

# NP160N04TUJ

R07DS0021EJ0100

Rev.1.00

Jul 01, 2010

## MOS FIELD EFFECT TRANSISTOR

### Description

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

### Features

- Low on-state resistance  
—  $R_{DS(on)} = 2.0 \text{ m}\Omega \text{ MAX.}$  ( $V_{GS} = 10 \text{ V}$ ,  $I_D = 80 \text{ A}$ )
- Low Ciss:  $C_{iss} = 6900 \text{ pF TYP.}$  ( $V_{DS} = 25 \text{ V}$ ,  $V_{GS} = 0 \text{ V}$ )
- 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 ( $T_A = 25^\circ\text{C}$ )

Item	Symbol	Ratings	Unit
Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	40	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 20$	V
Drain Current (DC) ( $T_C = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 160$	A
Drain Current (pulse) *1	$I_{D(pulse)}$	$\pm 640$	A
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T1}$	250	W
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_{T2}$	1.8	W
Channel Temperature	$T_{ch}$	175	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +175	$^\circ\text{C}$
Repetitive Avalanche Current *2	$I_{AR}$	60	A
Repetitive Avalanche Energy *2	$E_{AR}$	360	mJ

Notes: \*1.  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$

\*2.  $T_{ch(peak)} \leq 150^\circ\text{C}$ ,  $R_G = 25 \Omega$

### Thermal Resistance

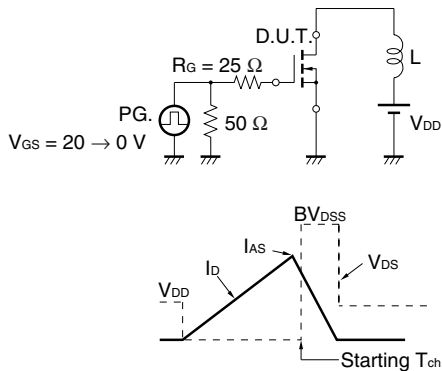
Channel to Case Thermal Resistance	$R_{th(ch-C)}$	0.60	$^\circ\text{C/W}$
Channel to Ambient Thermal Resistance	$R_{th(ch-A)}$	83.3	$^\circ\text{C/W}$

**Electrical Characteristics (T<sub>A</sub> = 25°C)**

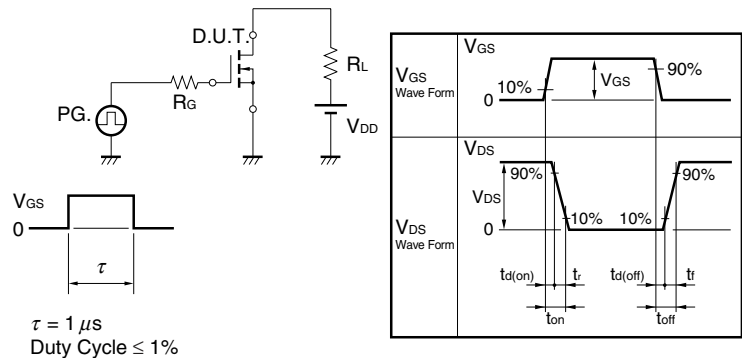
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Zero Gate Voltage Drain Current	I <sub>DSS</sub>			1	μA	V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V
Gate Leakage Current	I <sub>GSS</sub>			±100	nA	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V
Gate to Source Threshold Voltage	V <sub>GS(th)</sub>	2.0	3.0	4.0	V	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μA
Forward Transfer Admittance *1	y <sub>fs</sub>	55	110		S	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 80 A
Drain to Source On-state Resistance *1	R <sub>DS(on)</sub>		1.6	2.0	mΩ	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 80 A
Input Capacitance	C <sub>iss</sub>		6900	10350	pF	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz
Output Capacitance	C <sub>oss</sub>		930	1400	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>		360	650	pF	
Turn-on Delay Time	t <sub>d(on)</sub>		40	90	ns	V <sub>DD</sub> = 20 V, I <sub>D</sub> = 80 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 0 Ω
Rise Time	t <sub>r</sub>		20	50	ns	
Turn-off Delay Time	t <sub>d(off)</sub>		85	170	ns	
Fall Time	t <sub>f</sub>		15	40	ns	
Total Gate Charge	Q <sub>G</sub>		115	180	nC	V <sub>DD</sub> = 32 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 160 A
Gate to Source Charge	Q <sub>GS</sub>		28		nC	
Gate to Drain Charge	Q <sub>GD</sub>		36		nC	
Body Diode Forward Voltage *1	V <sub>F(S-D)</sub>		0.9	1.5	V	I <sub>F</sub> = 160 A, V <sub>GS</sub> = 0 V
Reverse Recovery Time	t <sub>rr</sub>		57		ns	I <sub>F</sub> = 160 A, V <sub>GS</sub> = 0 V,
Reverse Recovery Charge	Q <sub>rr</sub>		105		nC	di/dt = 100 A/μs

