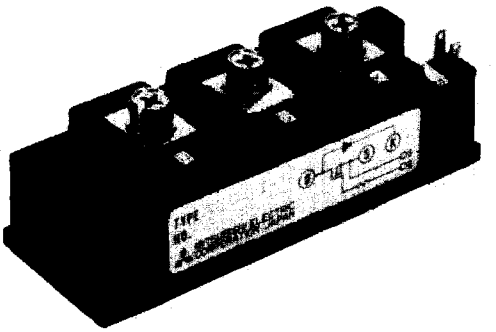
FM50E2Y/E3Y-9,-10

DC CHOPPER USE
INSULATED TYPE

FM50E2Y/E3Y – 9, – 10



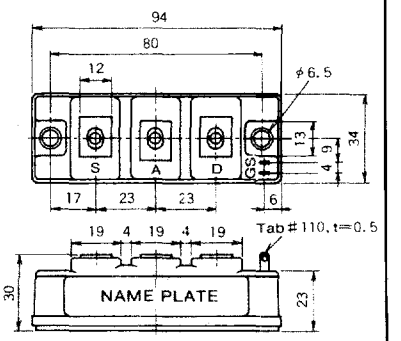
- I_D 50A
- V_{DSS} 450/500V
- 1-Element in a package
- Insulated Type
- UL Recognized Yellow Card No. ; E80276(N)
  File No. ; E80271

APPLICATION

AC & DC Motor Controls, General Purpose Inverters, UPS, CVCF, Welders, Servo Controls, NC, Robotics, Cutting Tools, Induction Heating, etc.

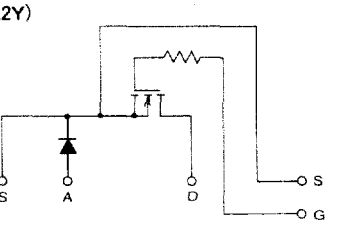
OUTLINE DRAWING

Dimensions in mm

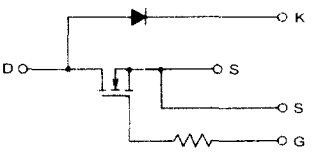


CIRCUIT DIAGRAM

(E2Y)



(E3Y)



ABSOLUTE MAXIMUM RATINGS (T_{ch}=25℃)

Symbol	Parameter	Conditions	Voltage class		Unit
			-9	-10	
V_{DSS}	Drain-sourse voltage	G-S short	450	500	V
V_{GSS}	Gate-sourse voltage	D-S short	±20		V
V_{RRM}	Repetitive peak reverse voltage	Clamp diode part	550		V

Symbol	Parameter	Conditions	Ratings	Unit
I_D	Drain current	T_C=25℃	50	A
I_S (Note 1)	Source current	T_C=25℃	5	A
I_F	Clamp diode forward current	T_C=25℃	50	A
P_D	Maximum power dissipation	T_C=25℃	420	W
T_{ch}	Channel temperature		−40~+150	℃
T_{stg}	Storage temperature		−40~+125	℃
V_{isol}	Isolation voltage	Main terminal to case, AC for 1 minute	2500	V
—	Mounting torque	Main terminal M5 screw	15~20	kg·cm
		Mounting M6 screw	20~30	kg·cm
—	Weight	Typical value	210	g

ELECTRICAL CHARACTERISTICS (T_{ch}=25℃)

