

FM400TU-2A

HIGH POWER SWITCHING USE INSULATED PACKAGE

FM400TU-2A



- ID(rms) 200A
- VDSS 100V
- Insulated Type
- 6-elements in a pack
- Thermistor inside
- UL Recognized

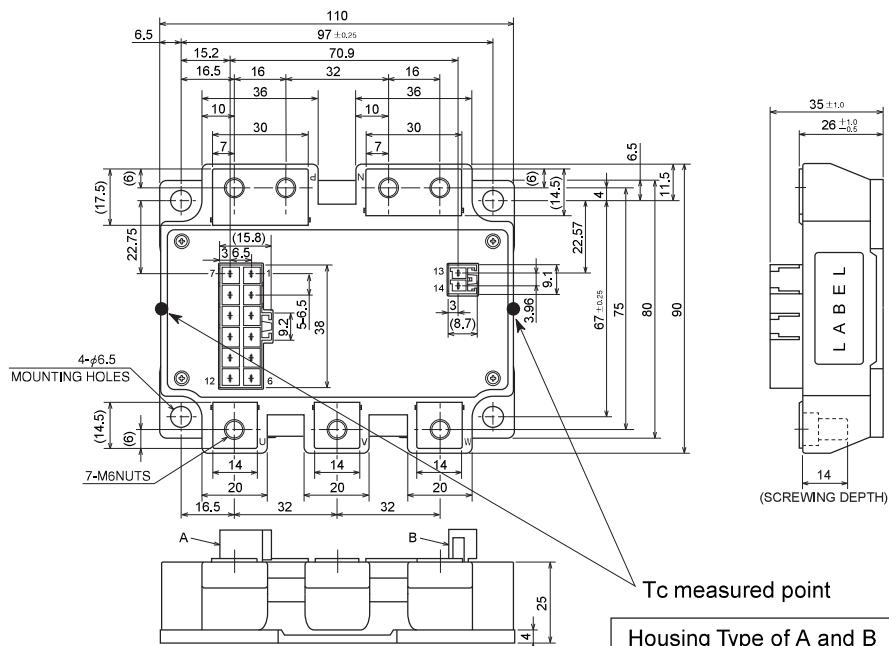
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APPLICATION

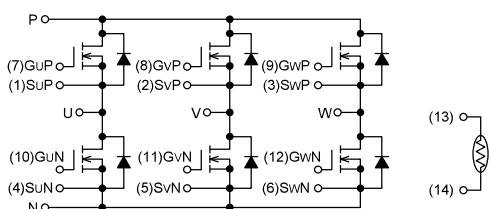
AC motor control of forklift (battery power source), UPS

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)GUuN	(11)GvN	(12)GwN	
(13)TH1	(14)TH2					B

ABSOLUTE MAXIMUM RATINGS ($T_j = 25^\circ\text{C}$ unless otherwise specified.)

Symbol	Item	Conditions	Rating	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	$T_c' = 130^\circ\text{C}^{*3}$	200	A
I_{DM}		Pulse ^{*2}	400	A
I_{DA}	Avalanche current	$L = 10\mu\text{H}$ Pulse ^{*2}	200	A
I_S^{*1}	Source current		200	A
I_{SM}^{*1}		Pulse ^{*2}	400	A
P_D^{*4}	Maximum power dissipation	$T_c = 25^\circ\text{C}$	650	W
P_D^{*4}		$T_c' = 25^\circ\text{C}^{*3}$	880	W
T_{ch}	Channel temperature		$-40 \sim +150$	$^\circ\text{C}$
T_{stg}	Storage temperature		$-40 \sim +125$	$^\circ\text{C}$
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 ($T_j = 25^\circ\text{C}$ unless otherwise specified.)