Note: \*1. Pulsed

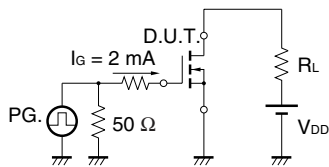
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



**TEST CIRCUIT 2 SWITCHING TIME**

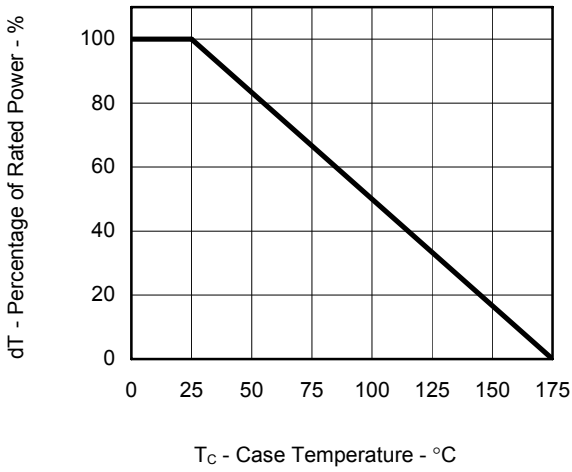


**TEST CIRCUIT 3 GATE CHARGE**

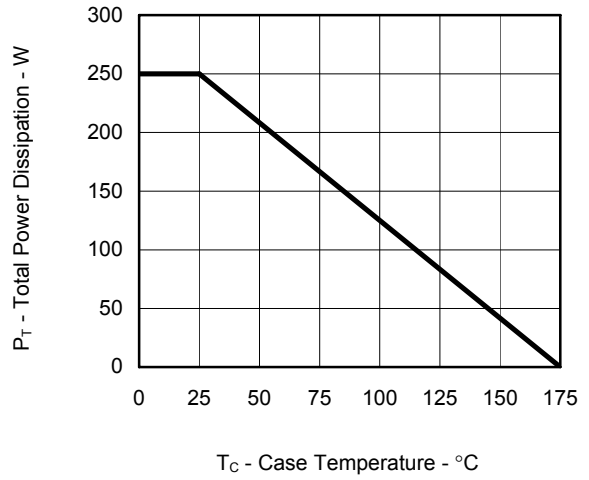


Typical Characteristics (T<sub>A</sub> = 25°C)

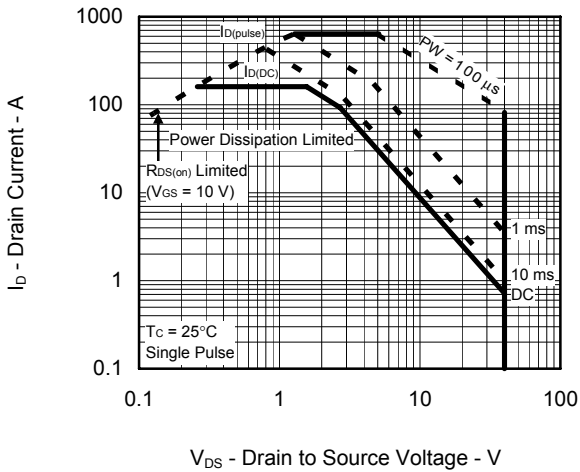
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



