

# NP180N04TUJ

R07DS0180EJ0100

Rev.1.00

Dec 17, 2010

## MOS FIELD EFFECT TRANSISTOR

### Description

The NP180N04TUJ is N-channel MOS Field Effect Transistor designed for high current switching applications.

### Features

- Low on-state resistance  
—  $R_{DS(on)} = 1.5 \text{ m}\Omega \text{ MAX.}$  ( $V_{GS} = 10 \text{ V}$ ,  $I_D = 90 \text{ A}$ )
- Low Ciss:  $C_{iss} = 9500 \text{ pF TYP.}$  ( $V_{DS} = 25 \text{ V}$ )
- Designed for automotive application and AEC-Q101 qualified

### Ordering Information

Part No.	LEAD PLATING	PACKING	Package
NP180N04TUJ -E1-AY *1	Pure Sn (Tin)	Tape 800 p/reel	TO-263-7pin, Taping (E1 type)
NP180N04TUJ -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) ( $T_C = 25^\circ\text{C}$ )	$I_{D(DC)}$	$\pm 180$	A
Drain Current (pulse) *1	$I_{D(pulse)}$	$\pm 720$	A
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T1}$	348	W
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ ) *2	$P_{T2}$	1.8	W
Channel Temperature	$T_{ch}$	175	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +175	$^\circ\text{C}$
Repetitive Avalanche Current *3	$I_{AR}$	72	A
Repetitive Avalanche Energy *3	$E_{AR}$	518	mJ

### Thermal Resistance

Channel to Case Thermal Resistance	$R_{th(ch-C)}$	0.43	$^\circ\text{C/W}$
Channel to Ambient Thermal Resistance *2	$R_{th(ch-A)}$	83.3	$^\circ\text{C/W}$

Notes: \*1.  $T_C = 25^\circ\text{C}$ ,  $PW \leq 10 \mu\text{s}$ , Duty Cycle  $\leq 1\%$

\*2. Mounted on glass epoxy substrate of 40 mm x 40 mm x 0.8 mm

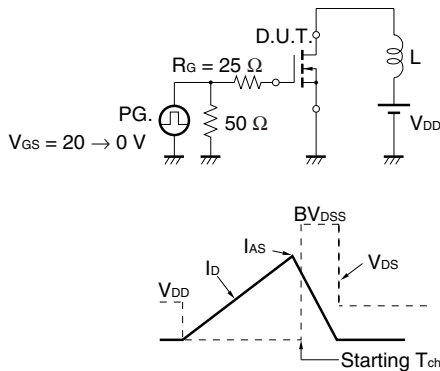
\*3.  $T_{ch(peak)} \leq 150^\circ\text{C}$ ,  $R_G = 25 \Omega$

