

To our customers,

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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Not recommended
for new design

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MOS FIELD EFFECT TRANSISTOR NP82N04MLG, NP82N04NLG

SWITCHING N-CHANNEL POWER MOS FET

DESCRIPTION

The NP82N04MLG and NP82N04NLG are N-channel MOS Field Effect Transistors designed for high current switching applications.

ORDERING INFORMATION

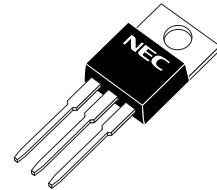
| PART NUMBER | LEAD PLATING | PACKING | PACKAGE |
|-----------------------------------|---------------|-----------|-----------------------------|
| NP82N04MLG-S18-AY ^{Note} | Pure Sn (Tin) | Tube | TO-220 (MP-25K) typ. 1.9 g |
| NP82N04NLG-S18-AY ^{Note} | | 50 p/tube | TO-262 (MP-25SK) typ. 1.8 g |

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

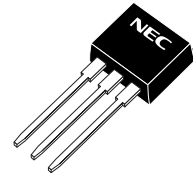
FEATURES

- Logic level
- Built-in gate protection diode
- Super low on-state resistance
 $R_{DS(on)1} = 4.2 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 41 \text{ A)}$
 $R_{DS(on)2} = 8.5 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.5 \text{ V, } I_D = 41 \text{ A)}$
- High current rating
 $I_{D(DC)} = \pm 82 \text{ A}$
- Low input capacitance
 $C_{iss} = 6000 \text{ pF TYP.}$
- Designed for automotive application and AEC-Q101 qualified

(TO-220)



(TO-262)



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

| | | | |
|---|-----------------------|-------------|----|
| Drain to Source Voltage (V _{GS} = 0 V) | V _{DSS} | 40 | V |
| Gate to Source Voltage (V _{DS} = 0 V) | V _{GSS} | ±20 | V |
| Drain Current (DC) (T _C = 25°C) | I _{D(DC)} | ±82 | A |
| Drain Current (pulse) ^{Note1} | I _{D(pulse)} | ±328 | A |
| Total Power Dissipation (T _C = 25°C) | P _{T1} | 143 | W |
| Total Power Dissipation (T _A = 25°C) | P _{T2} | 1.8 | W |
| Channel Temperature | T _{ch} | 175 | °C |
| Storage Temperature | T _{stg} | -55 to +175 | °C |
| Repetitive Avalanche Current ^{Note2} | I _{AR} | 43 | A |
| Repetitive Avalanche Energy ^{Note2} | E _{AR} | 185 | mJ |

Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1%

2. T_{ch} ≤ 150°C, R_G = 25 Ω

THERMAL RESISTANCE

| | | | |
|---------------------------------------|-----------------------|------|------|
| Channel to Case Thermal Resistance | R _{th(ch-C)} | 1.05 | °C/W |
| Channel to Ambient Thermal Resistance | R _{th(ch-A)} | 83.3 | °C/W |

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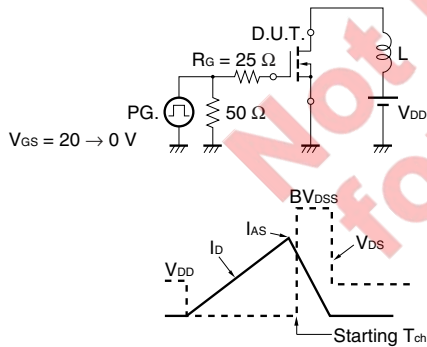
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ELECTRICAL CHARACTERISTICS (Ta = 25°C)

