

TOSHIBA Field Effect Transistor Silicon N-Channel MOS Type (U-MOSVI-H)

TPCA8052-H

Switching Regulator Applications

Motor Drive Applications

DC-DC Converter Applications

Unit: mm

- Small footprint due to a small and thin package
- High-speed switching
- Small gate charge: $Q_{SW} = 6.8 \text{ nC (typ.)}$
- Low drain-source ON-resistance: $R_{DS(ON)} = 7.2 \text{ m}\Omega \text{ (typ.)}$
- High forward transfer admittance: $|Y_{fs}| = 58 \text{ S (typ.)}$
- Low leakage current: $I_{DSS} = 10 \text{ }\mu\text{A (max)} \text{ (} V_{DS} = 40 \text{ V)}$
- Enhancement mode: $V_{th} = 1.3 \text{ to } 2.3 \text{ V (} V_{DS} = 10 \text{ V, } I_D = 0.2 \text{ mA)}$

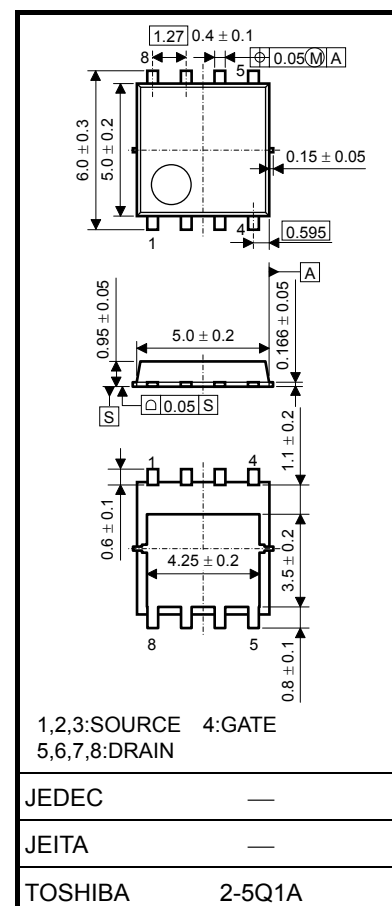
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristic		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	40	V
Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)		V_{DGR}	40	V
Gate-source voltage		V_{GSS}	± 20	V
Drain current	DC (Note 1)	I_D	20	A
	Pulsed (Note 1)	I_{DP}	60	
Drain power dissipation ($T_c = 25^\circ\text{C}$)		P_D	30	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}	37	mJ
Avalanche current		I_{AR}	20	A
Repetitive avalanche energy ($T_c = 25^\circ\text{C}$) (Note 4)		E_{AR}	2.24	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.

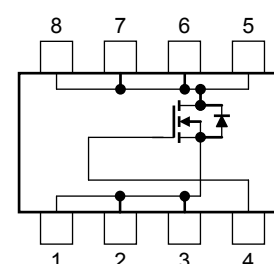
Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within 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.



Weight: 0.069 g (typ.)

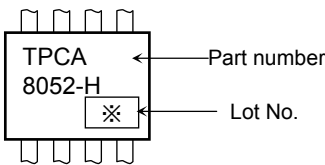
Circuit Configuration



Thermal Characteristics

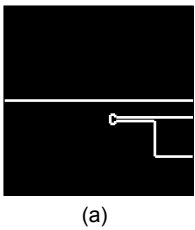
Characteristic	Symbol	Max	Unit
Thermal resistance, channel to case (Tc = 25°C)	R _{th} (ch-c)	4.17	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	R _{th} (ch-a)	44.6	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	R _{th} (ch-a)	78.1	°C/W

Marking (Note 5)

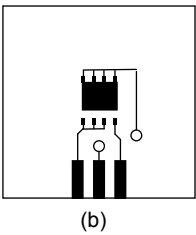


Note 1: Ensure that the channel temperature does not exceed 150°C.

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



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

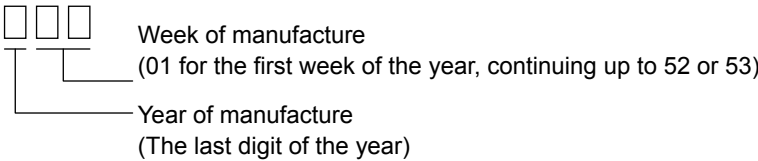


FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

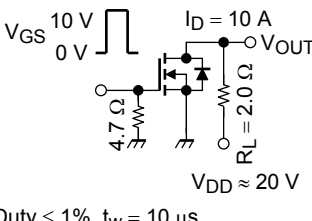
Note 3: V_{DD} = 24 V, T_{ch} = 25 °C (initial), L = 100 μH, R_G = 25 Ω, I_{AR} = 20 A