Symbol	Item	Conditions	Limits			Unit
			Min.	Typ.	Max.	
I_{DSS}	Drain cutoff current	$V_{DS} = V_{DSS}$, $V_{GS} = 0\text{V}$	—	—	1	mA
$V_{GS(th)}$	Gate-source threshold voltage	$I_D = 20\text{mA}$, $V_{DS} = 10\text{V}$	4.7	6	7.3	V
I_{GSS}	Gate leakage current	$V_{GS} = V_{GSS}$, $V_{DS} = 0\text{V}$	—	—	1.5	μA
$r_{DS(on)}$ (chip)	Static drain-source On-state resistance	$I_D = 200\text{A}$ $V_{GS} = 15\text{V}$	$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$	— —	1.45 2.5	2.0 —
$V_{DS(on)}$ (chip)	Static drain-source On-state voltage	$I_D = 200\text{A}$ $V_{GS} = 15\text{V}$	$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$	— —	0.29 0.50	0.40 —
$R_{DD-SS'}$	Internal lead resistance	$I_D = 200\text{A}$ terminal-chip	$T_j = 25^\circ\text{C}$ $T_j = 125^\circ\text{C}$	— —	0.8 1.12	— —
C_{iss}	Input capacitance	$V_{DS} = 10\text{V}$ $V_{GS} = 0\text{V}$	—	—	75	nF
C_{oss}	Output capacitance		—	—	10	
C_{rss}	Reverse transfer capacitance		—	—	6	
Q_G	Total gate charge	$V_{DD} = 48\text{V}$, $I_D = 200\text{A}$, $V_{GS} = 15\text{V}$	—	1200	—	nC
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 48\text{V}$, $I_D = 200\text{A}$, $V_{GS1} = V_{GS2} = 15\text{V}$ $R_G = 6.3\Omega$, Inductive load switching operation $I_S = 200\text{A}$	—	—	400	ns
t_r	Rise time		—	—	400	
$t_{d(off)}$	Turn-off delay time		—	—	450	
t_f	Fall time		—	—	300	
t_{rr}^{*1}	Reverse recovery time		—	—	250	ns
Q_{rr}^{*1}	Reverse recovery charge	$I_S = 200\text{A}$, $V_{GS} = 0\text{V}$	—	6.0	—	μC
V_{SD}^{*1}	Source-drain voltage		—	—	1.3	V
$R_{th(j-c)}$	Thermal resistance	MOSFET part (1/6 module) ^{*7}	—	—	0.19	K/W
$R_{th(j-c)}$		MOSFET part (1/6 module) ^{*3}	—	—	0.142	
$R_{th(c-s)}$	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	$T_{TH} = 25^\circ\text{C}^{*5}$	—	100	—	k Ω
B^{*6}	B Constant	Resistance at $T_{TH} = 25^\circ\text{C}$, 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.