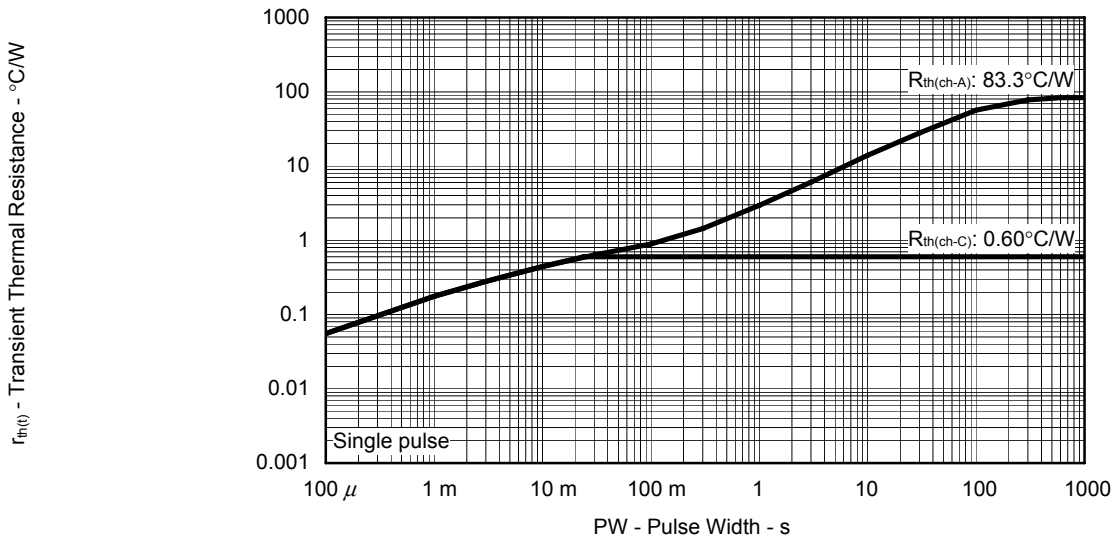
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



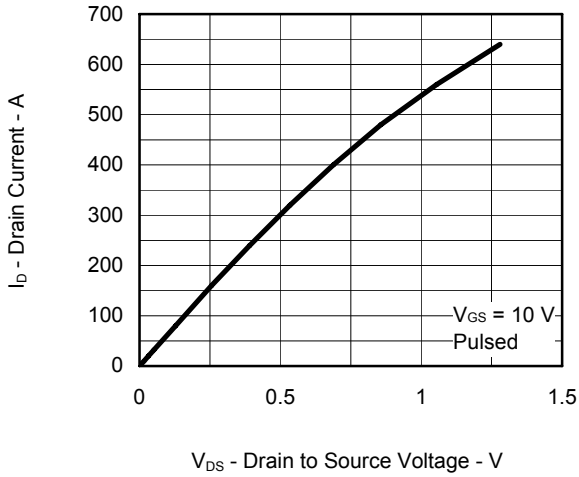
FORWARD BIAS SAFE OPERATING AREA



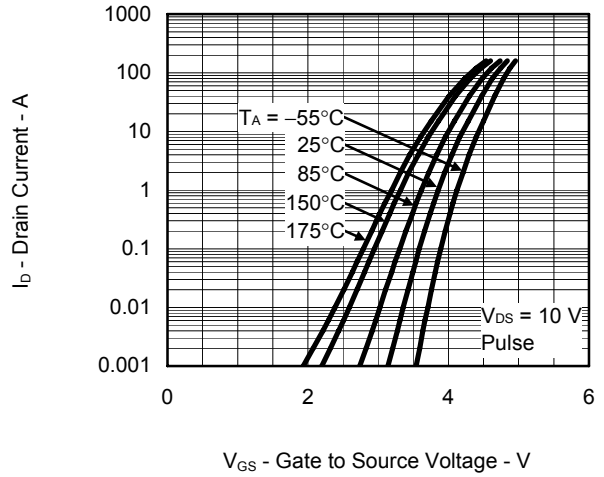
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



