

MITSUBISHI <MOSFET MODULE>

# FM600TU-07A

HIGH POWER SWITCHING USE  
INSULATED PACKAGE

## FM600TU-07A



- ID(rms) .....300A
- VDSS..... 75V
- Insulated Type
- 6-elements in a pack
- Thermistor inside
- UL Recognized

Yellow Card No.E80276  
File No.E80271

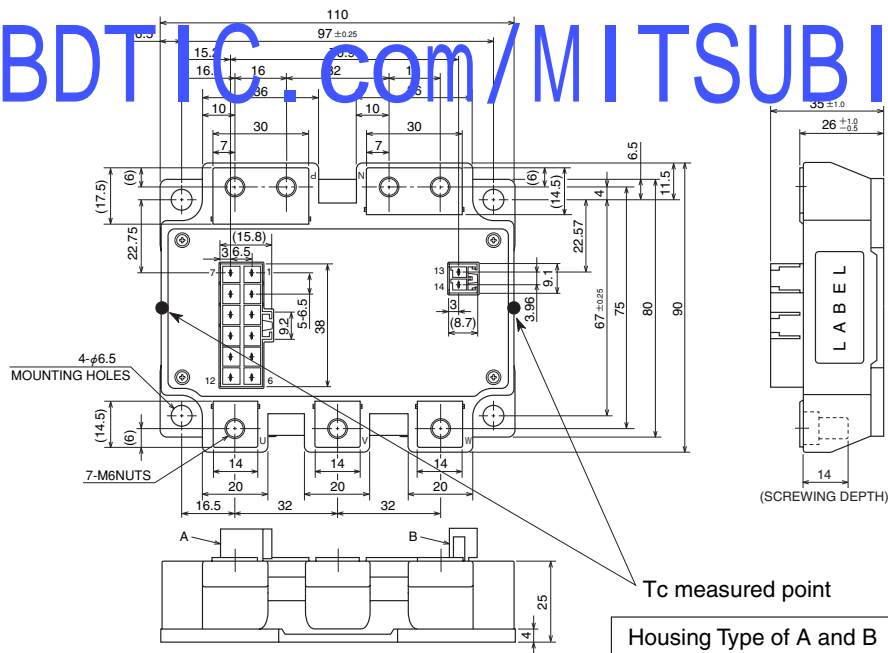
## APPLICATION

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

## OUTLINE DRAWING & CIRCUIT DIAGRAM

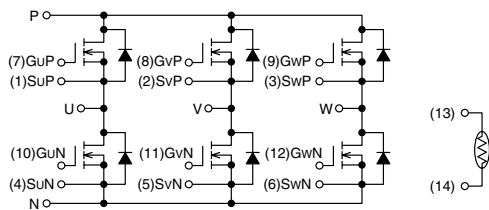
Dimensions in mm

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Tc measured point  
Housing Type of A and B  
(Tyco Electronics P/N:)  
A: 917353-1  
B: 179838-1

## 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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**ABSOLUTE MAXIMUM RATINGS (Tch = 25°C unless otherwise specified.)**

Symbol	Item	Conditions	Ratings	Unit
V <sub>DSS</sub>	Drain-source voltage	G-S Short	75	V
V <sub>GSS</sub>	Gate-source voltage	D-S Short	±20	V
I <sub>D</sub>	Drain current	T <sub>C</sub> ' = 139°C* <sup>3</sup>	300	A
I <sub>DM</sub>		Pulse* <sup>2</sup>	600	A
I <sub>DA</sub>	Avalanche current	L = 10μH Pulse* <sup>2</sup>	300	A
I <sub>S</sub> * <sup>1</sup>	Source current		300	A
I <sub>SM</sub> * <sup>1</sup>		Pulse* <sup>2</sup>	600	A
P <sub>D</sub> * <sup>4</sup>	Maximum power dissipation	T <sub>C</sub> = 25°C	960	W
P <sub>D</sub> * <sup>4</sup>		T <sub>C</sub> ' = 25°C* <sup>3</sup>	1300	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 (Tch = 25°C unless otherwise specified.)**

