Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: http://www.renesas.com

April 1st, 2010 Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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DATA SHEET

MOS FIELD EFFECT TRANSISTOR

NP88N075EUE, NP88N075KUE

NP88N075CUE, NP88N075DUE, NP88N075MUE, NP88N075NUE

SWITCHING N-CHANNEL POWER MOS FET

DESCRIPTION

These products are N-channel MOS Field Effect Transistors designed for high current switching applications.

ORDERING INFORMATION <R>

PART NUMBER	LEAD PLATING	PACKING	PACKAGE	
NP88N075EUE-E1-AY Note1, 2			TO-263 (MP-25ZJ) typ. 1.4 g	
NP88N075EUE-E2-AY Note1, 2	Dura Ca (Tia)	Tana 200 n/raal		
NP88N075KUE-E1-AY Note1	Pure Sn (Tin)	Tape 800 p/reel	TO-263 (MP-25ZK) typ. 1.5 g	
NP88N075KUE-E2-AY Note1				
NP88N075CUE-S12-AZ Note1, 2	Sn-Ag-Cu		TO-220 (MP-25) typ. 1.9 g	
NP88N075DUE-S12-AY Note1, 2		T. b = 50 = 15 b =	TO-262 (MP-25 Fin Cut) typ. 1.8 g	
NP88N075MUE-S18-AY Note1	Pure Sn (Tin)	Tube 50 p/tube	TO-220 (MP-25K) typ. 1.9 g	
NP88N075NUE-S18-AY Note1			TO-262 (MP-25SK) typ. 1.8 g	

Notes 1. Pb-free (This product does not contain Pb in the external electrode.)

2. Not for new design

FEATURES

- Channel temperature 175 degree rated
- Super low on-state resistance

 $R_{DS(on)} = 8.5 \text{ m}\Omega$ MAX. (Vgs = 10 V, ID = 44 A)

• Low input capacitance

Ciss = 8200 pF TYP.

(TO-220)



(TO-262)





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ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

Drain to Source Voltage (Vgs = 0 V)	VDSS	75	V
Gate to Source Voltage (V _{DS} = 0 V)	Vgss	±20	V
Drain Current (DC) (Tc = 25°C) Note1	ID(DC)	±88	Α
Drain Current (Pulse) Note2	ID(pulse)	±352	Α
Total Power Dissipation (Tc = 25°C)	P _{T1}	288	W
Total Power Dissipation (T _A = 25°C)	P _{T2}	1.8	W
Channel Temperature	Tch	175	°C
Storage Temperature	T _{stg}	-55 to +175	°C
Single Avalanche Current Note3	las	69/88	Α
Single Avalanche Energy Note3	Eas	450/14	mJ

Notes 1. Calculated constant current according to MAX. allowable channel temperature.

- **2.** PW \leq 10 μ s, Duty cycle \leq 1%
- 3. Starting Tch = 25°C, VdD = 35 V, Rg = 25 Ω , Vgs = 20 \rightarrow 0 V (See Figure 4.)

THERMAL RESISTANCE

Channel to Case Thermal Resistance	Rth(ch-C)	0.52	°C/W
Channel to Ambient Thermal Resistance	Rth(ch-A)	83.3	°C/W

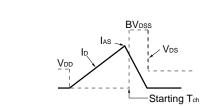


ELECTRICAL CHARACTERISTICS (TA = 25°C)