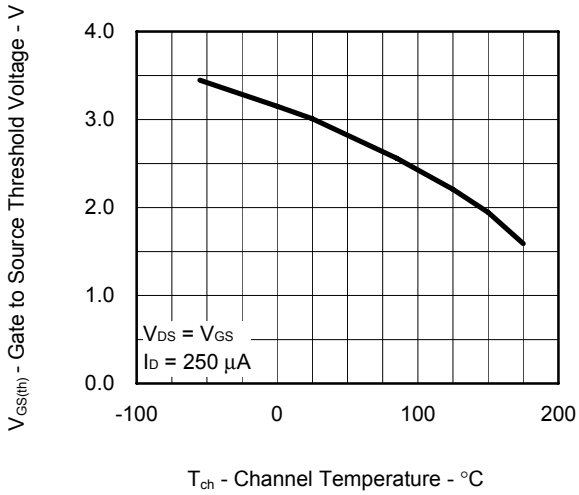
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



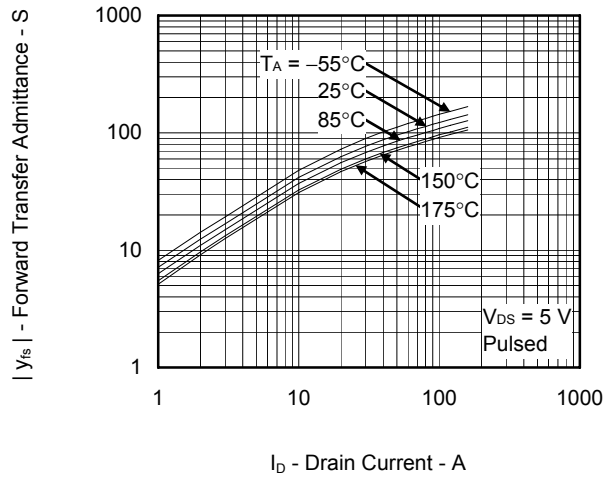
FORWARD TRANSFER CHARACTERISTICS



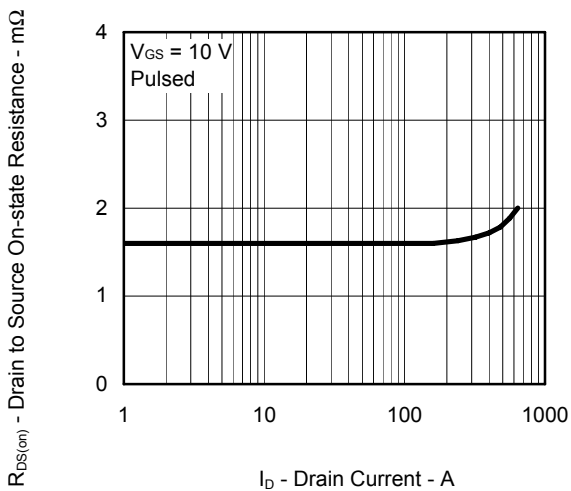
GATE TO SOURCE THRESHOLD VOLTAGE vs. CHANNEL TEMPERATURE