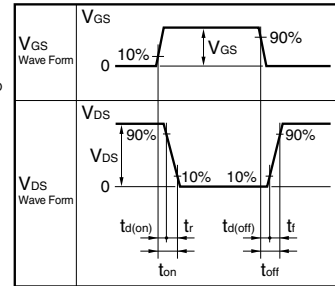
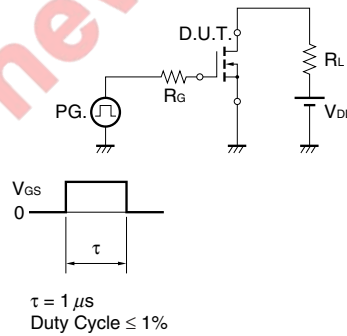
| CHARACTERISTICS | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---------------|---|------|------|----------|------------------|
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$ | | | 1 | μA |
| Gate Leakage Current | I_{GSS} | $V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$ | | | ± 10 | μA |
| Gate to Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$ | 1.4 | | 2.5 | V |
| Forward Transfer Admittance ^{Note} | $ y_{fs} $ | $V_{DS} = 5\text{ V}, I_D = 41\text{ A}$ | 20 | 65 | | S |
| Drain to Source On-state Resistance ^{Note} | $R_{DS(on)1}$ | $V_{GS} = 10\text{ V}, I_D = 41\text{ A}$ | | 3.4 | 4.2 | $\text{m}\Omega$ |
| | $R_{DS(on)2}$ | $V_{GS} = 4.5\text{ V}, I_D = 41\text{ A}$ | | 5.4 | 8.5 | $\text{m}\Omega$ |
| Input Capacitance | C_{iss} | $V_{DS} = 25\text{ V},$ | | 6000 | 9000 | pF |
| Output Capacitance | C_{oss} | $V_{GS} = 0\text{ V},$ | | 580 | 870 | pF |
| Reverse Transfer Capacitance | C_{rss} | $f = 1\text{ MHz}$ | | 370 | 670 | pF |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD} = 20\text{ V}, I_D = 41\text{ A},$ | | 26 | 60 | ns |
| Rise Time | t_r | $V_{GS} = 10\text{ V},$ | | 68 | 170 | ns |
| Turn-off Delay Time | $t_{d(off)}$ | $R_G = 0\ \Omega$ | | 73 | 150 | ns |
| Fall Time | t_f | | | 11 | 30 | ns |
| Total Gate Charge | Q_G | $V_{DD} = 32\text{ V},$ | | 100 | 150 | nC |
| Gate to Source Charge | Q_{GS} | $V_{GS} = 10\text{ V},$ | | 19 | | nC |
| Gate to Drain Charge | Q_{GD} | $I_D = 82\text{ A}$ | | 32 | | nC |
| Body Diode Forward Voltage ^{Note} | $V_{F(S-D)}$ | $I_F = 82\text{ A}, V_{GS} = 0\text{ V}$ | | 0.9 | 1.5 | V |
| Reverse Recovery Time | t_{rr} | $I_F = 82\text{ A}, V_{GS} = 0\text{ V},$ | | 43 | | ns |
| Reverse Recovery Charge | Q_{rr} | $di/dt = 100\text{ A}/\mu\text{s}$ | | 47 | | nC |

