To all our customers

Regarding the change of names mentioned in the document, such as Mitsubishi Electric and Mitsubishi XX, to Renesas Technology Corp.

The semiconductor operations of Hitachi and Mitsubishi Electric were transferred to Renesas Technology Corporation on April 1st 2003. These operations include microcomputer, logic, analog and discrete devices, and memory chips other than DRAMs (flash memory, SRAMs etc.) Accordingly, although Mitsubishi Electric, Mitsubishi Electric Corporation, Mitsubishi Semiconductors, and other Mitsubishi brand names are mentioned in the document, these names have in fact all been changed to Renesas Technology Corp. Thank you for your understanding. Except for our corporate trademark, logo and corporate statement, no changes whatsoever have been made to the contents of the document, and these changes do not constitute any alteration to the contents of the document itself.

Note : Mitsubishi Electric will continue the business operations of high frequency & optical devices and power devices.

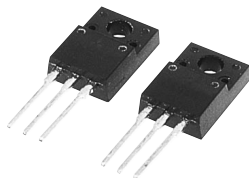Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

RENESAS
Renesas Technology Corp.

MITSUBISHI Pch POWER MOSFET

FX20KMJ-2

HIGH-SPEED SWITCHING USE

FX20KMJ-2

- 4V DRIVE
- V_{DSS} .... −100V
- r_{DS} (ON) (MAX) 0.26Ω
- I_D .... −20A
- Integrated Fast Recovery Diode (TYP.) 100ns
- V_{iso} 2000V

OUTLINE DRAWING   Dimensions in mm

① GATE
② DRAIN
③ SOURCE
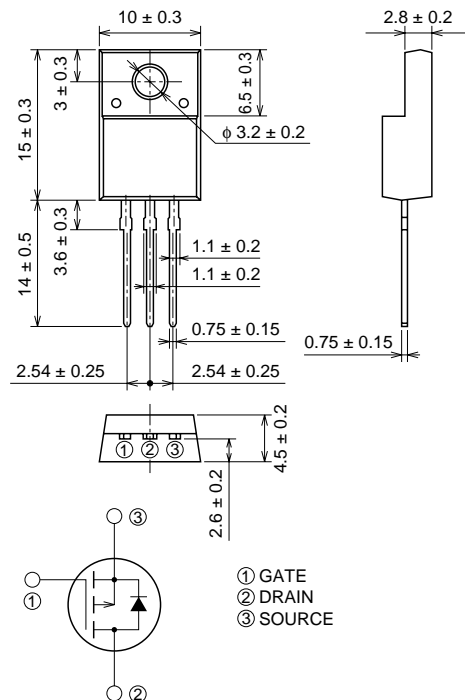
TO-220FN

APPLICATION

Motor control, Lamp control, Solenoid control
DC-DC converter, etc.

MAXIMUM RATINGS (Tc = 25°C)

| Symbol	Parameter	Conditions	Ratings	Unit
V_{DSS}	Drain-source voltage	V_{GS} = 0V	−100	V
V_{GSS}	Gate-source voltage	V_{DS} = 0V	±20	V
I_D	Drain current		−20	A
I_{DM}	Drain current (Pulsed)		−80	A
I_{DA}	Avalanche drain current (Pulsed)	L = 50μH	−20	A
I_S	Source current		−20	A
I_{SM}	Source current (Pulsed)		−80	A
P_D	Maximum power dissipation		25	W
T_{ch}	Channel temperature		−55 ~ +150	°C
T_{stg}	Storage temperature		−55 ~ +150	°C
V_{iso}	Isolation voltage	AC for 1minute, Terminal to case	2000	V
—	Weight	Typical value	2.0	g