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
I <sub>DSS</sub>	Drain cutoff current	V <sub>Ds</sub> = V <sub>DSS</sub> , V <sub>Gs</sub> = 0V	—	—	1	mA
V <sub>Gs(th)</sub>	Gate-source threshold voltage	I <sub>D</sub> = 30mA, V <sub>Ds</sub> = 10V	4.7	6	7.3	V
I <sub>GSS</sub>	Gate leakage current	V <sub>Gs</sub> = V <sub>GSS</sub> , V <sub>Ds</sub> = 0V	—	—	1.5	μA
r <sub>Ds(ON)</sub> (chip)	Static drain-source On-state resistance	I <sub>D</sub> = 300A V <sub>Gs</sub> = 15V	T <sub>ch</sub> = 25°C —	0.53	0.73	mΩ
V <sub>Ds(ON)</sub> (chip)	Static drain-source On-state voltage	I <sub>D</sub> = 300A V <sub>Gs</sub> = 15V	T <sub>ch</sub> = 125°C —	0.87	—	V
R <sub>(lead)</sub>	Lead resistance	I <sub>D</sub> = 300A terminal-chip	T <sub>ch</sub> = 25°C —	0.6	0.22	mΩ
			T <sub>ch</sub> = 125°C —	0.26	—	mΩ
C <sub>iss</sub>	Input capacitance	V <sub>Ds</sub> = 10V	—	—	110	nF
C <sub>oss</sub>	Output capacitance	V <sub>Gs</sub> = 0V	—	—	15	nF
C <sub>rss</sub>	Reverse transfer capacitance		—	—	10	nF
Q <sub>G</sub>	Total gate charge	V <sub>DD</sub> = 48V, I <sub>D</sub> = 300A, V <sub>Gs</sub> = 15V	—	1650	—	nC
t <sub>d(on)</sub>	Turn-on delay time	V <sub>DD</sub> = 48V, I <sub>D</sub> = 300A, V <sub>Gs1</sub> = V <sub>Gs2</sub> = 15V R <sub>G</sub> = 4.2Ω, Inductive load switching operation I <sub>S</sub> = 300A	—	—	450	ns
t <sub>r</sub>	Turn-on rise time		—	—	600	
t <sub>d(off)</sub>	Turn-off delay time		—	—	600	
t <sub>f</sub>	Turn-off fall time		—	—	600	
t <sub>rr</sub> * <sup>1</sup>	Reverse recovery time		—	—	200	
Q <sub>rr</sub> * <sup>1</sup>	Reverse recovery charge		—	4.8	—	
V <sub>SD</sub> * <sup>1</sup>	Source-drain voltage	I <sub>S</sub> = 300A, V <sub>Gs</sub> = 0V	—	—	1.3	V
R <sub>th(ch-c)</sub>	Thermal resistance	MOSFET part (1/6 module)* <sup>7</sup>	—	—	0.13	°C/W
R <sub>th(ch-c')</sub>		MOSFET part (1/6 module)* <sup>3</sup>	—	—	0.096	
R <sub>th(c-f)</sub>	Contact thermal resistance	Case to fin, Thermal grease Applied* <sup>8</sup> (1/6 module)	—	0.1	—	
R <sub>th(c'-f)</sub>		Case to fin, Thermal grease Applied* <sup>3, 8</sup> (1/6 module)	—	0.09	—	

**THERMISTOR PART**

Symbol	Parameter	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R <sub>TH</sub> * <sup>6</sup>	Resistance	T <sub>TH</sub> = 25°C* <sup>5</sup>	—	100	—	kΩ
B* <sup>6</sup>	B Constant	Resistance at T <sub>TH</sub> = 25°C, 50°C* <sup>5</sup>	—	4000	—	K