Note Pulsed test

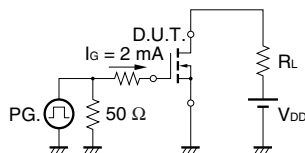
TEST CIRCUIT 1 AVALANCHE CAPABILITY



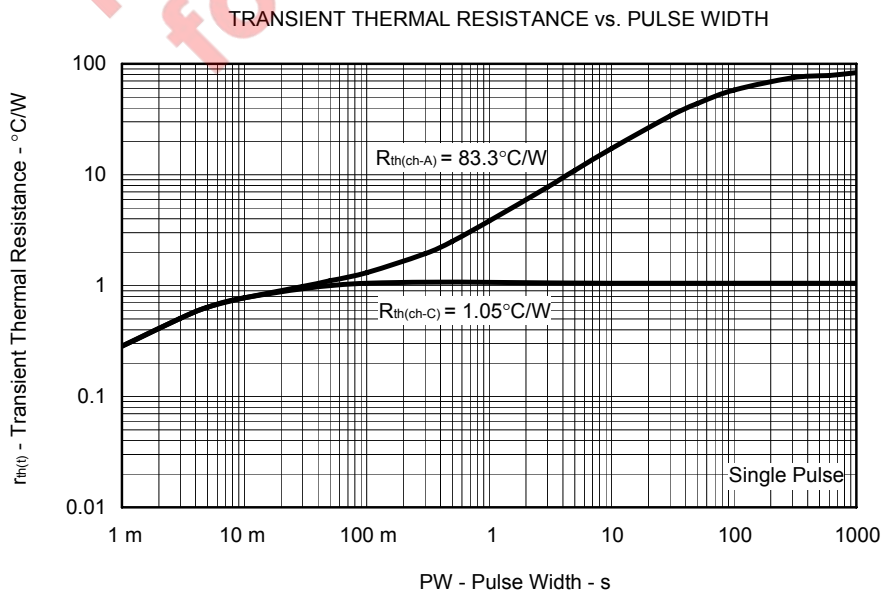
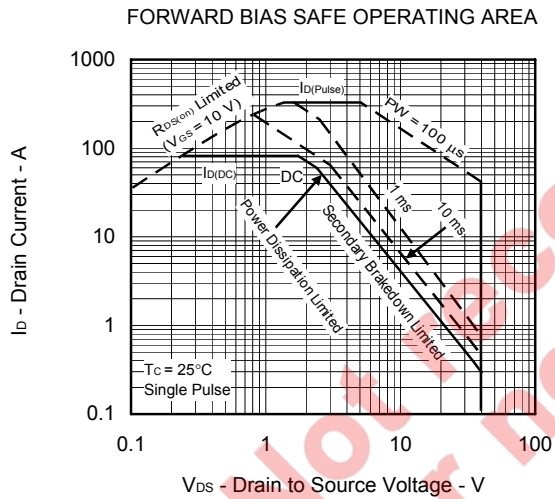
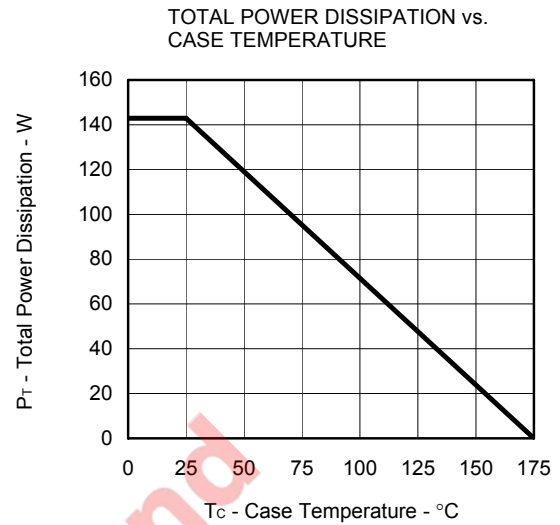
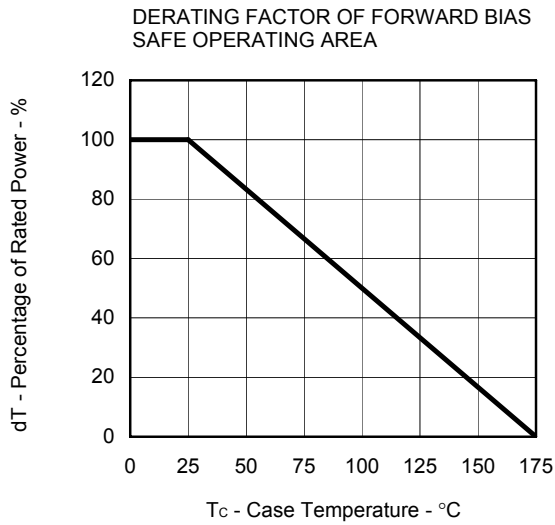
TEST CIRCUIT 2 SWITCHING TIME



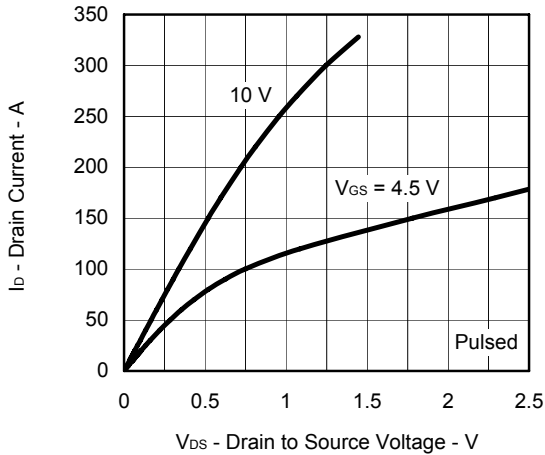
TEST CIRCUIT 3 GATE CHARGE



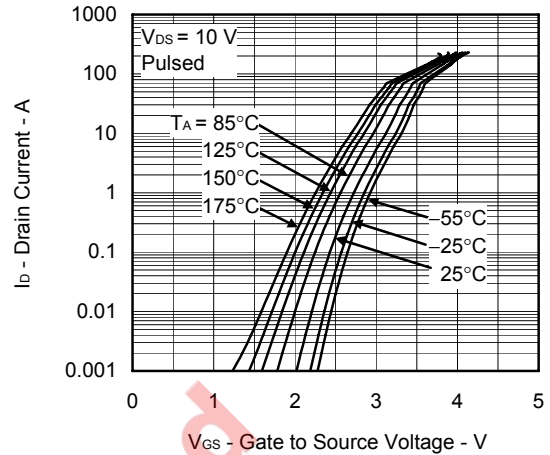
TYPICAL CHARACTERISTICS (T_A = 25°C)



