

# μPA2816T1S

P-channel MOSFET

-30 V, -17 A, 15.5 mΩ

R07DS0778EJ0101

Rev.1.01

May 28, 2013

## Description

The μPA2816T1S is P-channel MOS Field Effect Transistor designed for DC/DC converter and power management applications of portable equipment.

## Features

- $V_{DSS} = -30\text{ V}$  ( $T_A = 25^\circ\text{C}$ )
- Low on-state resistance  
—  $R_{DS(on)} = 15.5\text{ m}\Omega\text{ MAX.}$  ( $V_{GS} = -10\text{ V}$ ,  $I_D = -17\text{ A}$ )
- 4.5 V Gate-drive available
- Small & thin type surface mount package with heat spreader
- Pb-free and Halogen free



HWSON-8

## Ordering Information

Part No.	LEAD PLATING	PACKING	Package
μPA2816T1S-E2-AT *1	Pure Sn	Tape 5000 p/reel	HWSON-8 typ. 0.022 g

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

## Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ )

Item	Symbol	Ratings	Unit
Drain to Source Voltage ( $V_{GS} = 0\text{ V}$ )	$V_{DSS}$	-30	V
Gate to Source Voltage ( $V_{DS} = 0\text{ V}$ )	$V_{GSS}$	-25 / +20	V
Drain Current (DC) ( $T_C = 25^\circ\text{C}$ )	$I_{D(DC)}$	±17	A
Drain Current (pulse) *1	$I_{D(pulse)}$	±68	A
Total Power Dissipation *2	$P_{T1}$	1.5	W
Total Power Dissipation (PW = 10 sec) *2	$P_{T2}$	3.8	W
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{T3}$	12	W
Channel Temperature	$T_{ch}$	150	°C
Storage Temperature	$T_{stg}$	-55 to +150	°C
Single Avalanche Current *3	$I_{AS}$	17	A
Single Avalanche Energy *3	$E_{AS}$	28.9	mJ

## Thermal Resistance

Channel to Ambient Thermal Resistance *2	$R_{th(ch-A)}$	83.3	°C/W
Channel to Case (Drain) Thermal Resistance	$R_{th(ch-C)}$	10.4	°C/W

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

\*2. Mounted on a glass epoxy board of 25.4 mm x 25.4 mm x 0.8 mm

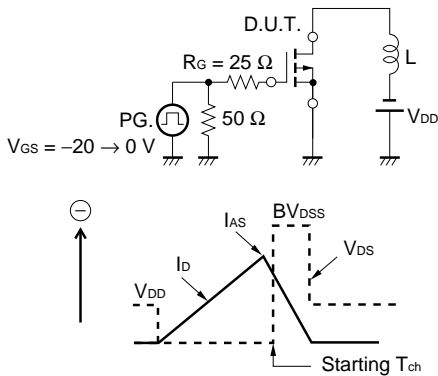
\*3. Starting  $T_{ch} = 25^\circ\text{C}$ ,  $V_{DD} = -15\text{ V}$ ,  $R_G = 25\ \Omega$ ,  $V_{GS} = -20 \rightarrow 0\text{ V}$ ,  $L = 100\ \mu\text{H}$

