# NP160N04TUJ

## MOS FIELD EFFECT TRANSISTOR

R07DS0021EJ0100
Rev.1.00
Jul 01, 2010

## Description

The NP160N04TUJ is N-channel MOS Field Effect Transistor designed for high current switching applications.

## Features

- Low on-state resistance
  — $R_{DS(on)}$ = 2.0 mΩ MAX. ($V_{GS}$ = 10 V, $I_D$ = 80 A)
- Low Ciss: Ciss = 6900 pF TYP. ($V_{DS}$ = 25 V, $V_{GS}$ = 0 V)
- Designed for automotive application and AEC-Q101 qualified

## Ordering Information

| Part No. | LEAD PLATING | PACKING | Package |
|---|---|---|---|
| NP160N04TUJ -E1-AY *1 | Pure Sn (Tin) | Tape 800 pcs/reel | TO-263-7pin, Taping (E1 type) |
| NP160N04TUJ -E2-AY *1 | | | TO-263-7pin, Taping (E2 type) |

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

## Absolute Maximum Ratings ($T_A$ = 25°C)

| Item | Symbol | Ratings | Unit |
|---|---|---|---|
| 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) | $I_{D(DC)}$ | ±160 | A |
| Drain Current (pulse) *1 | $I_{D(pulse)}$ | ±640 | A |
| Total Power Dissipation ($T_C$ = 25°C) | $P_{T1}$ | 250 | 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 *2 | $I_{AR}$ | 60 | A |
| Repetitive Avalanche Energy *2 | $E_{AR}$ | 360 | mJ |

Notes: *1. PW ≤ 10 μs, Duty Cycle ≤ 1%
*2. $T_{ch(peak)}$ ≤ 150°C, $R_G$ = 25 Ω

## Thermal Resistance

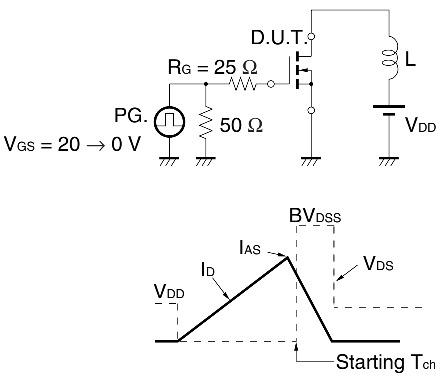
| | | | |
|---|---|---|---|
| Channel to Case Thermal Resistance | $R_{th(ch-C)}$ | 0.60 | °C/W |
| Channel to Ambient Thermal Resistance | $R_{th(ch-A)}$ | 83.3 | °C/W |