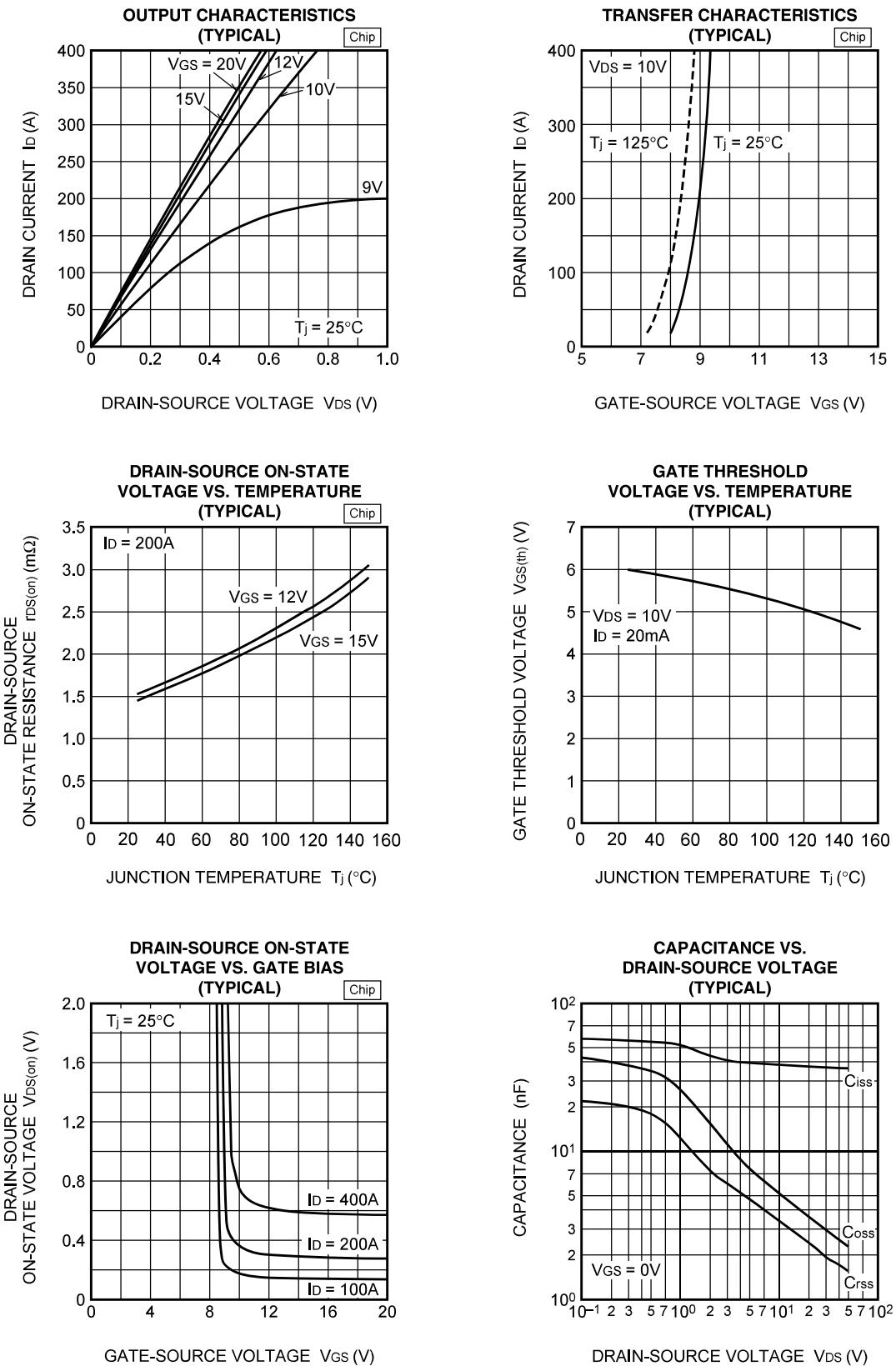
*4: Pulse width and repetition rate should be such as to cause negligible temperature rise.