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

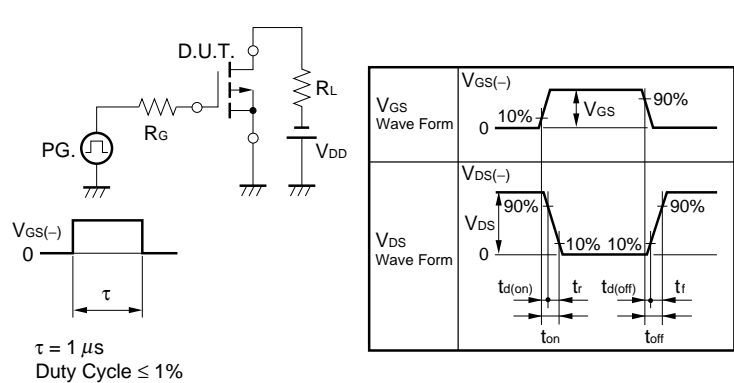
Item	Symbol	MIN.	TYP.	MAX.	Unit	Test Conditions
Zero Gate Voltage Drain Current	I <sub>DS</sub>			-1	μA	V <sub>DS</sub> = -30 V, V <sub>GS</sub> = 0 V
Gate Leakage Current	I <sub>GSS</sub>			±100	nA	V <sub>GS</sub> = -25/+20 V, V <sub>DS</sub> = 0 V
Gate Cut-off Voltage	V <sub>GS(off)</sub>	-1.0		-2.5	V	V <sub>DS</sub> = -10 V, I <sub>D</sub> = -1 mA
Forward Transfer Admittance *1	y <sub>fs</sub>	10			S	V <sub>DS</sub> = -5 V, I <sub>D</sub> = -8.5 A
Drain to Source On-state Resistance *1	R <sub>DS(on)1</sub>		12	15.5	mΩ	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -17 A
	R <sub>DS(on)2</sub>		25	45	mΩ	V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -7.0 A
Input Capacitance	C <sub>iSS</sub>		1160		pF	V <sub>DS</sub> = -10 V, V <sub>GS</sub> = 0 V, f = 1 MHz
Output Capacitance	C <sub>oSS</sub>		620		pF	
Reverse Transfer Capacitance	C <sub>rSS</sub>		560		pF	
Turn-on Delay Time	t <sub>d(on)</sub>		12		ns	V <sub>DD</sub> = -15 V, I <sub>D</sub> = -8.5 A, V <sub>GS</sub> = -10 V, R <sub>G</sub> = 10 Ω
Rise Time	t <sub>r</sub>		35		ns	
Turn-off Delay Time	t <sub>d(off)</sub>		55		ns	
Fall Time	t <sub>f</sub>		80		ns	
Total Gate Charge	Q <sub>G</sub>		33.4		nC	V <sub>DD</sub> = -24 V, V <sub>GS</sub> = -10 V, I <sub>D</sub> = -17 A
Gate to Source Charge	Q <sub>GS</sub>		3.6		nC	
Gate to Drain Charge	Q <sub>GD</sub>		18.4		nC	
Body Diode Forward Voltage *1	V <sub>F(S-D)</sub>		0.9		V	I <sub>F</sub> = 17 A, V <sub>GS</sub> = 0 V
Reverse Recovery Time	t <sub>rr</sub>		100		ns	I <sub>F</sub> = 17 A, V <sub>GS</sub> = 0 V, di/dt = 100 A/μs
Reverse Recovery Charge	Q <sub>rr</sub>		99		nC	

Note: \*1. Pulsed

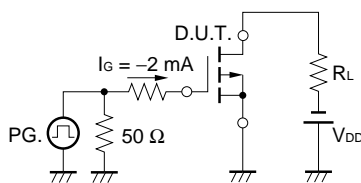
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



**TEST CIRCUIT 2 SWITCHING TIME**

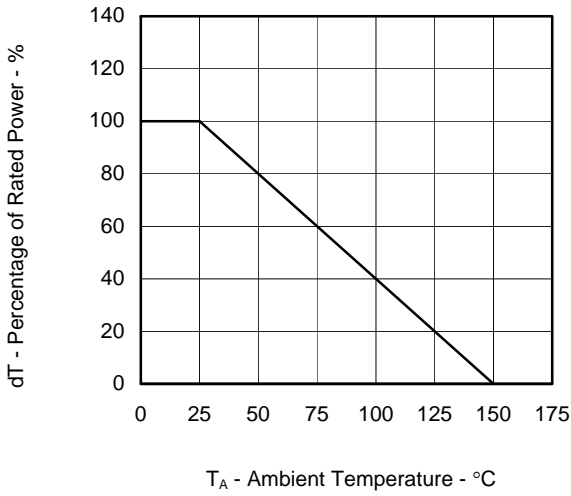


**TEST CIRCUIT 3 GATE CHARGE**

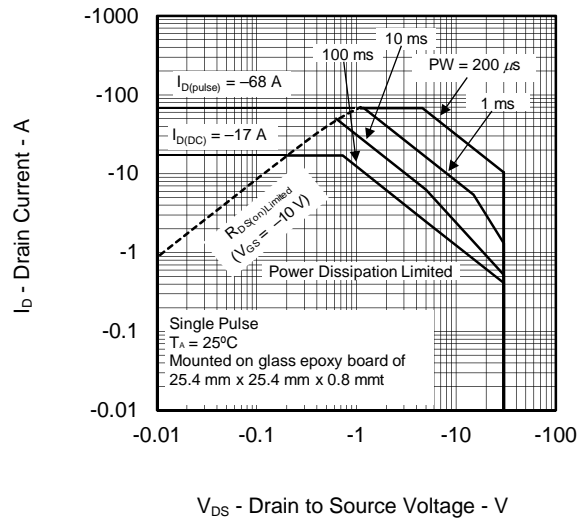


Typical Characteristics (T<sub>A</sub> = 25°C)

