FM600TU-3A

HIGH POWER SWITCHING USE
INSULATED PACKAGE

FM600TU-3A

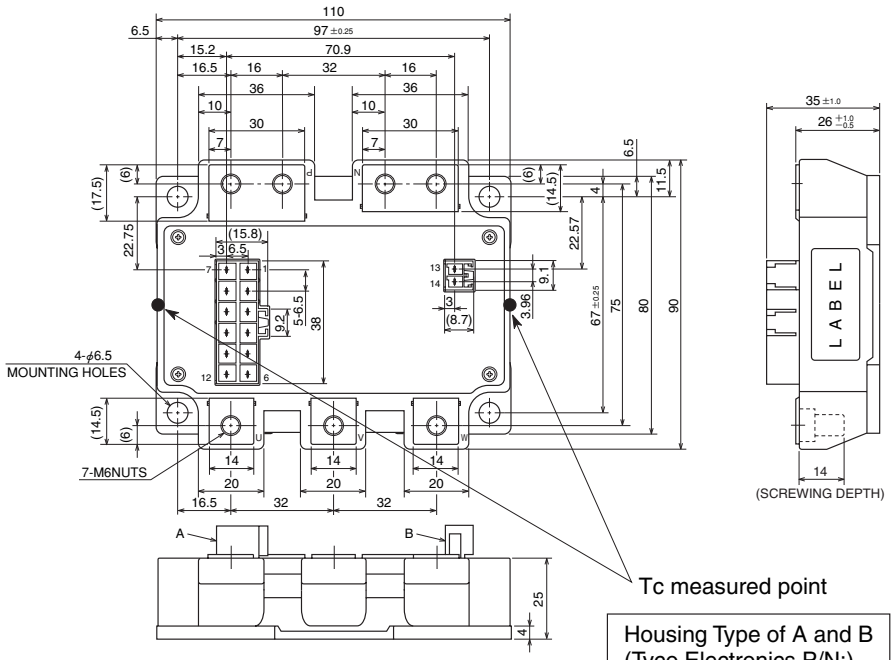
- $I_{D(rms)}$ 300A
- V_{DSS} 150V
- Insulated Type
- 6-elements in a pack
- Thermistor inside
- UL Recognized
  File No.E323585

APPLICATION

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

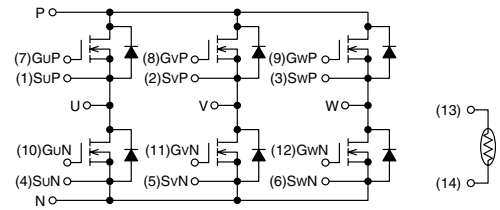
OUTLINE DRAWING & CIRCUIT DIAGRAM

Dimensions in mm



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	
(13)TH1	(14)TH2					B

MITSUBISHI ELECTRIC

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INSULATED PACKAGE

ABSOLUTE MAXIMUM RATINGS (T_j = 25°C unless otherwise specified.)

Symbol	Item	Conditions	Rating	Unit
V_{DSS}	Drain-source voltage	G-S Short	150	V
V_{GSS}	Gate-source voltage	D-S Short	±20	V
I_D	Drain current	T_C' = 114°C*3	300	A
I_{DM}		Pulse*2	600	A
I_{DA}	Avalanche current	L = 10μH Pulse*2	300	A
I_S*1	Source current		300	A
I_{SM}*1		Pulse*2	600	A
P_D*4	Maximum power dissipation	T_C = 25°C	960	W
P_D*4		T_C' = 25°C*3	1300	W
T_{ch}	Channel temperature		–40 ~ +150	°C
T_{stg}	Storage temperature		–40 ~ +125	°C
V_{isol}	Isolation voltage	Main terminal to base plate, AC 1 min, f=60Hz, RMS	2500	V
—	Mounting torque	Main Terminal M6	3.5 ~ 4.5	N • m
		Mounting to heat sink M6	3.5 ~ 4.5	N • m
—	Weight	Typical value	600	g

ELECTRICAL CHARACTERISTICS (T_j = 25°C unless otherwise specified.)

