

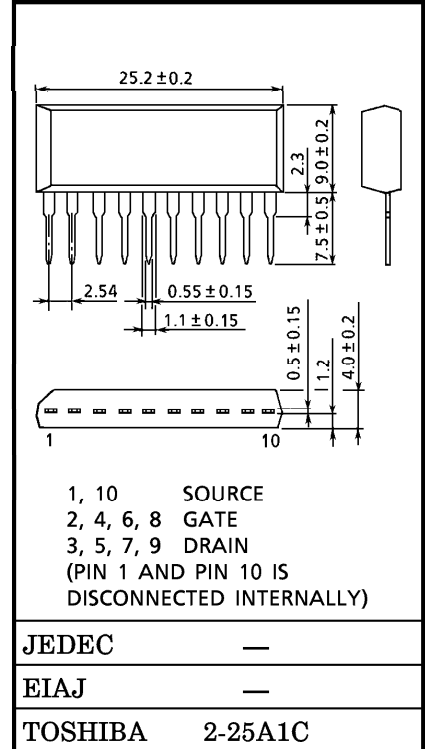
TOSHIBA POWER MOS FET MODULE SILICON N CHANNEL MOS TYPE (L²-π-MOS V 4 IN 1)

MP4209

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

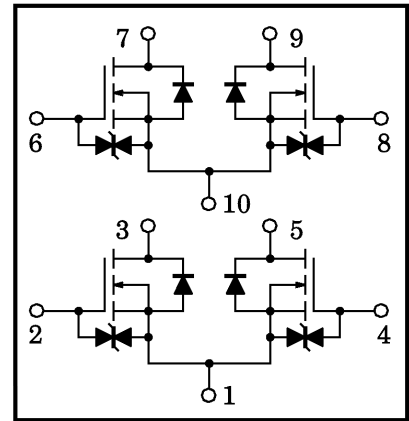
INDUSTRIAL APPLICATIONS
 Unit in mm

- 4 V Gate Drive Available
- Small Package by Full Molding (SIP 10 Pin)
- High Drain Power Dissipation (4 Devices Operation)
 : P_T = 4 W (T_a = 25°C)
- Low Drain-Source ON Resistance : R_{DS (ON)} = 0.28 Ω (typ.)
- High Forward Transfer Admittance : |Y_{fs}| = 3.5 S (typ.)
- Low Leakage Current : I_{GSS} = ±10 μA (max.) (V_{GS} = ±16 V)
 I_{DSS} = 100 μA (max.) (V_{DS} = 100 V)
- Enhancement-Mode : V_{th} = 0.8~2.0 V
 (V_{DS} = 10 V, I_D = 1 mA)



Weight : 2.1 g (typ.)

ARRAY CONFIGURATION



MAXIMUM RATINGS (T_a = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Drain-Source Voltage	V _{DSS}	100	V
Drain-Gate Voltage (R _{GS} = 20 kΩ)	V _{DGR}	100	V
Gate-Source Voltage	V _{GSS}	±20	V
Drain Current	DC	I _D	3
	Pulse	I _{DP}	12
Drain Power Dissipation (1 Device Operation, T _a = 25°C)	P _D	2.0	W
Drain Power Dissipation (4 Devices Operation, T _a = 25°C)	P _D T	4.0	W
Single Pulse Avalanche Energy*	E _{AS}	140	mJ
Avalanche Current	I _{AR}	3	A
Repetitive Avalanche Energy**	1 Device Operation	E _{AR}	0.2
	4 Devices Operation	E _{ART}	0.4
Channel Temperature	T _{ch}	150	°C
Storage Temperature Range	T _{stg}	-55~150	°C

Note ;

- * Avalanche energy (single pulse) applied condition
 V_{DD} = 50 V, Starting T_{ch} = 25°C, L = 20 mH, R_G = 25 Ω, I_{AR} = 3 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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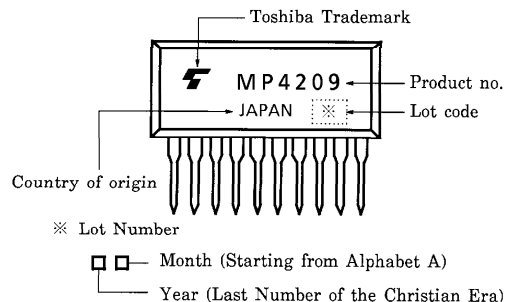
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THERMAL CHARACTERISTICS