## Electrical Characteristics ($T_A$ = 25°C)

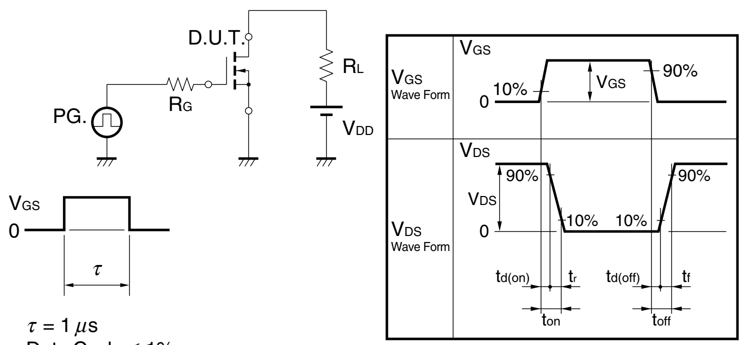
| Item | Symbol | Min | Typ | Max | Unit | Test Conditions |
|---|---|---|---|---|---|---|
| Zero Gate Voltage Drain Current | $I_{DSS}$ | | | 1 | μA | $V_{DS}$ = 40 V, $V_{GS}$ = 0 V |
| Gate Leakage Current | $I_{GSS}$ | | | ±100 | nA | $V_{GS}$ = ±20 V, $V_{DS}$ = 0 V |
| Gate to Source Threshold Voltage | $V_{GS(th)}$ | 2.0 | 3.0 | 4.0 | V | $V_{DS}$ = $V_{GS}$, $I_D$ = 250 μA |
| Forward Transfer Admittance *1 | \| $y_{fs}$ \| | 55 | 110 | | S | $V_{DS}$ = 5 V, $I_D$ = 80 A |
| Drain to Source On-state Resistance *1 | $R_{DS(on)}$ | | 1.6 | 2.0 | mΩ | $V_{GS}$ = 10 V, $I_D$ = 80 A |
| Input Capacitance | $C_{iss}$ | | 6900 | 10350 | pF | $V_{DS}$ = 25 V, |
| Output Capacitance | $C_{oss}$ | | 930 | 1400 | pF | $V_{GS}$ = 0 V, |
| Reverse Transfer Capacitance | $C_{rss}$ | | 360 | 650 | pF | f = 1 MHz |
| Turn-on Delay Time | $t_{d(on)}$ | | 40 | 90 | ns | $V_{DD}$ = 20 V, $I_D$ = 80 A, |
| Rise Time | $t_r$ | | 20 | 50 | ns | $V_{GS}$ = 10 V, |
| Turn-off Delay Time | $t_{d(off)}$ | | 85 | 170 | ns | $R_G$ = 0 Ω |
| Fall Time | $t_f$ | | 15 | 40 | ns | |
| Total Gate Charge | $Q_G$ | | 115 | 180 | nC | $V_{DD}$ = 32 V, |
| Gate to Source Charge | $Q_{GS}$ | | 28 | | nC | $V_{GS}$ = 10 V, |
| Gate to Drain Charge | $Q_{GD}$ | | 36 | | nC | $I_D$ = 160 A |
| Body Diode Forward Voltage *1 | $V_{F(S-D)}$ | | 0.9 | 1.5 | V | $I_F$ = 160 A, $V_{GS}$ = 0 V |
| Reverse Recovery Time | $t_{rr}$ | | 57 | | ns | $I_F$ = 160 A, $V_{GS}$ = 0 V, |
| Reverse Recovery Charge | $Q_{rr}$ | | 105 | | nC | di/dt = 100 A/μs |