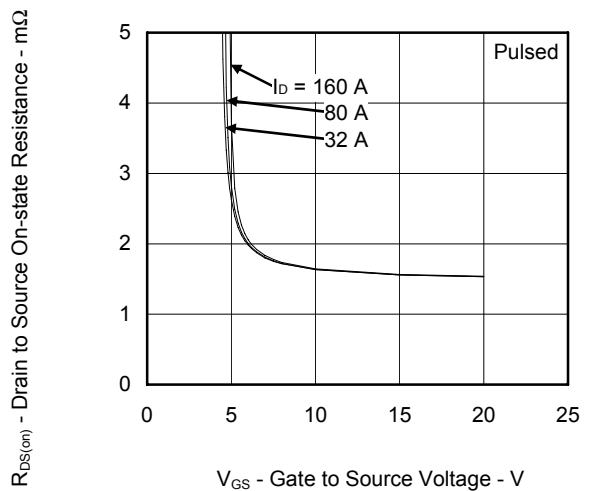
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



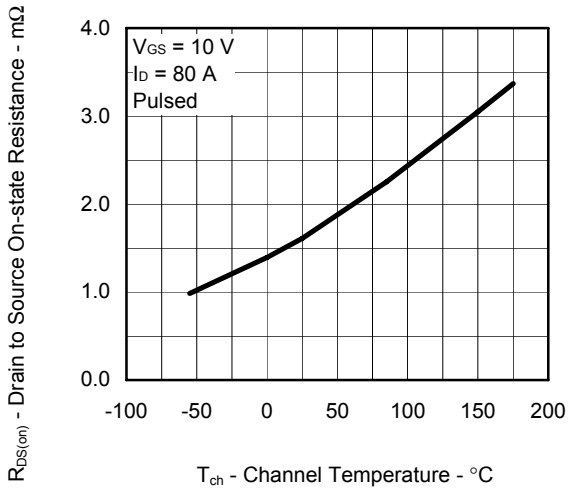
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



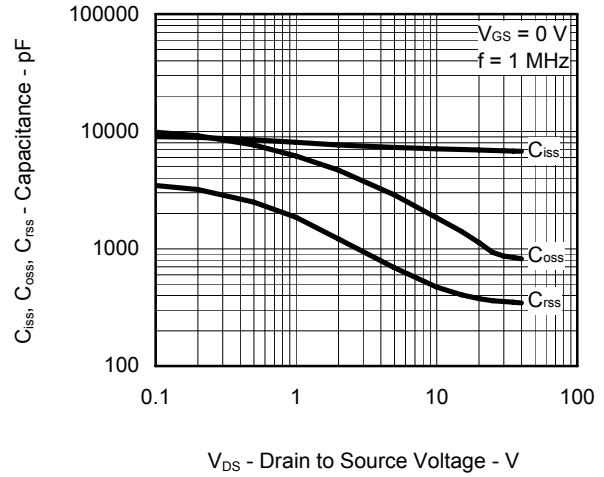
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



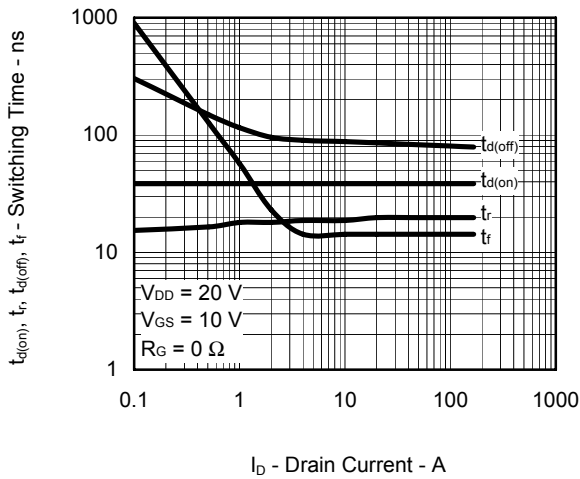
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