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

MARKING

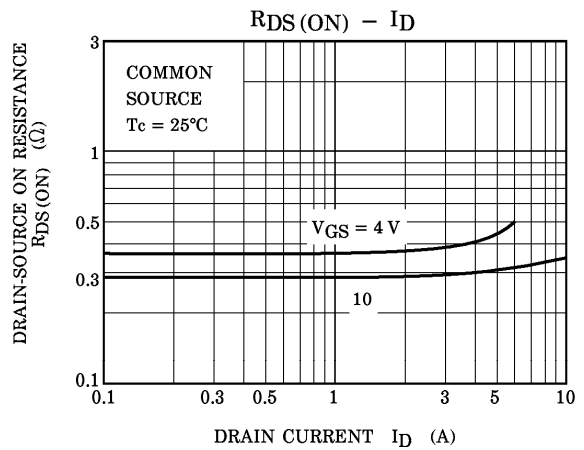
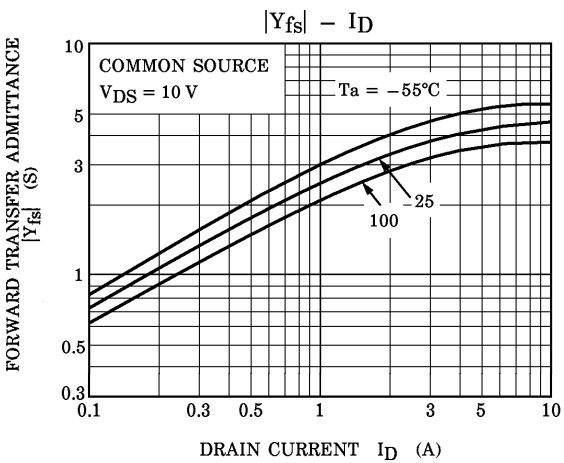
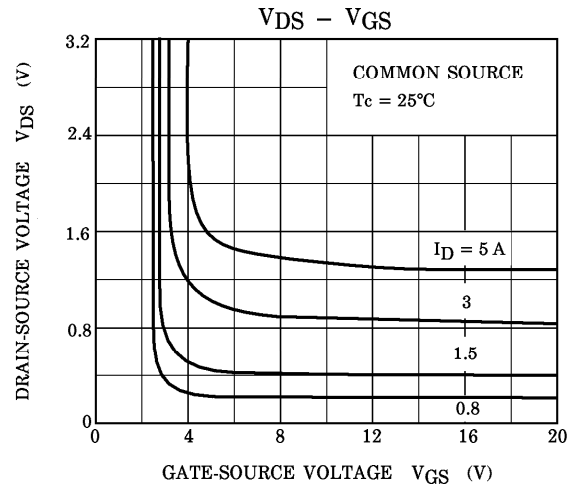
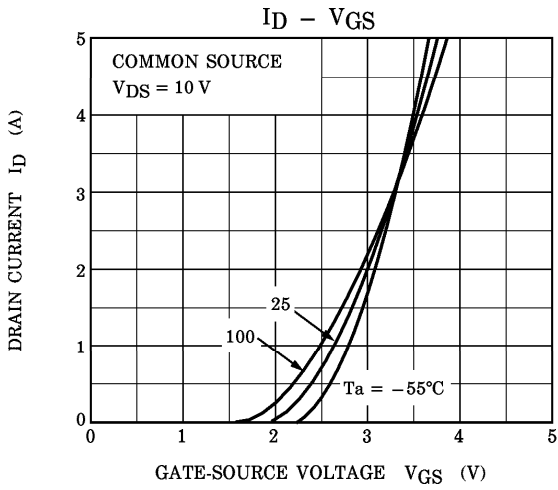
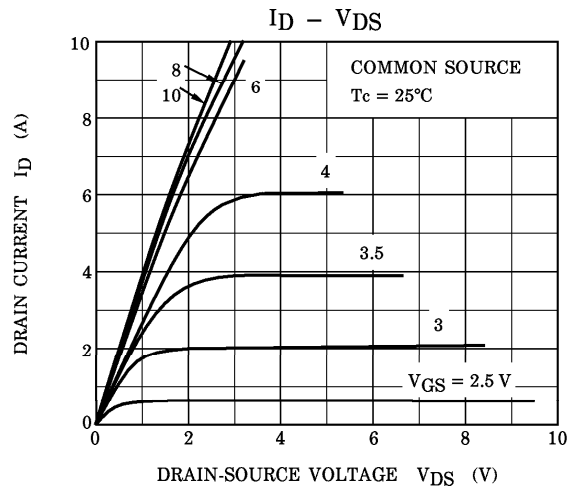
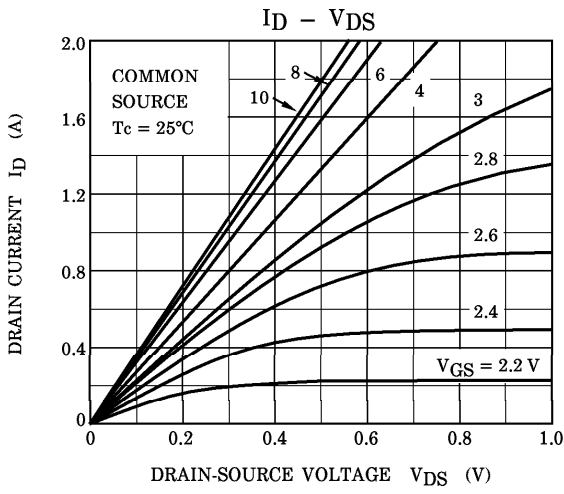


