

# N0604N

N-channel MOSFET  
60 V, 82 A, 6.5 mΩ

R07DS0850EJ0100  
Rev.1.00  
Aug 27, 2012

## Description

The N0604N is N-channel MOS Field Effect Transistor designed for high current switching applications.

## Features

- Low on-state resistance  
 $R_{DS(on)} = 6.5 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 41 \text{ A)}$
- Low input capacitance  
 $C_{iss} = 4150 \text{ pF TYP. (} V_{DS} = 25 \text{ V, } V_{GS} = 0 \text{ V)}$
- High current  
 $I_{D(DC)} = \pm 82 \text{ A}$
- RoHS Compliant

## Ordering Information

Part No.	Lead Plating	Packing	Package
N0604N-S19-AY*1	Pure Sn (Tin)	Tube 50 p/tube	TO-220 1.9 g TYP.

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

## Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ , all terminals are connected)

Item	Symbol	Ratings	Unit
Drain to Source Voltage ( $V_{GS} = 0 \text{ V}$ )	$V_{DSS}$	60	V
Gate to Source Voltage ( $V_{DS} = 0 \text{ V}$ )	$V_{GSS}$	$\pm 20$	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 82$	A
Drain Current (pulse) *1	$I_{D(pulse)}$	$\pm 200$	A
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T1}$	116	W
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_{T2}$	1.5	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$
Single Avalanche Current *2	$I_{AS}$	35	A
Single Avalanche Energy *2	$E_{AS}$	125	mJ

## Thermal Resistance

Channel to Case (Drain) Thermal Resistance  $R_{th(ch-C)}$  1.08  $^\circ\text{C/W}$   
 Channel to Ambient Thermal Resistance \*2  $R_{th(ch-A)}$  83.3  $^\circ\text{C/W}$

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

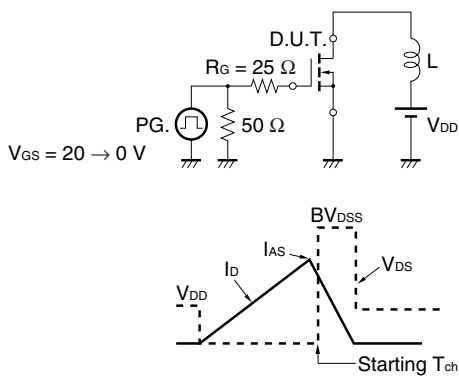
\*2. Starting  $T_{ch} = 25^\circ\text{C}$ ,  $R_G = 25 \Omega$ ,  $V_{DD} = 30 \text{ V}$ ,  $V_{GS} = 20 \rightarrow 0 \text{ V}$ ,  $L = 100 \mu\text{H}$

