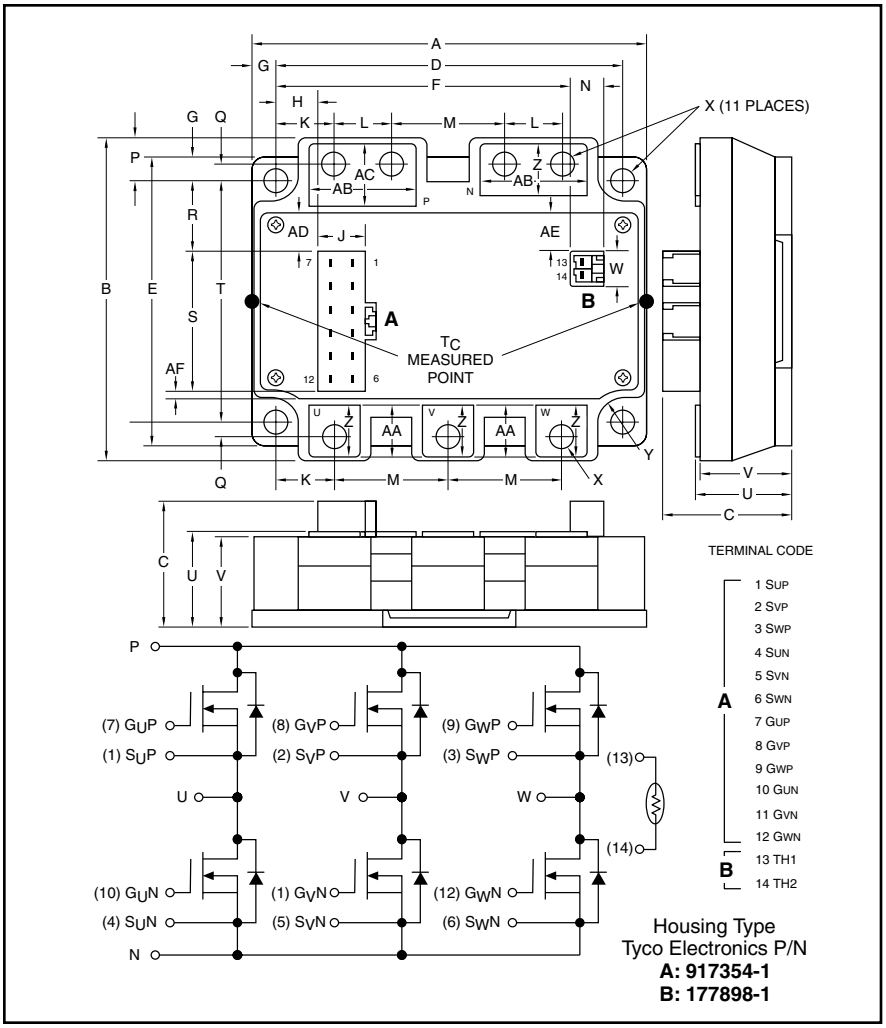
FM400TU-2A

Powerex, Inc., 200 E. Hillis Street, Youngwood, Pennsylvania 15697-1800 (724) 925-7272

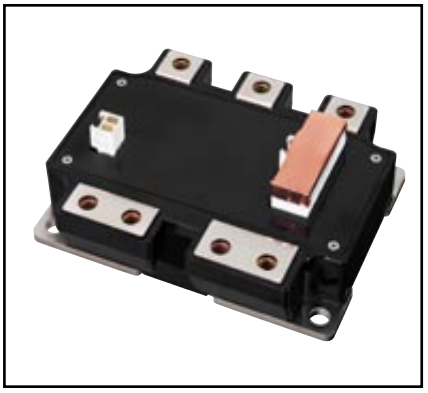
6-Pack High Power MOSFET Module
200 Amperes/100 Volts



Outline Drawing and Circuit Diagram

Dimensions	Inches	Millimeters
A	4.33	110.0
B	3.54	90.0
C	1.38	35.0
D	3.82	97.0
E	3.15	80.0
F	3.27	83.0
G	0.26	6.5
H	0.48	12.0
J	0.51	12.9
K	0.65	16.5
L	0.63	16.0
M	1.26	32.0
N	0.35	8.8
P	0.45	11.5
Q	0.16	4.0

Dimensions	Inches	Millimeters
R	0.79	20.0
S	1.50	38.0
T	2.64	67.0
U	1.02	26.0
V	0.98	25.0
W	0.36	9.1
X	Dia. 0.25	Dia. 6.5
Y	Rad. 0.25	Rad. 6.5
Z	0.57	14.5
AA	0.55	14.0
AB	1.18	30.0
AC	0.69	17.5
AD	0.47	12.0
AE	0.61	15.5
AF	0.18	4.5



Description:
Powerex MOSFET Modules are designed for use in low voltage switching applications. Each module consists of 6 MOSFET switches with low $R_{ds(on)}$ and a fast recovery body diode to yield low loss. All components and interconnects are isolated from the heat sink baseplate. This offers simplified system assembly and thermal management.

