

TOSHIBA Field Effect Transistor Silicon N-Channel MOS Type (Ultra-High-Speed U-MOSIII)

TPCA8022-H

Switching Regulator Applications

Motor Drive Applications

DC/DC Converter Applications

- Small footprint due to a small and thin package
- High speed switching
- Low drain-source ON-resistance
: $R_{DS(ON)} = 17 \text{ m}\Omega$ (typ.) ($V_{GS}=10\text{V}$, $I_D=11\text{A}$)
- High forward transfer admittance: $|Y_{fs}| = 46 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 10 \text{ }\mu\text{A}$ (max) ($V_{DS} = 100 \text{ V}$)
- Enhancement mode: $V_{th} = 2.0$ to 4.0 V ($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

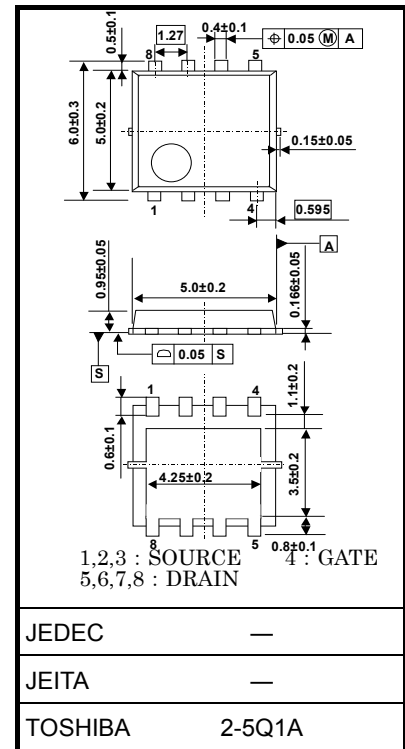
Characteristic		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	100	V
Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)		V_{DGR}	100	V
Gate-source voltage		V_{GSS}	± 20	V
Drain current	DC (Note 1)	I_D	22	A
	Pulsed (Note 1)	I_{DP}	66	
Drain power dissipation	($T_c=25^\circ\text{C}$)	P_D	45	W
Drain power dissipation	($t = 10 \text{ s}$) (Note 2a)	P_D	2.8	W
Drain power dissipation	($t = 10 \text{ s}$) (Note 2b)	P_D	1.6	W
Single-pulse avalanche energy	(Note 3)	E_{AS}	197	mJ
Avalanche current		I_{AR}	22	A
Repetitive avalanche energy	(Note 2a) (Note 4)	E_{AR}	3.8	mJ
Channel temperature		T_{ch}	150	$^\circ\text{C}$
Storage temperature range		T_{stg}	-55 to 150	$^\circ\text{C}$

Note: For Notes 1 to 4, refer to the next page.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings. Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

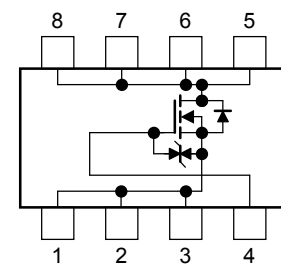
This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm



Weight: 0.069 g (typ.)

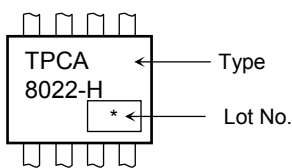
Circuit Configuration



Thermal Characteristics

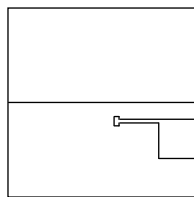
Characteristic	Symbol	Max	Unit
Thermal resistance, channel to case ($T_c=25^\circ\text{C}$)	$R_{th}(ch-c)$	2.78	$^\circ\text{C/W}$
Thermal resistance, channel to ambient ($t = 10\text{ s}$) (Note 2a)	$R_{th}(ch-a)$	44.6	$^\circ\text{C/W}$
Thermal resistance, channel to ambient ($t = 10\text{ s}$) (Note 2b)	$R_{th}(ch-a)$	78.1	$^\circ\text{C/W}$

Marking (Note 5)



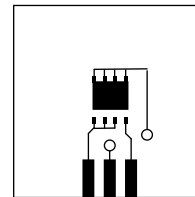
Note 1: The channel temperature should not exceed 150°C during use.