Note: *1. Pulsed

**TEST CIRCUIT 1 AVALANCHE CAPABILITY**

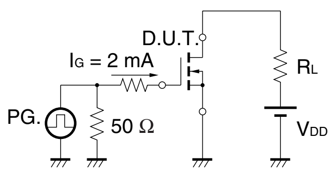



**TEST CIRCUIT 2 SWITCHING TIME**

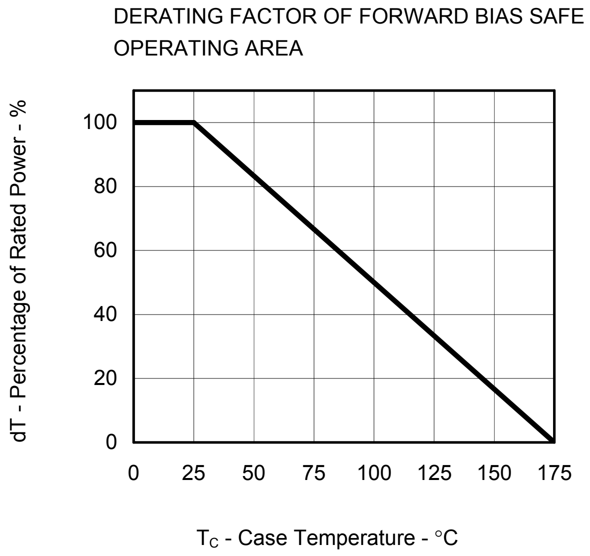


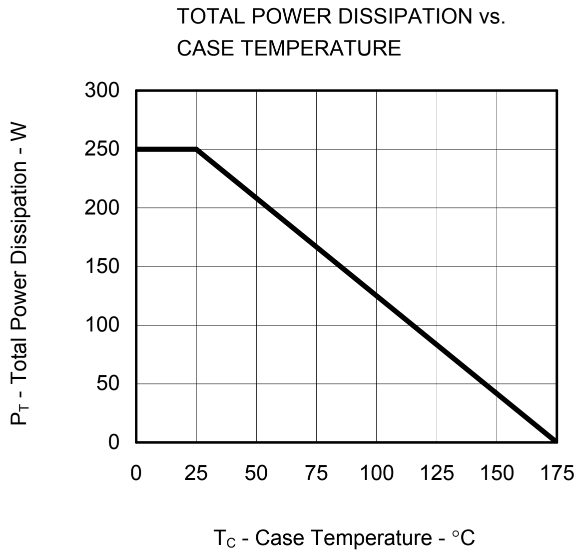

τ = 1 μs
Duty Cycle ≤ 1%

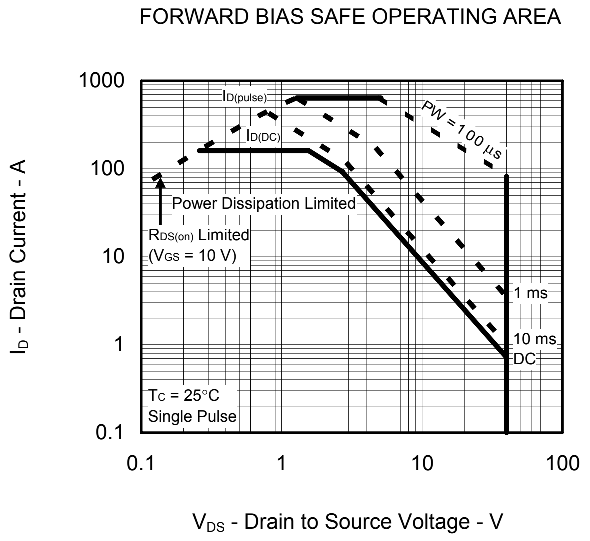