Features:
- ☐ Low $E_{SW(off)}$ and Low $R_{ds(on)}$
- ☐ Super-Fast Recovery Free-Wheel Diode
- ☐ Thermistor for T_C Sensing
- ☐ Parallel Legs to make a Dual Module at 3X the Rating
- ☐ Positive Locking Connectors
- ☐ Easy Bus Bar Layout Due to Flow Through Power Design

Applications:
- ☐ Forklift
- ☐ Off road Electric Vehicle
- ☐ Welder
- ☐ UPS
- ☐ Chopper

Ordering Information:
Example: Select the complete part module number you desire from the table below -i.e. FM400TU-2A is a 100V (V_{DSS}), 200 Ampere 6-Pack High Power MOSFET Module.

Type	Current Rating Amperes	V_{DSS} Volts
FM	200	100

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Absolute Maximum Ratings, T_j = 25°C unless otherwise specified

Ratings	Symbol	FM400TU-2A	Units
Channel Temperature	T_j	–40 to 150	°C
Storage Temperature	T_{stg}	–40 to 125	°C
Drain-Source Voltage (G-S Short)	V_{DSS}	100	Volts
Gate-Source Voltage (D-E Short)	V_{GSS}	±20	Volts
Drain Current (T_C = 25°C)	$I_{D(rms)}$	200	A_{rms}
Peak Drain Current (Pulse)	I_{DM}	400*	Amperes
Avalanche Current (L = 10µH, Pulse)	I_{DA}	200*	Amperes
Source Current (T_C = 25°C)**	$I_{S(rms)}$	200	A_{rms}
Peak Source Current (Pulse)**	I_{SM}	400*	Amperes
Maximum Power Dissipation (T_C = 25°C, T_j < 150°C)***	P_D	650	Watts
Maximum Peak Power Dissipation ($T_{C'}$ = 25°C, T_j < 150°C)***	P_D	880	Watts
Mounting Torque, M6 Main Terminal	—	40	in-lb
Mounting Torque, M6 Mounting	—	40	in-lb
Weight	—	600	Grams
Isolation Voltage (Main Terminal to Baseplate, AC 1 min.)	V_{ISO}	2500	Volts

Electrical Characteristics, T_j = 25°C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Drain-Cutoff Current	I_{DSS}	V_{DS} = V_{DSS}, V_{GS} = 0V	—	—	1.0	mA
Gate-Source Threshold Voltage	$V_{GS(th)}$	I_D = 20mA, V_{DS} = 10V	4.7	6.0	7.3	Volts
Gate Leakage Current	I_{GSS}	V_{DS} = V_{DSS}, V_{DS} = 0V	—	—	1.5	µA
Static Drain-Source On-State Resistance	$r_{DS(on)}$	I_D = 200A, V_{GS} = 15V, T_j = 25°C	—	1.45	2.0	mΩ
(Chip)		I_D = 200A, V_{GS} = 15V, T_j = 125°C	—	2.5	—	mΩ
Static Drain-Source On-State Voltage	$V_{DS(on)}$	I_D = 200A, V_{GS} = 15V, T_j = 25°C	—	0.29	0.4	Volts
(Chip)		I_D = 200A, V_{GS} = 15V, T_j = 125°C	—	0.5	—	Volts
Lead Resistance	R_{lead}	I_D = 200A, Terminal-Chip, T_j = 25°C	—	0.8	—	mΩ
		I_D = 200A, Terminal-Chip, T_j = 125°C	—	1.12	—	mΩ
Input Capacitance	C_{iss}	V_{DS} = 10V, V_{GS} = 0V	—	—	75	nf
Output Capacitance	C_{oss}		—	—	10	nf
Reverse Transfer Capacitance	C_{rss}		—	—	6	nf
Total Gate Charge	Q_G	V_{DD} = 48V, I_D = 200A, V_{GS} = 15V	—	1200	—	nC
Inductive Turn-on Delay Time	$t_{d(on)}$	V_{DD} = 48V, I_D = 200A, V_{GS1} = V_{GS2} = 15V, R_G = 6.3Ω, Inductive Load SwiTjing Operation, I_S = 200A	—	—	400	ns
Load Rise Time	t_r		—	—	400	ns
SwiTj Turn-off Delay Time	$t_{d(off)}$		—	—	450	ns
Time Fall Time	t_f		—	—	300	ns
Diode Reverse Recovery Time**	t_{rr}		—	—	250	ns
Diode Reverse Recovery Charge**	Q_{rr}		—	6.0	—	µC
Source-Drain Voltage	V_{SD}	I_S = 200A, V_{GS} = 0V	—	—	1.3	Volts

* Pulse width and repetition rate should be such that device channel temperature (T_j) does not exceed $T_{j(max)}$ rating.
**Represents characteristics of the anti-parallel, source-to-drain free-wheel diode (FWDi).
***$T_{C'}$ measured point is just under the chips. If you use this value, $R_{th(f-a)}$ should be measured just under the chips.