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

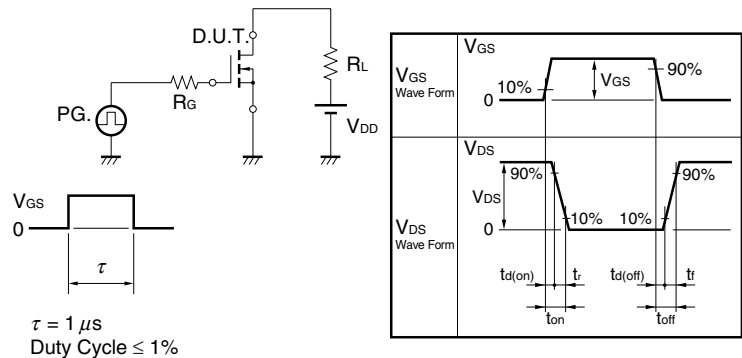
Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Zero Gate Voltage Drain Current	I <sub>DSS</sub>			1	μA	V <sub>DS</sub> = 40 V, V <sub>GS</sub> = 0 V
Gate Leakage Current	I <sub>GSS</sub>			±100	nA	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V
Gate to Source Threshold Voltage	V <sub>GS(th)</sub>	2.0	3.0	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>	65	130		S	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 90 A
Drain to Source On-state Resistance *1	R <sub>DS(on)</sub>		1.2	1.5	mΩ	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 90 A
Input Capacitance	C <sub>iss</sub>		9500	14250	pF	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz
Output Capacitance	C <sub>oss</sub>		1250	1880	pF	
Reverse Transfer Capacitance	C <sub>rss</sub>		410	740	pF	
Turn-on Delay Time	t <sub>d(on)</sub>		45	100	ns	V <sub>DD</sub> = 20 V, I <sub>D</sub> = 90 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 0 Ω
Rise Time	t <sub>r</sub>		22	60	ns	
Turn-off Delay Time	t <sub>d(off)</sub>		100	200	ns	
Fall Time	t <sub>f</sub>		15	40	ns	
Total Gate Charge	Q <sub>G</sub>		150	230	nC	V <sub>DD</sub> = 32 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 180 A
Gate to Source Charge	Q <sub>GS</sub>		35		nC	
Gate to Drain Charge	Q <sub>GD</sub>		50		nC	
Body Diode Forward Voltage *1	V <sub>F(S-D)</sub>		0.9	1.5	V	I <sub>F</sub> = 180 A, V <sub>GS</sub> = 0 V
Reverse Recovery Time	t <sub>rr</sub>		68		ns	I <sub>F</sub> = 180 A, V <sub>GS</sub> = 0 V,
Reverse Recovery Charge	Q <sub>rr</sub>		135		nC	di/dt = 100 A/μs

Note: \*1. Pulsed

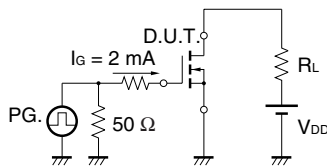
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



