

TOSHIBA POWER MOS FET MODULE SILICON P CHANNEL MOS TYPE (L²- π -MOSV 4 IN 1)

MP4211

HIGH POWER, HIGH SPEED SWITCHING APPLICATIONS
FOR PRINTER HEAD PIN DRIVER AND PULSE MOTOR DRIVER
FOR SOLENOID DRIVER

INDUSTRIAL APPLICATIONS

Unit in mm

- 4 V Gate Drive Available
- Small Package by Full Molding (SIP 10 Pin)
- High Drain Power Dissipation (4 Devices Operation)
: $P_T = 4\text{ W}$ ($T_a = 25^\circ\text{C}$)
- Low Drain-Source ON Resistance : $R_{DS(ON)} = 0.16\ \Omega$ (typ.)
- High Forward Transfer Admittance : $|Y_{fs}| = 4.0\text{ S}$ (typ.)
- Low Leakage Current : $I_{GSS} = \pm 10\ \mu\text{A}$ (max.) ($V_{GS} = \pm 16\text{ V}$)
 $I_{DSS} = -100\ \mu\text{A}$ (max.) ($V_{DS} = -60\text{ V}$)
- Enhancement-Mode : $V_{th} = -0.8 \sim -2.0\text{ V}$
($V_{DS} = -10\text{ V}$, $I_D = -1\text{ mA}$)

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

CHARACTERISTIC		SYMBOL	RATING	UNIT
Drain-Source Voltage		V_{DSS}	-60	V
Drain-Gate Voltage ($R_{GS} = 20\text{ k}\Omega$)		V_{DGR}	-60	V
Gate-Source Voltage		V_{GSS}	± 20	V
Drain Current	DC	I_D	-5	A
	Pulse	I_{DP}	-20	
Drain Power Dissipation (1 Device Operation, $T_a = 25^\circ\text{C}$)		P_D	2.0	W
Drain Power Dissipation (4 Devices Operation, $T_a = 25^\circ\text{C}$)		P_{DT}	4.0	W
Single Pulse Avalanche Energy*		E_{AS}	273	mJ
Avalanche Current		I_{AR}	-5	A
Repetitive Avalanche Energy**	1 Device Operation	E_{AR}	0.2	mJ
	4 Devices Operation	E_{ART}	0.4	
Channel Temperature		T_{ch}	150	$^\circ\text{C}$
Storage Temperature Range		T_{stg}	-55~150	$^\circ\text{C}$

Note ;

* Avalanche energy (single pulse) applied condition

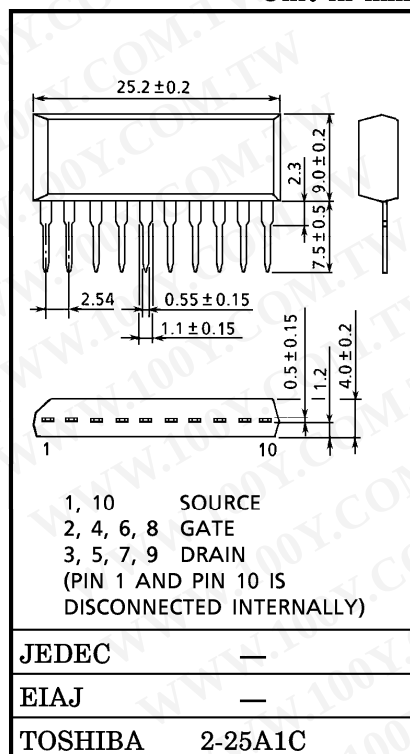
 $V_{DD} = -25\text{ V}$, Starting $T_{ch} = 25^\circ\text{C}$, $L = 14.84\text{ mH}$, $R_G = 25\ \Omega$, $I_{AR} = -5\text{ A}$

** Repetitive rating ; Pulse Width Limited by maximum channel temperature.

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

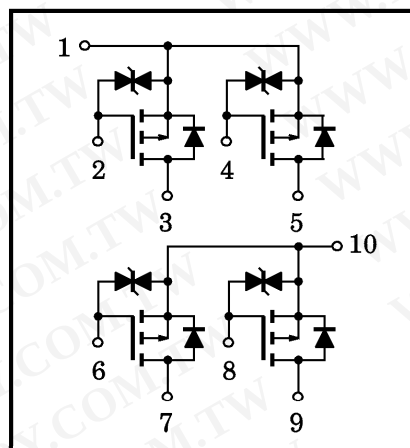
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Weight : 2.1 g (typ.)