**Electrical Characteristics (T<sub>A</sub> = 25°C, all terminals are connected)**

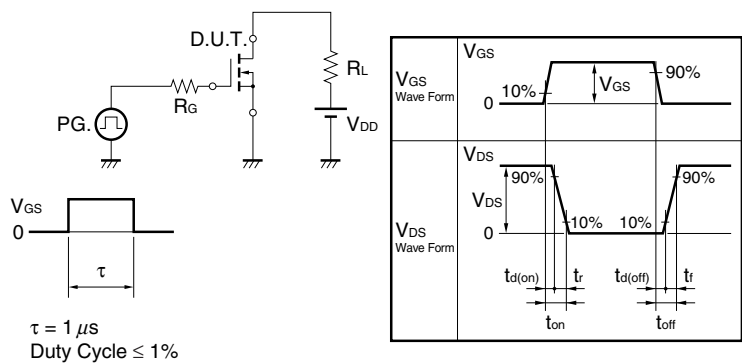
Item	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Zero Gate Voltage Drain Current	I <sub>DSS</sub>			1	μA	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V
Gate Leakage Current	I <sub>GSS</sub>			±100	nA	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V
Gate to Source Cut-off Voltage	V <sub>GS(off)</sub>	2.0		4.0	V	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA
Forward Transfer Admittance *1	y <sub>fs</sub>	30			S	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 41 A
Drain to Source On-state Resistance *1	R <sub>DS(on)</sub>		5.1	6.5	mΩ	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 41 A
Input Capacitance	C <sub>iSS</sub>		4150		pF	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz
Output Capacitance	C <sub>oSS</sub>		310		pF	
Reverse Transfer Capacitance	C <sub>rSS</sub>		165		pF	
Turn-on Delay Time	t <sub>d(on)</sub>		24		ns	V <sub>DD</sub> = 30 V, I <sub>D</sub> = 41 A, V <sub>GS</sub> = 10 V, R <sub>G</sub> = 0 Ω
Rise Time	t <sub>r</sub>		8		ns	
Turn-off Delay Time	t <sub>d(off)</sub>		64		ns	
Fall Time	t <sub>f</sub>		7		ns	
Total Gate Charge	Q <sub>G</sub>		75		nC	V <sub>DD</sub> = 48 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 82 A
Gate to Source Charge	Q <sub>GS</sub>		21		nC	
Gate to Drain Charge	Q <sub>GD</sub>		21		nC	
Body Diode Forward Voltage *1	V <sub>F(S-D)</sub>			1.5	V	I <sub>F</sub> = 82 A, V <sub>GS</sub> = 0 V
Reverse Recovery Time	t <sub>rr</sub>		38		ns	I <sub>F</sub> = 82 A, V <sub>GS</sub> = 0 V,
Reverse Recovery Charge	Q <sub>rr</sub>		39		nC	di/dt = 100 A/μs

Note: \*1. Pulsed

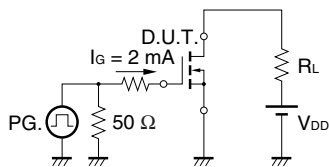
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



**TEST CIRCUIT 2 SWITCHING TIME**

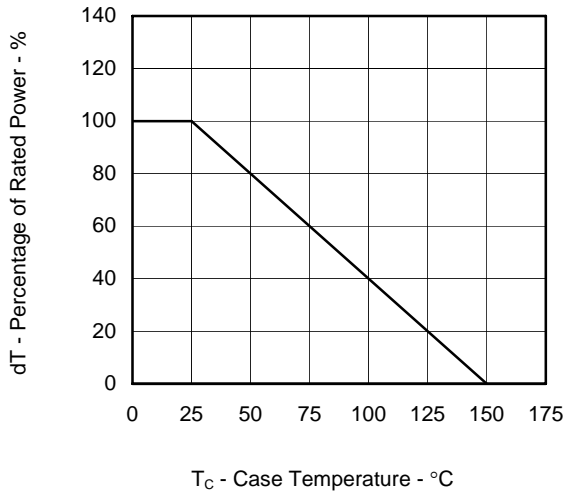


**TEST CIRCUIT 3 GATE CHARGE**

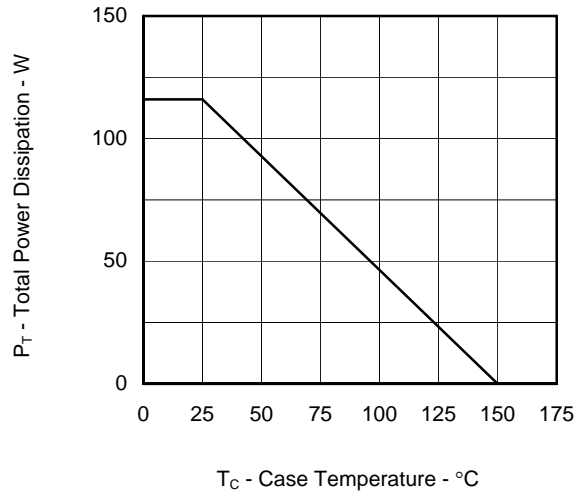


Typical Characteristics (T<sub>A</sub> = 25°C)

