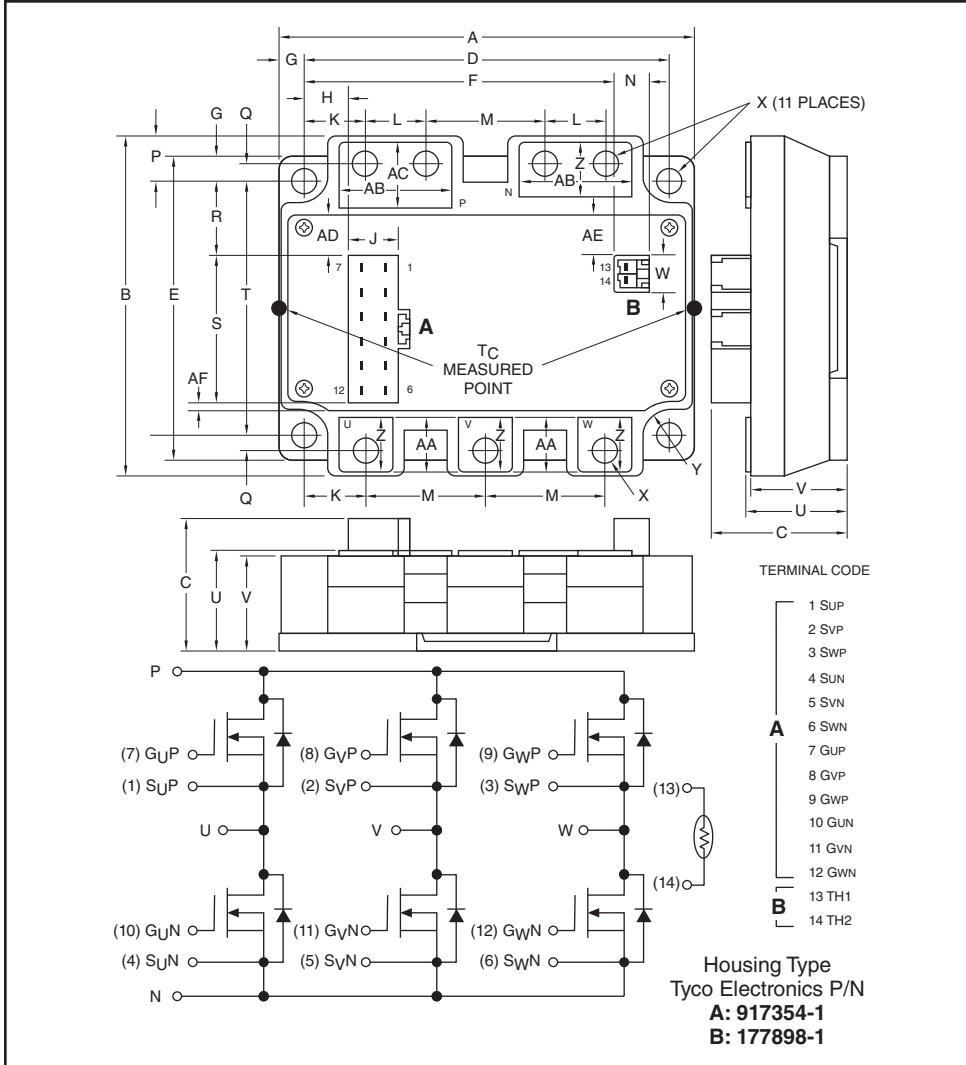


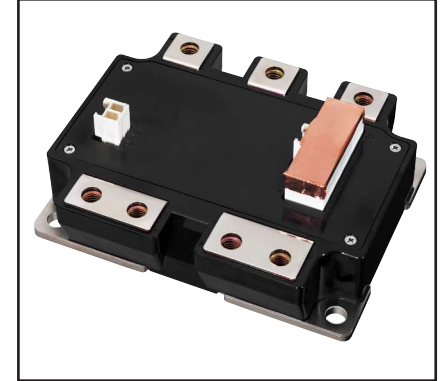
6-PACK High Power MOSFET Module 200 Amperes/150 Volts



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-3A is a 150V (V_{DSS}), 200 Ampere 6-Pack High Power MOSFET Module.