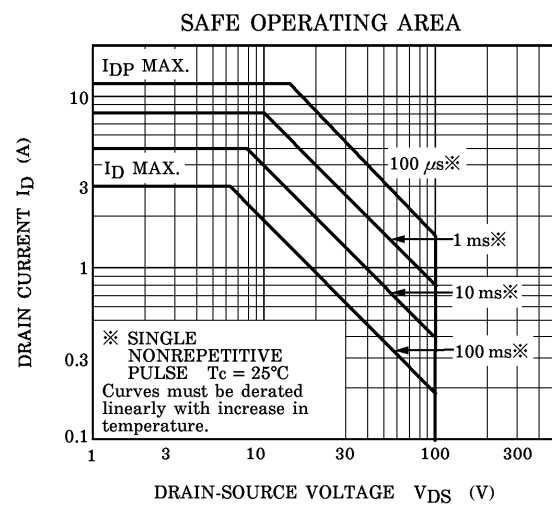
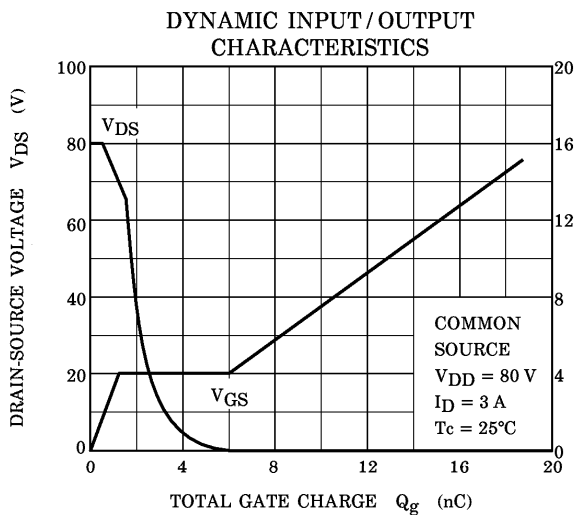
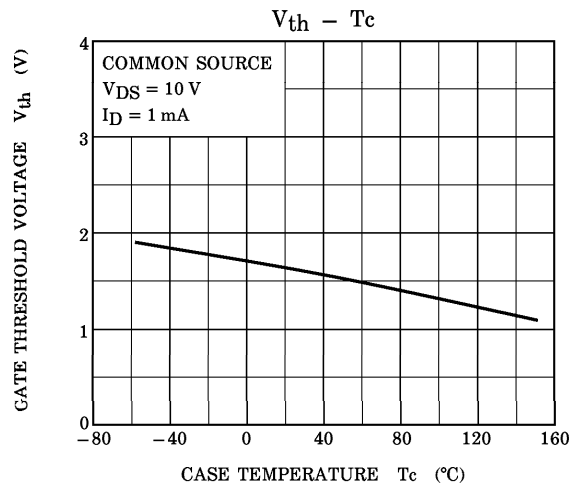
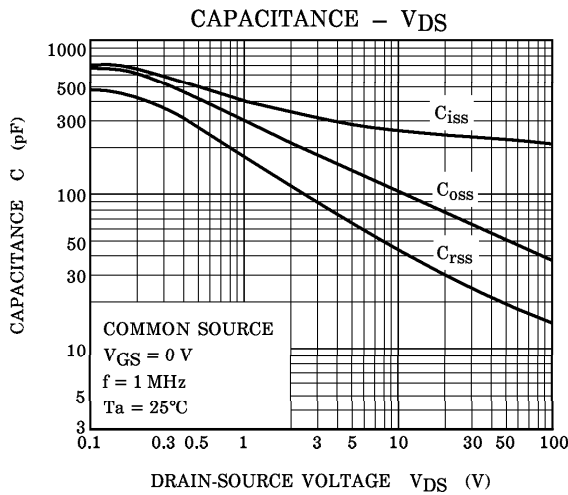
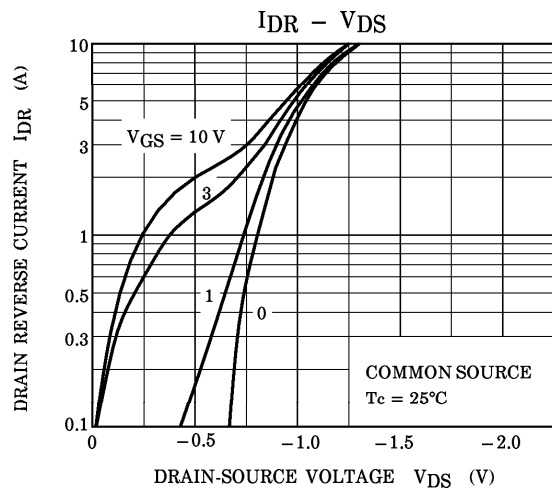
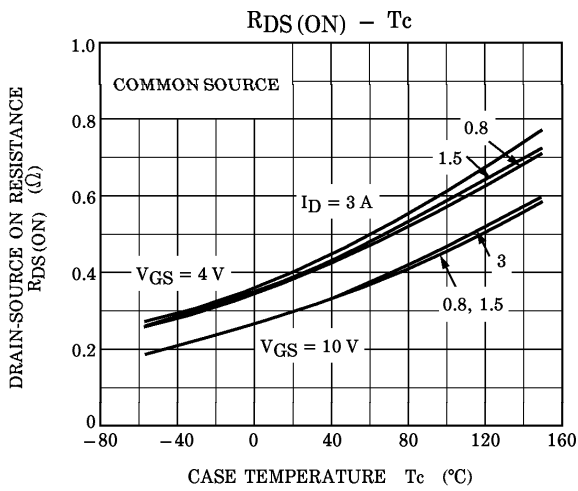
ELECTRICAL CHARACTERISTICS (Ta = 25°C)