ELECTRICAL CHARACTERISTICS (Tch = 25°C)

| Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V (BR) DSS	Drain-source breakdown voltage	$I_D = -1mA$, $V_{GS} = 0V$	−100	—	—	V
IGSS	Gate-source leakage current	$V_{GS} = \pm20V$, $V_{DS} = 0V$	—	—	±0.1	μA
IDSS	Drain-source leakage current	$V_{DS} = -100V$, $V_{GS} = 0V$	—	—	−0.1	mA
VGS (th)	Gate-source threshold voltage	$I_D = -1mA$, $V_{DS} = -10V$	−1.0	−1.5	−2.0	V
rDS (ON)	Drain-source on-state resistance	$I_D = -10A$, $V_{GS} = -10V$	—	0.20	0.26	Ω
rDS (ON)	Drain-source on-state resistance	$I_D = -10A$, $V_{GS} = -4V$	—	0.25	0.32	Ω
VDS (ON)	Drain-source on-state voltage	$I_D = -10A$, $V_{GS} = -10V$	—	−2.0	−2.6	V
|yfs|	Forward transfer admittance	$I_D = -10A$, $V_{DS} = -10V$	—	10.3	—	S
Ciss	Input capacitance		—	2360	—	pF
Coss	Output capacitance	$V_{DS} = -10V$, $V_{GS} = 0V$, f = 1MHz	—	198	—	pF
Crss	Reverse transfer capacitance		—	99	—	pF
td (on)	Turn-on delay time		—	13	—	ns
tr	Rise time	$V_{DD} = -50V$, $I_D = -10A$, $V_{GS} = -10V$, $R_{GEN} = R_{GS} = 50\Omega$	—	30	—	ns
td (off)	Turn-off delay time		—	139	—	ns
tf	Fall time		—	74	—	ns
VSD	Source-drain voltage	$I_S = -10A$, $V_{GS} = 0V$	—	−1.0	−1.5	V
Rth (ch-c)	Thermal resistance	Channel to case	—	—	5.00	°C/W
trr	Reverse recovery time	$I_S = -20A$, dis/dt = 100A/μs	—	100	—	ns

PERFORMANCE CURVES

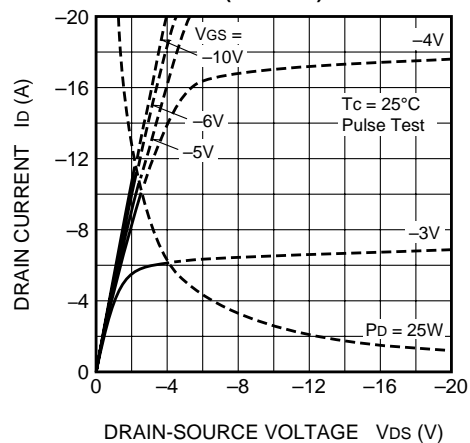### POWER DISSIPATION DERATING CURVE
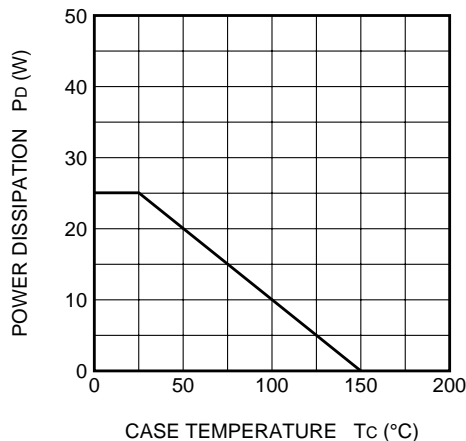
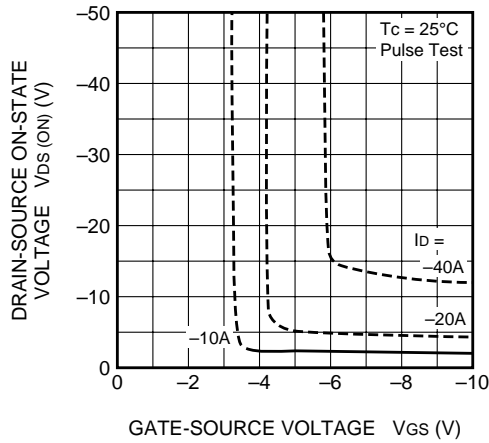### MAXIMUM SAFE OPERATING AREA
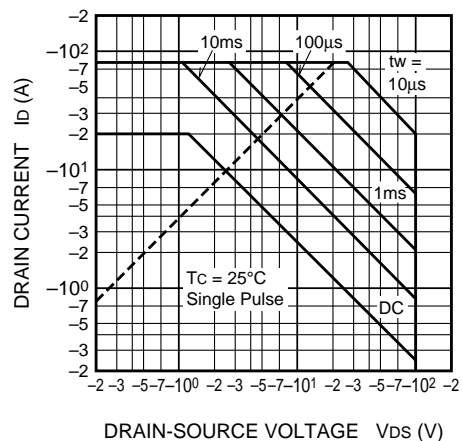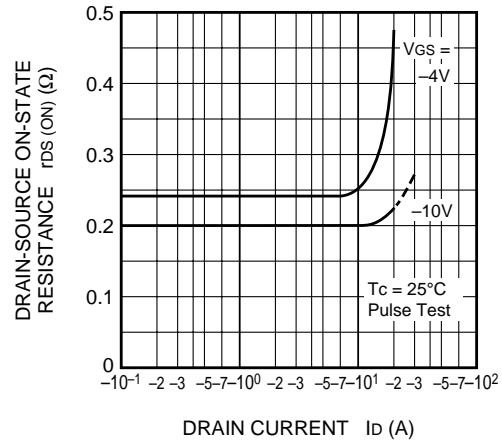