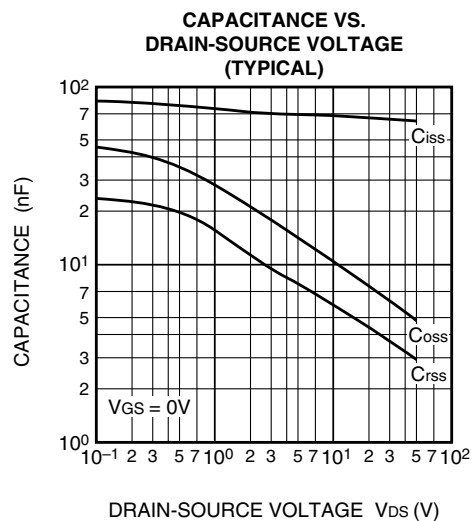
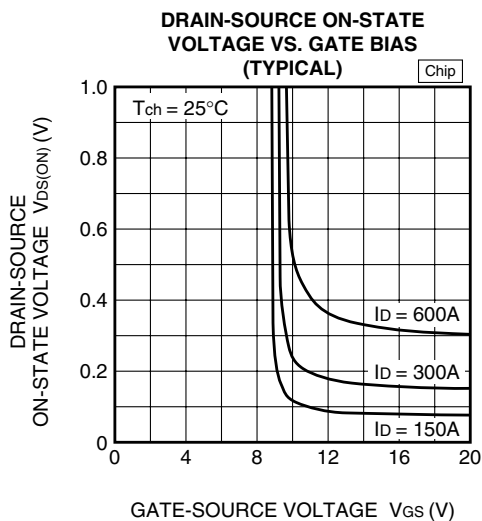
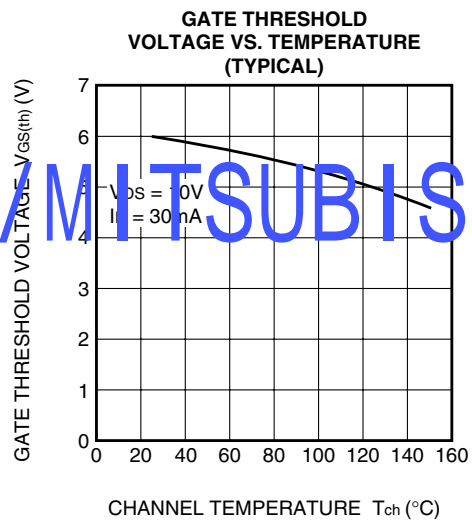
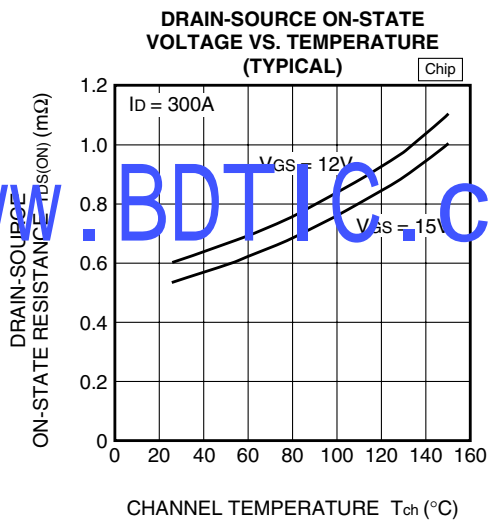
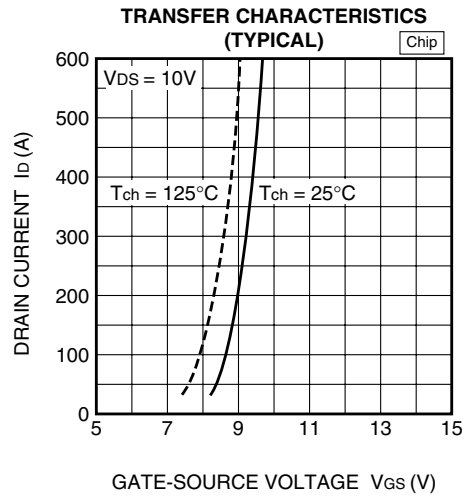
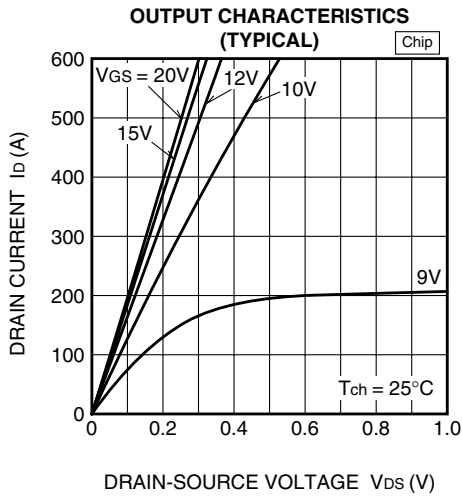
\*1: It is characteristics of the anti-parallel, source to drain free-wheel diode (FWDi).  
 \*2: Pulse width and repetition rate should be such that the device channel temperature (T<sub>ch</sub>) does not exceed T<sub>ch</sub> max rating.  
 \*3: T<sub>C</sub>' measured point is just under the chips. 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