Symbol	Parameter	Test conditions			Limits			Unit
					Min	Typ	Max	
I_{DSS}	Drain current, with gate short circuit to source	$V_{DS}=V_{DSS}$, $V_{GS}=0V$			—	—	1	mA
		$V_{DS}=0.8 \cdot V_{DSS}$, $V_{GS}=0V$, T_{ch}=125℃			—	—	10	
$V_{GS(th)}$	Gate-source threshold voltage	I_D=1mA, V_{DS}=10V			2	3	4	V
$\pm I_{GSS}$	Gate leakage current	$\pm V_{GS}=V_{GSS}$, $V_{DS}=0V$			—	—	0.5	μA
$r_{DS(ON)}$	Static drain-source on-state resistance	T_{ch}=25℃	I_D=50A		—	—	0.14	Ω
		T_{ch}=150℃	V_{GS}=15V	(Note 3)	—	—	0.34	
$V_{DS(ON)}$	Static drain-source on-state voltage	T_{ch}=25℃	I_D=50A		—	—	7.0	V
		T_{ch}=150℃	V_{GS}=15V	(Note 3)	—	—	17.0	
$\lvert y_{fs} \rvert$	Forward transfer admittance	I_D=25A, V_{DS}=10V		(Note 3)	10	—	—	S
C_{iss}	Input capacitance	V_{GS}=0V			—	—	14000	pF
C_{oss}	Output capacitance	V_{DS}=10V			—	—	3000	pF
C_{rss}	Reverse transfer capacitance	f=1MHz			—	—	1200	pF
Q_G	Total gate charge	V_{DD}=300V, I_D=50A, V_{GS}=15V			—	600	—	nC
t_{on}	Turn-on time	V_{DD}=300V, I_D=25A, V_{GS}=+15V			—	—	500	ns
t_{off}	Turn-off time	$R_{GEN}=R_{GS}$=50Ω			—	—	1300	ns
t_{on}	Turn-on time	V_{DD}=300V, I_D=50A, V_{GS}=±10V			—	350	—	ns
t_{off}	Turn-off time	$R_{G1}=R_{G2}$=4.7Ω			—	250	—	ns
V_{SD} (Note 1)	Source-drain voltage	I_S=5A, V_{GS}=0V			—	—	1.2	V
$R_{th(ch-c)}$	Thermal resistance	MOSFET part			—	—	0.3	℃/W
$R_{th(c-f)}$	Contact thermal resistance	Conductive grease applied			—	—	0.15	℃/W

CLAMP DIODE PART (T_j=25℃)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
t_{rr}	Reverse recovery time	I_F=50A, di/dt=−100A/μs	—	—	150	ns
Q_{rr}	Reverse recovery charge		—	650	—	μC
V_F	Forward voltage drop	I_F=50A	—	—	2.5	V
I_{RRM}	Repetitive reverse current	$V_R=V_{RRM}$, T_j=150℃	—	—	10	mA
$R_{th(j-c)}$	Thermal resistance	Diode part	—	—	0.7	℃/W

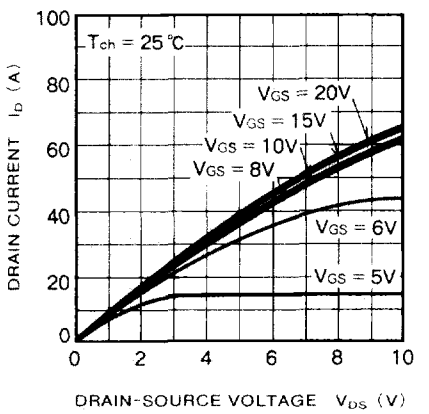
Note 1. I_S, V_{SD} represent characteristics of the anti-parallel, source to drain diode of the MOSFET which is not expressed in the circuit diagram. The diode is not a high speed one.

2. Pulse width and repetition rate should be such that the device channel temp. (T_{ch}) does not exceed T_{chmax} rating.

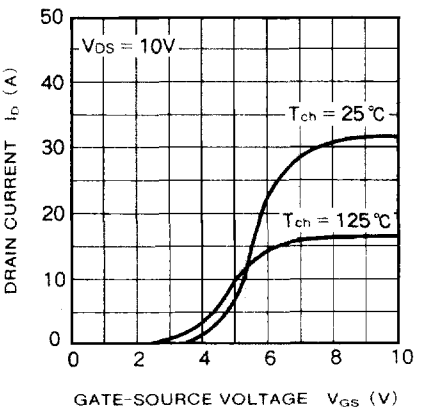
3. Pulse width and repetition rate should be such as to cause negligible temperature rise.

PERFORMANCE CURVES

OUTPUT CHARACTERISTICS (TYPICAL)

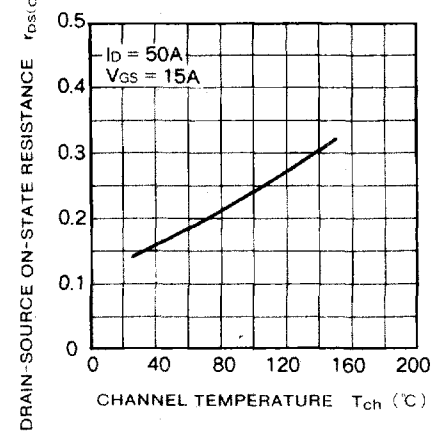


TRANSFER CHARACTERISTICS (TYPICAL)