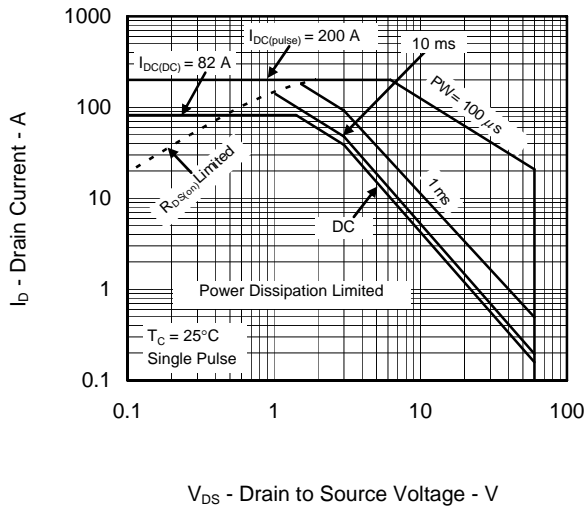
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



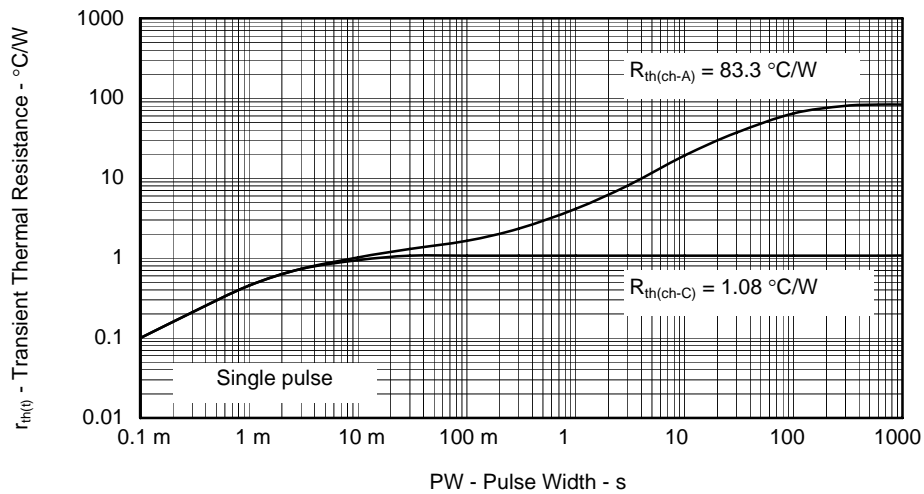
TOTAL POWER DISSIPATION vs. CASE TEMPERATURE