Type	Current Rating Amperes	V_{DSS} Volts
FM	200	150



Powerex, Inc., 173 Pavilion Lane, Youngwood, Pennsylvania 15697 (724) 925-7272 www.pwr.com

FM400TU-3A

6-Pack High Power MOSFET Module

200 Amperes/150 Volts

Absolute Maximum Ratings, $T_j = 25^\circ\text{C}$ unless otherwise specified

Ratings	Symbol	FM400TU-3A	Units
Channel Temperature	T_j	-40 to 150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-40 to 125	$^\circ\text{C}$
Drain-Source Voltage (G-S Short)	V_{DSS}	150	Volts
Gate-Source Voltage (D-E Short)	V_{GSS}	± 20	Volts
Drain Current ($T_C = 25^\circ\text{C}$)	$I_{D(rms)}$	200	A_{rms}
Peak Drain Current (Pulse)	I_{DM}	400*	Amperes
Avalanche Current ($L = 10\mu\text{H}$, Pulse)	I_{DA}	200*	Amperes
Source Current ($T_C = 25^\circ\text{C}$)**	$I_{S(rms)}$	200	A_{rms}
Peak Source Current (Pulse)**	I_{SM}	400*	Amperes
Maximum Power Dissipation ($T_C = 25^\circ\text{C}$, $T_j < 150^\circ\text{C}$)***	P_D	650	Watts
Maximum Peak Power Dissipation ($T_C = 25^\circ\text{C}$, $T_j < 150^\circ\text{C}$)***	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

* 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.

FM400TU-3A
6-Pack High Power MOSFET Module
 200 Amperes/150 Volts

Electrical Characteristics, $T_j = 25^\circ\text{C}$ 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}	$V_{GS} = V_{GSS}, V_{DS} = 0V$	—	—	1.5	μA
Static Drain-Source On-State Resistance (Chip)	$r_{DS(on)}$	$I_D = 200A, V_{GS} = 15V, T_j = 25^\circ\text{C}$	—	2.6	3.55	$m\Omega$
		$I_D = 200A, V_{GS} = 15V, T_j = 125^\circ\text{C}$	—	4.8	—	$m\Omega$
Static Drain-Source On-State Voltage (Chip)	$V_{DS(on)}$	$I_D = 200A, V_{GS} = 15V, T_j = 25^\circ\text{C}$	—	0.52	0.71	Volts
		$I_D = 200A, V_{GS} = 15V, T_j = 125^\circ\text{C}$	—	0.96	—	Volts
Lead Resistance	R_{lead}	$I_D = 200A, \text{Terminal-Chip}, T_j = 25^\circ\text{C}$	—	0.8	—	$m\Omega$
		$I_D = 200A, \text{Terminal-Chip}, T_j = 125^\circ\text{C}$	—	1.12	—	$m\Omega$
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	$V_{DD} = 48V, I_D = 200A, V_{GS} = 15V$	—	1300	—	nC
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 48V, I_D = 200A,$ $V_{GS1} = V_{GS2} = 15V, R_G = 6.3\Omega,$ Inductive Load Switching Operation, $I_S = 200A$	—	—	400	ns
Rise Time	t_r		—	—	300	ns
Turn-off Delay Time	$t_{d(off)}$		—	—	450	ns
Fall Time	t_f		—	—	200	ns
Diode Reverse Recovery Time**	t_{rr}		—	—	200	ns
Diode Reverse Recovery Charge**	Q_{rr}		—	7.0	—	μC
Source-Drain Voltage	V_{SD}	$I_S = 200A, V_{GS} = 0V$	—	—	1.3	Volts