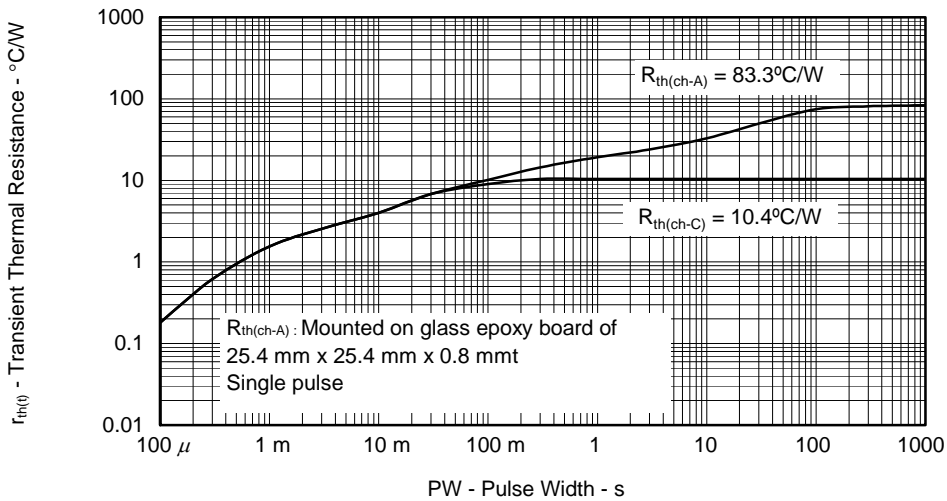
DERATING FACTOR OF FORWARD BIAS SAFE OPERATING AREA



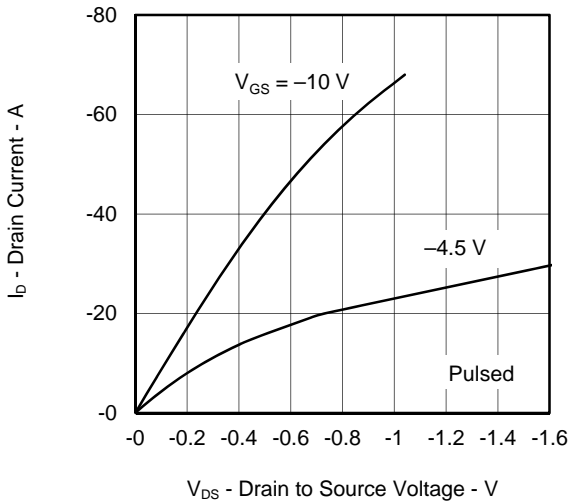
FORWARD BIAS SAFE OPERATING AREA



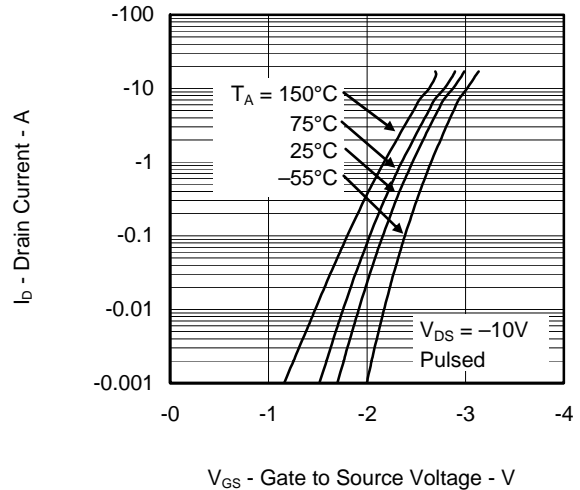
TRANSIENT THERMAL RESISTANCE vs. PULSE WIDTH