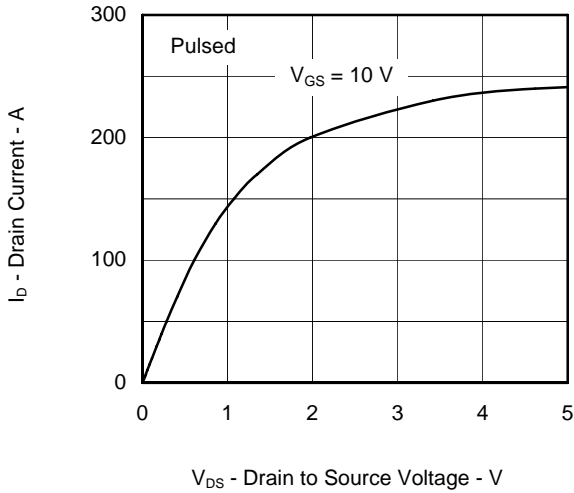
FORWARD BIAS SAFE OPERATING AREA



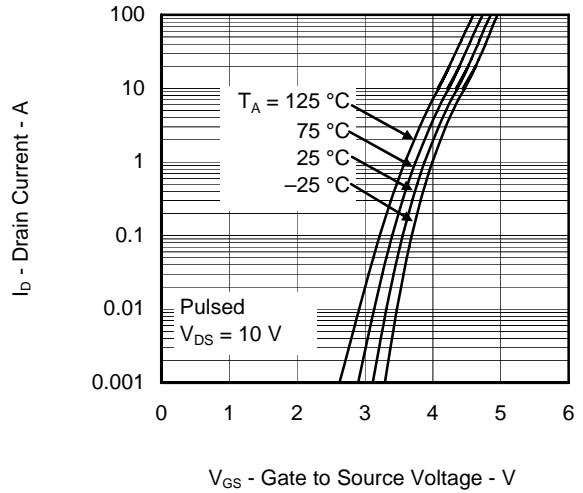
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



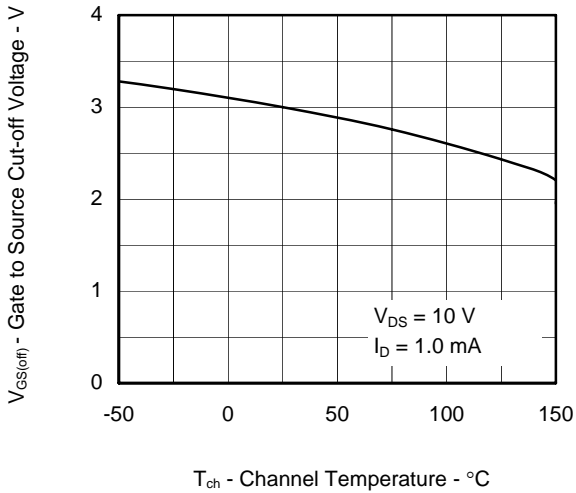
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



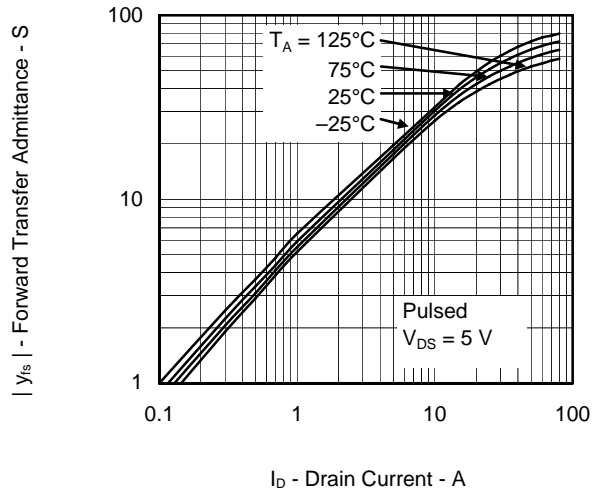
FORWARD TRANSFER CHARACTERISTICS



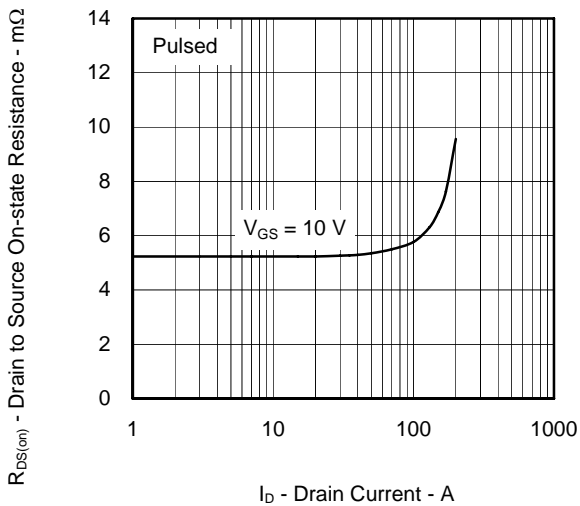
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



