

TOSHIBA Power MOS FET Module Silicon N Channel MOS Type (L<sup>2</sup>-π-MOSV 4 in 1)

## MP4410

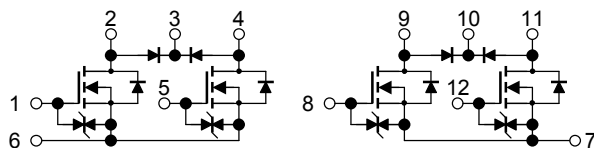
High Power, High Speed Switching Applications.  
Hammer Drive, Pulse Motor Drive and Inductive Load Switching.

- 4 V gate drive available
- Small package by full molding (SIP 12 pin)
- High drain power dissipation (4 devices operation)  
: P<sub>T</sub> = 28 W (T<sub>c</sub> = 25°C)
- Low drain-source ON resistance: R<sub>DS (ON)</sub> = 0.12 Ω (typ.)
- Low leakage current: I<sub>GSS</sub> = ±10 μA (max) (V<sub>GS</sub> = ±16 V)  
I<sub>DSS</sub> = 100 μA (max) (V<sub>DS</sub> = 60 V)
- Enhancement-mode: V<sub>th</sub> = 0.8 to 2.0 V (I<sub>D</sub> = 1 mA)

### Maximum Ratings (Ta = 25°C)

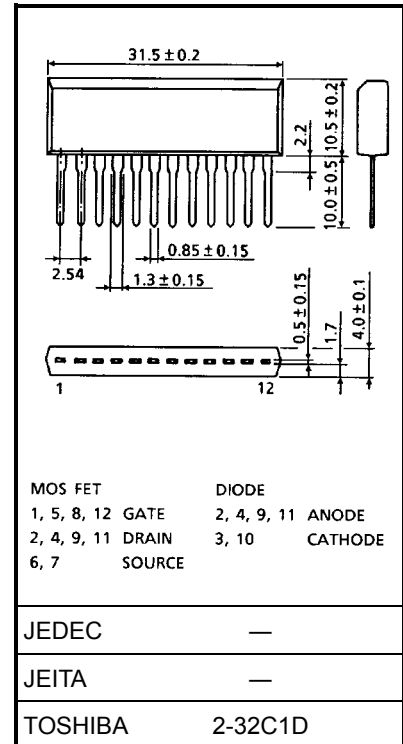
Characteristics	Symbol	Rating	Unit
Drain-source voltage	V <sub>DSS</sub>	60	V
Gate-source voltage	V <sub>GSS</sub>	±20	V
Drain current	I <sub>D</sub>	5	A
Peak drain current	I <sub>DP</sub>	20	A
Drain power dissipation (1 device operation)	P <sub>D</sub>	2.2	W
Drain power dissipation (4 devices operation)	T <sub>a</sub> = 25°C	4.4	W
	T <sub>c</sub> = 25°C	28	
Channel temperature	T <sub>ch</sub>	150	°C
Storage temperature range	T <sub>stg</sub>	-55 to 150	°C

### Array Configuration



Industrial Applications

Unit: mm



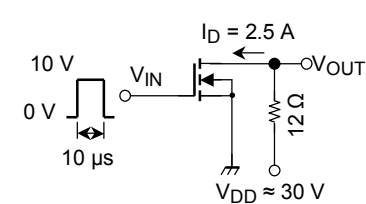
Weight: 3.9 g (typ.)

## Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance of channel to ambient (4 devices operation, $T_a = 25^\circ\text{C}$ )	$\Sigma R_{th} (ch-a)$	28.4	$^\circ\text{C/W}$
Thermal resistance of channel to case (4 devices operation, $T_c = 25^\circ\text{C}$ )	$\Sigma R_{th} (ch-c)$	4.46	$^\circ\text{C/W}$
Maximum lead temperature for soldering purposes (3.2 mm from case for 10 s)	$T_L$	260	$^\circ\text{C}$

This Transistor is an Electrostatic Sensitive Device. Please Handle with Caution.

## Electrical Characteristics ( $T_a = 25^\circ\text{C}$ )

Characteristics		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		$I_{DSS}$	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	$\mu\text{A}$
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
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 2.5\text{ A}$	3.0	5.0	—	S
Drain-source ON resistance		$R_{DS(ON)}$	$I_D = 2.5\text{ A}, V_{GS} = 4\text{ V}$	—	0.21	0.31	$\Omega$
			$I_D = 2.5\text{ A}, V_{GS} = 10\text{ V}$	—	0.12	0.16	
Input capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	370	—	$\mu\text{F}$
Reverse transfer capacitance		$C_{rss}$		—	60	—	$\mu\text{F}$
Output capacitance		$C_{oss}$		—	180	—	$\mu\text{F}$
Switching time	Rise time	$t_r$	 <p><math>I_D = 2.5\text{ A}</math>  <math>V_{IN}</math>: <math>t_r, t_f &lt; 5\text{ ns}, \text{duty cycle} \leq 1\%</math></p>	—	18	—	ns
	Turn-on time	$t_{on}$		—	25	—	
	Fall time	$t_f$		—	15	—	
	Turn-off time	$t_{off}$		—	170	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$I_D = 5\text{ A}, V_{GS} = 10\text{ V}, V_{DD} = 48\text{ V}$	—	12	—	nC
Gate-source charge		$Q_{gs}$		—	8	—	nC
Gate-drain ("miller") charge		$Q_{gd}$		—	4	—	nC

## Source-Drain Diode Rating and Characteristics ( $T_a = 25^\circ\text{C}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	$I_{DR}$	—	—	—	5	A
Peak 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

**Flyback-Diode Rating and Characteristics (Ta = 25°C)**

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Maximum forward current	$I_{FM}$	—	—	—	5	A
Reverse current	$I_R$	$V_R = 120\text{ V}$	—	—	0.4	$\mu\text{A}$
Reverse voltage	$V_R$	$I_R = 100\ \mu\text{A}$	120	—	—	V
Forward voltage	$V_F$	$I_F = 1\ \text{A}$	—	—	1.8	V

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