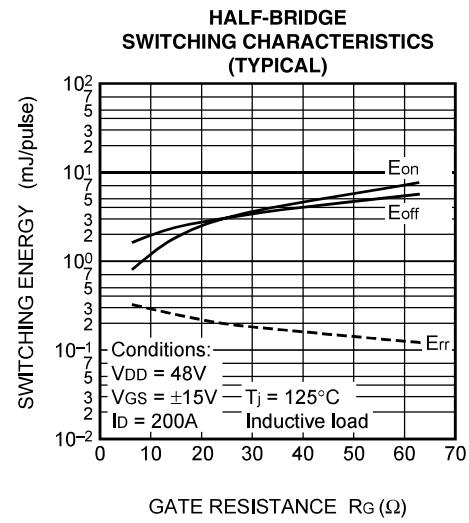
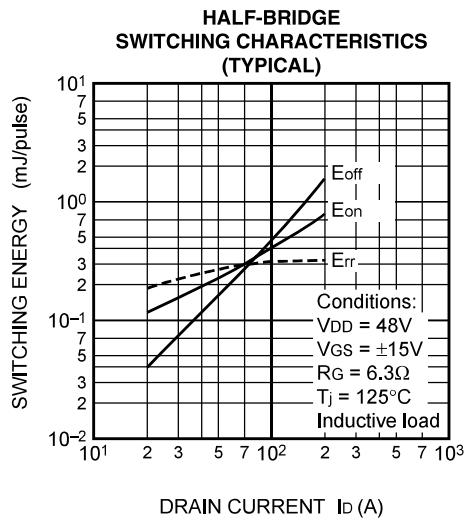
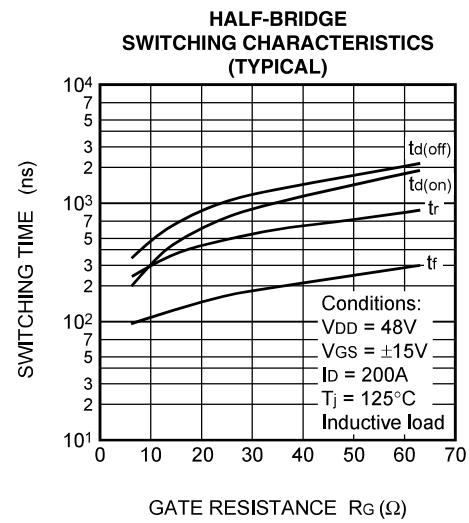
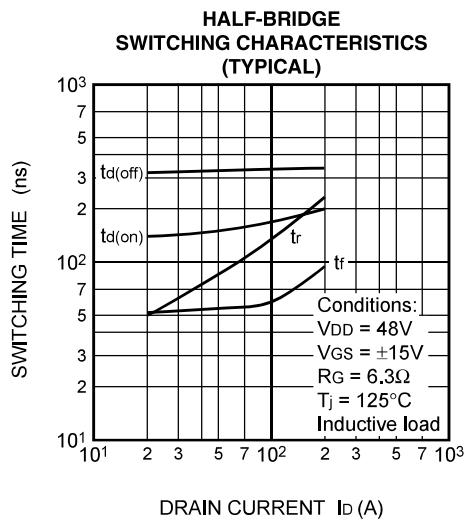
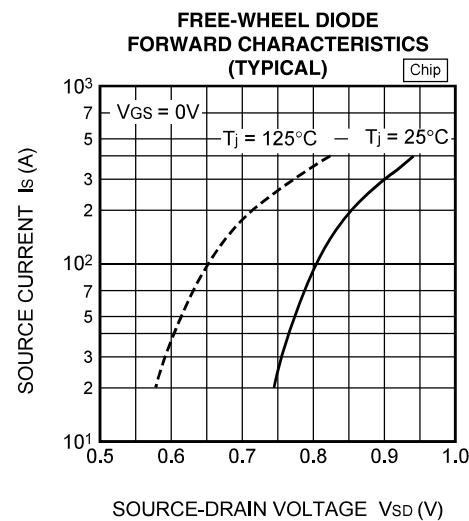
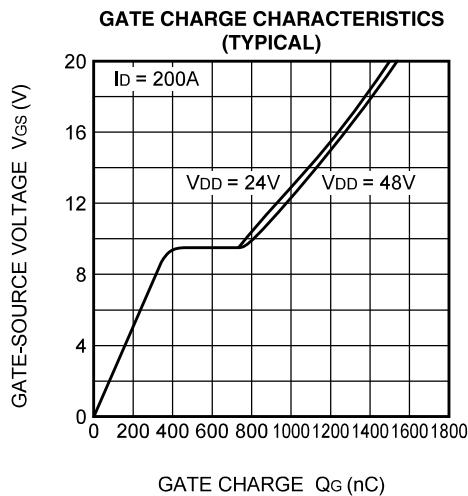
*5: T_{TH} is thermistor temperature.*6: $B = (\ln R_1 - \ln R_2) / (1/T_1 - 1/T_2)$ R1: Resistance at $T_1(\text{K})$, R2: Resistance at $T_2(\text{K})$ *7: T_c measured point is shown in page OUTLINE DRAWING.*8: Typical value is measured by using thermally conductive grease of $\lambda=0.9\text{ W}/(\text{m}\cdot\text{K})$.