**TEST CIRCUIT 3 GATE CHARGE**

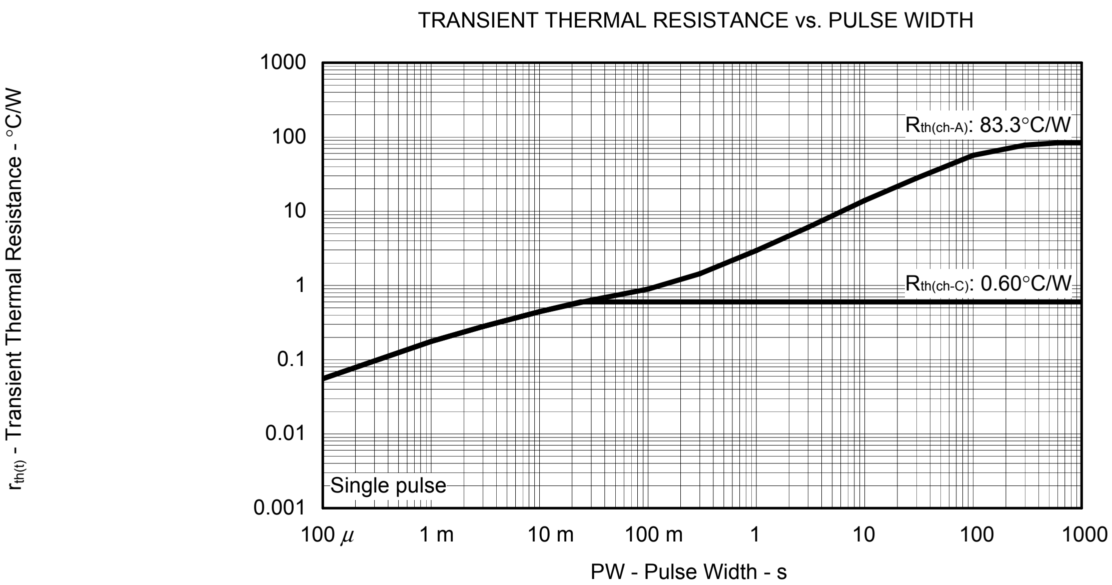


## Typical Characteristics ($T_A$ = 25°C)

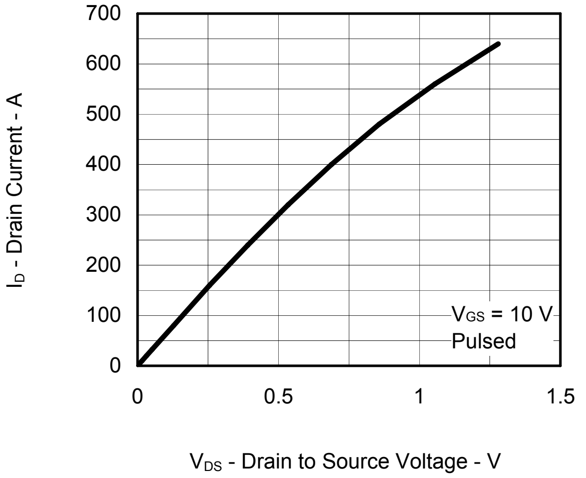


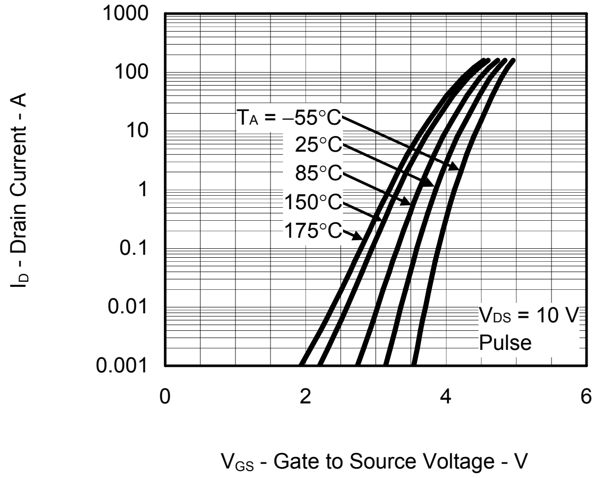



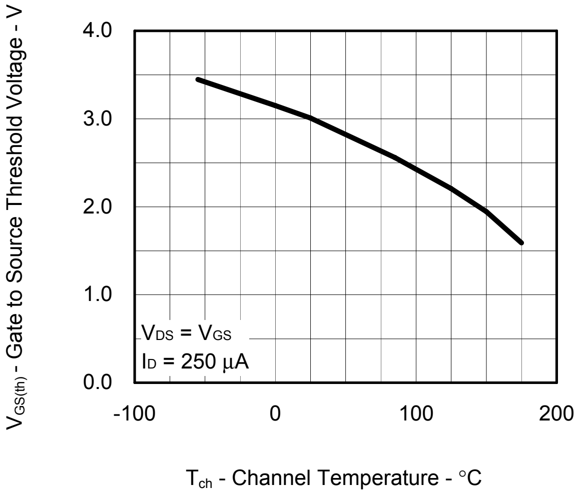
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