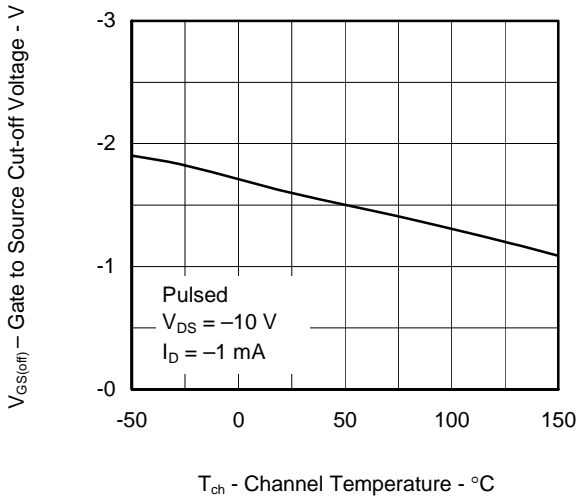
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



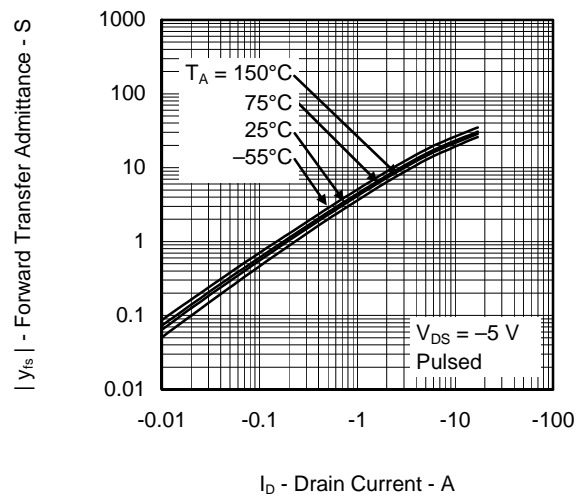
FORWARD TRANSFER CHARACTERISTICS



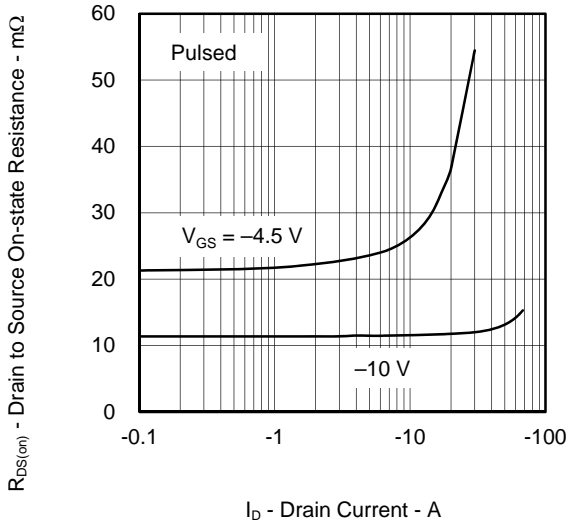
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



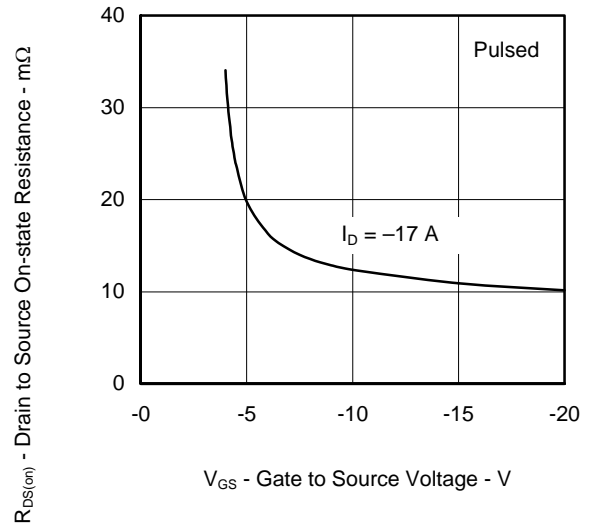
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



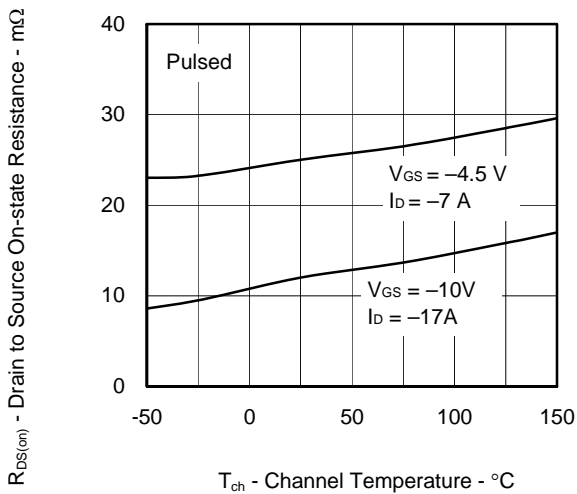
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



