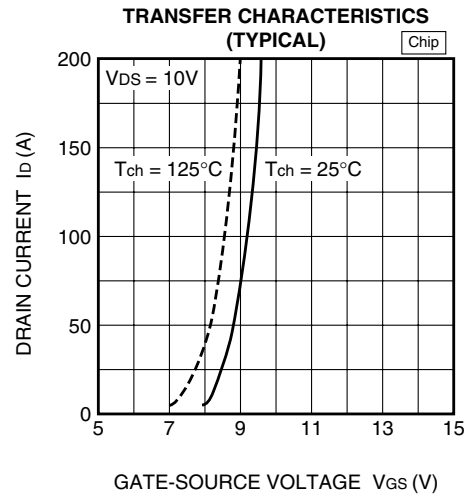
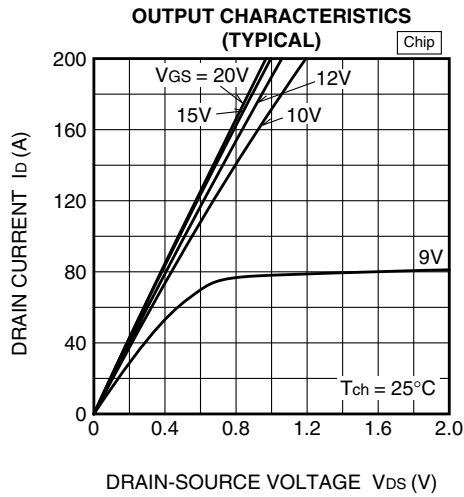
\*5: T<sub>TH</sub> is thermistor temperature.\*6: B = (lnR<sub>1</sub> - lnR<sub>2</sub>) / (1/T<sub>1</sub> - 1/T<sub>2</sub>) R<sub>1</sub>: Resistance at T<sub>1</sub>(K), R<sub>2</sub>: Resistance at T<sub>2</sub>(K)\*7: T<sub>C</sub> measured point is shown in page OUTLINE DRAWING.

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

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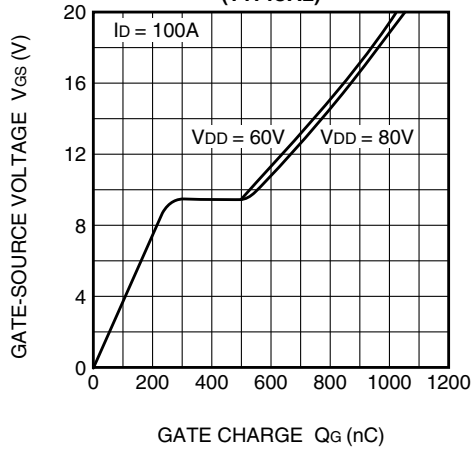
## PERFORMANCE CURVES



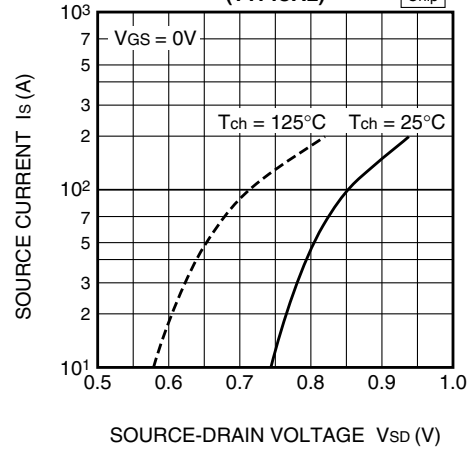
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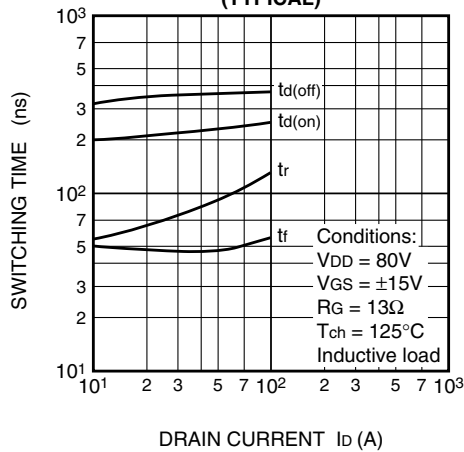
**GATE CHARGE CHARACTERISTICS  
(TYPICAL)**