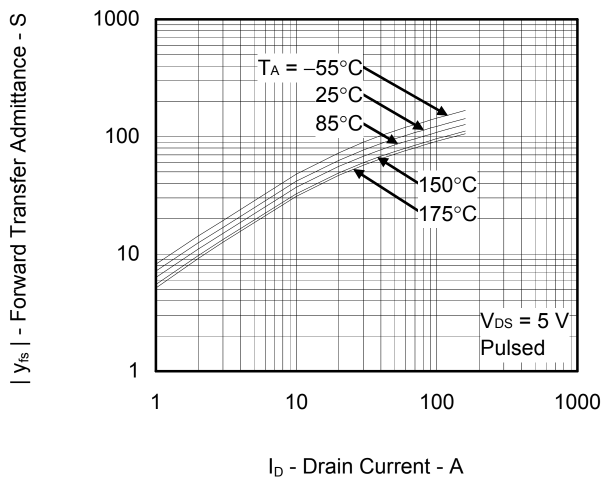

FORWARD TRANSFER CHARACTERISTICS



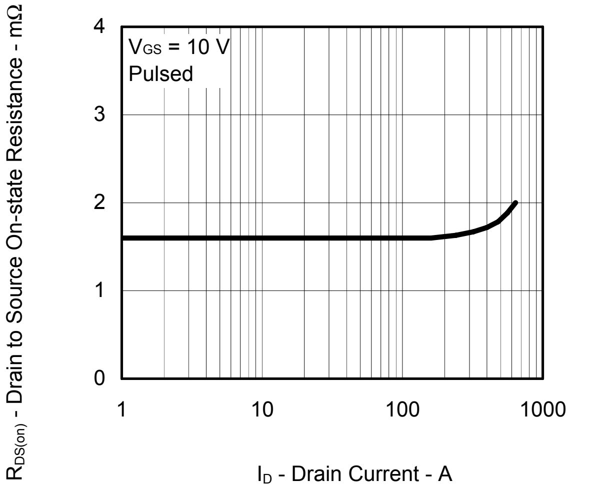

GATE TO SOURCE THRESHOLD VOLTAGE
vs. CHANNEL TEMPERATURE



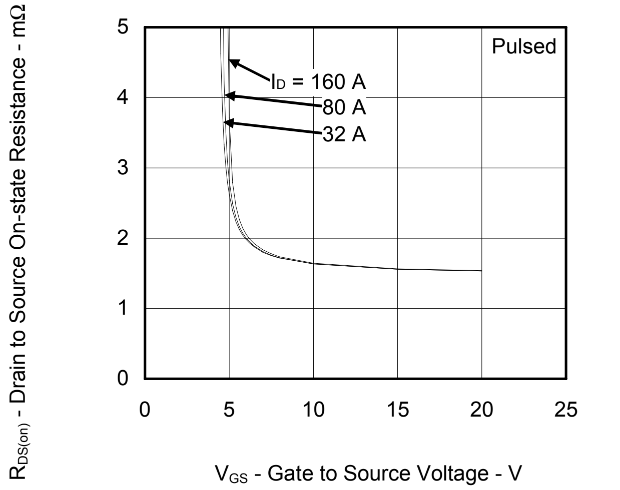

FORWARD TRANSFER ADMITTANCE vs. DRAIN
CURRENT



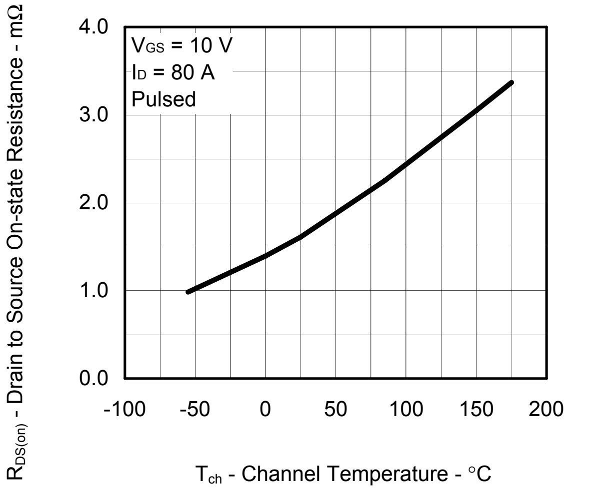

DRAIN TO SOURCE ON-STATE RESISTANCE vs.
DRAIN CURRENT



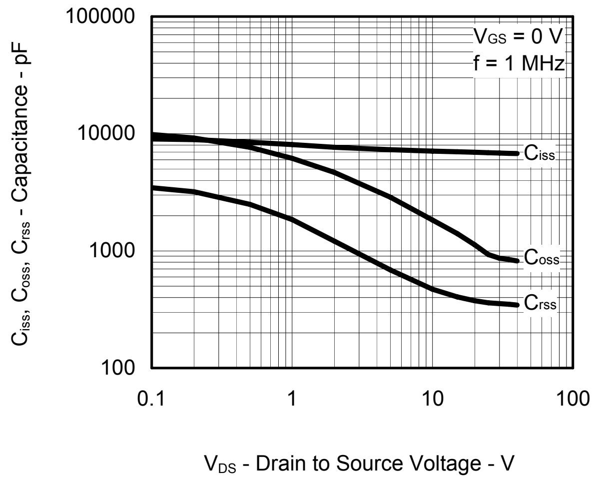

DRAIN TO SOURCE ON-STATE RESISTANCE vs.
GATE TO SOURCE VOLTAGE



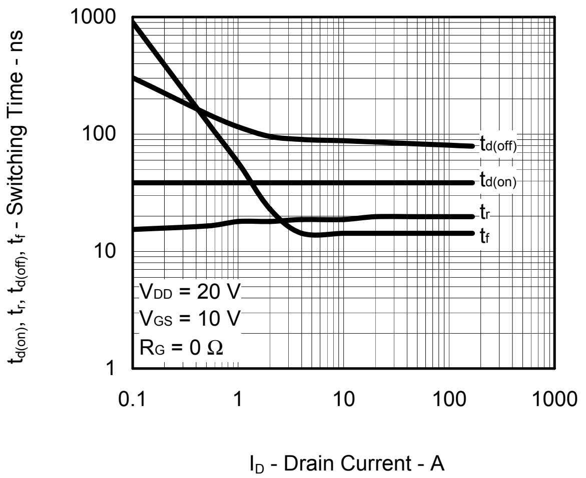
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