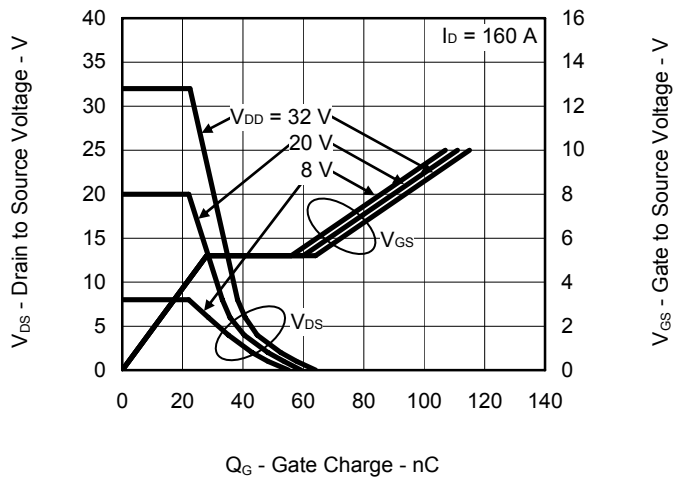
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



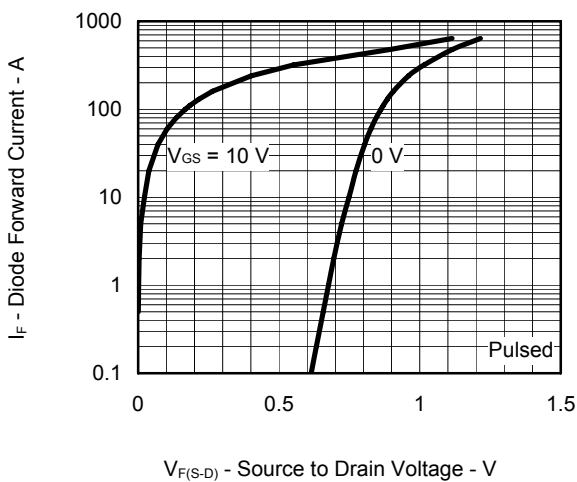
SWITCHING CHARACTERISTICS



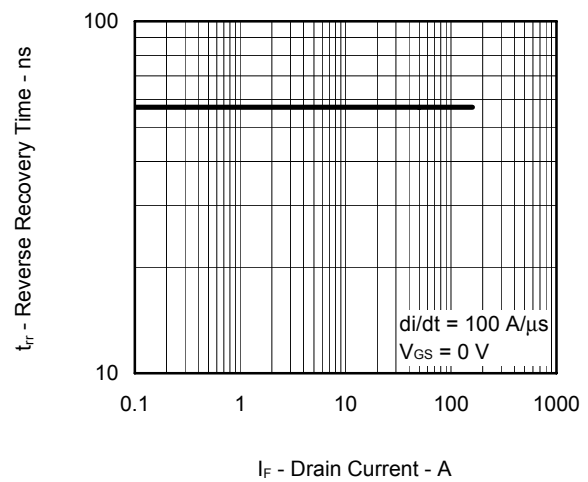
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