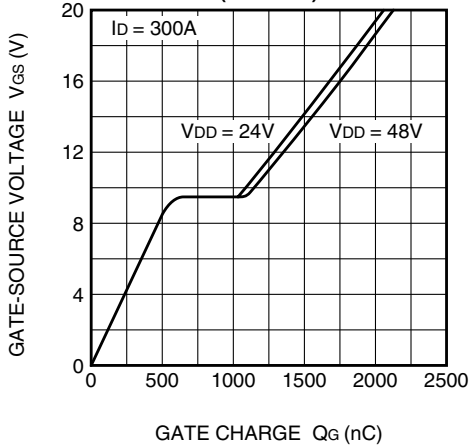


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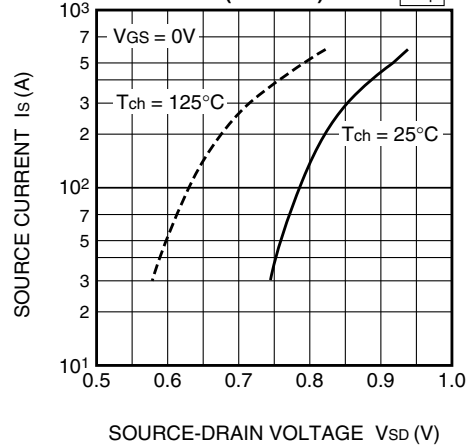
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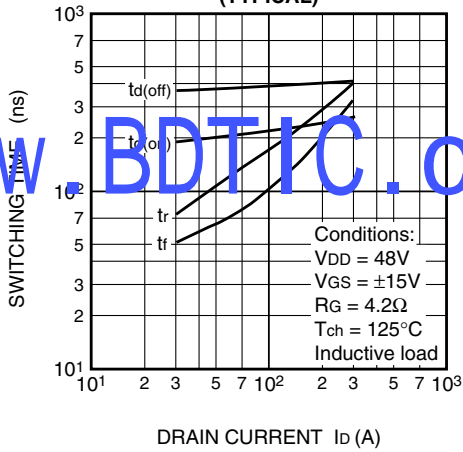
**GATE CHARGE CHARACTERISTICS (TYPICAL)**



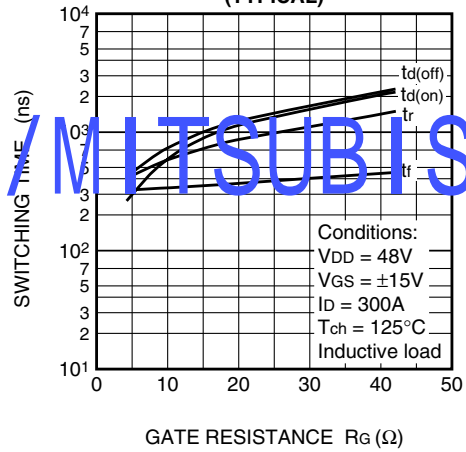
**FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)**



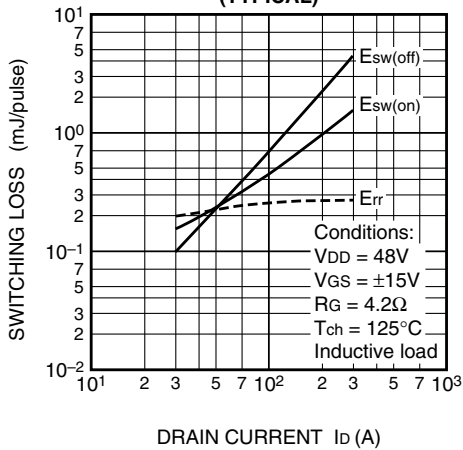
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



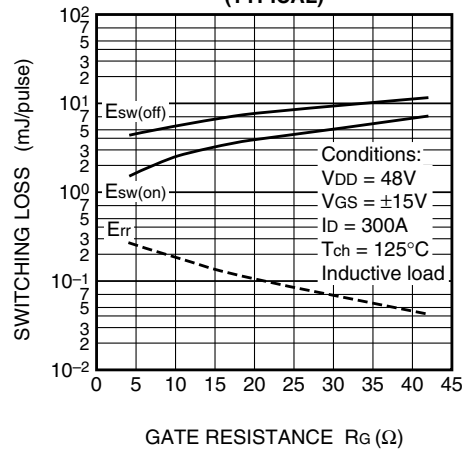
**HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)**



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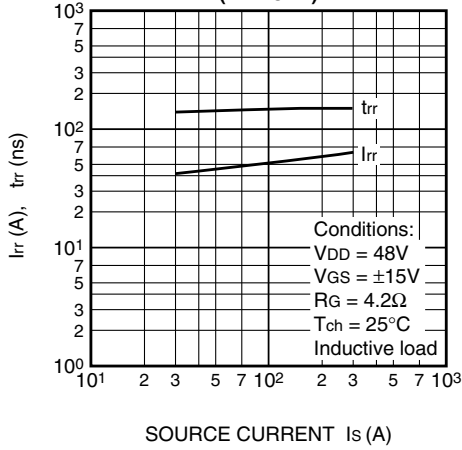


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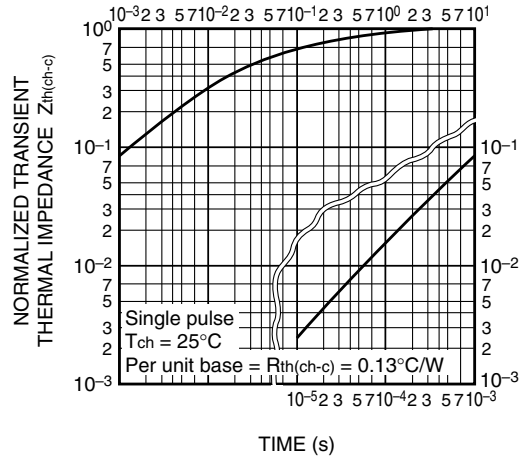
# FM600TU-07A

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



TRANSIENT THERMAL  
IMPEDANCE CHARACTERISTICS



CHIP LAYOUT

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