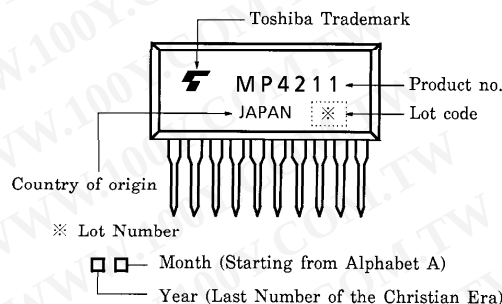
ARRAY CONFIGURATION



THERMAL CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MAX.	UNIT
Thermal Resistance of Channel to Ambient (4 Devices Operation, $T_a = 25^\circ\text{C}$)	$\Sigma R_{th(ch-a)}$	31.2	$^\circ\text{C/W}$
Maximum Lead Temperature for Soldering Purposes (3.2 mm from Case for $t = 10$ s)	T_L	260	$^\circ\text{C}$

MARKING

ELECTRICAL CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current	I_{GSS}	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 10	μA
Drain Cut-off Current	I_{DSS}	$V_{DS} = -60\text{ V}, V_{GS} = 0\text{ V}$	—	—	-100	μA
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	$I_D = -10\text{ mA}, V_{GS} = 0\text{ V}$	-60	—	—	V
Gate Threshold Voltage	V_{th}	$V_{DS} = -10\text{ V}, I_D = -1\text{ mA}$	-0.8	—	-2.0	V
Drain-Source ON Resistance	$R_{DS(ON)}$	$V_{GS} = -4\text{ V}, I_D = -2.5\text{ A}$	—	0.24	0.28	Ω
		$V_{GS} = -10\text{ V}, I_D = -2.5\text{ A}$	—	0.16	0.19	
Forward Transfer Admittance	$ Y_{fs} $	$V_{DS} = -10\text{ V}, I_D = -2.5\text{ A}$	2.0	4.0	—	S
Input Capacitance	C_{iss}	$V_{DS} = -10\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}$	—	630	—	pF
Reverse Transfer Capacitance	C_{rss}		—	95	—	
Output Capacitance	C_{oss}		—	290	—	
Switching Time	Rise Time		—	25	—	ns
	Turn-on Time		—	45	—	
	Fall Time		—	55	—	
	Turn-off Time		—	200	—	
Total Gate Charge (Gate-Source Plus Gate-Drain)	Q_g	$V_{DD} \doteq -48\text{ V}, V_{GS} = -10\text{ V},$ $I_D = -5\text{ A}$	—	22	—	nC
Gate-Source Charge	Q_{gs}		—	16	—	
Gate-Drain ("Miller") Charge	Q_{gd}		—	6	—	