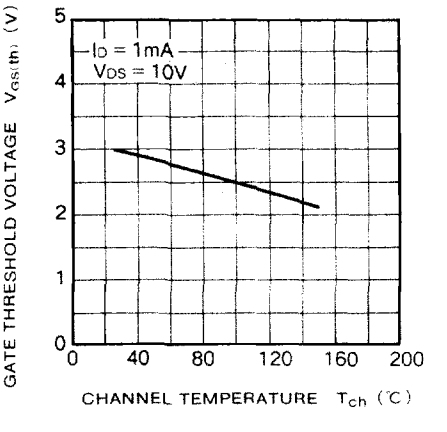


MITSUBISHI ELECTRIC

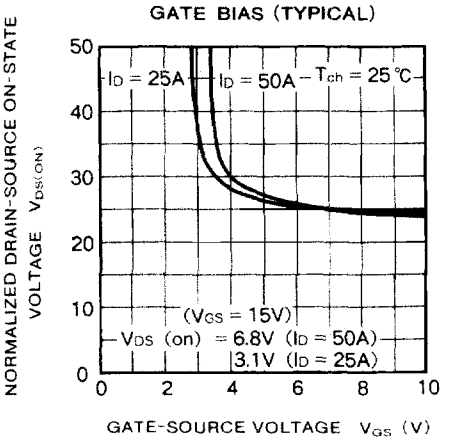
ON-STATE RESISTANCE vs. TEMPERATURE (TYPICAL)



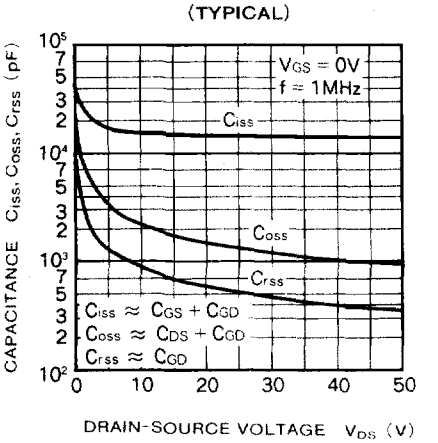
GATE THRESHOLD VOLTAGE vs. TEMPERATURE (TYPICAL)



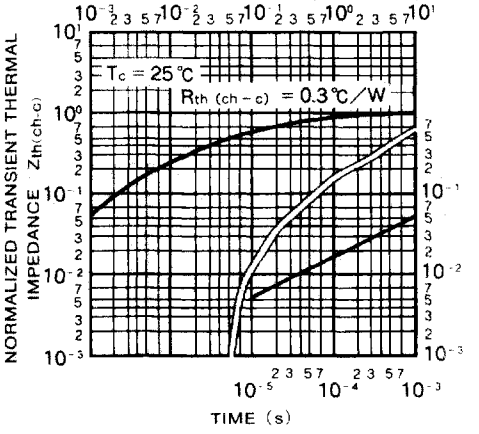
NORMALIZED ON-STATE VOLTAGE vs. GATE BIAS (TYPICAL)



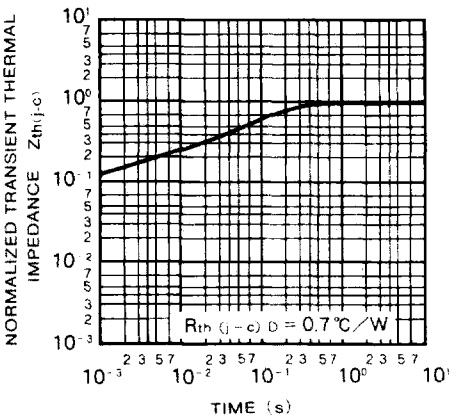
CAPACITANCE vs. DRAIN-SOURCE VOLTAGE (TYPICAL)



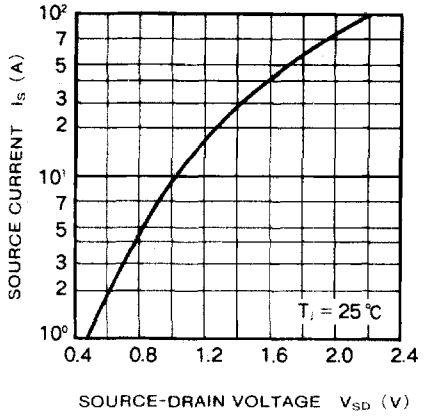
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (MOS FET)