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Thermal and Mechanical Characteristics, T_j = 25 °C unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Thermal Resistance, Channel to Case	$R_{th(j-c)}$	MOSFET part (1/6 Module)	—	—	0.19	°C/W
		T_C Reference Point per Outline Drawing				
Thermal Resistance, Channel to Case	$R_{th(j-c')}$	MOSFET part (1/6 Module)	—	—	0.142	°C/W
		Measured Point is Just Under the Chips.				
Contact Thermal Resistance	$R_{th(c-f)}$	Per 1/6 Module, Thermal Grease Applied	—	0.1	—	°C/W

Thermistors Part

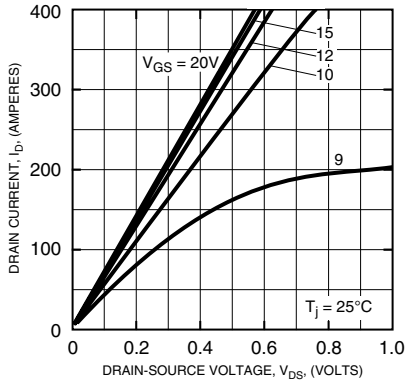
Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Resistance*	R_{th}	T_C = 25°C	—	100	—	kΩ
B Constant*	B	Resistance at 25°C, 50°C	—	4000	—	K

*$B = (\ln R_1 - \ln R_2) / (1/T_1 - 1/T_2)$

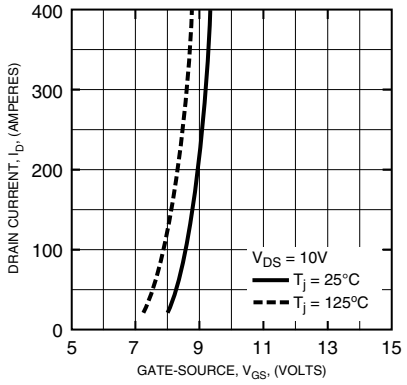
R_1: Resistance at T_1(K),

R_2: Resistance at T_2(K)

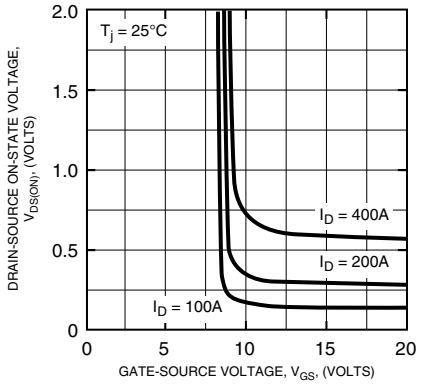
OUTPUT CHARACTERISTICS (TYPICAL)



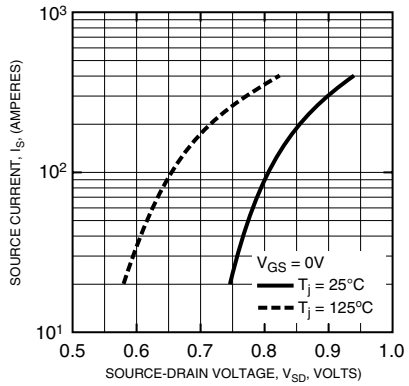
TRANSFER CHARACTERISTICS (TYPICAL)



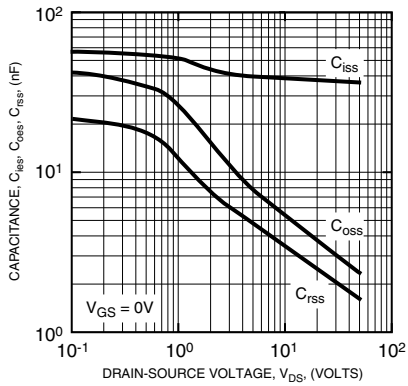
DRAIN-SOURCE ON-STATE VOLTAGE VS. GATE BIAS CHARACTERISTICS (TYPICAL)



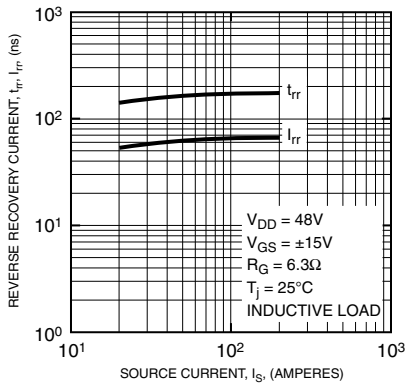
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL - INVERTER PART)