OUTPUT CHARACTERISTICS (TYPICAL)
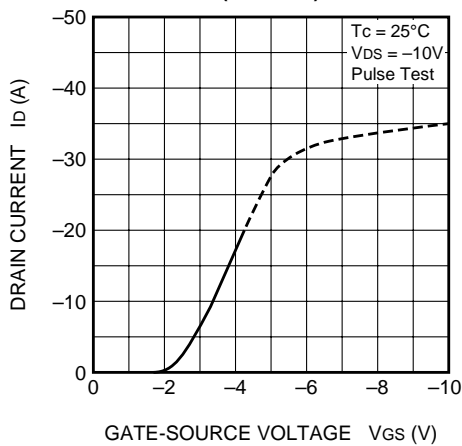

OUTPUT CHARACTERISTICS (TYPICAL)

Jan.1999
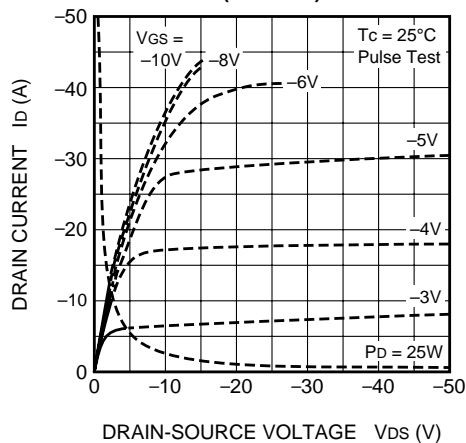
ON-STATE VOLTAGE VS. GATE-SOURCE VOLTAGE (TYPICAL)

Tc = 25°C
Pulse Test

I_D =
−40A
−20A
−10A

DRAIN-SOURCE ON-STATE VOLTAGE $V_{DS (ON)}$ (V)

GATE-SOURCE VOLTAGE V_{GS} (V)

ON-STATE RESISTANCE VS. DRAIN CURRENT (TYPICAL)

V_{GS} = −4V
−10V

Tc = 25°C
Pulse Test

DRAIN-SOURCE ON-STATE RESISTANCE $r_{DS (ON)}$ (Ω)

DRAIN CURRENT I_D (A)

TRANSFER CHARACTERISTICS (TYPICAL)

Tc = 25°C
V_{DS} = −10V
Pulse Test

DRAIN CURRENT I_D (A)

GATE-SOURCE VOLTAGE V_{GS} (V)

FORWARD TRANSFER ADMITTANCE VS. DRAIN CURRENT (TYPICAL)

T_C = 25°C   75°C   125°C

V_{DS} = −10V
Pulse Test

FORWARD TRANSFER ADMITTANCE │y_{fs}│ (S)

DRAIN CURRENT I_D (A)
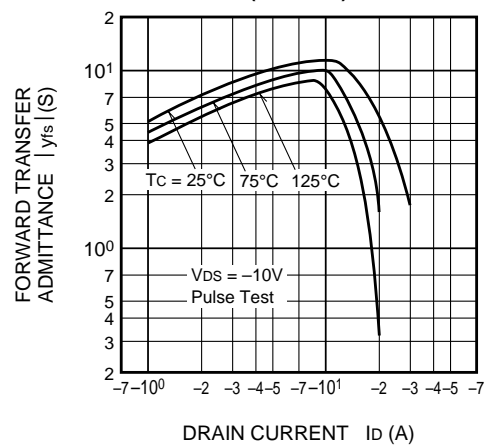
CAPACITANCE VS. DRAIN-SOURCE VOLTAGE (TYPICAL)