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

Note 5: * Weekly code: (Three digits)

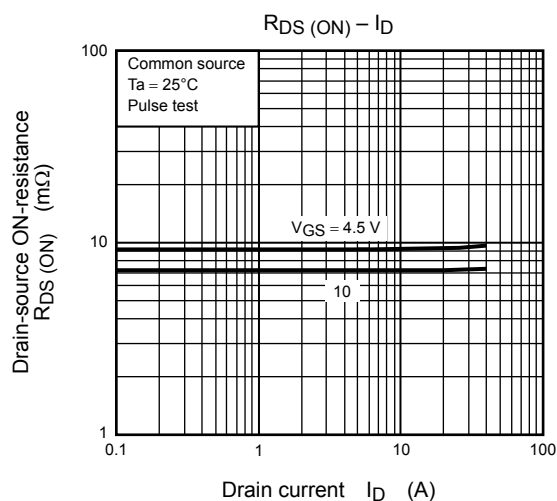
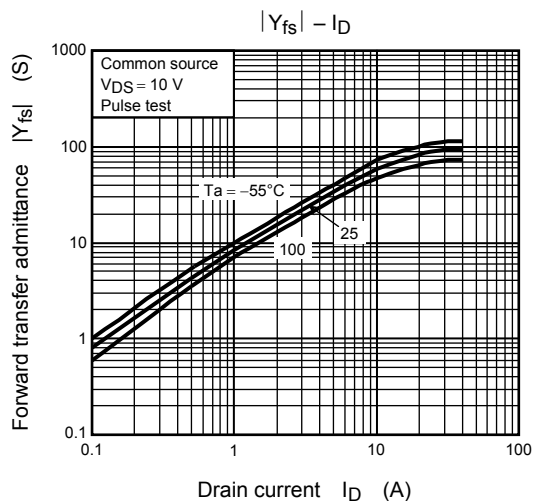
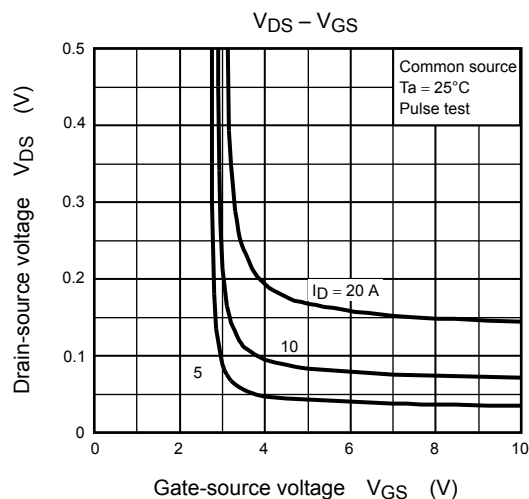
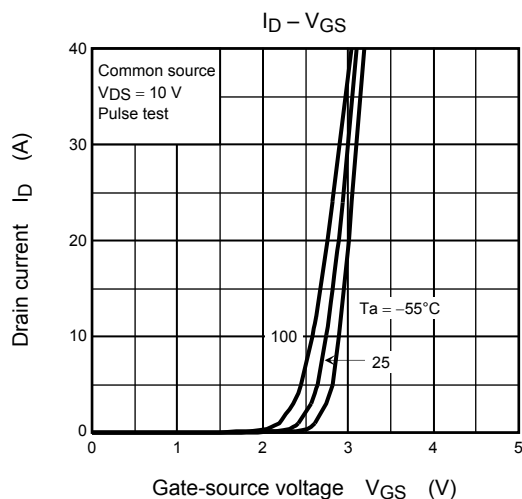
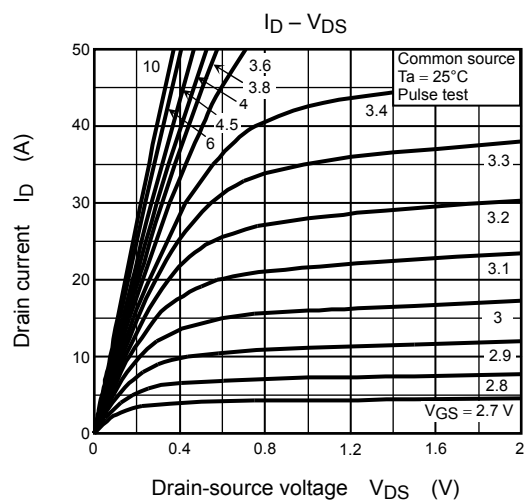
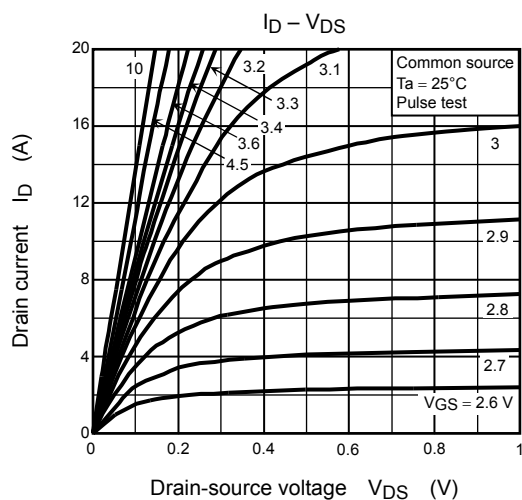