Symbol	Item	Conditions		Limits			Unit
				Min.	Typ.	Max.	
I_{DSS}	Drain cutoff current	V_{DS} = V_{DSS}, V_{GS} = 0V		—	—	1	mA
$V_{GS(th)}$	Gate-source threshold voltage	I_D = 30mA, V_{DS} = 10V		4.7	6	7.3	V
I_{GSS}	Gate leakage current	V_{GS} = V_{GSS}, V_{DS} = 0V		—	—	1.5	μA
$r_{DS(on)}$ (chip)	Static drain-source On-state resistance	I_D = 300A, V_{GS} = 15V	T_j = 25°C	—	1.6	2.2	mΩ
			T_j = 125°C	—	3.0	—	
$V_{DS(on)}$ (chip)	Static drain-source On-state voltage	I_D = 300A, V_{GS} = 15V	T_j = 25°C	—	0.48	0.66	V
			T_j = 125°C	—	0.91	—	
$R_{DD'-SS'}$	Internal lead resistance	I_D = 300A terminal-chip	T_j = 25°C	—	0.7	—	mΩ
			T_j = 125°C	—	1.0	—	
C_{iss}	Input capacitance	V_{DS} = 10V, V_{GS} = 0V		—	—	110	nF
C_{oss}	Output capacitance			—	—	15	
C_{rss}	Reverse transfer capacitance			—	—	10	
Q_G	Total gate charge	V_{DD} = 80V, I_D = 300A, V_{GS} = 15V		—	1950	—	nC
$t_{d(on)}$	Turn-on delay time	V_{DD} = 80V, I_D = 300A, V_{GS1} = V_{GS2} = 15V, R_G = 4.2Ω, Inductive load switching operation, I_S = 300A		—	—	400	ns
t_r	Rise time			—	—	400	
$t_{d(off)}$	Turn-off delay time			—	—	500	
t_f	Fall time			—	—	400	
t_{rr}*1	Reverse recovery time			—	—	200	ns
Q_{rr}*1	Reverse recovery charge			—	8.0	—	μC
V_{SD}*1	Source-drain voltage	I_S = 300A, V_{GS} = 0V		—	—	1.3	V
$R_{th(j-c)}$	Thermal resistance	MOSFET part (1/6 module)*7		—	—	0.13	K/W
$R_{th(j-c')}$		MOSFET part (1/6 module)*3		—	—	0.096	
$R_{th(c-s)}$	Contact thermal resistance	Case to fin, Thermal grease Applied*8 (1/6 module)		—	0.1	—	
$R_{th(c'-s')}$		Case to fin, Thermal grease Applied*3, *8 (1/6 module)		—	0.09	—	

NTC THERMISTOR PART

Symbol	Parameter	Conditions	Limits			Unit
			Min.	Typ.	Max.	
R_{25}*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 junction temperature (T_j) does not exceed T_j max rating.
*3: T_C' measured point is just under the chips. If use this value, $R_{th(s-a)}$ 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: $B = (\ln R_1 - \ln R_2)/(1/T_1 - 1/T_2)$ R_1: Resistance at T_1(K), R_2: Resistance at T_2(K)
*7: T_C measured point is shown in page OUTLINE DRAWING.
*8: Typical value is measured by using thermally conductive grease of λ=0.9 W/(m·K).

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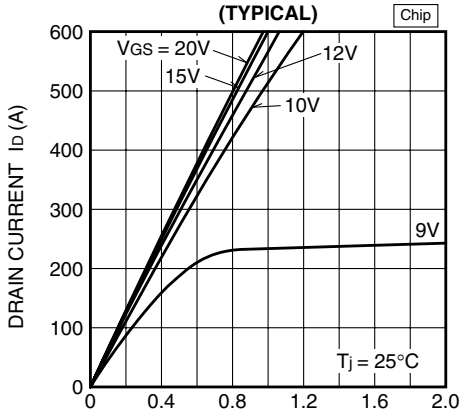
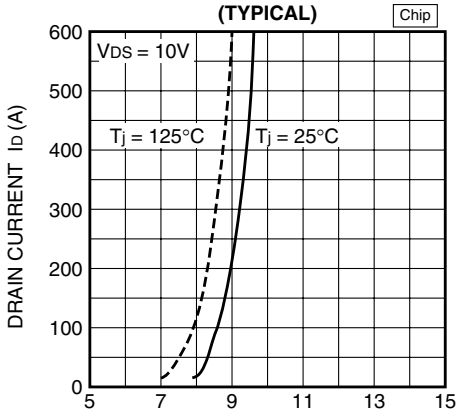
PERFORMANCE CURVES