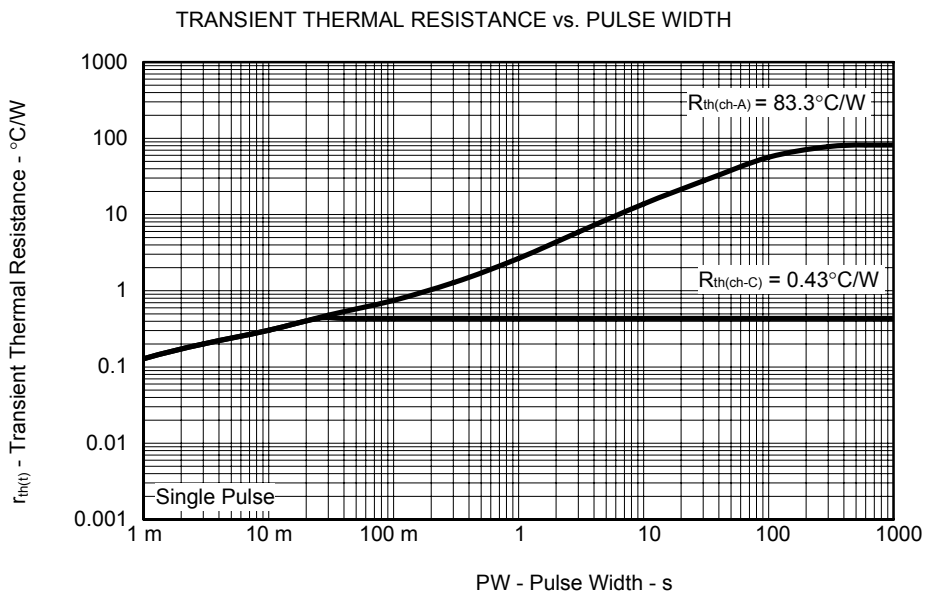
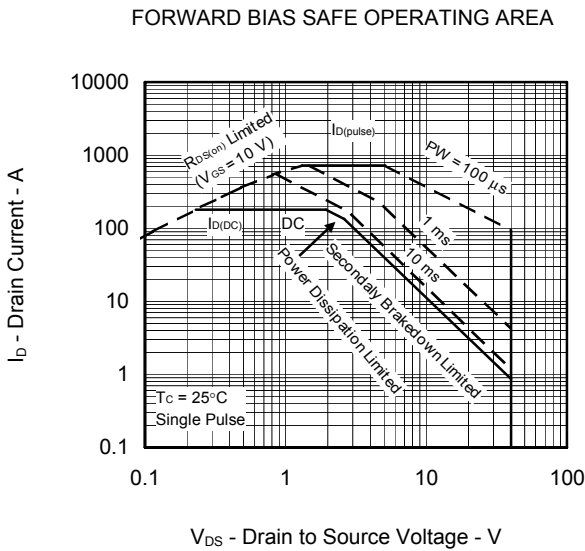
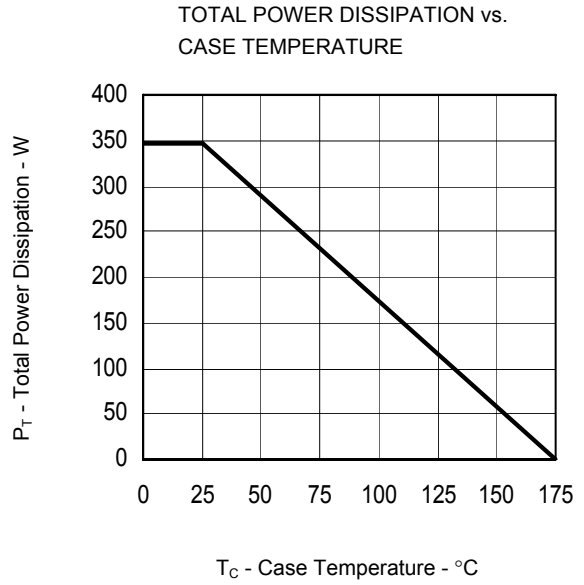
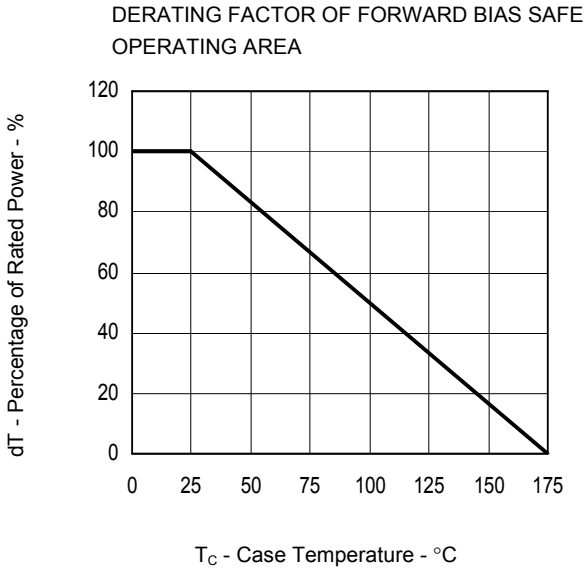
**TEST CIRCUIT 2 SWITCHING TIME**