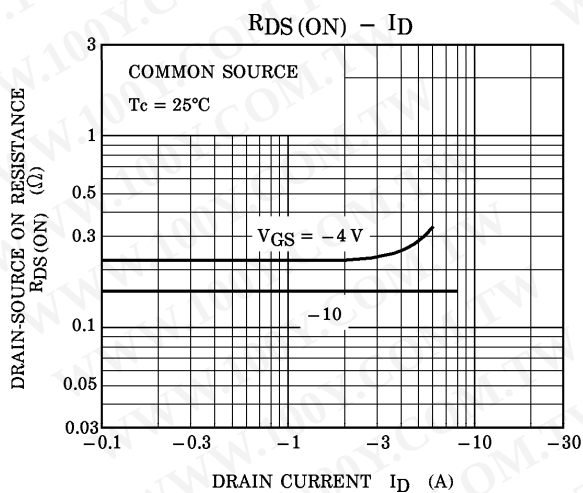
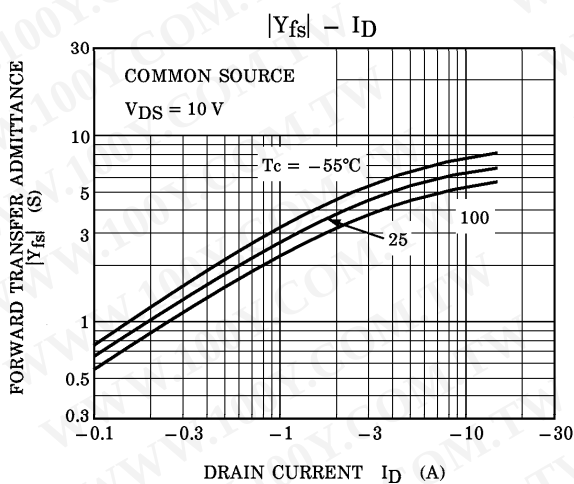
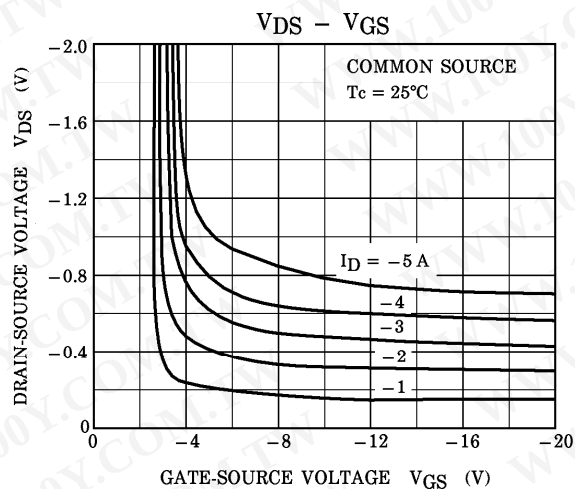
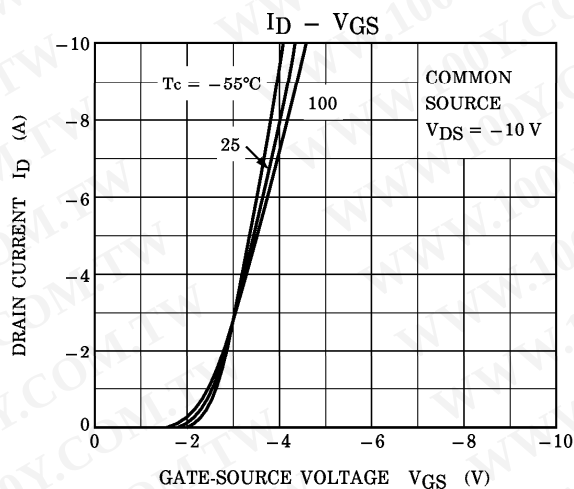
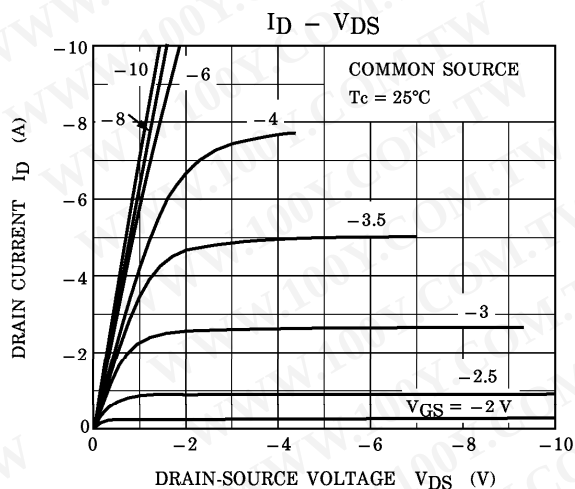
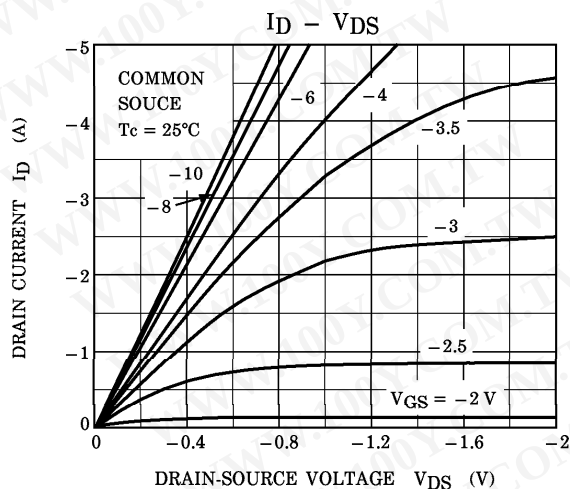
SOURCE-DRAIN DIODE RATINGS AND CHARACTERISTICS ($T_a = 25^\circ\text{C}$)