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INSULATED PACKAGE

PERFORMANCE CURVES

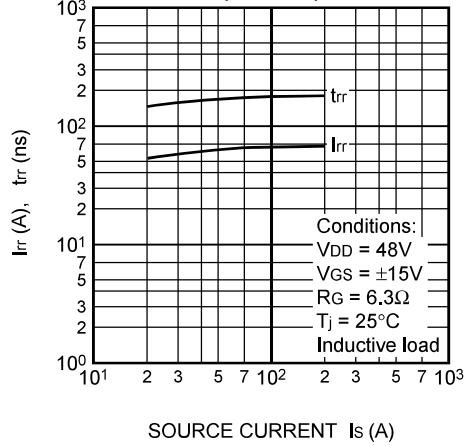




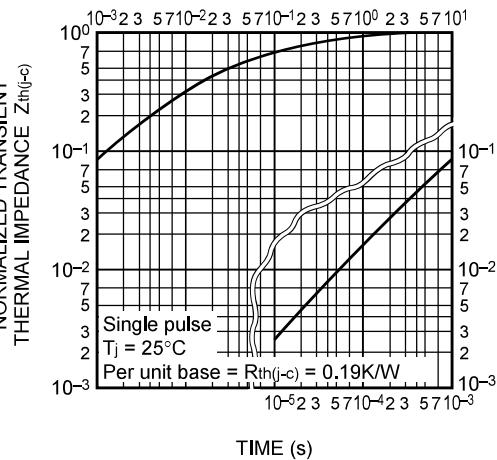
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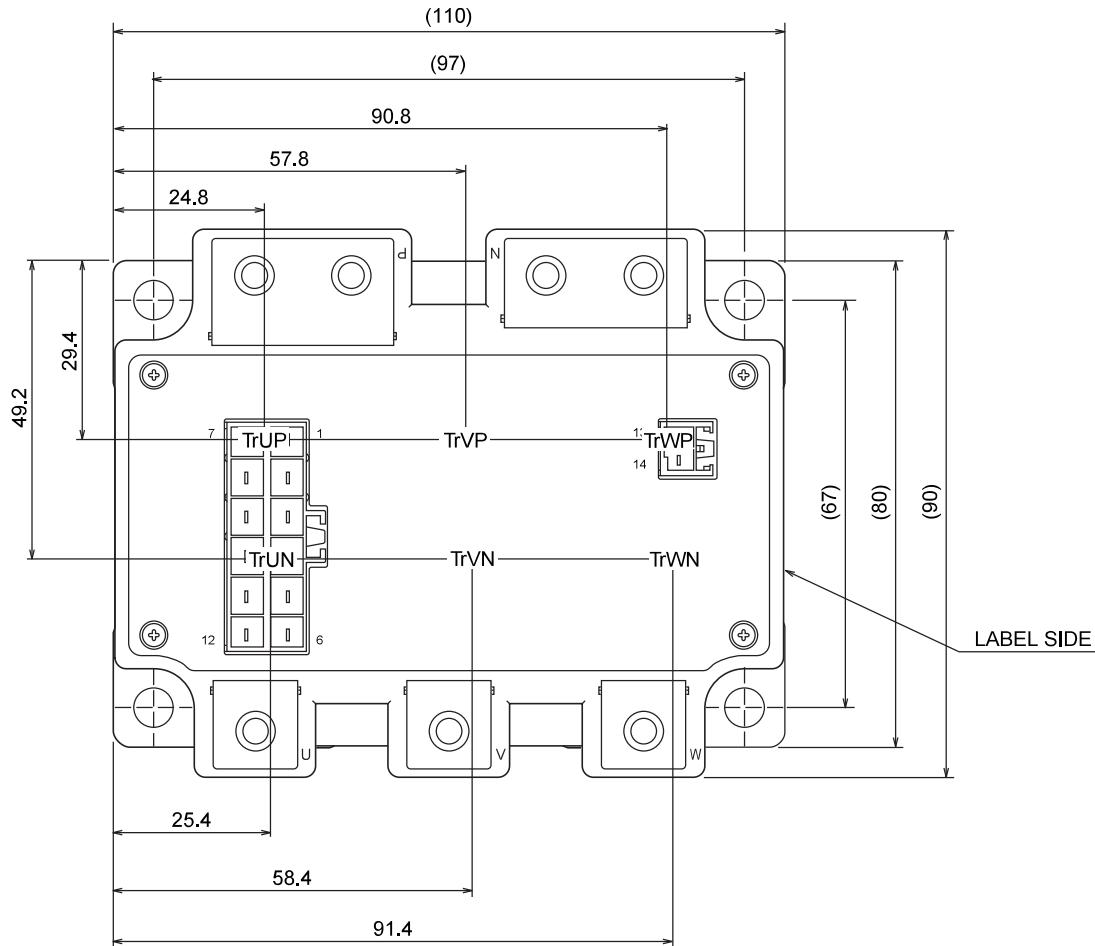
REVERSE RECOVERY CHARACTERISTICS
OF FREE-WHEEL DIODE
(TYPICAL)



TRANSIENT THERMAL
IMPEDANCE CHARACTERISTICS



CHIP LAYOUT



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Mar. 2013

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