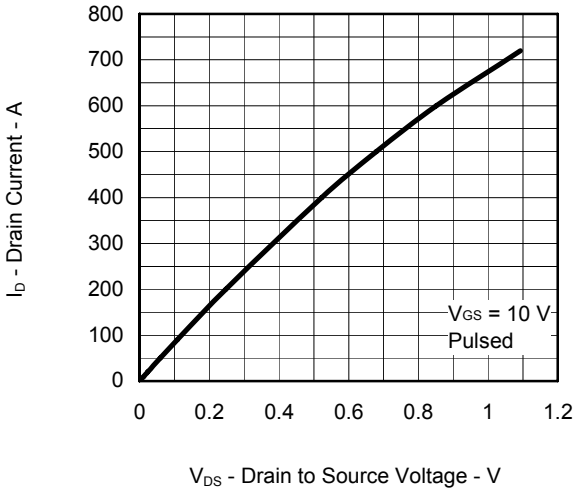
**TEST CIRCUIT 3 GATE CHARGE**



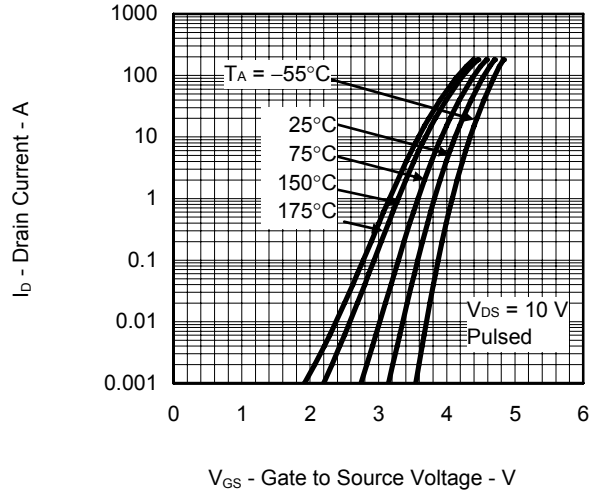
Typical Characteristics (T<sub>A</sub> = 25°C)



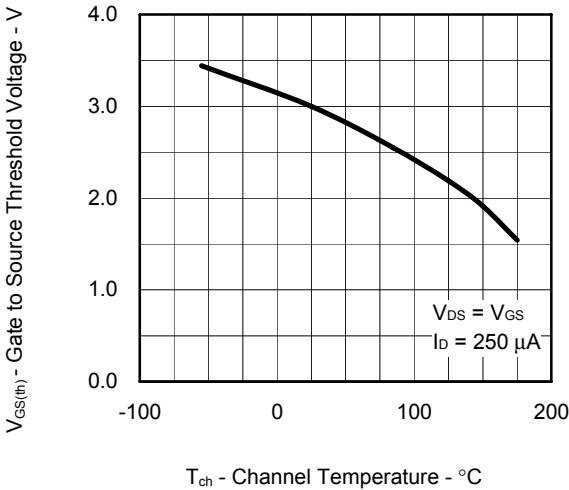
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



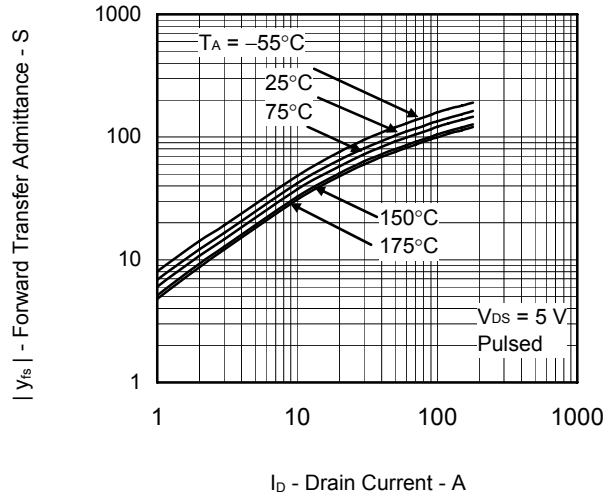
FORWARD TRANSFER CHARACTERISTICS



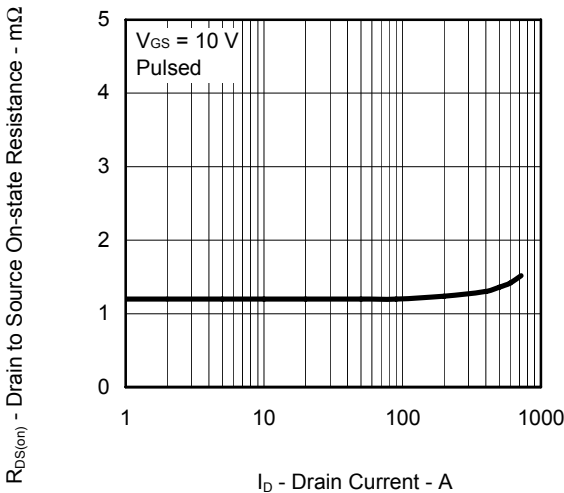
GATE TO SOURCE THRESHOLD VOLTAGE vs. CHANNEL TEMPERATURE