Ciss
Coss
Crss

Tch = 25°C
f = 1MHz
V_{GS} = 0V

CAPACITANCE Ciss, Coss, Crss (pF)

DRAIN-SOURCE VOLTAGE V_{DS} (V)
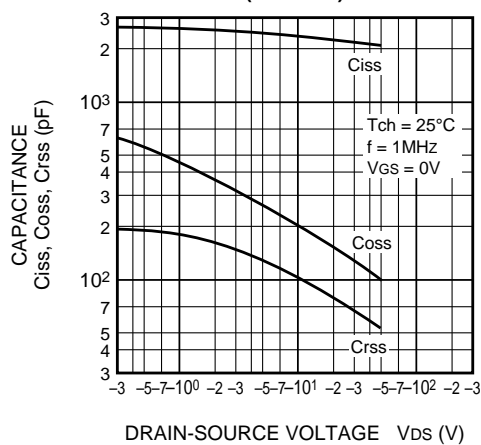
SWITCHING CHARACTERISTICS (TYPICAL)

td(off)
tf
tr
td(on)

Tch = 25°C
V_{GS} = −10V
V_{DD} = −50V
R_{GEN} = R_{GS} = 50Ω

SWITCHING TIME (ns)

DRAIN CURRENT I_D (A)

PRELIMINARY
Notice: This is not a final specification.
Some parametric limits are subject to change.

MITSUBISHI Pch POWER MOSFET

FX20KMJ-2

HIGH-SPEED SWITCHING USE
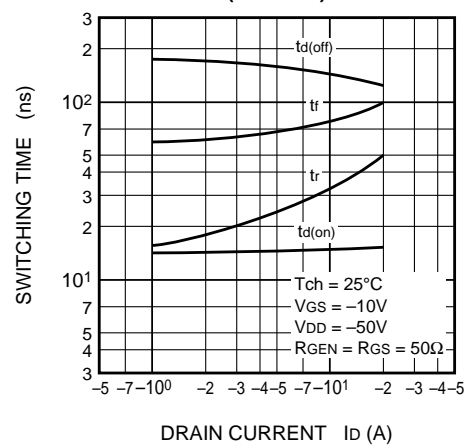
GATE-SOURCE VOLTAGE VS. GATE CHARGE (TYPICAL)

Tch = 25°C
ID = −20A

VDS = −20V, −50V, −80V

X-axis: GATE CHARGE Qg (nC)
Y-axis: GATE-SOURCE VOLTAGE VGS (V)
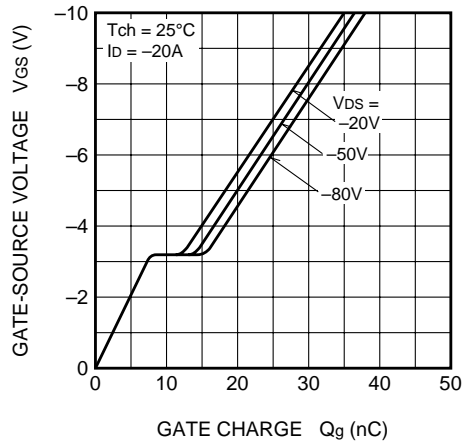
SOURCE-DRAIN DIODE FORWARD CHARACTERISTICS (TYPICAL)

VGS = 0V
Pulse Test

TC = 25°C, 75°C, 125°C

X-axis: SOURCE-DRAIN VOLTAGE VSD (V)
Y-axis: SOURCE CURRENT IS (A)
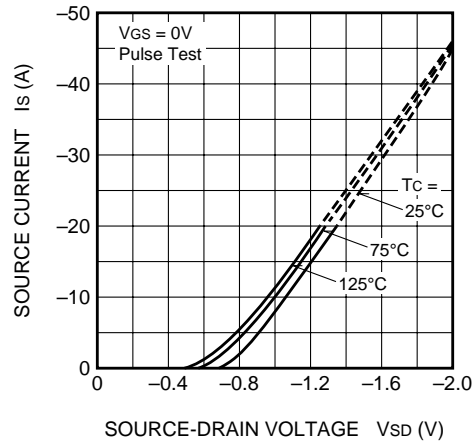
ON-STATE RESISTANCE VS. CHANNEL TEMPERATURE (TYPICAL)

