

TOSHIBA FIELD EFFECT TRANSISTOR SILICON N, P CHANNEL MOS TYPE (U-MOSII)

## TPC8403

MOTOR DRIVE  
NOTE BOOK PC  
PORTABLE DEVICES

INDUSTRIAL APPLICATIONS  
Unit in mm

- Low Drain-Source ON Resistance  
: P CHANNEL  $R_{DS(ON)} = 45 \text{ m}\Omega$  (Typ.)  
N CHANNEL  $R_{DS(ON)} = 25 \text{ m}\Omega$  (Typ.)
- High Forward Transfer Admittance  
: P CHANNEL  $|Y_{fs}| = 6.2 \text{ S}$  (Typ.)  
N CHANNEL  $|Y_{fs}| = 7.8 \text{ S}$  (Typ.)
- Low Leakage Current  
: P CHANNEL  $I_{DSS} = -10 \mu\text{A}$  ( $V_{DS} = -30 \text{ V}$ )  
N CHANNEL  $I_{DSS} = 10 \mu\text{A}$  ( $V_{DS} = 30 \text{ V}$ )
- Enhancement-Mode  
: P CHANNEL  $V_{th} = -1.0 \sim -2.2 \text{ V}$  ( $V_{DS} = -10 \text{ V}$ ,  $I_D = -1 \text{ mA}$ )  
N CHANNEL  $V_{th} = 1.3 \sim 2.5 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

CHARACTERISTIC		SYMBOL	RATING		UNIT
			P CHANNEL	N CHANNEL	
Drain-Source Voltage		$V_{DSS}$	-30	30	V
Drain-Gate Voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	-30	30	V
Gate-Source Voltage		$V_{GSS}$	$\pm 20$	$\pm 20$	V
Drain Current	DC	$I_D$	-4.5	6	A
	Pulse	$I_{DP}$	-18	24	A
Drain Power Dissipation**** ( $T_a = 25^\circ\text{C}$ )		$P_D$	2.0		W
Single Pulse Avalanche Energy		$E_{AS}$	26.3**	46.8***	mJ
Avalanche Current		$I_{AR}$	-4.5	6	A
Repetitive Avalanche Energy*		$E_{AR}$	0.2		mJ
Channel Temperature		$T_{ch}$	150		$^\circ\text{C}$
Storage Temperature Range		$T_{stg}$	$-55 \sim 150$		$^\circ\text{C}$

## THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Ambient****	$R_{th(ch-a)}$	62.5	$^\circ\text{C/W}$

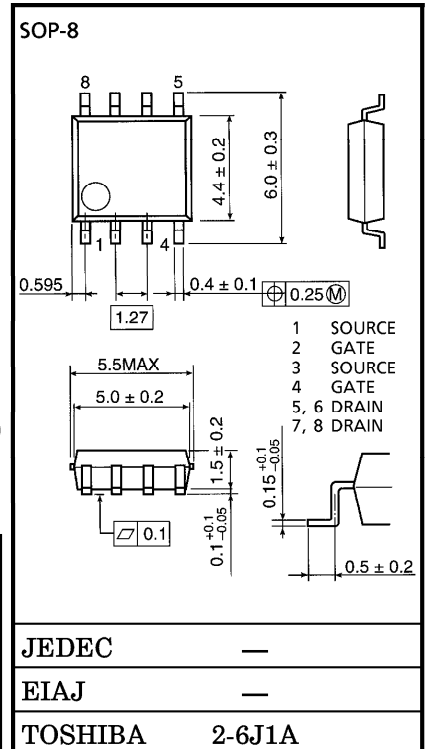
Note ;

- \* Repetitive rating ; Pulse Width Limited by Max. Junction temperature.
- \*\*  $V_{DD} = -24 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 1.0 \text{ mH}$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = -4.5 \text{ A}$
- \*\*\*  $V_{DD} = 24 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 1.0 \text{ mH}$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 6.0 \text{ A}$
- \*\*\*\* Drive operation ; Mount on glass epoxy board [ $1 \text{ inch}^2 \times 0.8 \text{ t}$ ] in the two devices driving ( $t = 10 \text{ s}$ )

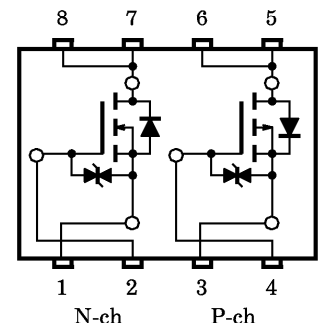
This transistor is an electrostatic sensitive device. Please handle with caution.