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



(a)

FR-4
 $25.4 \times 25.4 \times 0.8$
 (Unit: mm)



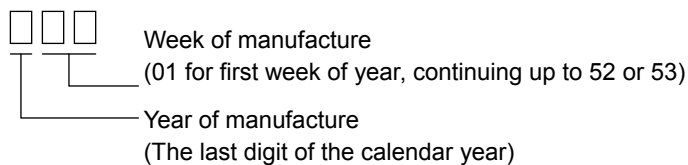
(b)

FR-4
 $25.4 \times 25.4 \times 0.8$
 (Unit: mm)

Note 3: $V_{DD} = 50\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 0.5\text{ mH}$, $R_G = 25\ \Omega$, $I_{AR} = 22\text{ A}$

Note 4: Repetitive rating: pulse width limited by max channel temperature

Note 5: * Weekly code: (Three digits)

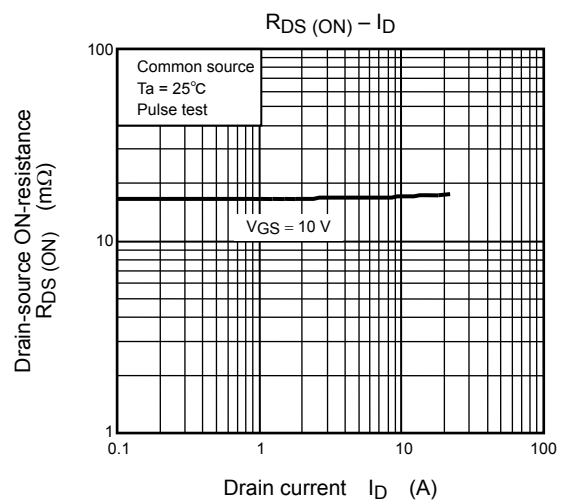
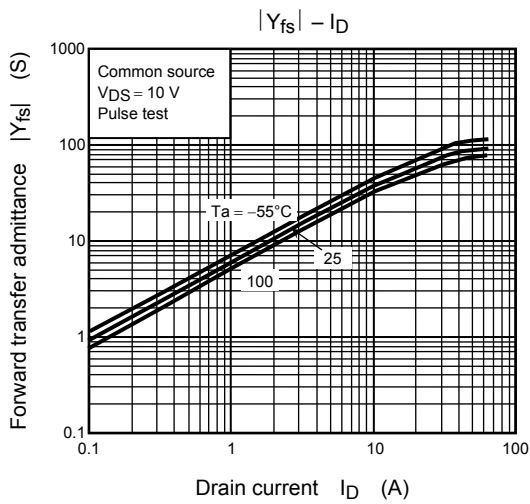
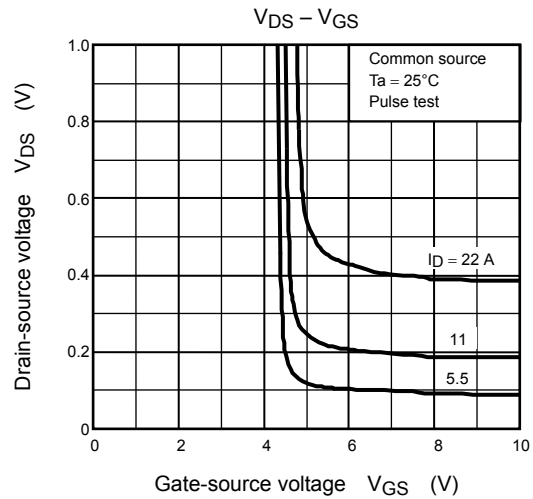
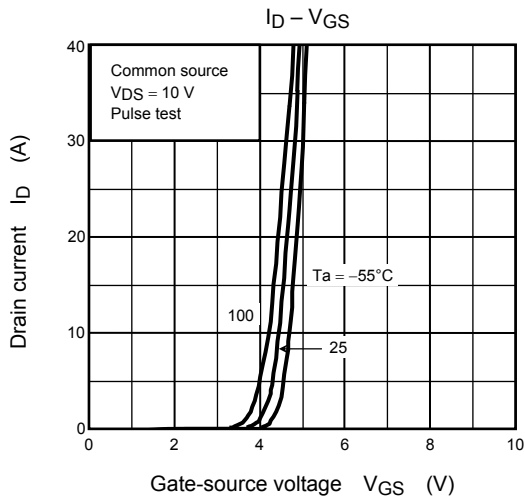
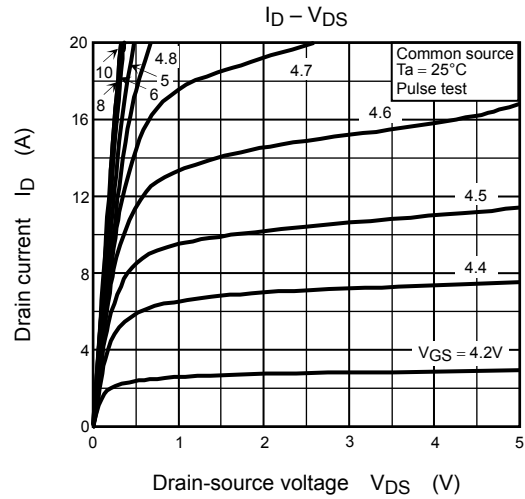
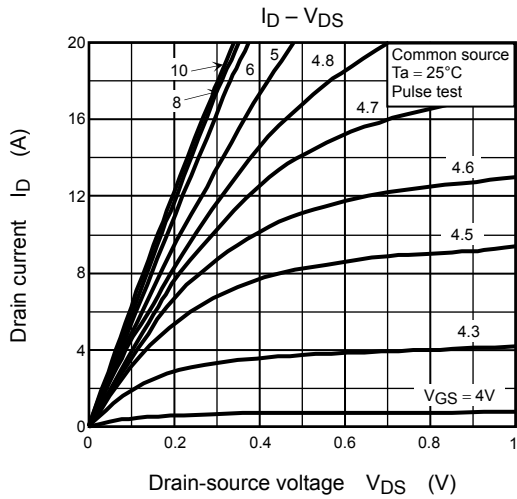


