

TOSHIBA Field Effect Transistor Silicon P, N Channel MOS Type (U-MOS IV / U-MOS III)

TPCP8402

Portable Equipment Applications
Motor Drive Applications
DC-DC Converter Applications

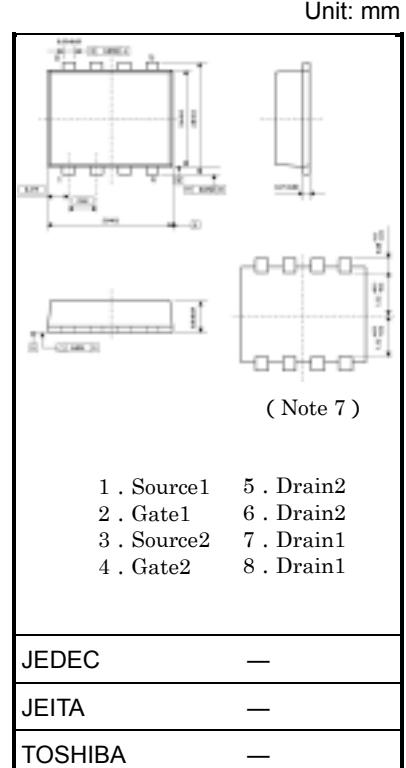
- Low drain-source ON resistance
 - P Channel RDS (ON) = 60 mΩ (typ.)
 - N Channel RDS (ON) = 38 mΩ (typ.)
- High forward transfer admittance
 - P Channel $|Y_{fs}| = 6.0 \text{ S}$ (typ.)
 - N Channel $|Y_{fs}| = 7.0 \text{ S}$ (typ.)
- Low leakage current
 - P Channel $ID_{SS} = -10 \mu\text{A}$ ($V_{DS} = -30 \text{ V}$)
 - N Channel $ID_{SS} = 10 \mu\text{A}$ ($V_{DS} = 30 \text{ V}$)
- Enhancement-mode
 - P Channel $V_{th} = -0.8 \text{ to } -2.0 \text{ V}$ ($V_{DS} = -10 \text{ V}$, $I_D = -1\text{mA}$)
 - N Channel $V_{th} = 1.3 \text{ to } 2.5 \text{ V}$ ($V_{DS} = 10 \text{ V}$, $I_D = 1\text{mA}$)

Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating		Unit
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}	± 20	± 20	V
Drain current	DC (Note 1)	I _D	-3.4	4.2	A
	Pulse (Note 1)	I _{DP}	-13.6	16.8	
Drain power dissipation ($t = 5\text{ s}$) (Note 2a)	Single-device operation (Note 3a)	P _D (1)	1.48	1.48	W
	Single-device value at dual operation (Note 3b)	P _D (2)	1.23	1.23	
Drain power dissipation ($t = 5\text{ s}$) (Note 2b)	Single-device operation (Note 3a)	P _D (1)	0.58	0.58	
	Single-device value at dual operation (Note 3b)	P _D (2)	0.36	0.36	
Single pulse avalanche energy (Note 4)		E _{AS}	0.75	2.86	mJ
Avalanche current		I _{AR}	-1.7	2.1	A
Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5)		E _{AR}	0.12		mJ
Channel temperature		T _{ch}	150		°C
Storage temperature range		T _{stg}	-55~150		°C

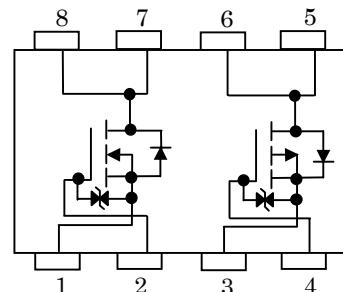
Note: For (Note 1), (Note 2), (Note 3), (Note 4), (Note 5) and (Note 6), please refer to the next page.

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

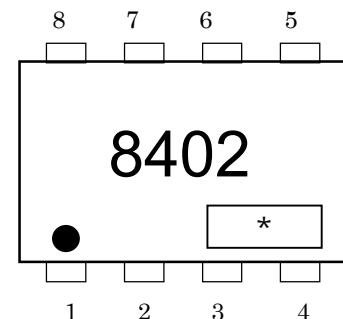


Weight: 0.017 g (typ.)

Circuit Configuration



Marking (Note 6)

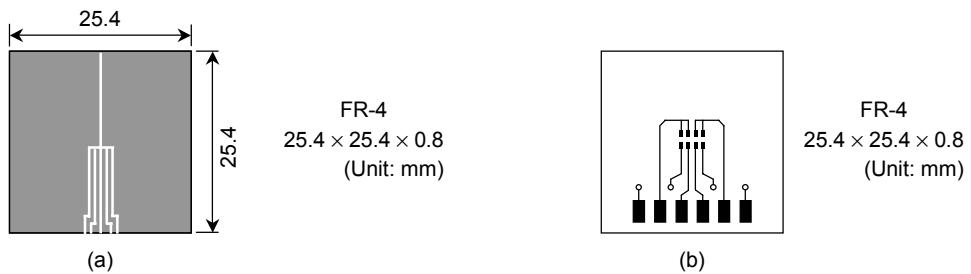


Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to ambient ($t = 5$ s) (Note 2a)	Single-device operation (Note 3a) R_{th} (ch-a) (1)	84.5	°C/W
	Single-device value at dual operation (Note 3b) R_{th} (ch-a) (2)	101.6	
Thermal resistance, channel to ambient ($t = 5$ s) (Note 2b)	Single-device operation (Note 3a) R_{th} (ch-a) (1)	215.5	°C/W
	Single-device value at dual operation (Note 3b) R_{th} (ch-a) (2)	347.2	

Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)



Note 3: a) The power dissipation and thermal resistance values are shown for a single device (During single-device operation, power is only applied to one device.).

b) The power dissipation and thermal resistance values are shown for a single device (During dual operation, power is evenly applied to both devices.).

Note 4: P Channel: $V_{DD} = -24$ V, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 0.2$ mH, $R_G = 25 \Omega$, $I_{AR} = -1.7$ A
N Channel: $V_{DD} = 24$ V, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 0.5$ mH, $R_G = 25 \Omega$, $I_{AR} = 2.1$ A

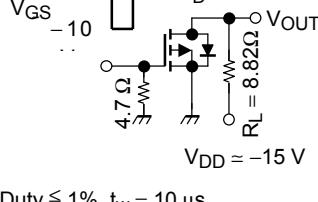
Note 5: Repetitive rating; Pulse width limited by maximum channel temperature.

Note 6: Black round marking “ ” locates on the left lower side of parts number marking “8402” indicates terminal No. 1.

“**” shows lot number, which is a three digit number. The first digit number expresses the year of manufacture: last decimal digit of the year of manufacture, the next two digit number expresses the week of manufacture.

P-ch

Electrical Characteristics (Ta = 25°C)

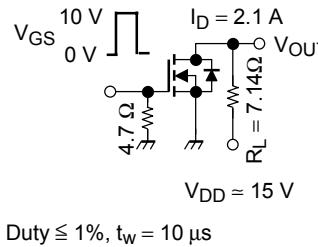
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	I _{GSS}	V _{GS} = ±16 V, V _{DS} = 0 V	—	—	±10	µA	
Drain cut-off current	I _{DSS}	V _{DS} = -30 V, V _{GS} = 0 V	—	—	10	µA	
Drain-source breakdown voltage	V _{(BR) DSS}	I _D = -10 mA, V _{GS} = 0 V	-30	—	—	V	
	V _{(BR) DSX}	I _D = -10 mA, V _{GS} = 20 V	-15	—	—		
Gate threshold voltage	V _{th}	V _{DS} = -10 V, I _D = -1 mA	-0.8	—	-2.0	V	
Drain-source ON resistance	R _{DS (ON)}	V _{GS} = -4.5 V, I _D = -1.7 A	—	80	105	mΩ	
		V _{GS} = -10 V, I _D = -1.7 A	—	60	72		
Forward transfer admittance	Y _{fs}	V _{DS} = -10 V, I _D = -1.7 A	3.0	6.0	—	S	
Input capacitance	C _{iss}	V _{DS} = -10 V, V _{GS} = 0 V, f = 1 MHz	—	600	—	pF	
Reverse transfer capacitance	C _{rss}		—	60	—		
Output capacitance	C _{oss}		—	70	—		
Switching time	Rise time	t _r	 V _{GS} 0 V -10 V ... ID = -1.7 A 4.7 Ω 8.82Ω RL V _{DD} = -15 V Duty ≤ 1%, t _W = 10 µs	—	5.3	—	ns
	Turn-on time	t _{on}		—	12	—	
	Fall time	t _f		—	8.4	—	
	Turn-off time	t _{off}		—	34	—	
Total gate charge (gate-source plus gate-drain)	Q _g	V _{DD} = -24 V, V _{GS} = -10 V, I _D = -3.4 A	—	14	—	nC	
Gate-source charge 1	Q _{gs1}		—	1.4	—		
Gate-drain ("miller") charge	Q _{gd}		—	2.7	—		

Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	I _{DRP}	—	—	—	-13.6	A
Forward voltage (diode)	V _{DSF}	I _{DR} = -3.4 A, V _{GS} = 0 V	—	—	1.2	V