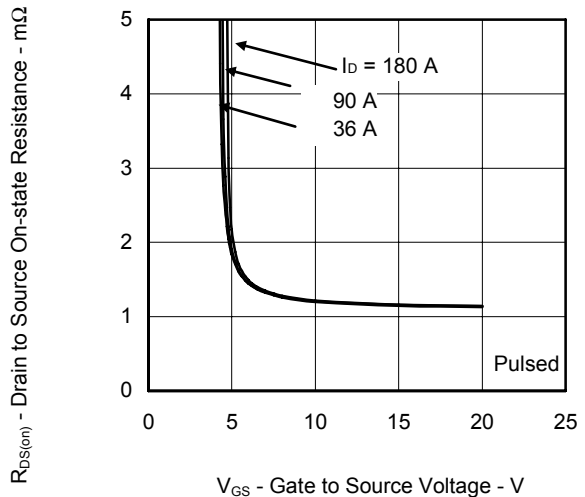
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



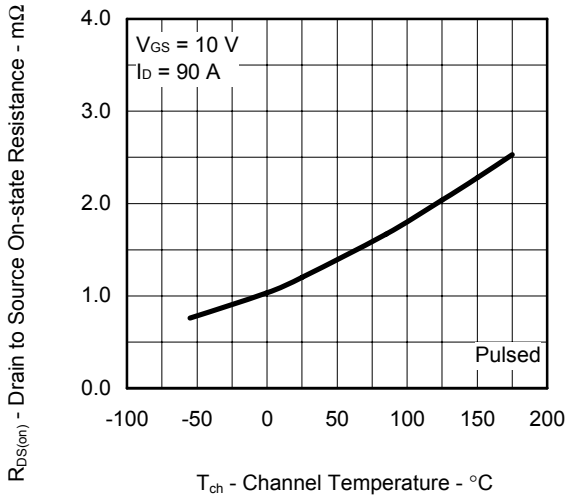
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



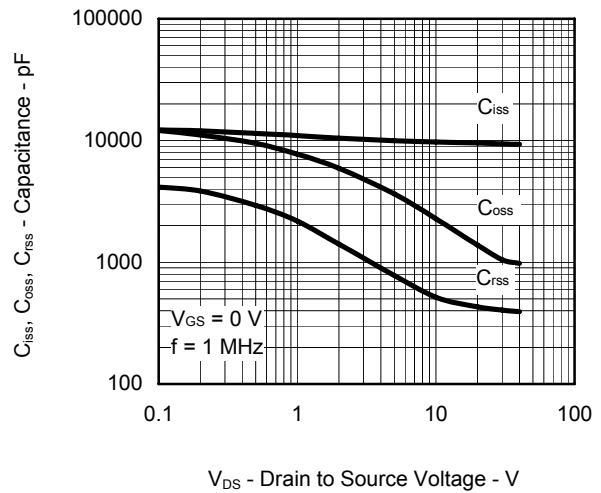
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



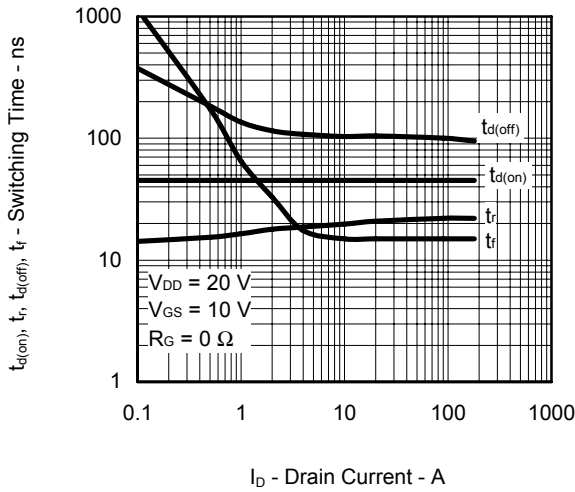
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