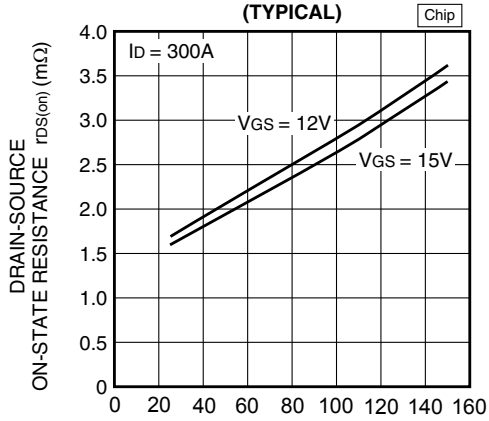
OUTPUT CHARACTERISTICS (TYPICAL) Chip



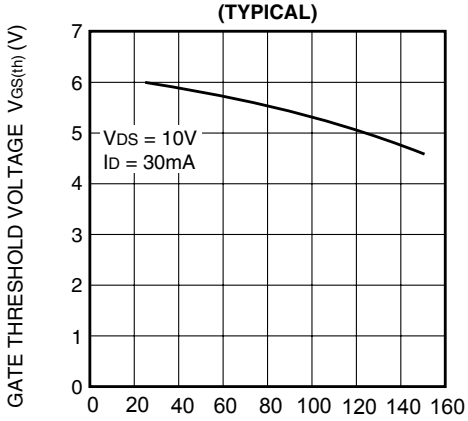
TRANSFER CHARACTERISTICS (TYPICAL) Chip



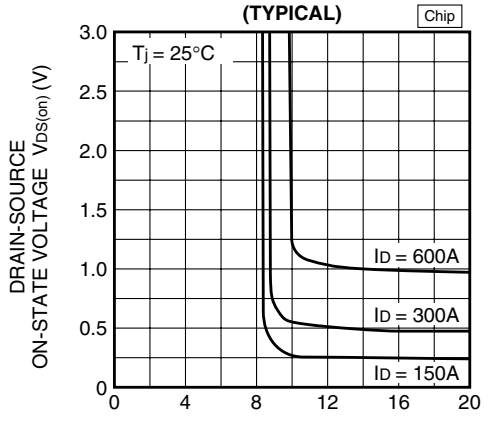
DRAIN-SOURCE ON-STATE VOLTAGE VS. TEMPERATURE (TYPICAL) Chip



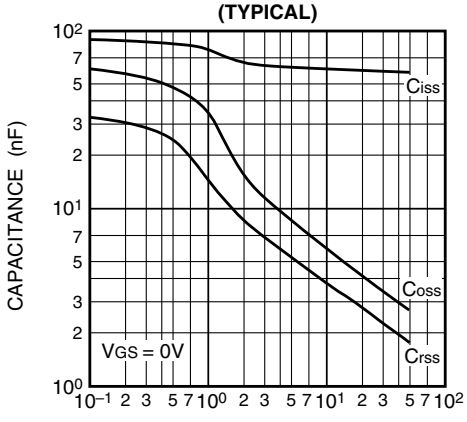
GATE THRESHOLD VOLTAGE VS. TEMPERATURE (TYPICAL)



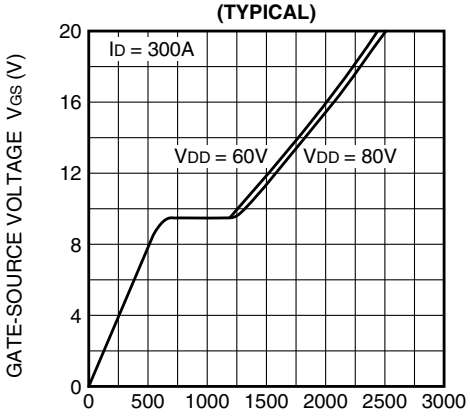
DRAIN-SOURCE ON-STATE VOLTAGE VS. GATE BIAS (TYPICAL) Chip