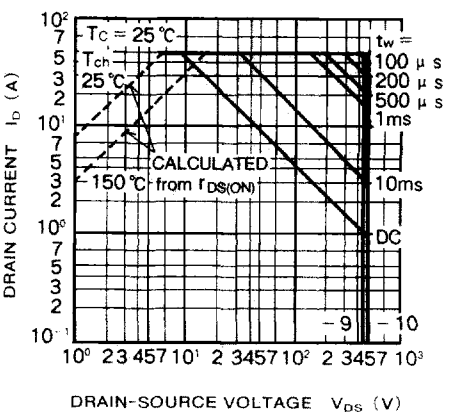
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS (DIODE)



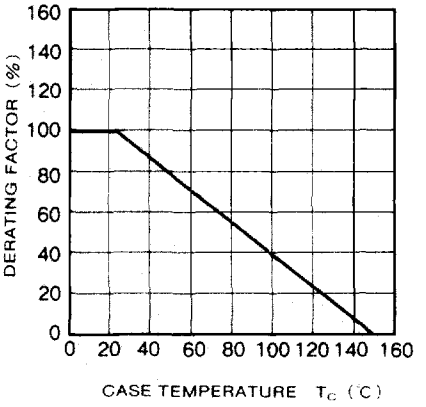
FREE-WHEEL DIODE FORWARD CHARACTERISTICS (TYPICAL)



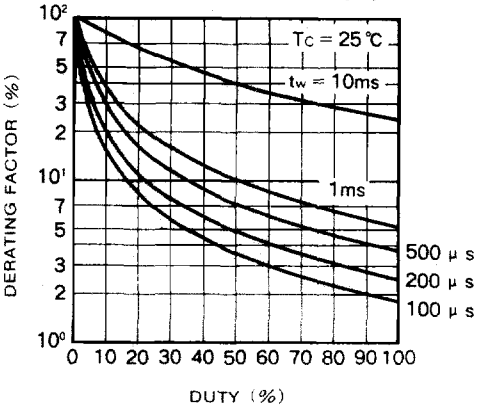
FORWARD BIAS SAFE OPERATING AREA



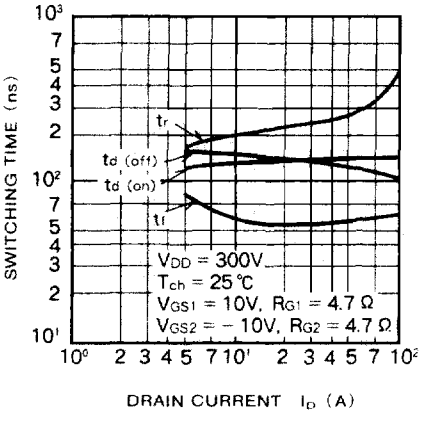
DERATING FACTOR OF S.O.A



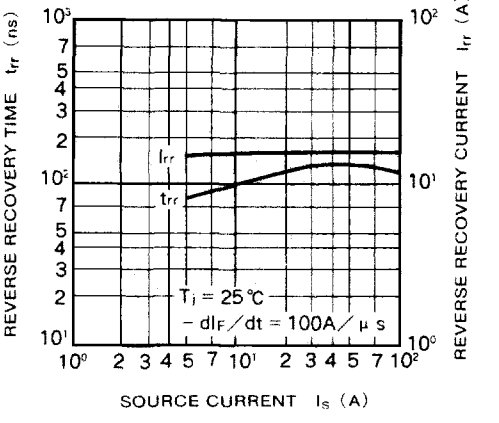
DERATING FACTOR OF S.O.A



SWITCHING CHARACTERISTICS (TYPICAL)

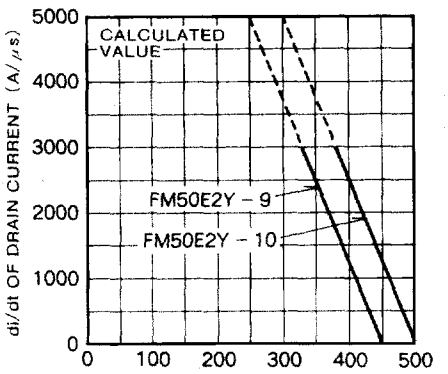


REVERSE RECOVERY CHARACTERISTICS (TYPICAL)



MITSUBISHI ELECTRIC

TURN-OFF di/dt DERATING CURVE



PEAK DAIN-SOURCE TERMINAL VOLTAGE V_{DS} (V)