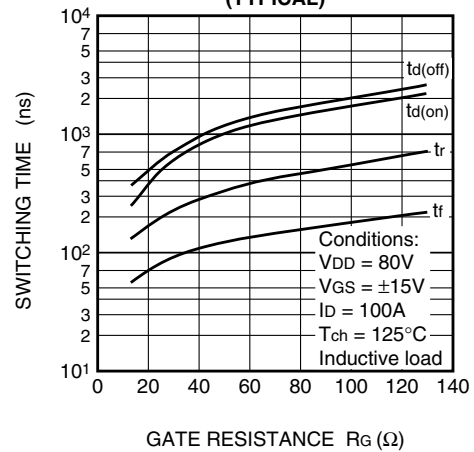
**FREE-WHEEL DIODE  
FORWARD CHARACTERISTICS  
(TYPICAL)**



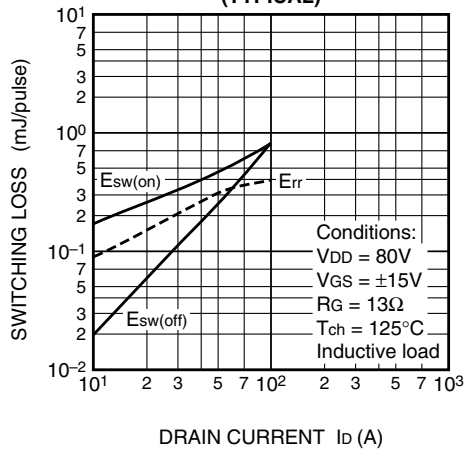
**HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)**



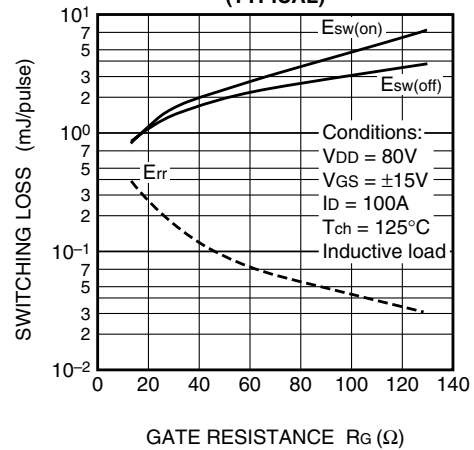
**HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)**



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



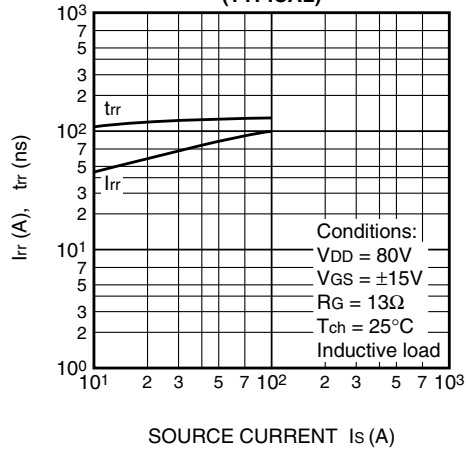
**HALF-BRIDGE  
SWITCHING CHARACTERISTICS  
(TYPICAL)**



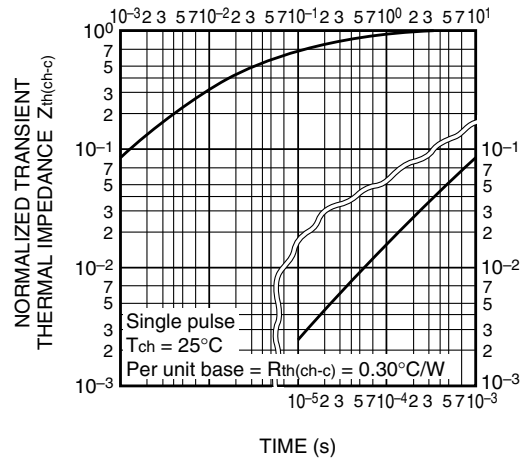
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HIGH POWER SWITCHING USE  
INSULATED PACKAGE

REVERSE RECOVERY CHARACTERISTICS  
OF FREE-WHEEL DIODE  
(TYPICAL)



TRANSIENT THERMAL  
IMPEDANCE CHARACTERISTICS



## CHIP LAYOUT

