

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	A
	Pulse	$I_{DP}$	-18	A
Drain Power Dissipation ( $T_a = 25^\circ\text{C}$ )	$P_D$ 1)	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	$T_{stg}$	$-55 \sim 150$		$^\circ\text{C}$

1) Mount on glass epoxy board [ $1 \text{ inch}^2 \times 0.8 \text{ t}$ ]

Note ;

\* Repetitive rating ; Pulse Width Limited by Max. Junction temperature.

\*\*  $V_{DD} = -24 \text{ V}$ , Starting  $T_{ch} = 25^\circ\text{C}$ ,  $L = 1.0 \text{ mH}$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = -4.5 \text{ A}$ \*\*\*  $V_{DD} = 24 \text{ V}$ , Starting  $T_{ch} = 25^\circ\text{C}$ ,  $L = 1.0 \text{ mH}$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 6.0 \text{ A}$ 

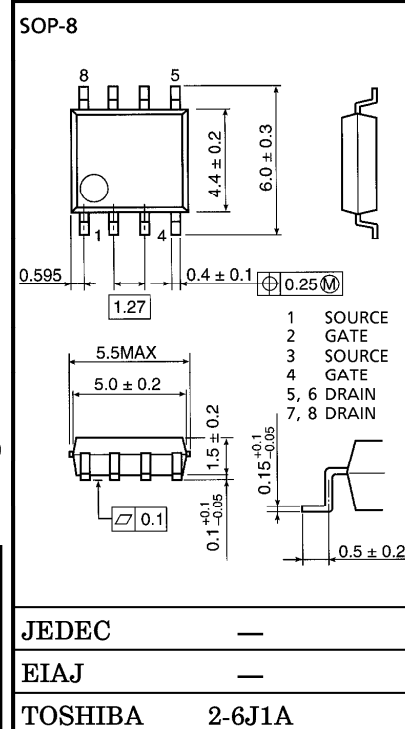
## THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance, Channel to Ambient	$R_{th(ch-a)}^{1)}$	62.5	$^\circ\text{C/W}$

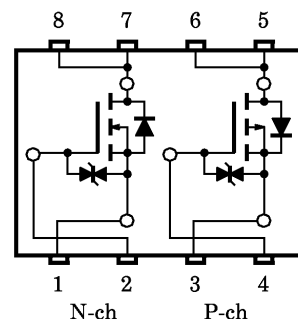
This transistor is an electrostatic sensitive device. Please handle with caution.

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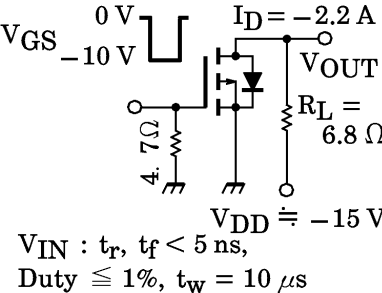


## CIRCUIT CONFIGURATION



P-ch

ELECTRICAL CHARACTERISTICS (Ta = 25°C)

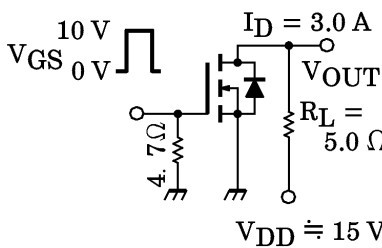
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain Cut-Off Current		$I_{DSS}$	$V_{DS} = -30 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	-10	$\mu\text{A}$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D = -10 \text{ mA}, V_{GS} = 0 \text{ V}$	-30	—	—	V
		$V_{(BR)DSX}$	$I_D = -10 \text{ mA}, V_{GS} = 20 \text{ V}$	-15	—	—	
Gate Threshold Voltage		$V_{th}$	$V_{DS} = -10 \text{ V}, I_D = -1 \text{ mA}$	-1.0	—	-2.2	V
Drain-Source ON Resistance		$R_{DS(ON)}$	$V_{GS} = -4.5 \text{ V}, I_D = -2.2 \text{ A}$	—	66	90	$\text{m}\Omega$
		$R_{DS(ON)}$	$V_{GS} = -10 \text{ V}, I_D = -2.2 \text{ A}$	—	45	55	
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS} = -10 \text{ V}, I_D = -2.2 \text{ A}$	3.1	6.2	—	S
Input Capacitance		$C_{iss}$	$V_{DS} = -10 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1 \text{ MHz}$	—	940	—	pF
Reverse Transfer Capacitance		$C_{rss}$		—	270	—	
Output Capacitance		$C_{oss}$		—	390	—	
Switching Time	Rise Time	$t_r$	 <p><math>V_{IN} : t_r, t_f &lt; 5 \text{ ns},</math> <math>\text{Duty} \leq 1\%, t_w = 10 \mu\text{s}</math></p>	—	13	—	ns
	Turn-On Time	$t_{on}$		—	21	—	
	Fall Time	$t_f$		—	25	—	
	Turn-Off Time	$t_{off}$		—	73	—	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{DD} = -24 \text{ V}, V_{GS} = -10 \text{ V}$ $I_D = -4.5 \text{ A}$	—	18	—	nC
Gate-Source Charge		$Q_{gs}$		—	14	—	
Gate-Drain ("Miller") Charge		$Q_{gd}$		—	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

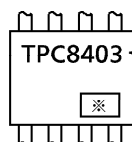
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		$I_{GSS}$	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain Cut-Off Current		$I_{DSS}$	$V_{DS} = 30 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	10	$\mu\text{A}$
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	30	—	—	V
		$V_{(BR)DSX}$	$I_D = 10 \text{ mA}, V_{GS} = -20 \text{ V}$	15	—	—	V
Gate Threshold Voltage		$V_{th}$	$V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$	1.3	—	2.5	V
Drain-Source ON Resistance		$R_{DS(ON)}$	$V_{GS} = 4.5 \text{ V}, I_D = 3 \text{ A}$	—	38	46	$\text{m}\Omega$
		$R_{DS(ON)}$	$V_{GS} = 10 \text{ V}, I_D = 3 \text{ A}$	—	25	33	$\text{m}\Omega$
Forward Transfer Admittance		$ Y_{fs} $	$V_{DS} = 10 \text{ V}, I_D = 3 \text{ A}$	3.9	7.8	—	S
Input Capacitance		$C_{iss}$	$V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1 \text{ MHz}$	—	850	—	pF
Reverse Transfer Capacitance		$C_{rss}$		—	180	—	
Output Capacitance		$C_{oss}$		—	270	—	
Switching Time	Rise Time	$t_r$	 <p><math>I_D = 3.0 \text{ A}</math> <math>R_L = 5.0 \Omega</math> <math>V_{DD} \doteq 15 \text{ V}</math></p>	—	11	—	ns
	Turn-On Time	$t_{on}$		—	18	—	
	Fall Time	$t_f$		—	6.5	—	
	Turn-Off Time	$t_{off}$		$V_{IN} : t_r, t_f < 5 \text{ ns}$ $\text{Duty} \leq 1\%, t_w = 10 \mu\text{s}$	—	27	
Total Gate Charge (Gate-Source Plus Gate-Drain)		$Q_g$	$V_{DD} \doteq 24 \text{ V}, V_{GS} = 10 \text{ V}$ $I_D = 6 \text{ A}$	—	17	—	nC
Gate-Source Charge		$Q_{gs}$		—	13	—	
Gate-Drain (“Miller”) Charge		$Q_{gd}$		—	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



TYPE

※ Lot Number



Month (Starting from Alphabet A)

Year (Last Number of the Christian Era)