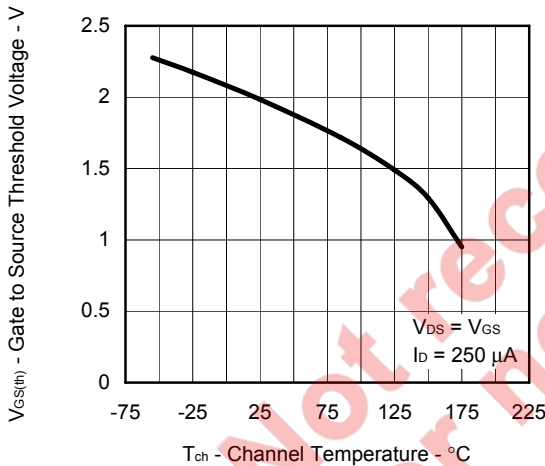
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



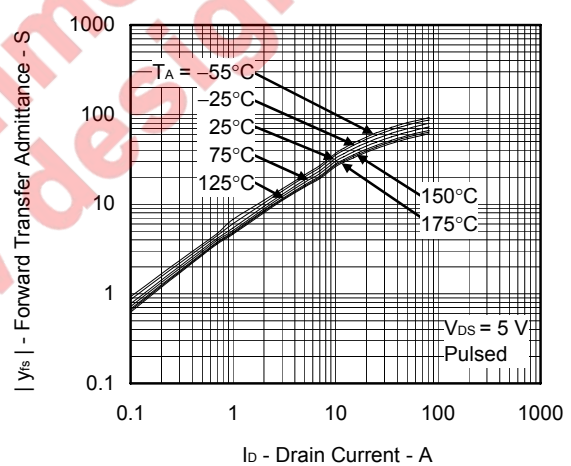
FORWARD TRANSFER CHARACTERISTICS



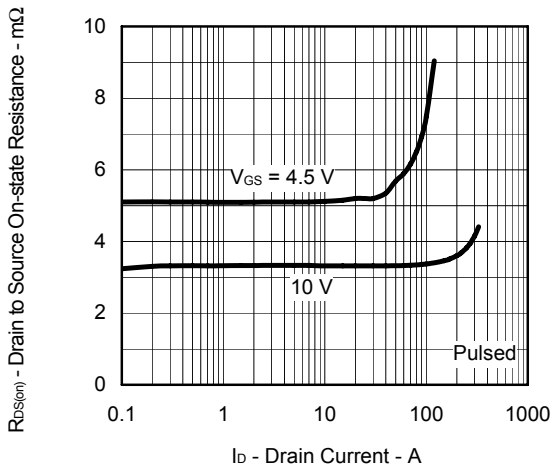
GATE TO SOURCE THRESHOLD VOLTAGE vs. CHANNEL TEMPERATURE



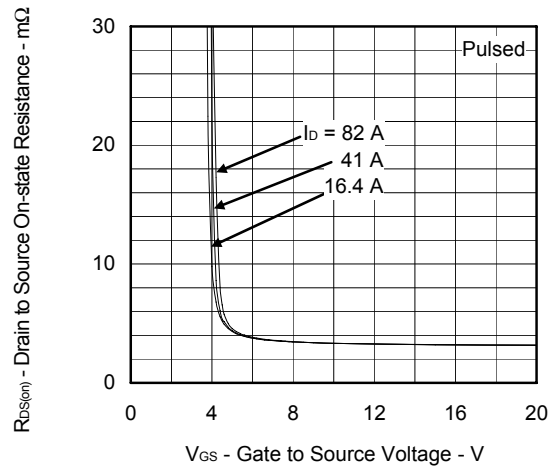
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



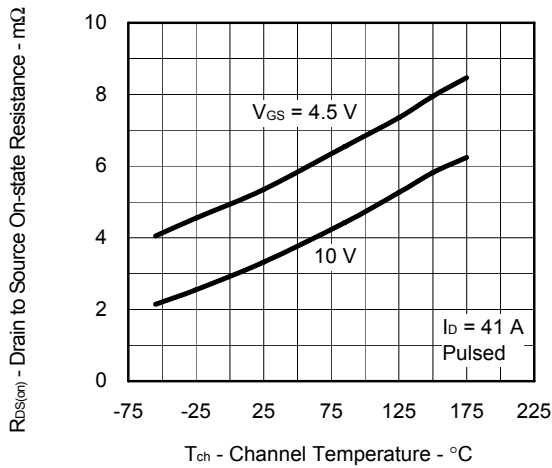
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