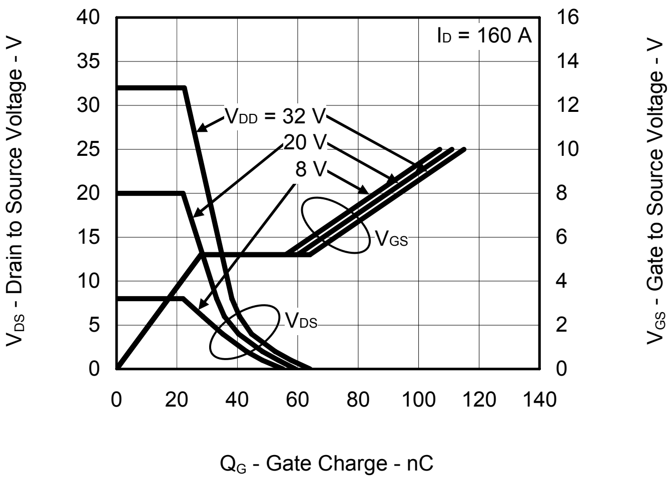

CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



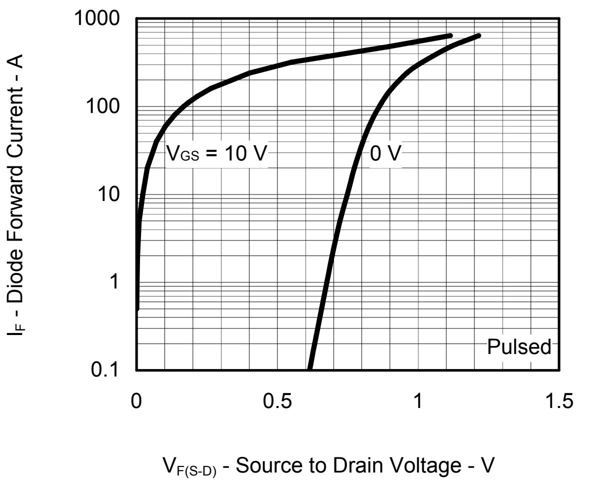

SWITCHING CHARACTERISTICS



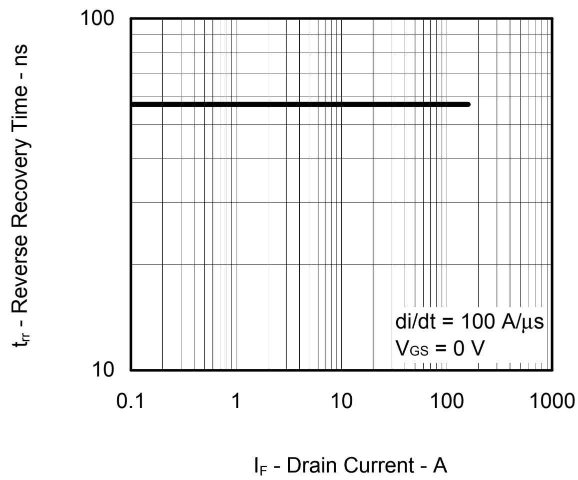

DYNAMIC INPUT/OUTPUT CHARACTERISTICS




SOURCE TO DRAIN DIODE FORWARD VOLTAGE

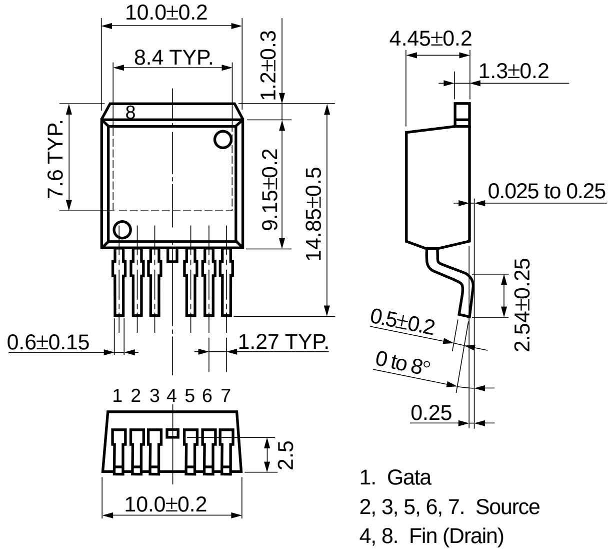



REVERSE RECOVERY TIME vs. DRAIN CURRENT

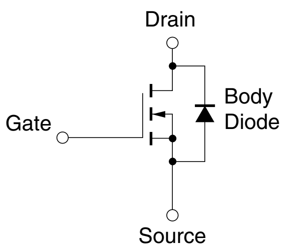


## Package Drawings (Unit: mm)

### TO-263-7pin (MP-25ZT) (Mass: 1.5 g TYP.)




## 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.

| Revision History | NP160N04TUJ |
|---|---|

| Rev. | Date | Description | |
|---|---|---|---|
| | | Page | Summary |
| 1.00 | Jul 01, 2010 | – | First Eddition Issued |
| | | | |

## SALES OFFICES

Renesas Electronics Corporation

http://www.renesas.com

Refer to "http://www.renesas.com/" for the latest and detailed information.

**Renesas Electronics America Inc.**
2880 Scott Boulevard Santa Clara, CA 95050-2554, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

**Renesas Electronics Canada Limited**
1101 Nicholson Road, Newmarket, Ontario L3Y 9C3, Canada
Tel: +1-905-898-5441, Fax: +1-905-898-3220

**Renesas Electronics Europe Limited**
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K
Tel: +44-1628-585-100, Fax: +44-1628-585-900

**Renesas Electronics Europe GmbH**
Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

**Renesas Electronics (China) Co., Ltd.**
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

**Renesas Electronics (Shanghai) Co., Ltd.**
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

**Renesas Electronics Hong Kong Limited**
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

**Renesas Electronics Taiwan Co., Ltd.**
7F, No. 363 Fu Shing North Road Taipei, Taiwan, R.O.C.
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

**Renesas Electronics Singapore Pte. Ltd.**
1 harbourFront Avenue, #06-10, keppel Bay Tower, Singapore 098632
Tel: +65-6213-0200, Fax: +65-6278-8001

**Renesas Electronics Malaysia Sdn.Bhd.**
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

**Renesas Electronics Korea Co., Ltd.**
11F., Samik Lavied' or Bldg., 720-2 Yeoksam-Dong, Kangnam-Ku, Seoul 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141




Colophon 1.0