**Represents characteristics of the anti-parallel, source-to-drain free-wheel diode (FWDi).



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FM400TU-3A

6-Pack High Power MOSFET Module

200 Amperes/150 Volts

Thermal and Mechanical Characteristics, $T_j = 25^\circ\text{C}$ 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) T_C Reference Point per Outline Drawing	—	—	0.19	$^\circ\text{C/W}$
Thermal Resistance, Channel to Case	$R_{th(j-c')}$	MOSFET part (1/6 Module) Measured Point is Just Under the Chips.	—	—	0.142	$^\circ\text{C/W}$
Contact Thermal Resistance	$R_{th(c-f)}$	Per 1/6 Module, Thermal Grease Applied	—	0.1	—	$^\circ\text{C/W}$

Thermistors Part

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Resistance*	R_{th}	$T_C = 25^\circ\text{C}$	—	100	—	k Ω
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 $T_1(K)$,

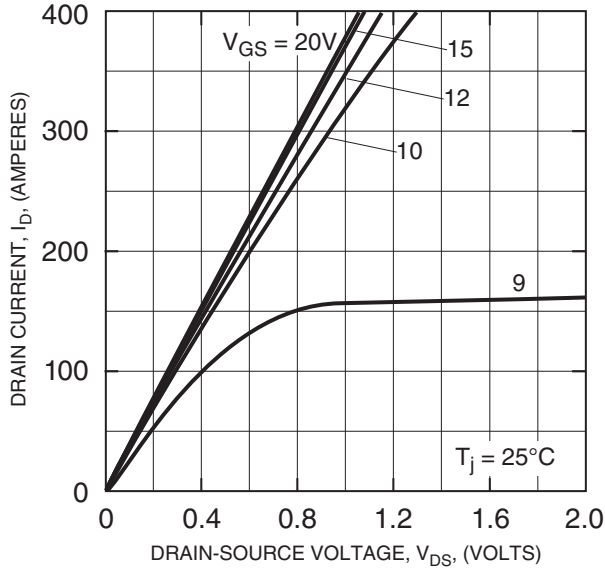
R_2 : Resistance at $T_2(K)$

FM400TU-3A

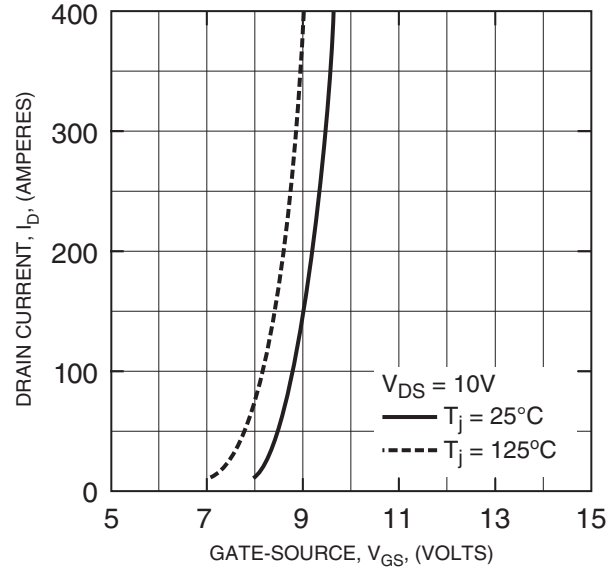
6-Pack High Power MOSFET Module

200 Amperes/150 Volts

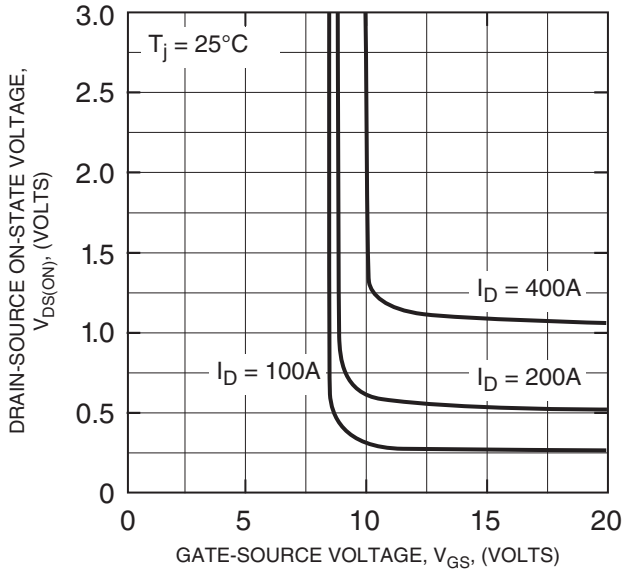
**OUTPUT CHARACTERISTICS
(TYPICAL)**