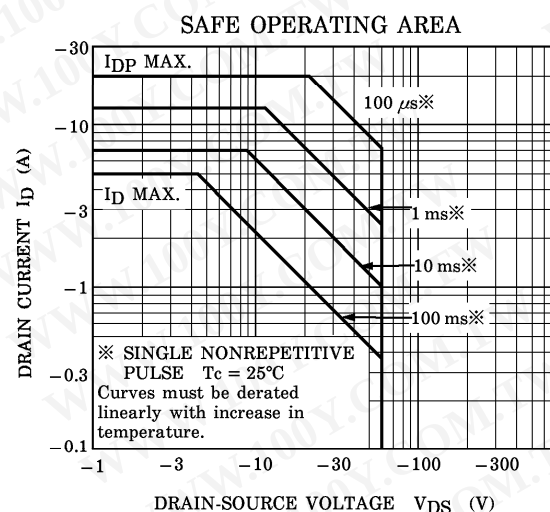
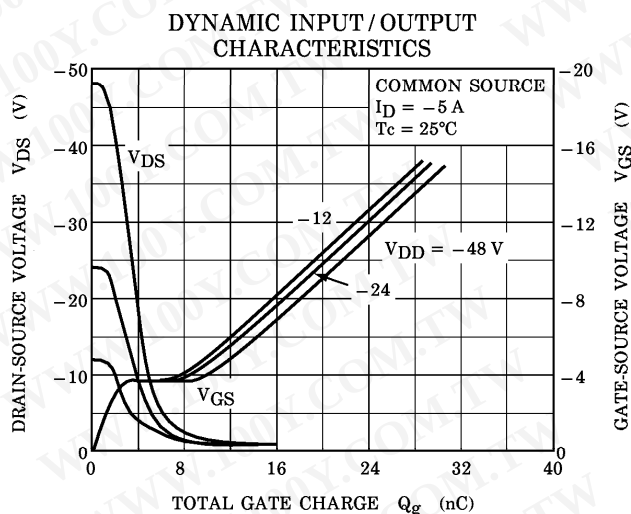
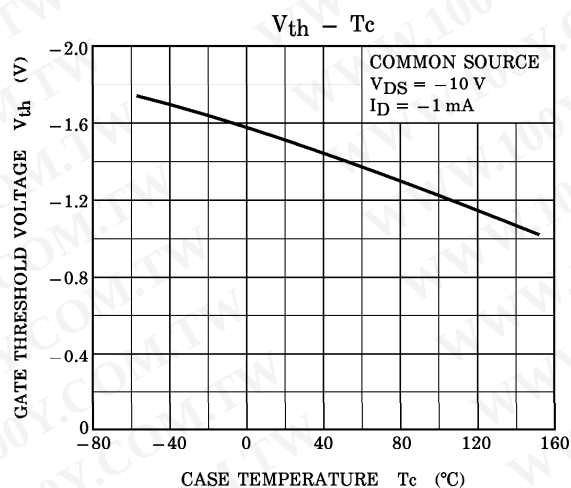
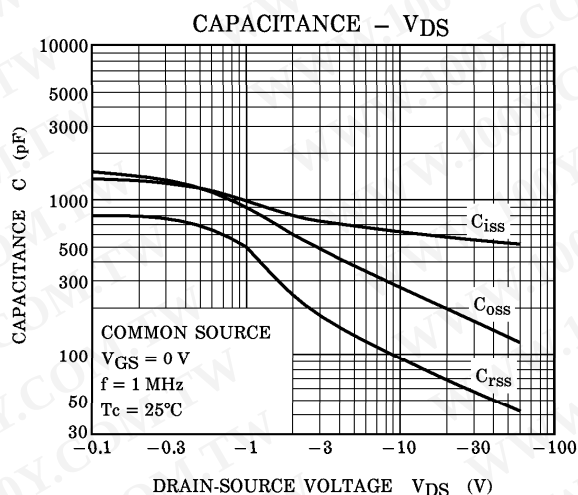
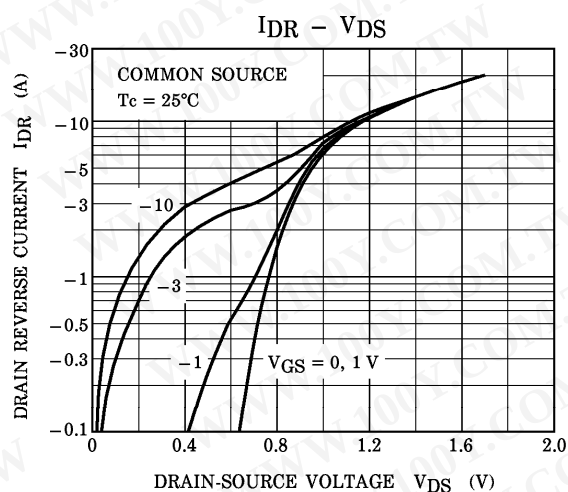
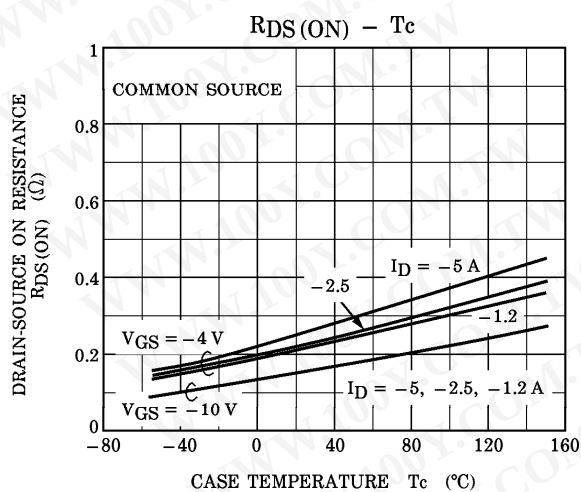
CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	I_{DR}	—	—	—	-5	A
Pulse Drain Reverse Current	I_{DRP}	—	—	—	-20	A
Diode Forward Voltage	V_{DSF}	$I_{DR} = -5\text{ A}, V_{GS} = 0\text{ V}$	—	—	1.7	V
Reverse Recovery Time	t_{rr}	$I_{DR} = -5\text{ A}, V_{GS} = 0\text{ V}$	—	80	—	ns
Reverse Recovery Charge	Q_{rr}	$dI_{DR}/dt = 50\text{ A}/\mu\text{s}$	—	0.1	—	μC