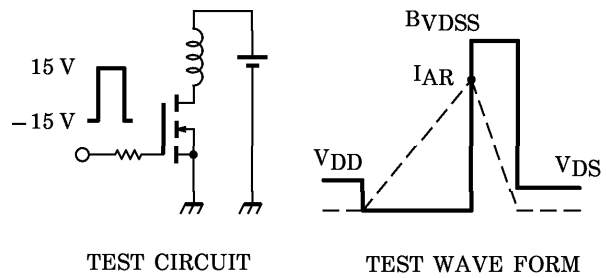
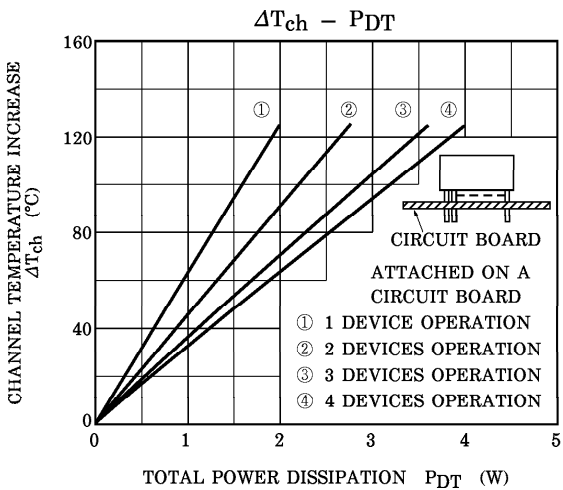
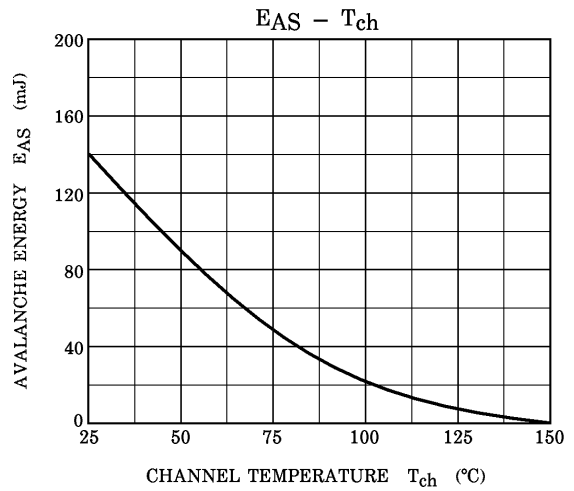
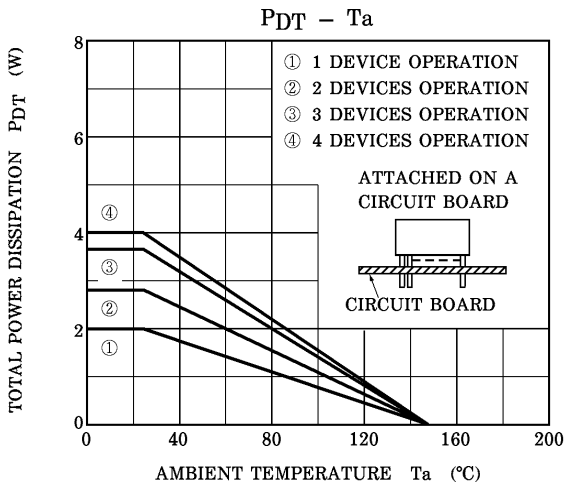
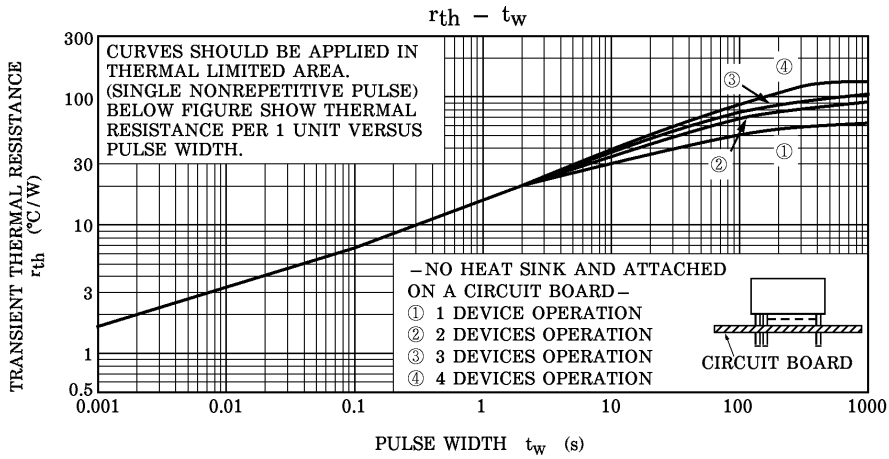
CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Gate Leakage Current		I _{GSS}	V _{GS} = ±16 V, V _{DS} = 0 V	—	—	±10	μA
Drain Cut-off Current		I _{DSS}	V _{DS} = 100 V, V _{GS} = 0 V	—	—	100	μA
Drain-Source Breakdown Voltage		V (BR) DSS	I _D = 10 mA, V _{GS} = 0 V	100	—	—	V
Gate Threshold Voltage		V _{th}	V _{DS} = 10 V, I _D = 1 mA	0.8	—	2.0	V
Drain-Source ON Resistance		R _{D(S) ON}	V _{GS} = 4 V, I _D = 2 A V _{GS} = 10 V, I _D = 2 A	—	0.36 0.28	0.45 0.35	Ω
Forward Transfer Admittance		Y _{fs}	V _{DS} = 10 V, I _D = 2 A	1.5	3.5	—	S
Input Capacitance		C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V f = 1 MHz	—	280	—	pF
Reverse Transfer Capacitance		C _{rss}		—	50	—	
Output Capacitance		C _{oss}		—	105	—	