N-ch

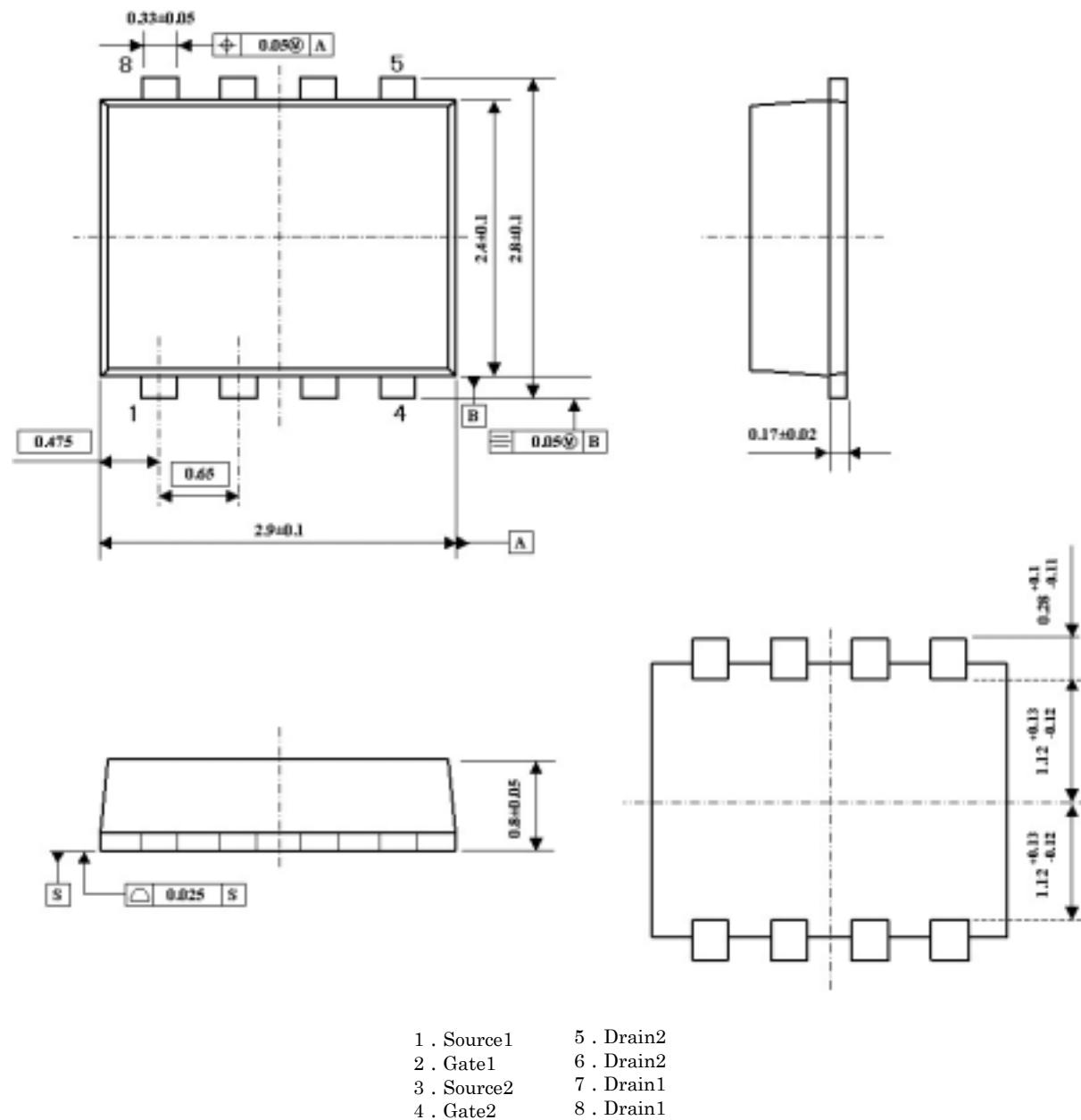
Electrical Characteristics (Ta = 25°C)

Characteristics	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} = 30 V, V _{GS} = 0 V	—	—	10	μA
Drain-source breakdown voltage	V _{(BR) DSS}	I _D = 10 mA, V _{GS} = 0 V	30	—	—	V
	V _{(BR) DSX}	I _D = 10 mA, V _{GS} = -20 V	15	—	—	
Gate threshold voltage	V _{th}	V _{DS} = 10 V, I _D = 1 mA	1.3	—	2.5	V
Drain-source ON resistance	R _{DSS} (ON)	V _{GS} = 4.5 V, I _D = 2.1 A	—	58	77	mΩ
		V _{GS} = 10 V, I _D = 2.1 A	—	38	50	
Forward transfer admittance	Y _{fs}	V _{DS} = 10 V, I _D = 2.1 A	3.5	7.0	—	S
Input capacitance	C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	—	470	—	pF
Reverse transfer capacitance	C _{rss}		—	60	—	
Output capacitance	C _{oss}		—	80	—	
Switching time	Rise time	t _r	 V _{GS} 10 V 0 V t _r ID = 2.1 A V _{OUT} 4.7Ω 7.14Ω RL V _{DD} ≈ 15 V Duty ≤ 1%, t _w = 10 μs	—	5.2	—
	Turn-on time	t _{on}		—	8.3	—
	Fall time	t _f		—	4.0	—
	Turn-off time	t _{off}		—	22	—
Total gate charge (gate-source plus gate-drain)	Q _g	V _{DD} ≈ 24 V, V _{GS} = 10 V, I _D = 6 A	—	10	—	nC
Gate-source charge 1	Q _{gs1}		—	1.7	—	
Gate-drain ("miller") charge	Q _{gd}		—	2.4	—	

Source-Drain Ratings and Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current Pulse (Note 1)	I _{DRP}	—	—	—	16.8	A
Forward voltage (diode)	V _{DSF}	I _{DR} = 4.2 A, V _{GS} = 0 V	—	—	-1.2	V

注7: 外形図



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