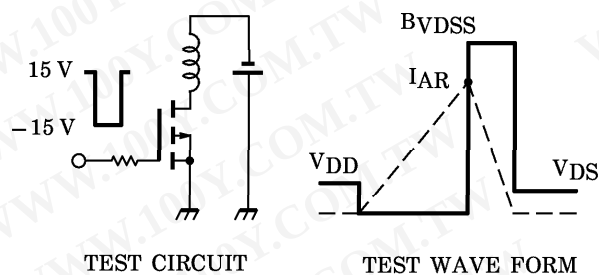
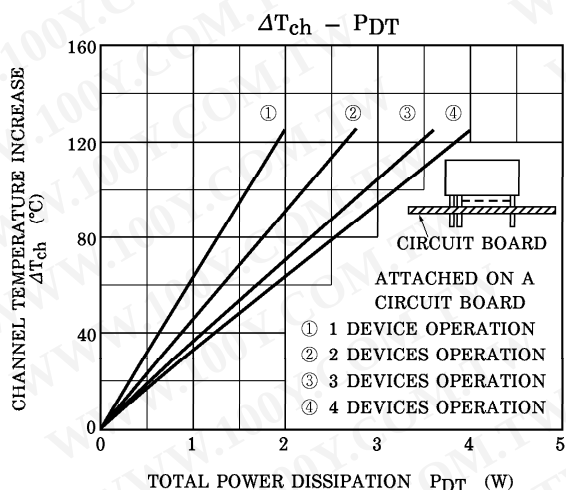
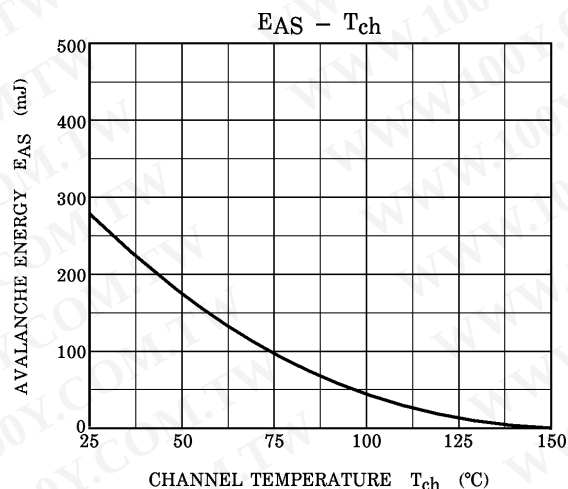
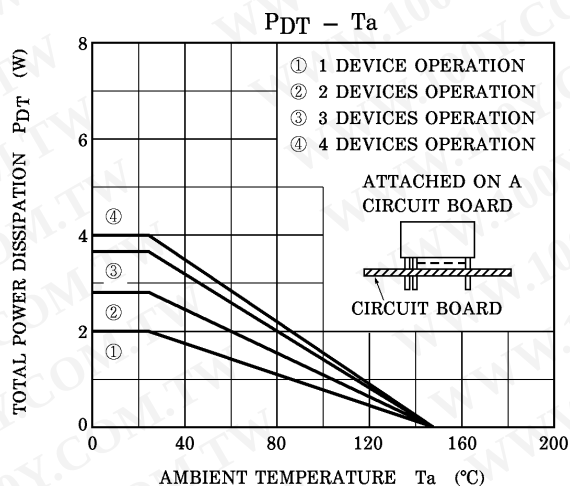
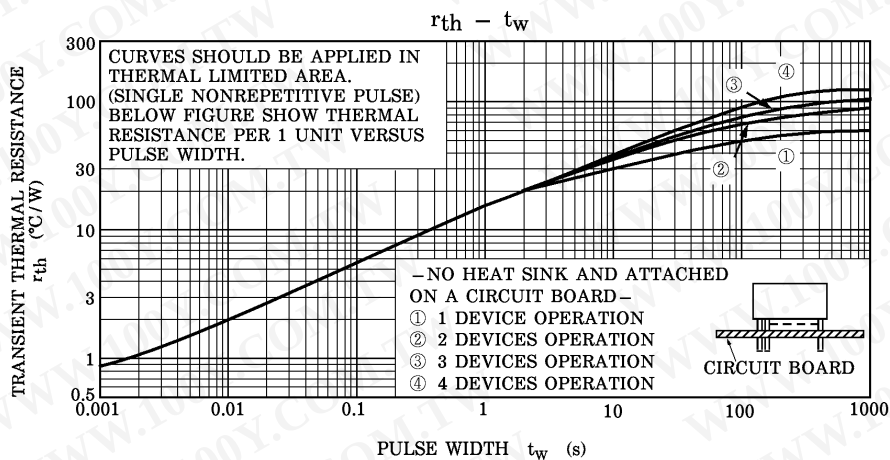
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Peak $I_{AR} = -5 \text{ A}$, $R_G = 25 \Omega$
 $V_{DD} = -25 \text{ V}$, $L = 14.84 \text{ mH}$

$$E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \left(\frac{BVDSS}{BVDSS - V_{DD}} \right)$$