CAPACITANCE VS. DRAIN-SOURCE VOLTAGE (TYPICAL)



REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



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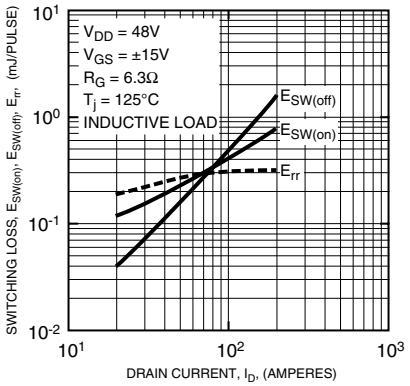
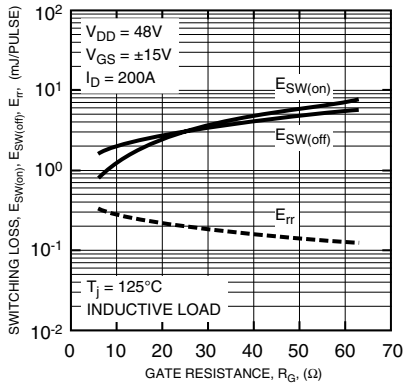
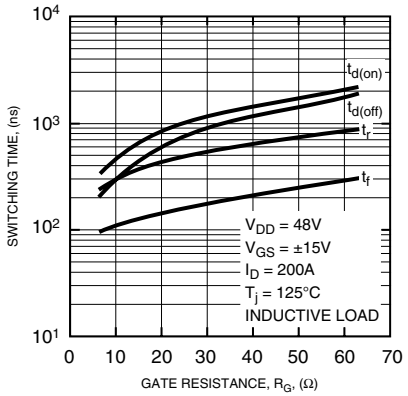
SWITCHING LOSS VS. DRAIN CURRENT (TYPICAL)



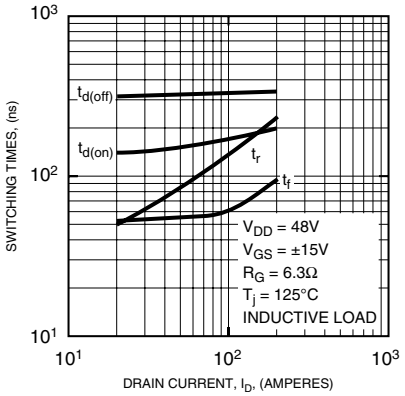
SWITCHING LOSS VS. GATE RESISTANCE (TYPICAL)



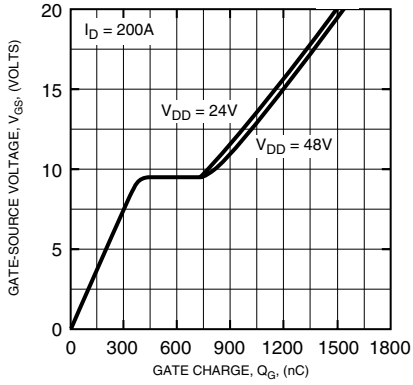
SWITCHING TIME VS. GATE RESISTANCE (TYPICAL)



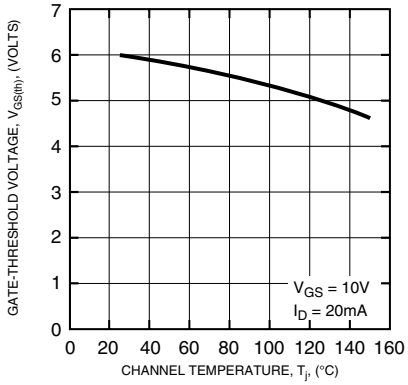
SWITCHING TIME VS. DRAIN CURRENT (TYPICAL)



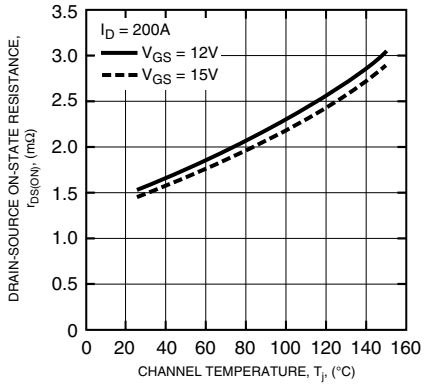
GATE CHARGE CHARACTERISTICS (TYPICAL)



GATE THRESHOLD VOLTAGE VS. TEMPERATURE (TYPICAL)



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



TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (TYPICAL)