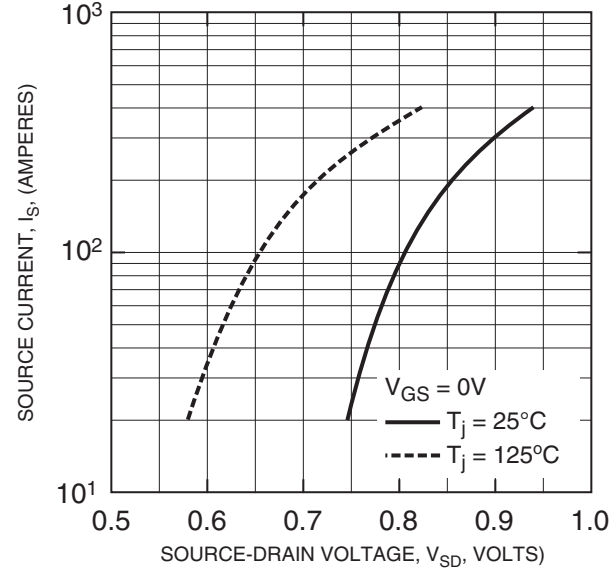
**TRANSFER CHARACTERISTICS
(TYPICAL)**



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

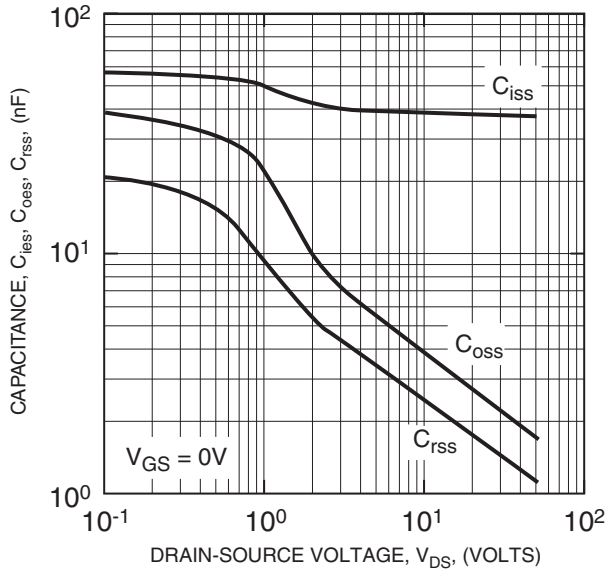


**FREE-WHEEL DIODE
FORWARD CHARACTERISTICS
(TYPICAL - INVERTER PART)**

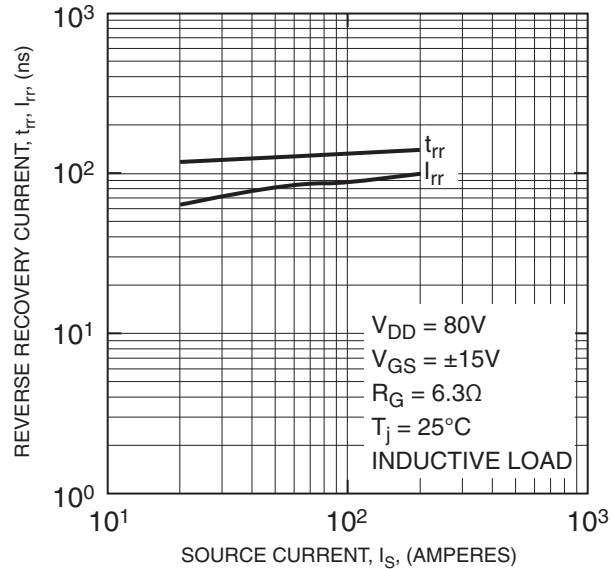


FM400TU-3A
6-Pack High Power MOSFET Module
 200 Amperes/150 Volts

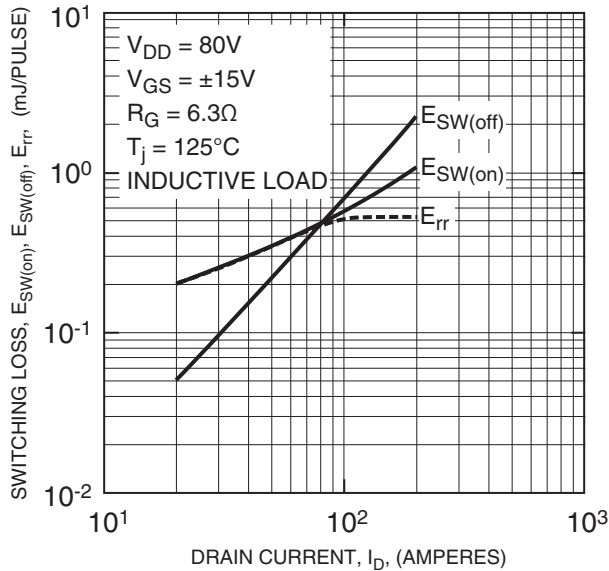
**CAPACITANCE VS.
DRAIN-SOURCE VOLTAGE
(TYPICAL)**



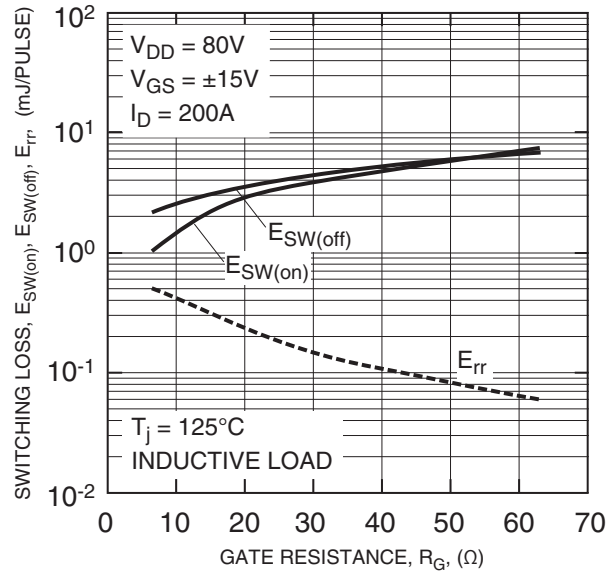
**REVERSE RECOVERY CHARACTERISTICS
(TYPICAL)**