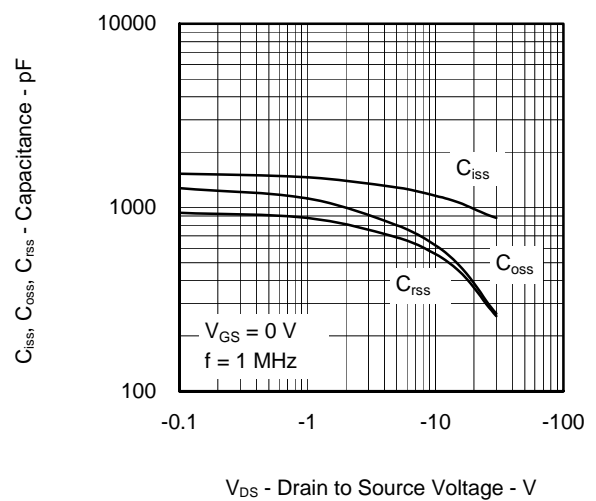
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



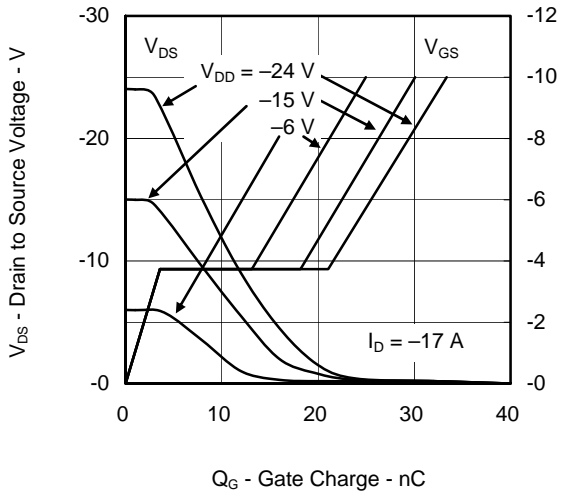
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



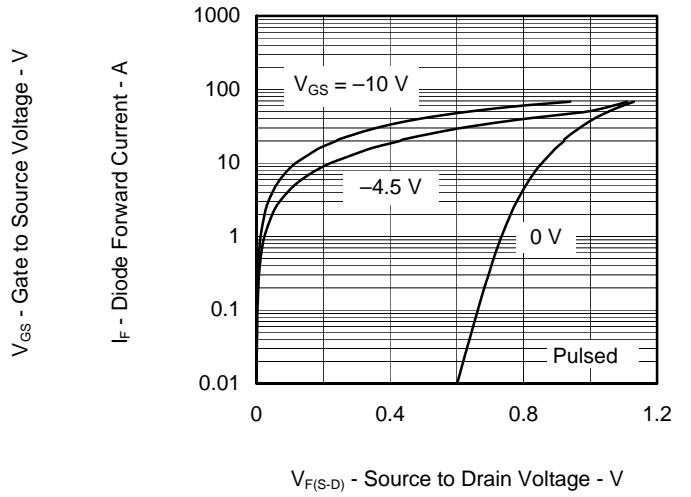
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