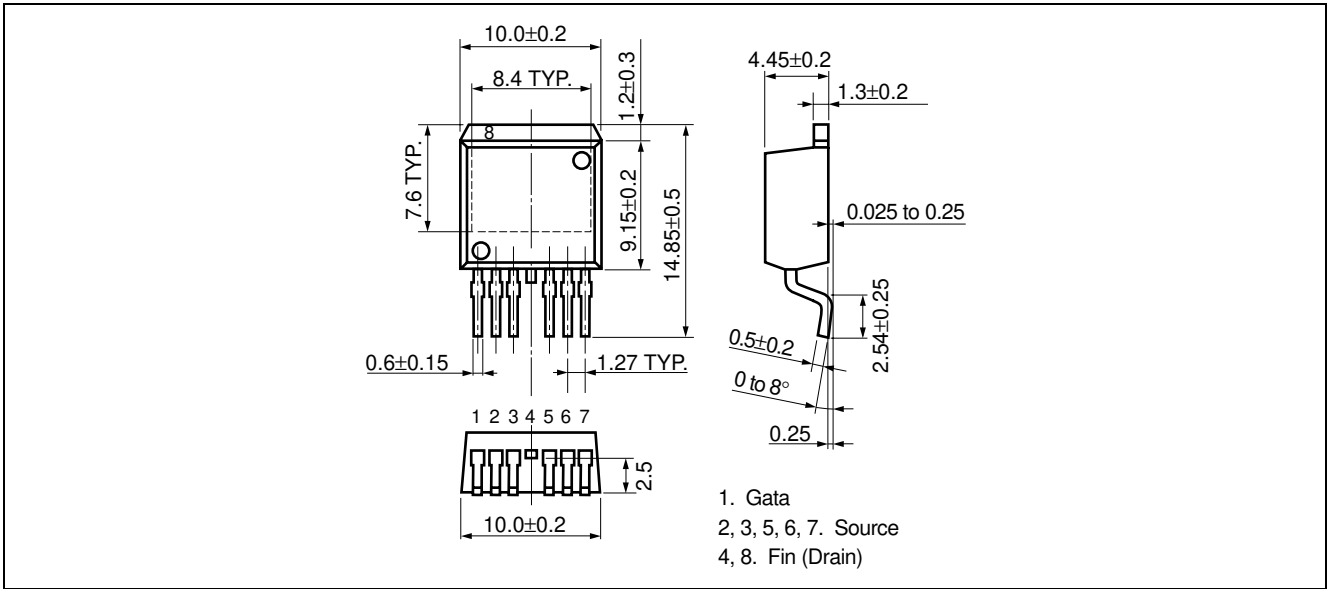


REVERSE RECOVERY TIME vs. DRAIN CURRENT

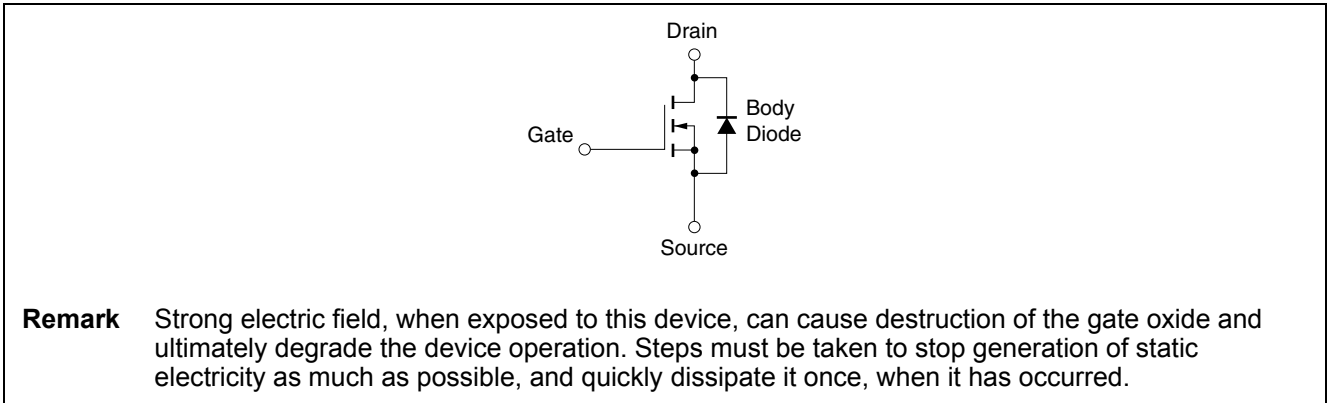


Package Drawings (Unit: mm)

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



Equivalent Circuit



<b>Revision History</b>	<b>NP160N04TUJ</b>
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Rev.	Date	Description	
		Page	Summary
1.00	Jul 01, 2010	-	First Eddition Issued

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

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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  
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#### Renesas Electronics Taiwan Co., Ltd.

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