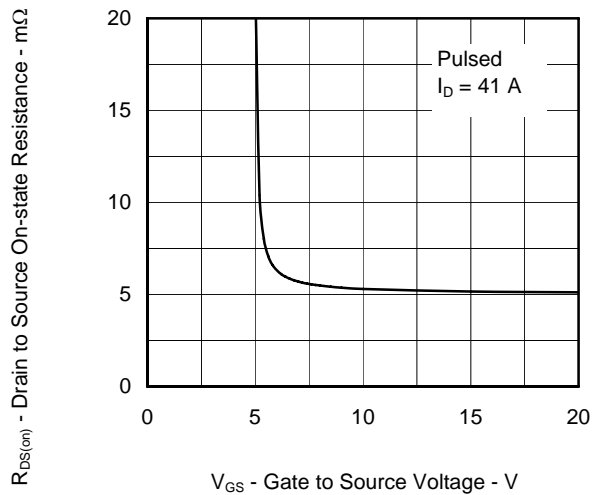
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



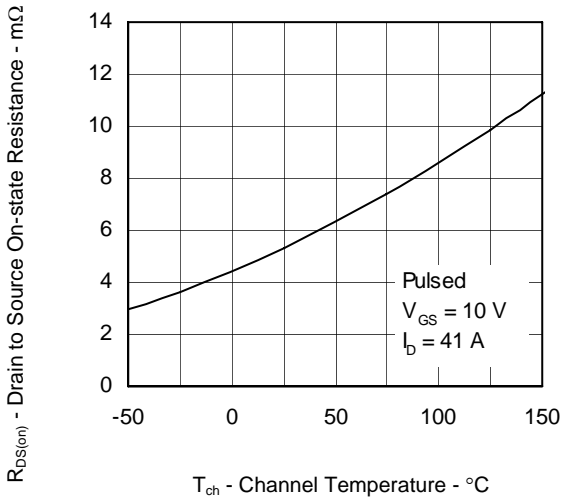
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



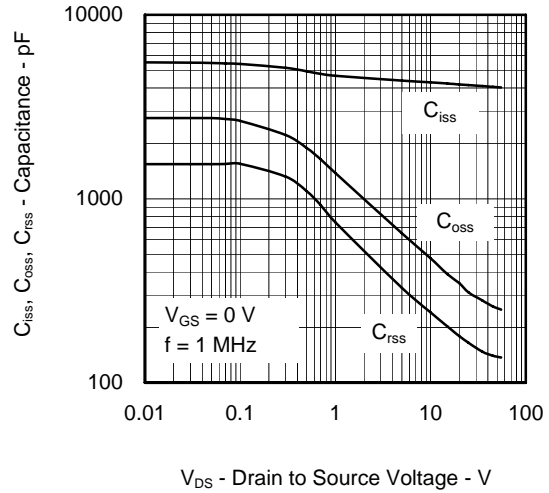
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



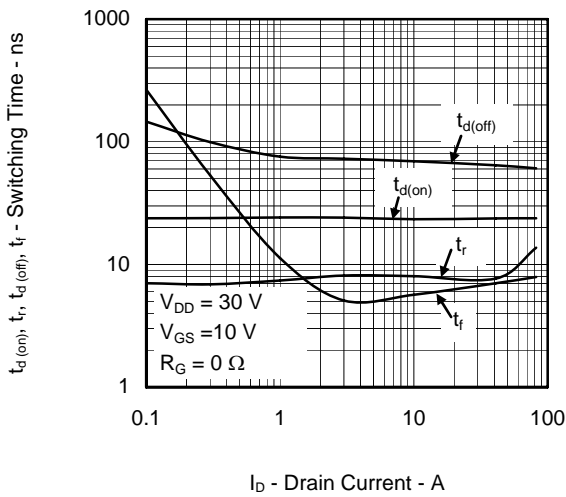
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