**DYNAMIC INPUT/OUTPUT CHARACTERISTICS**

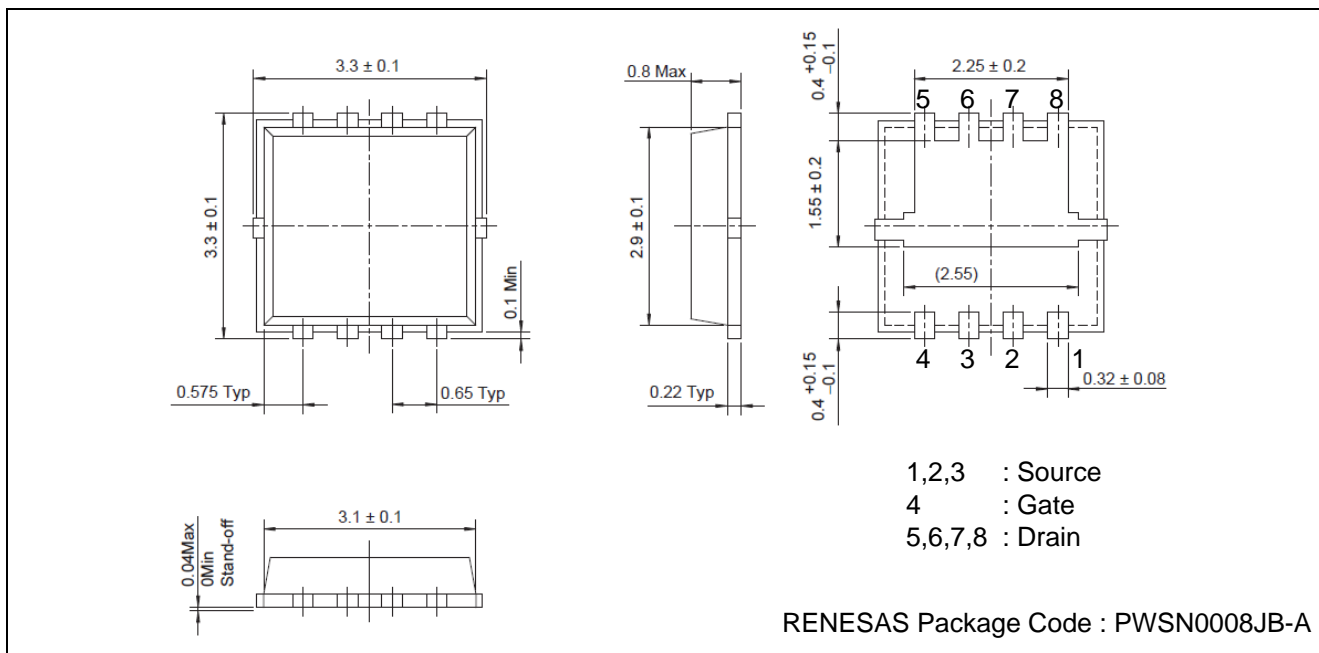


**SOURCE TO DRAIN DIODE FORWARD VOLTAGE**

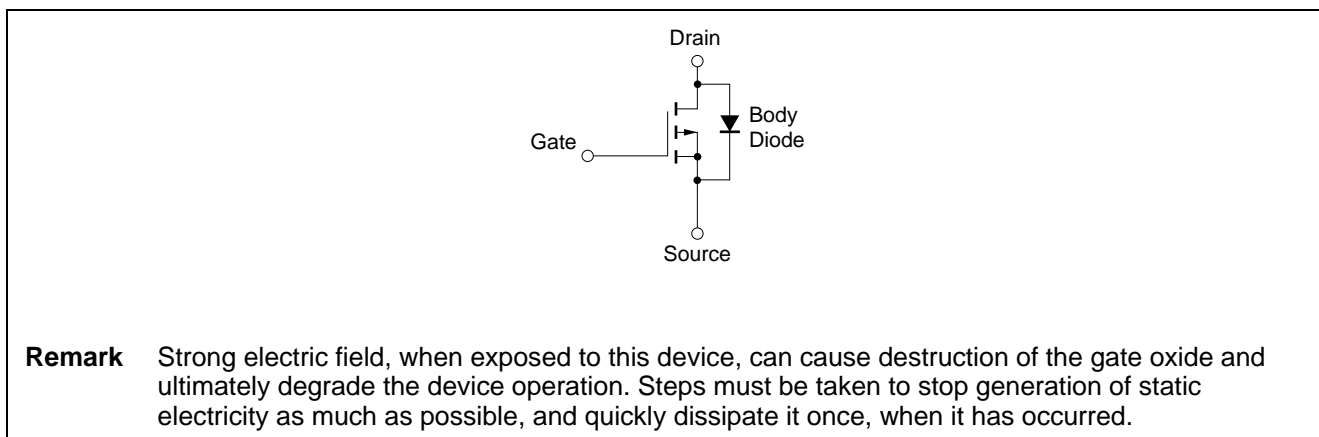


### Package Drawings (Unit: mm)

#### HWSO-8



### Equivalent Circuit



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