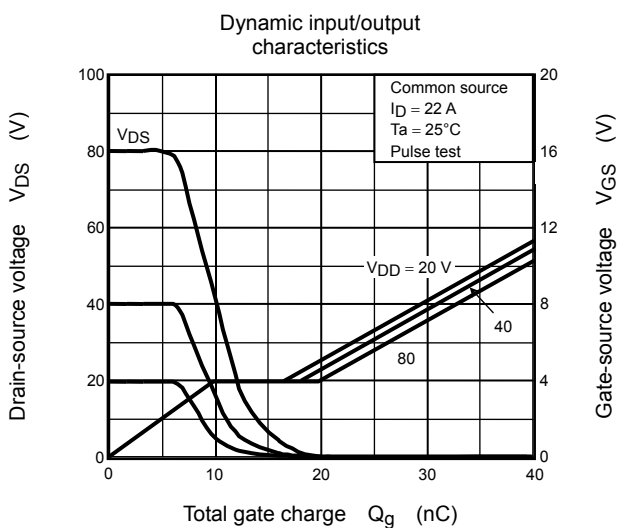
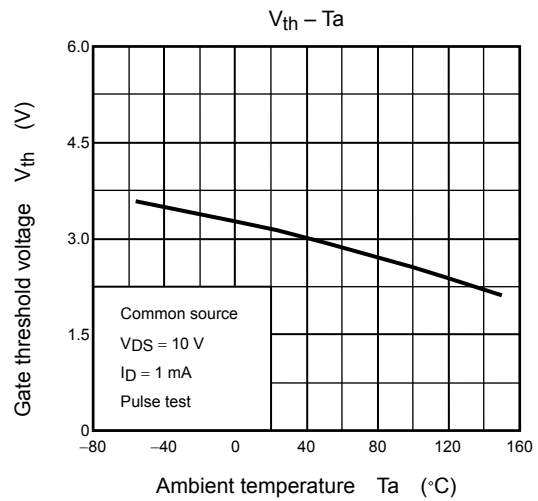
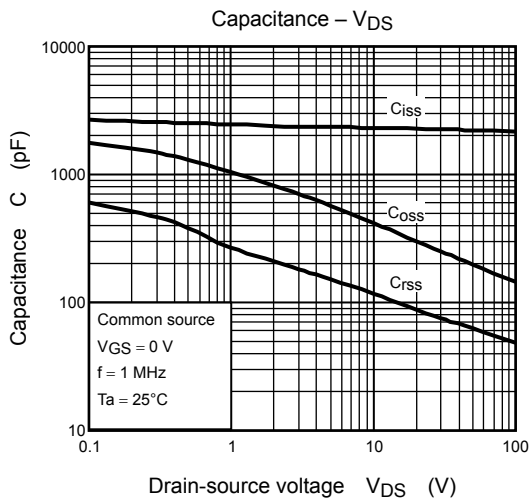
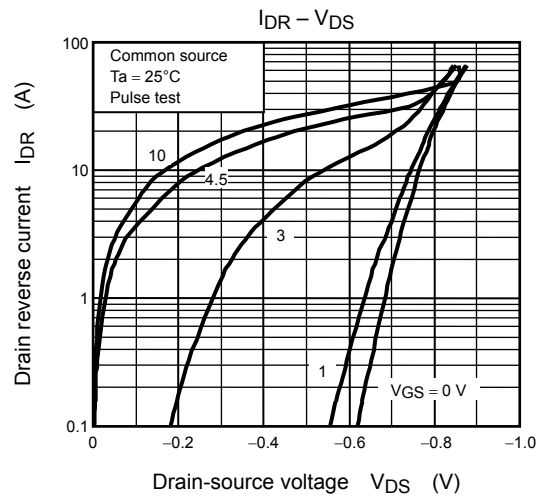
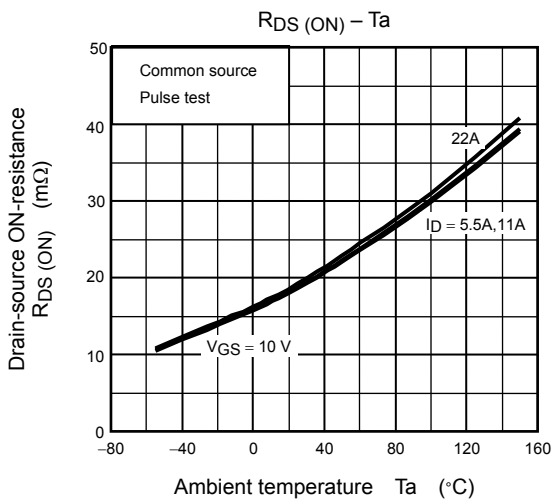
Electrical Characteristics (Ta = 25°C)