**SWITCHING LOSS VS. DRAIN CURRENT
(TYPICAL)**



**SWITCHING LOSS VS. GATE RESISTANCE
(TYPICAL)**

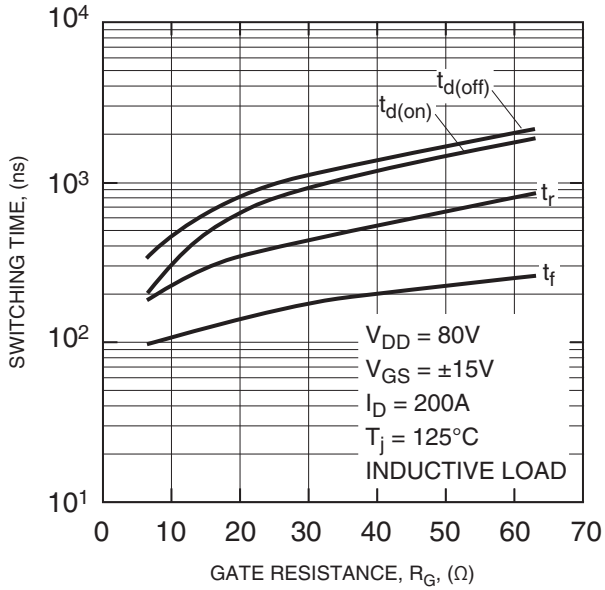


FM400TU-3A

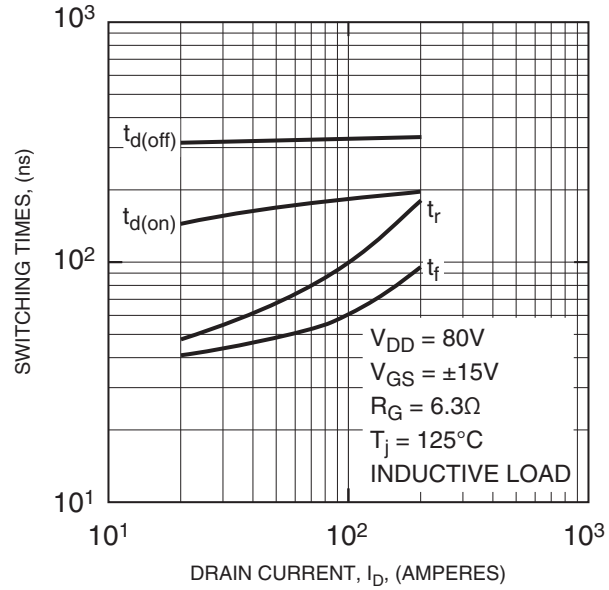
6-Pack High Power MOSFET Module

200 Amperes/150 Volts

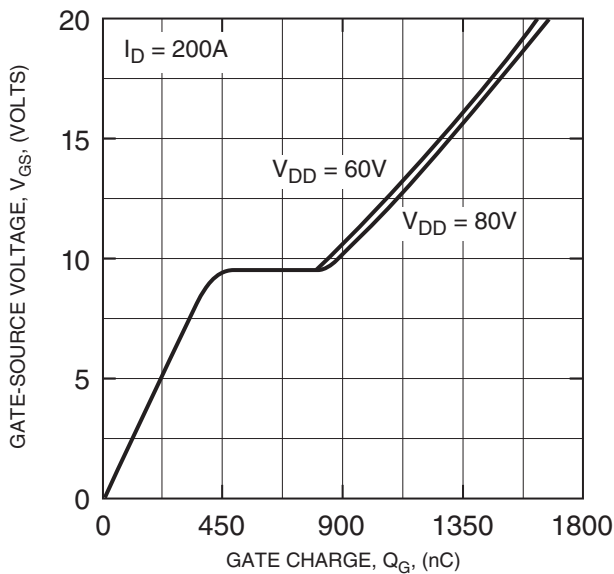
**SWITCHING TIME VS. GATE RESISTANCE
(TYPICAL)**



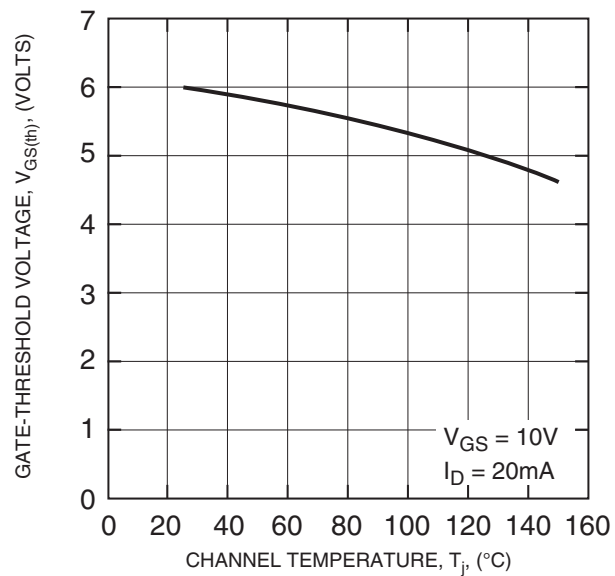
**SWITCHING TIME VS. DRAIN CURRENT
(TYPICAL)**



**GATE CHARGE CHARACTERISTICS
(TYPICAL)**



**GATE THRESHOLD VOLTAGE
VS. TEMPERATURE (TYPICAL)**



FM400TU-3A

6-Pack High Power MOSFET Module

200 Amperes/150 Volts