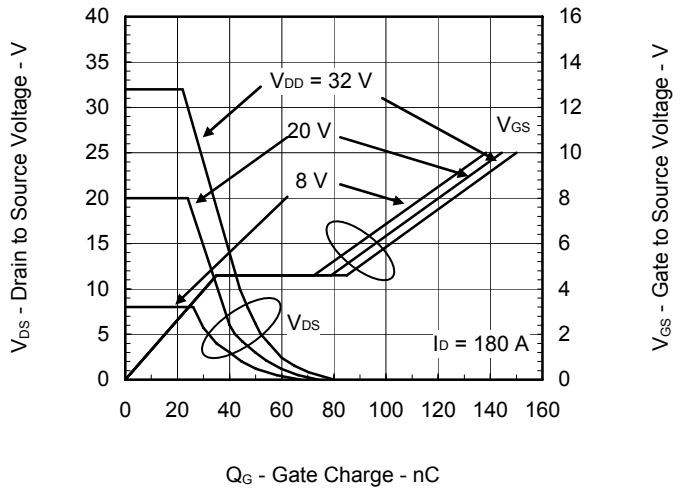
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



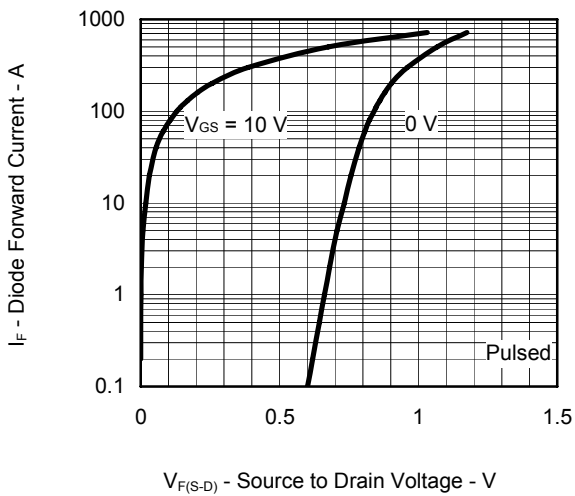
SWITCHING CHARACTERISTICS



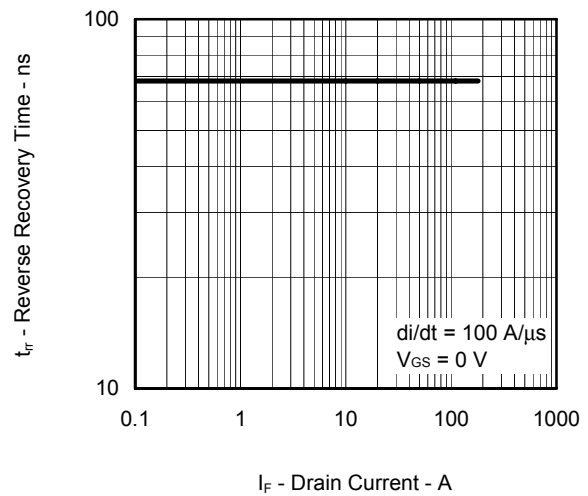
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