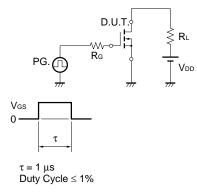
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	Ipss	V _{DS} = 75 V, V _{GS} = 0 V			10	μΑ
Gate Leakage Current	Igss	V _{GS} = ±20 V, V _{DS} = 0 V			±100	nA
Gate to Source Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = 250 μA	2.0	3.0	4.0	٧
Forward Transfer Admittance	yfs	V _{DS} = 10 V, I _D = 44 A	30	60		S
Drain to Source On-state Resistance	R _{DS(on)}	V _{GS} = 10 V, I _D = 44 A		6.2	8.5	mΩ
Input Capacitance	Ciss	V _{DS} = 25 V,		8200	12300	pF
Output Capacitance	Coss	V _{GS} = 0 V,		800	1200	pF
Reverse Transfer Capacitance	Crss	f = 1 MHz		440	800	pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = 38 V, I _D = 44 A,		35	77	ns
Rise Time	tr	V _{GS} = 10 V,		28	70	ns
Turn-off Delay Time	t _{d(off)}	$R_G = 0 \Omega$		105	210	ns
Fall Time	tf			16	40	ns
Total Gate Charge	Q _G	V _{DD} = 60 V,		150	230	nC
Gate to Source Charge	QGS	V _{GS} = 10 V,		30		nC
Gate to Drain Charge	Q _{GD}	ID = 88 A		52		nC
Body Diode Forward Voltage	V _{F(S-D)}	I _F = 88 A, V _{GS} = 0 V		1.0		٧
Reverse Recovery Time	trr	I _F = 88 A, V _{GS} = 0 V,		80		ns
Reverse Recovery Charge	Qrr	di/dt = 100 A/μs		240		nC

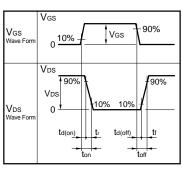
TEST CIRCUIT 1 AVALANCHE CAPABILITY

$\begin{array}{c|c} & D.U.T. \\ \hline R_G = 25 \ \Omega \\ \hline PG. \\ \hline \geqslant 50 \ \Omega \\ \end{array}$



TEST CIRCUIT 2 SWITCHING TIME





TEST CIRCUIT 3 GATE CHARGE

TYPICAL CHARACTERISTICS (TA = 25°C)

Figure 1. DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA

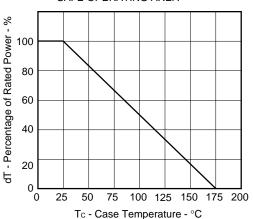


Figure 3. FORWARD BIAS SAFE OPERATING AREA

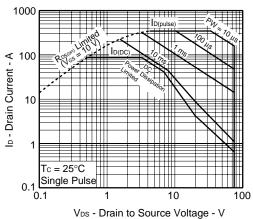


Figure2. TOTAL POWER DISSIPATION vs. CASE TEMPERATURE

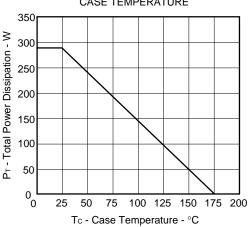
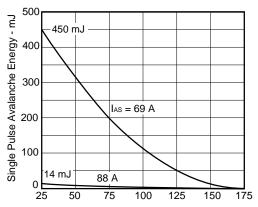


Figure4. SINGLE AVALANCHE ENERGY DERATING FACTOR



Starting T_{ch} - Starting Channel Temperature - $^{\circ}C$

Figure 5. TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH

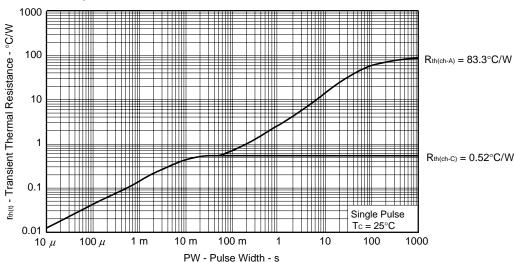


Figure 6. FORWARD TRANSFER CHARACTERISTICS

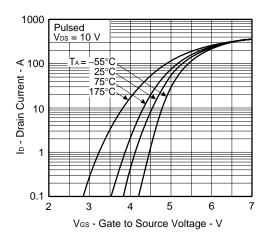
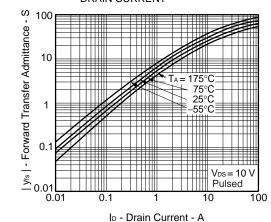
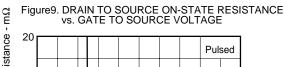