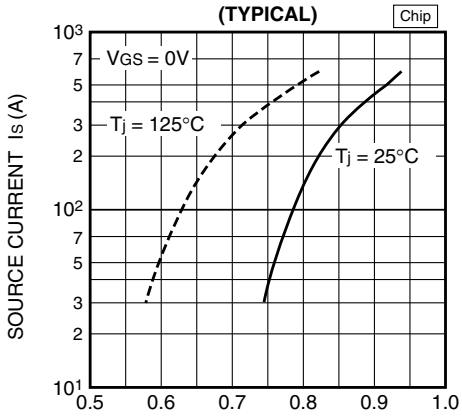
CAPACITANCE VS. DRAIN-SOURCE VOLTAGE (TYPICAL)



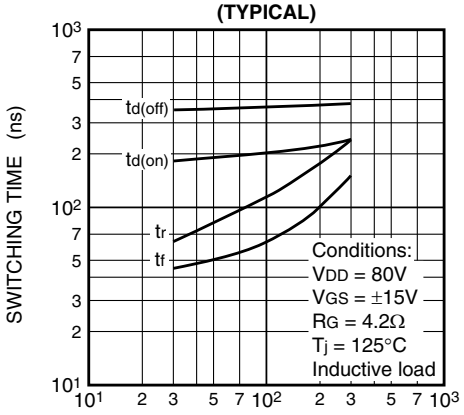
GATE CHARGE CHARACTERISTICS (TYPICAL)



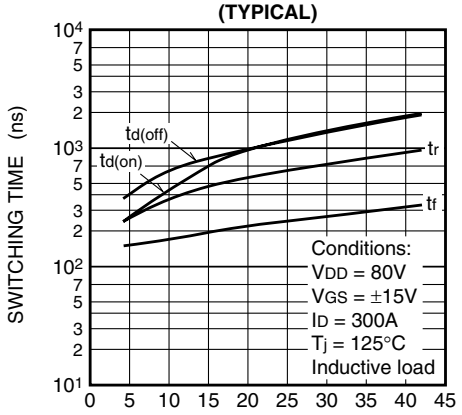
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



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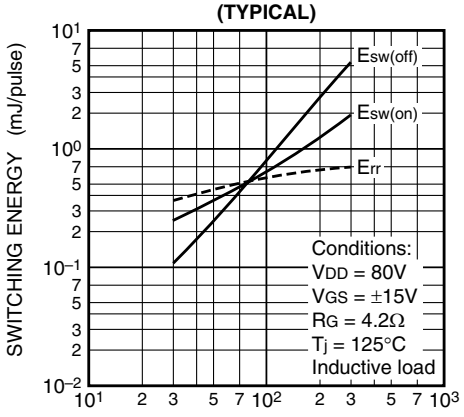
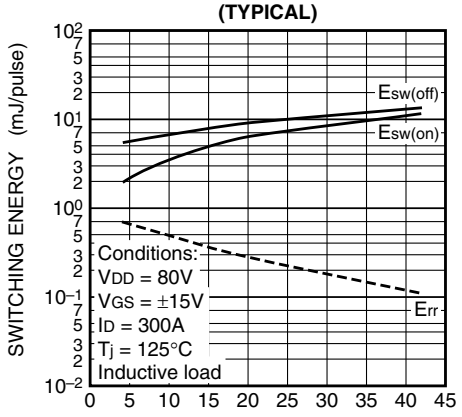
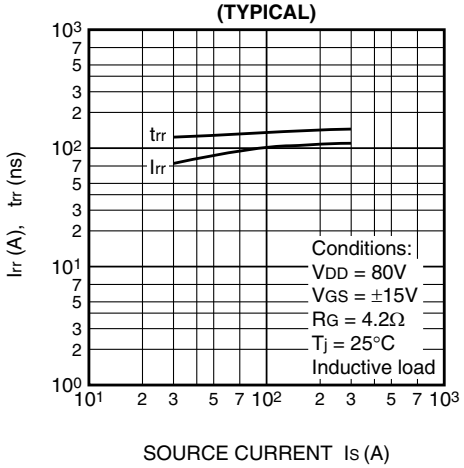