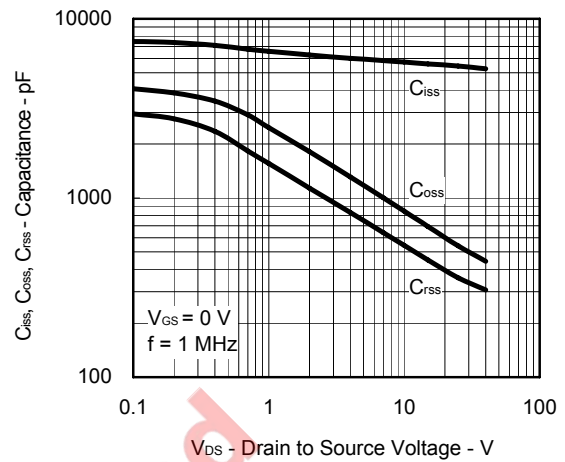
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



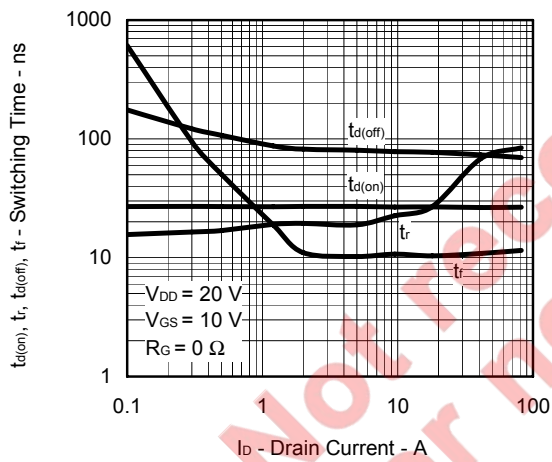
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



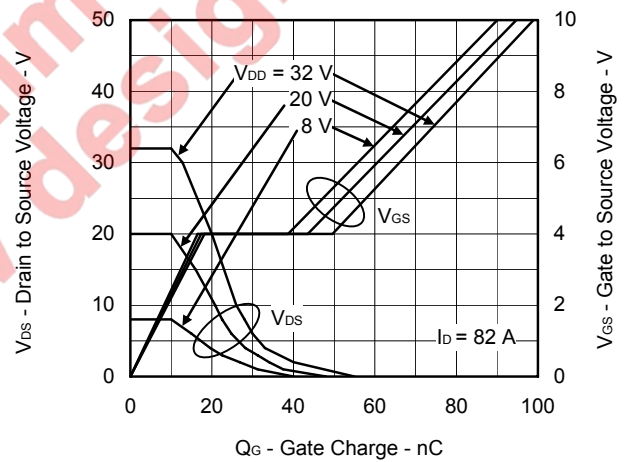
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



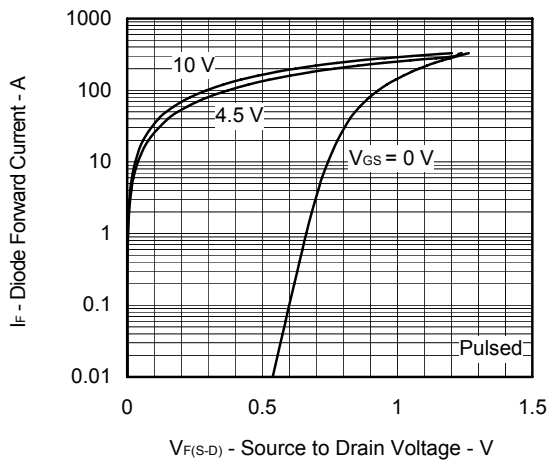
SWITCHING CHARACTERISTICS



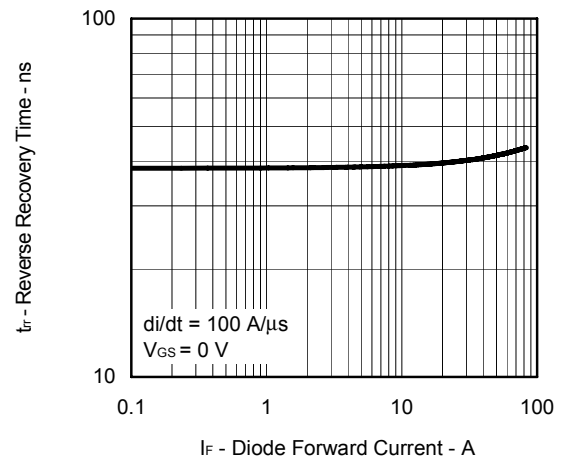
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