Figure 7. DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE 500 400 Ip - Drain Current - A 300 Vgs = 10 V 200 100 0 Pulsed

2 V_{DS} - Drain to Source Voltage - V

Figure8. FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT





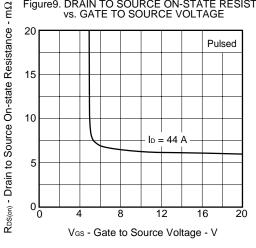


Figure 10. DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT

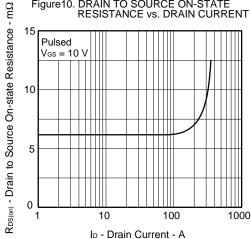
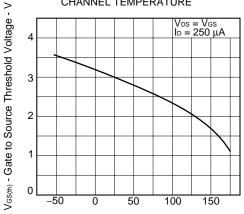
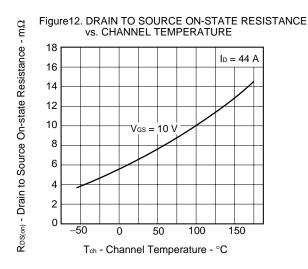
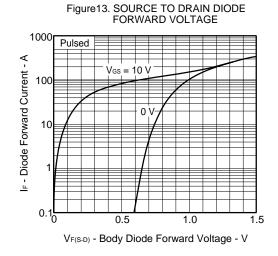


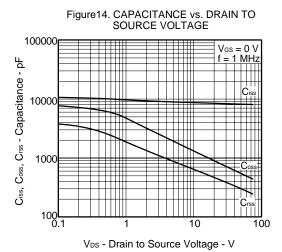
Figure11. GATE TO SOURCE THRESHOLD VOLTAGE vs. CHANNEL TEMPERATURE

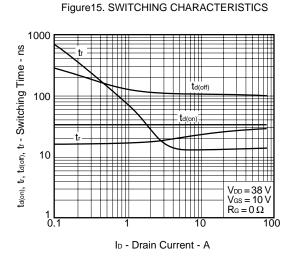


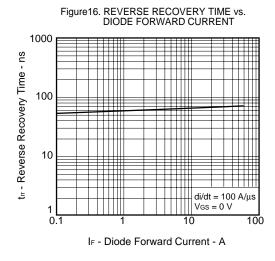
Tch - Channel Temperature - °C











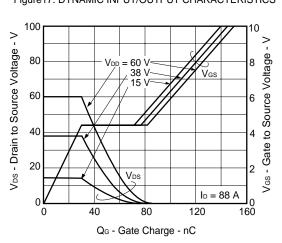
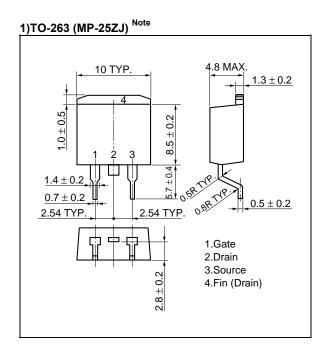
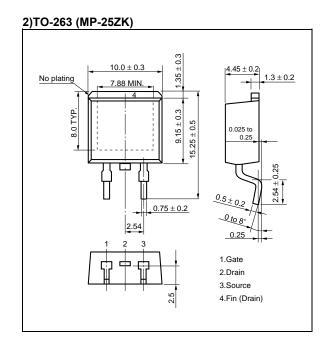
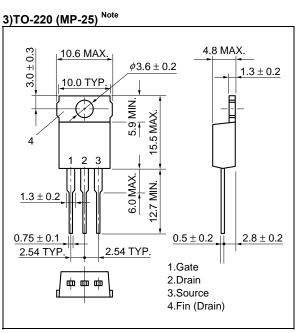