Switching Time	Rise Time	t _r		—	20	—	ns
	Turn-on Time	t _{on}		—	50	—	
	Fall Time	t _f		—	40	—	
	Turn-off Time	t _{off}		—	170	—	
Total Gate Charge (Gate-Source Plus Gate-Drain)		Q _g	V _{DD} ≅ 80 V, V _{GS} = 10 V I _D = 3 A	—	13.5	—	nC
Gate-Source Charge		Q _{gs}		—	8.5	—	
Gate-Drain ("Miller") Charge		Q _{gd}		—	5	—	

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

CHARACTERISTIC	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Continuous Drain Reverse Current	I _{DR}	—	—	—	3	A
Pulse Drain Reverse Current	I _{DRP}	—	—	—	12	A
Diode Forward Voltage	V _{DSF}	I _{DR} = 3 A, V _{GS} = 0 V	—	—	-1.5	V
Reverse Recovery Time	t _{rr}	I _{DR} = 3 A, V _{GS} = 0 V	—	100	—	ns
Reverse Recovery Charge	Q _{rr}	dI _{DR} / dt = 50 A / μs	—	0.2	—	μC







Peak $I_{AR} = 3\text{ A}$, $R_G = 25\Omega$, $V_{DD} = 50\text{ V}$, $L = 20\text{ mH}$

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