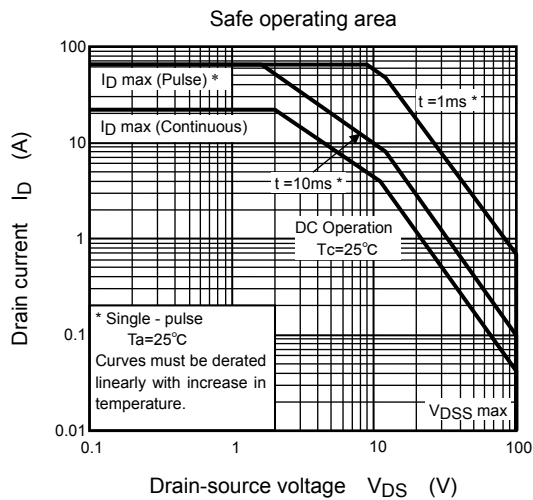
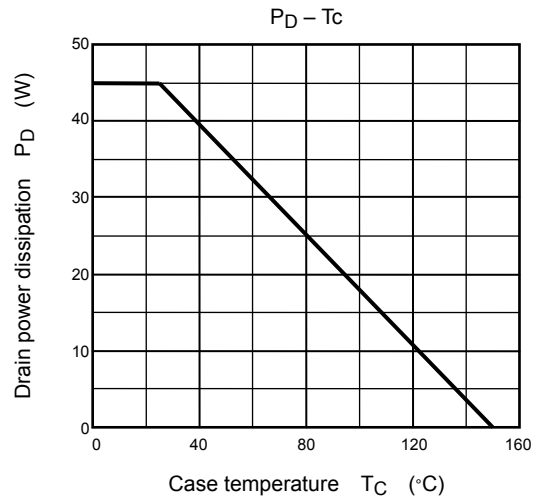
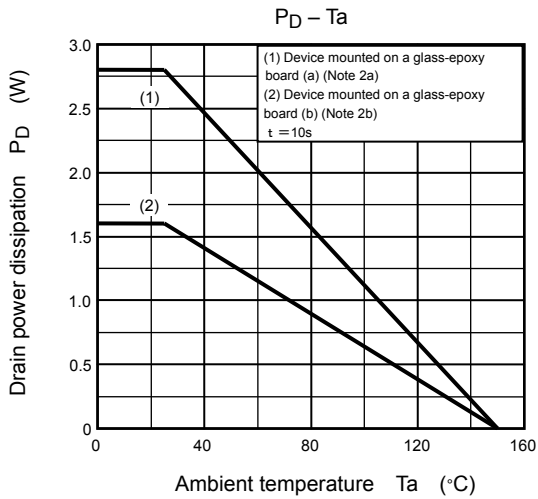
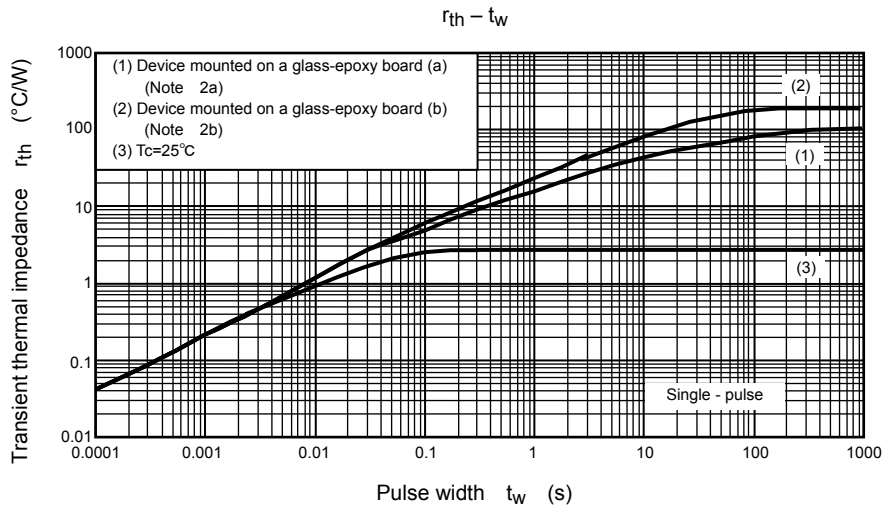
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 16 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	± 10	μA
Drain cutoff current		I_{DSS}	$V_{DS} = 100 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	100	—	—	V
Gate threshold voltage		V_{th}	$V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$	2.0	—	4.0	V
Drain-source ON-resistance		$R_{DS(ON)}$	$V_{GS} = 10 \text{ V}, I_D = 11 \text{ A}$	—	17	26	$\text{m}\Omega$
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10 \text{ V}, I_D = 11 \text{ A}$	23	46	—	S
Input capacitance		C_{iss}	$V_{DS} = 10 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	2330	—	pF
Reverse transfer capacitance		C_{rss}		—	110	—	
Output capacitance		C_{oss}		—	420	—	
Gate-Resistance		R_g		—	1.5	—	
Switching time	Rise time	t_r	<p>$V_{GS} \text{ 10 V / 0 V}$ $I_D = 11 \text{ A}$ $V_{DS} = 10 \text{ V}$ $R_L = 4.5\Omega$ $V_{DD} \approx 50 \text{ V}$ $\text{Duty} \leq 1\%, t_w = 10 \mu\text{s}$</p>	—	4.8	—	ns
	Turn-on time	t_{on}		—	14	—	
	Fall time	t_f		—	6.7	—	
	Turn-off time	t_{off}		—	42	—	
Total gate charge (gate-source plus gate-drain)		Q_g	$V_{DD} \approx 80 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 22 \text{ A}$	—	38	—	nC
Gate-source charge 1		Q_{gs1}		—	9.8	—	
Gate-drain ("Miller") charge		Q_{gd}		—	10	—	
Gate switch charge		Q_{SW}		—	14	—	

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

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse	I_{DRP}	—	—	—	66	A
Forward voltage (diode)		V_{DSF}	$I_{DR} = 22 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.2	V







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20070701-EN

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