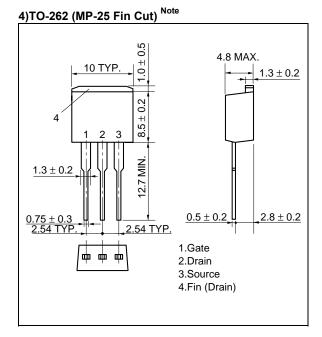
Figure 17. DYNAMIC INPUT/OUTPUT CHARACTERISTICS

<R> PACKAGE DRAWINGS (Unit: mm)



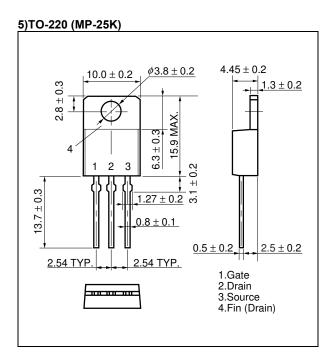


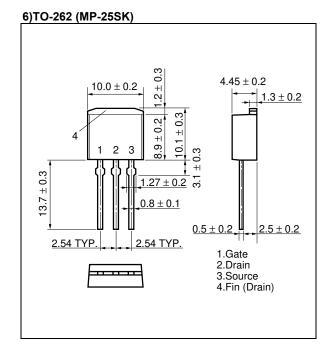




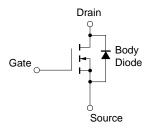
Note Not for new design







EQUIVALENT CIRCUIT

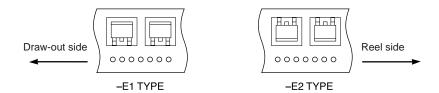


Remark Strong electric field, when exposed to this device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it once, when it has occurred.

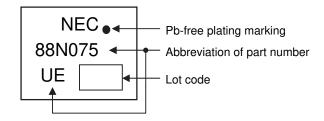
8

<R> TAPE INFORMATION

There are two types (-E1, -E2) of taping depending on the direction of the device.



<R> MARKING INFORMATION



<R> RECOMMENDED SOLDERING CONDITIONS

These products should be soldered and mounted under the following recommended conditions.

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For technical information, see the following website.

Semiconductor Device Mount Manual (http://www.necel.com/pkg/en/mount/index.html)

Soldering Method	Soldering Conditions	Recommended Condition Symbol
Infrared reflow	Maximum temperature (Package's surface temperature): 260°C or below	
MP-25ZJ, MP-25ZK	Time at maximum temperature: 10 seconds or less	
	Time of temperature higher than 220°C: 60 seconds or less	ID60 00 3
	Preheating time at 160 to 180°C: 60 to 120 seconds	IR60-00-3
	Maximum number of reflow processes: 3 times	
	Maximum chlorine content of rosin flux (percentage mass): 0.2% or less	
Wave soldering	Maximum temperature (Solder temperature): 260°C or below	
MP-25, MP-25K, MP-25SK,	Time: 10 seconds or less	THDWS
MP-25 Fin Cut	Maximum chlorine content of rosin flux: 0.2% (wt.) or less	
Partial heating	Maximum temperature (Pin temperature): 350°C or below	
MP-25ZJ, MP-25ZK,	Time (per side of the device): 3 seconds or less	P350
MP-25K, MP-25SK	Maximum chlorine content of rosin flux: 0.2% (wt.) or less	
Partial heating	Maximum temperature (Pin temperature): 300°C or below	
MP-25, MP-25 Fin Cut	Time (per side of the device): 3 seconds or less	P300
	Maximum chlorine content of rosin flux: 0.2% (wt.) or less	

Caution Do not use different soldering methods together (except for partial heating).

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