961001EAA2

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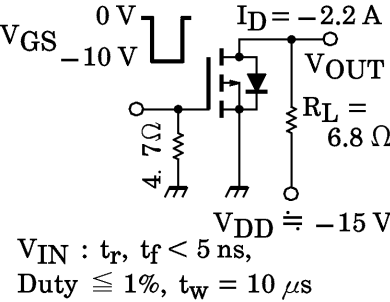


## CIRCUIT CONFIGURATION



P-ch

## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

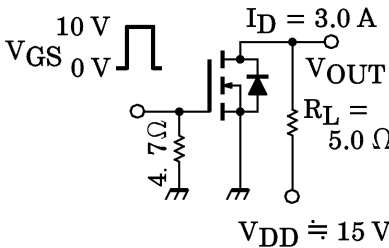
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I <sub>GSS</sub>	V <sub>GS</sub> = ±16 V, V <sub>DS</sub> = 0 V	—	—	±10	μA
Drain Cut-Off Current		I <sub>DSS</sub>	V <sub>DS</sub> = −30 V, V <sub>GS</sub> = 0 V	—	—	−10	μA
Drain-Source Breakdown Voltage		V (BR) DSS	I <sub>D</sub> = −10 mA, V <sub>GS</sub> = 0 V	−30	—	—	V
		V (BR) DSX	I <sub>D</sub> = −10 mA, V <sub>GS</sub> = 20 V	−15	—	—	
Gate Threshold Voltage		V <sub>th</sub>	V <sub>DS</sub> = −10 V, I <sub>D</sub> = −1 mA	−1.0	—	−2.2	V
Drain-Source ON Resistance		R <sub>DS</sub> (ON)	V <sub>GS</sub> = −4.5 V, I <sub>D</sub> = −2.2 A	—	66	90	mΩ
		R <sub>DS</sub> (ON)	V <sub>GS</sub> = −10 V, I <sub>D</sub> = −2.2 A	—	45	55	
Forward Transfer Admittance		Y <sub>fs</sub>	V <sub>DS</sub> = −10 V, I <sub>D</sub> = −2.2 A	3.1	6.2	—	S
Input Capacitance		C <sub>iss</sub>	V <sub>DS</sub> = −10 V, V <sub>GS</sub> = 0 V, f = 1 MHz	—	940	—	pF
Reverse Transfer Capacitance		C <sub>rss</sub>		—	270	—	
Output Capacitance		C <sub>oss</sub>		—	390	—	
Switching Time	Rise Time	t <sub>r</sub>		—	13	—	ns
	Turn-On Time	t <sub>on</sub>		—	21	—	
	Fall Time	t <sub>f</sub>		—	25	—	
	Turn-Off Time	t <sub>off</sub>		V <sub>IN</sub> : t <sub>r</sub> , t <sub>f</sub> < 5 ns, Duty ≤ 1%, t <sub>w</sub> = 10 μs	—	73	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q <sub>g</sub>	V <sub>DD</sub> ≐ −24 V, V <sub>GS</sub> = −10 V I <sub>D</sub> = −4.5 A	—	18	—	nC
Gate-Source Charge		Q <sub>gs</sub>		—	14	—	
Gate-Drain (“Miller”) Charge		Q <sub>gd</sub>		—	4	—	

## SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	—	—	—	-4.5	A
Pulse Drain Reverse Current	$I_{DRP}$	—	—	—	-18	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR} = -4.5 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	1.2	V

N-ch

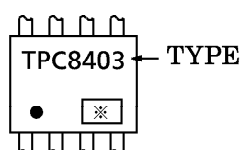
## ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I <sub>GSS</sub>	V <sub>GS</sub> = ±16 V, V <sub>DS</sub> = 0 V	—	—	±10	μA
Drain Cut-Off Current		I <sub>DSS</sub>	V <sub>DS</sub> = 30 V, V <sub>GS</sub> = 0 V	—	—	10	μA
Drain-Source Breakdown Voltage	V (BR) DSS	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V	30	—	—	V	
	V (BR) DSX	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = −20 V	15	—	—	V	
Gate Threshold Voltage		V <sub>th</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.3	—	2.5	V
Drain-Source ON Resistance		R <sub>DS(ON)</sub>	V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 3 A	—	38	46	mΩ
		R <sub>DS(ON)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3 A	—	25	33	mΩ
Forward Transfer Admittance		Y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 3 A	3.9	7.8	—	S
Input Capacitance		C <sub>iss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz	—	850	—	pF
Reverse Transfer Capacitance		C <sub>rss</sub>		—	180	—	
Output Capacitance		C <sub>oss</sub>		—	270	—	
Switching Time	Rise Time	t <sub>r</sub>	 <p>V<sub>IN</sub> : t<sub>r</sub>, t<sub>f</sub> &lt; 5 ns Duty ≤ 1%, t<sub>w</sub> = 10 μs</p>	—	11	—	ns
	Turn-On Time	t <sub>on</sub>		—	18	—	
	Fall Time	t <sub>f</sub>		—	6.5	—	
	Turn-Off Time	t <sub>off</sub>		—	27	—	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q <sub>g</sub>	V <sub>DD</sub> ≐ 24 V, V <sub>GS</sub> = 10 V I <sub>D</sub> = 6 A	—	17	—	nC
Gate-Source Charge		Q <sub>gs</sub>		—	13	—	
Gate-Drain (“Miller”) Charge		Q <sub>gd</sub>		—	4	—	


## SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS (Ta = 25°C)


CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	$I_{DR}$	—	—	—	6	A
Pulse Drain Reverse Current	$I_{DRP}$	—	—	—	24	A
Diode Forward Voltage	$V_{DSF}$	$I_{DR} = 6 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.2	V

## MARKING



※ Lot Number


 Month (Starting from Alphabet A)


 Year (Last Number of the Christian Era)