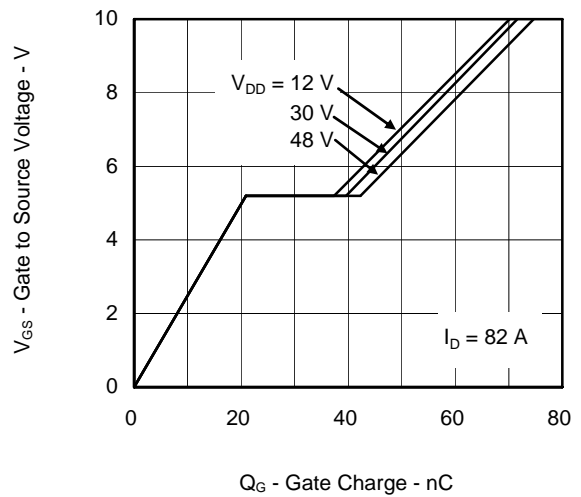
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



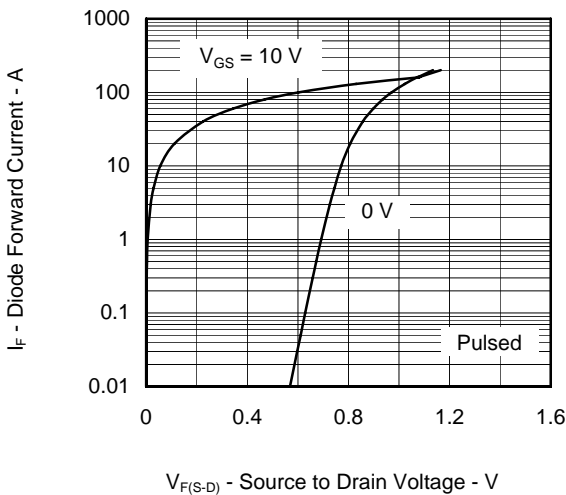
SWITCHING CHARACTERISTICS



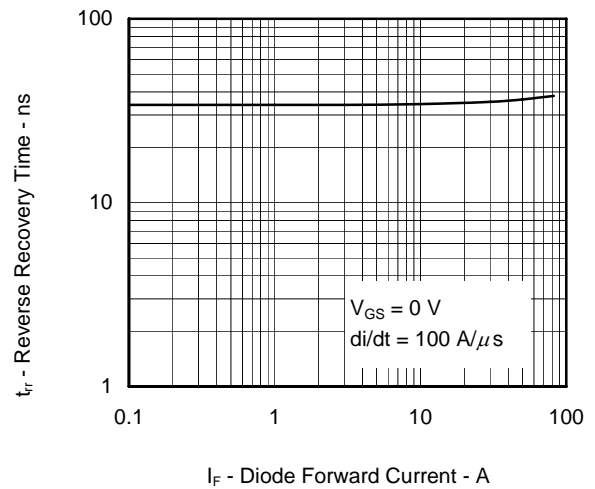
DYNAMIC INPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