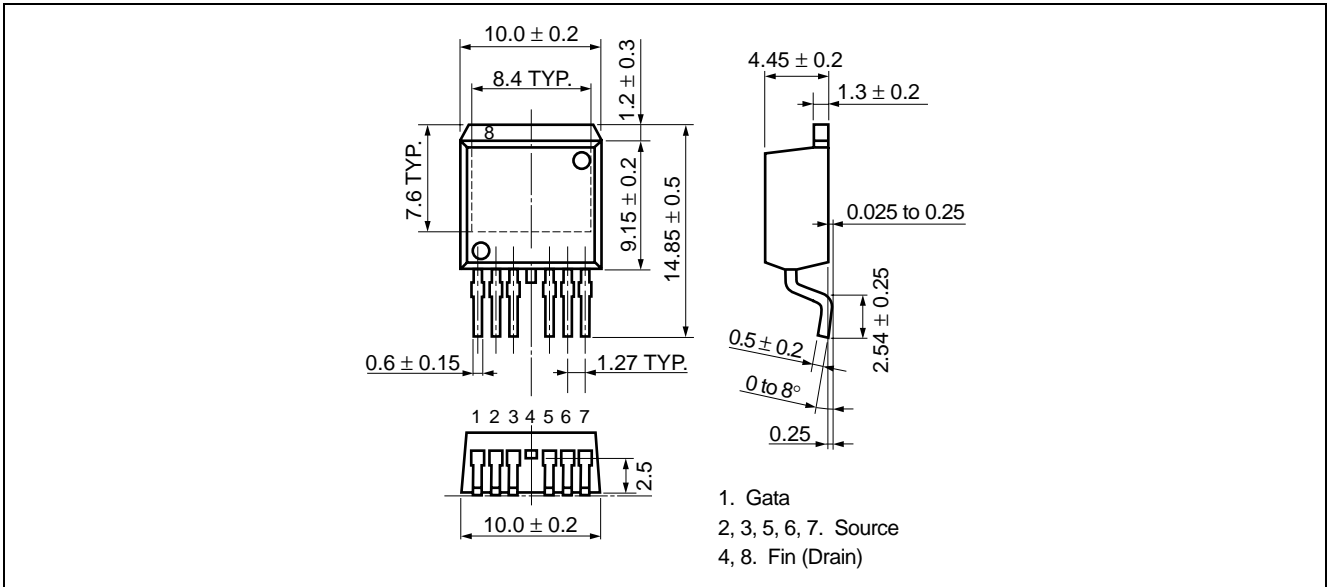


REVERSE RECOVERY TIME vs. DRAIN CURRENT

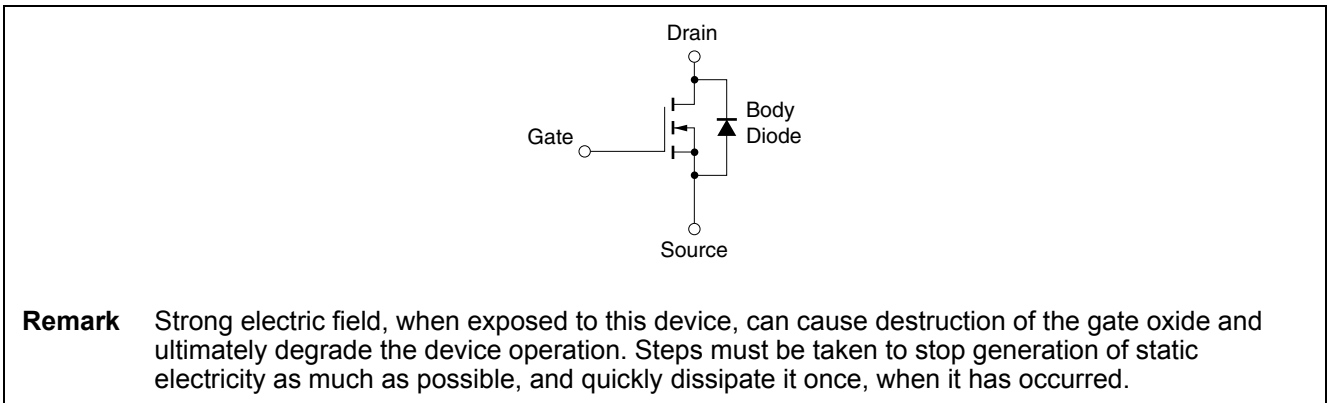


Package Drawings (Unit: mm)

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



Equivalent Circuit



<b>Revision History</b>	<b>NP180N04TUJ Data Sheet</b>
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<b>Rev.</b>	<b>Date</b>	<b>Description</b>	
		<b>Page</b>	<b>Summary</b>
1.00	Dec 17, 2010	-	First Edition Issued

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