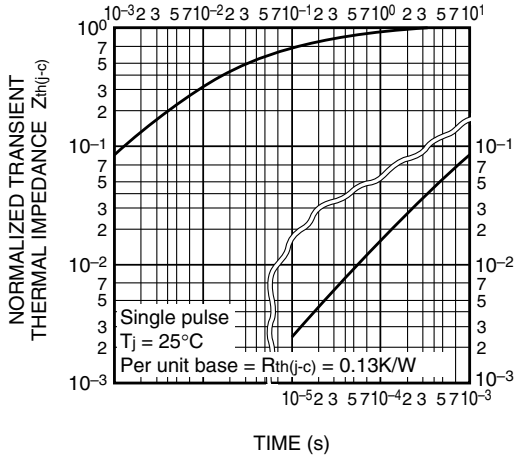
HALF-BRIDGE SWITCHING CHARACTERISTICS (TYPICAL)



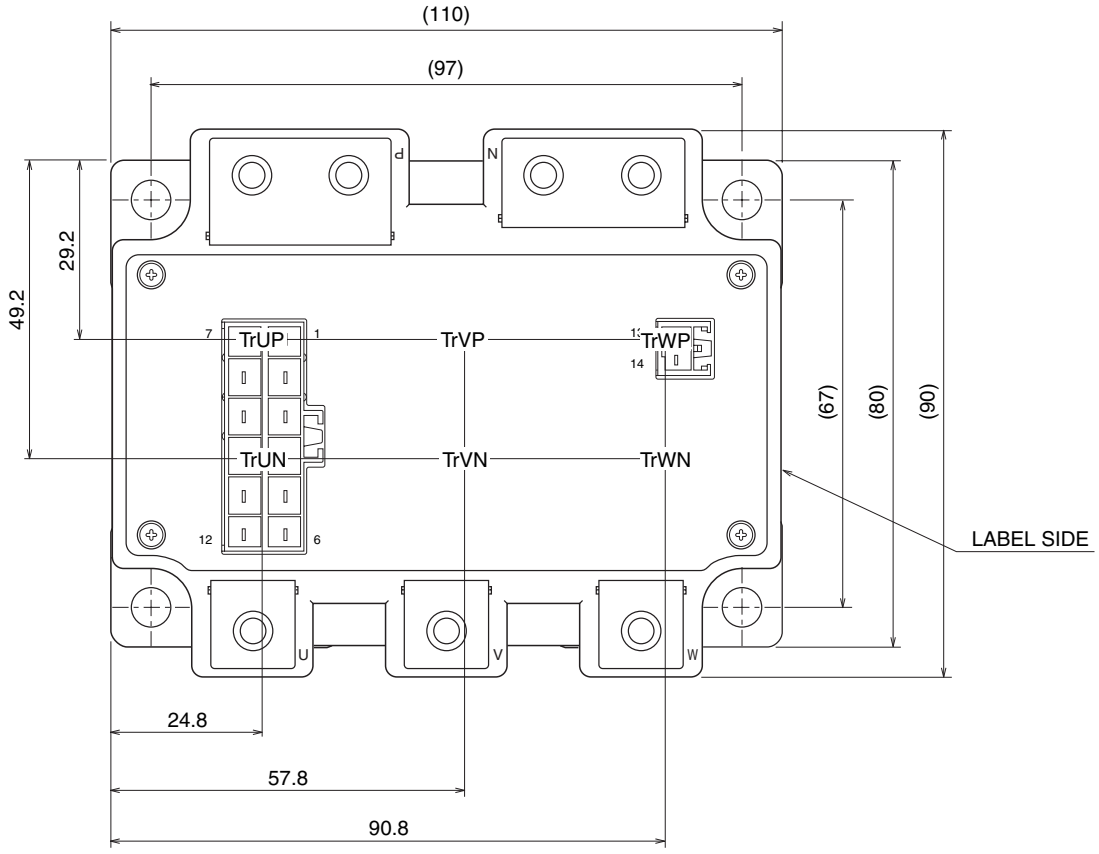
REVERSE RECOVERY CHARACTERISTICS OF FREE-WHEEL DIODE (TYPICAL)



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS



CHIP LAYOUT



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