VGS = −10V
ID = 1/2ID
Pulse Test

X-axis: CHANNEL TEMPERATURE Tch (°C)
Y-axis: DRAIN-SOURCE ON-STATE RESISTANCE $r_{DS\,(ON)}\,(t°C)$ / DRAIN-SOURCE ON-STATE RESISTANCE $r_{DS\,(ON)}\,(25°C)$
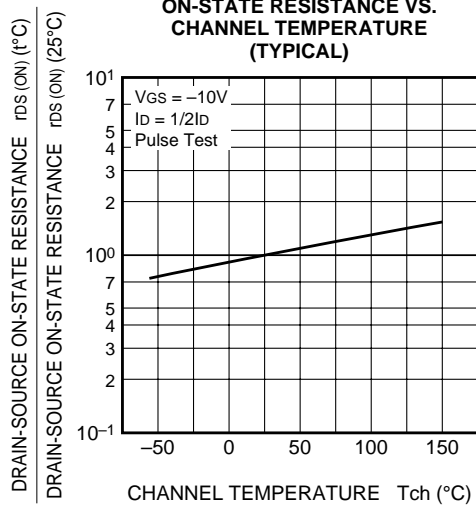
THRESHOLD VOLTAGE VS. CHANNEL TEMPERATURE (TYPICAL)

VDS = −10V
ID = −1mA

X-axis: CHANNEL TEMPERATURE Tch (°C)
Y-axis: GATE-SOURCE THRESHOLD VOLTAGE $V_{GS\,(th)}$ (V)
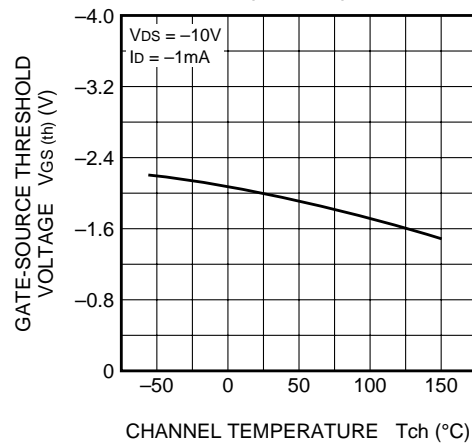
BREAKDOWN VOLTAGE VS. CHANNEL TEMPERATURE (TYPICAL)

VGS = 0V
ID = −1mA

X-axis: CHANNEL TEMPERATURE Tch (°C)
Y-axis: DRAIN-SOURCE BREAKDOWN VOLTAGE $V_{(BR)\,DSS}\,(t°C)$ / DRAIN-SOURCE BREAKDOWN VOLTAGE $V_{(BR)\,DSS}\,(25°C)$
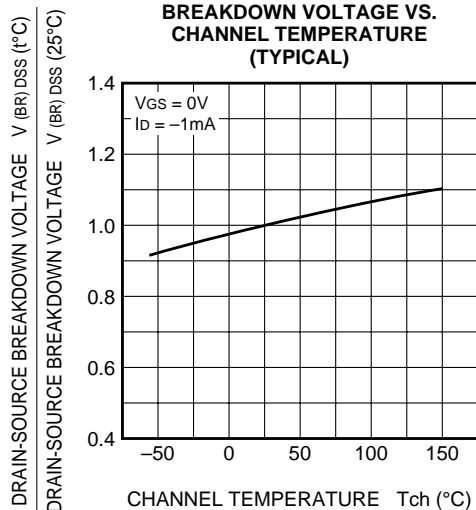
TRANSIENT THERMAL IMPEDANCE CHARACTERISTICS

D = 1.0, 0.5, 0.2, 0.1, 0.05, 0.02, 0.01
Single Pulse

$D = \dfrac{tw}{T}$

X-axis: PULSE WIDTH tw (s)
Y-axis: TRANSIENT THERMAL IMPEDANCE $Z_{th\,(ch-c)}$ (°C/W)