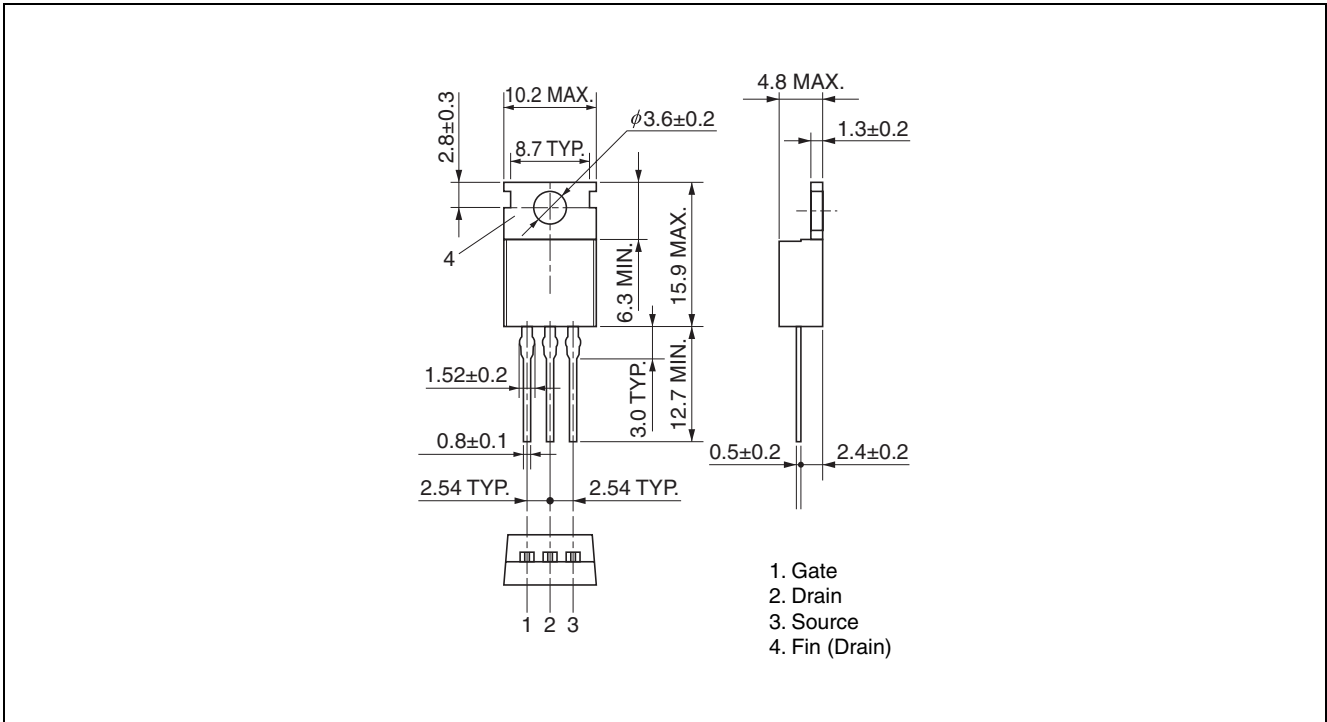


REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT

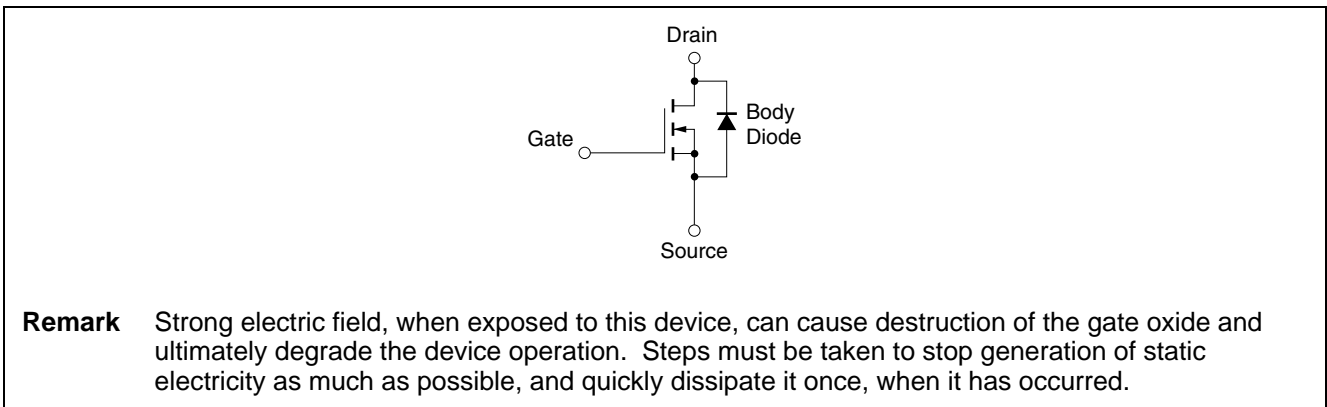


Package Drawing (Unit: mm)

TO-220



Equivalent Circuit



<b>Revision History</b>	<b>N0604N Data Sheet</b>
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Rev.	Date	Description	
		Page	Summary
1.00	Aug 27, 2012	-	First Edition Issued

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