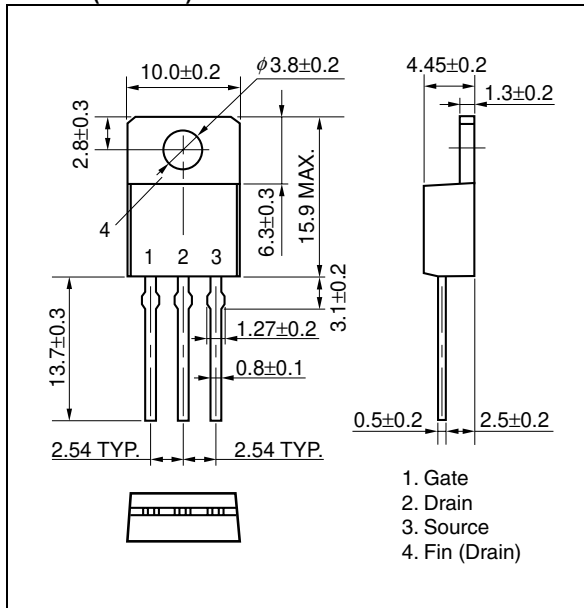


REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT

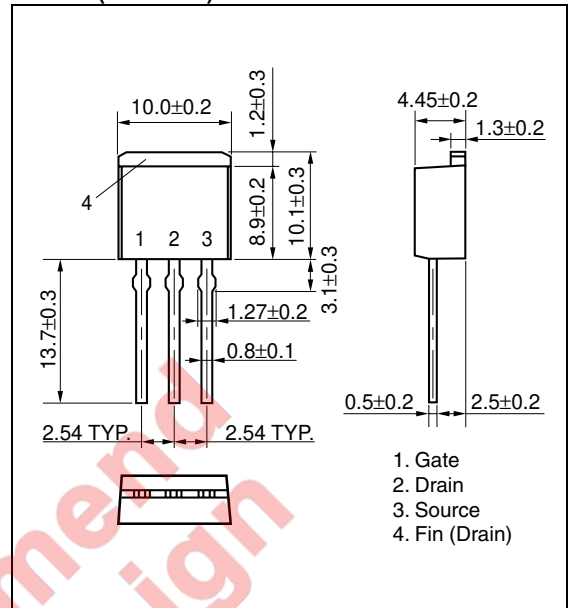


PACKAGE DRAWINGS (Unit: mm)

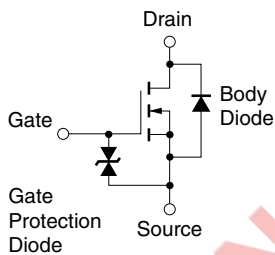
TO-220 (MP-25K)



TO-262 (MP-25SK)

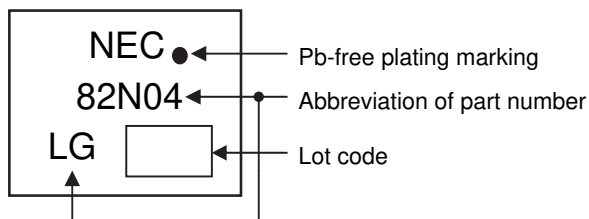


EQUIVALENT CIRCUIT



Remark The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

MARKING INFORMATION



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

For soldering methods and conditions other than those recommended below, please contact an NEC Electronics sales representative.

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 |
|--|---|------------------------------|
| Wave soldering NP82N04MLG, NP82N04NLG | Maximum temperature (Solder temperature): 260°C or below Time: 10 seconds or less Maximum chlorine content of rosin flux: 0.2% (wt.) or less | THDWS |
| Partial heating NP82N04MLG, NP82N04NLG | Maximum temperature (Pin temperature): 350°C or below Time (per side of the device): 3 seconds or less Maximum chlorine content of rosin flux: 0.2% (wt.) or less | P350 |

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

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