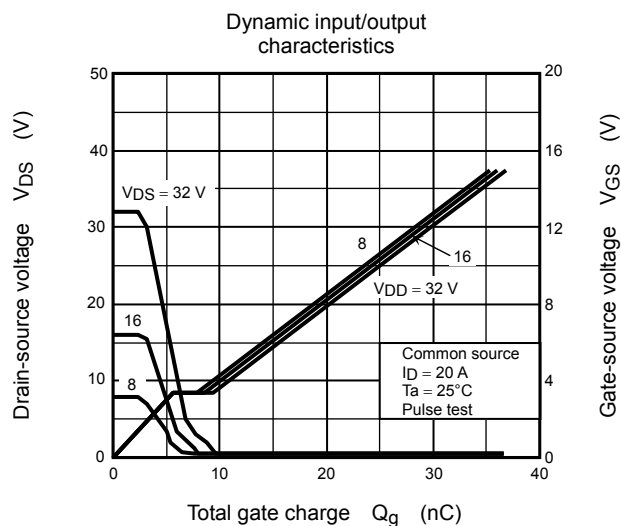
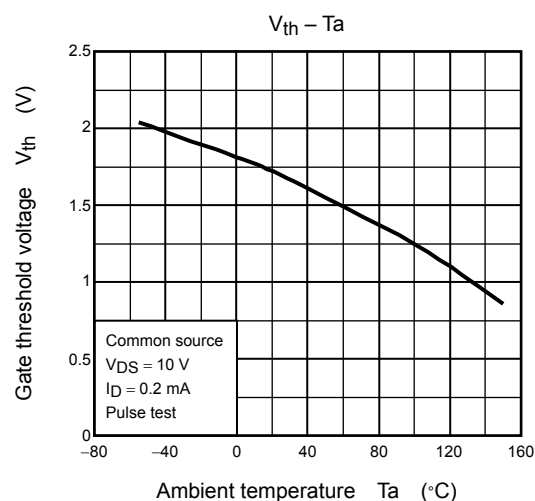
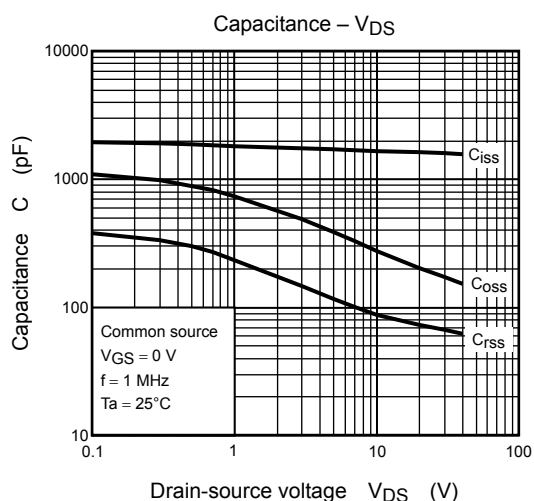
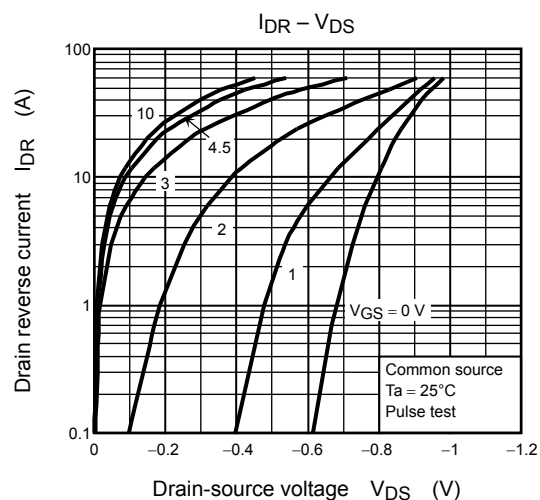
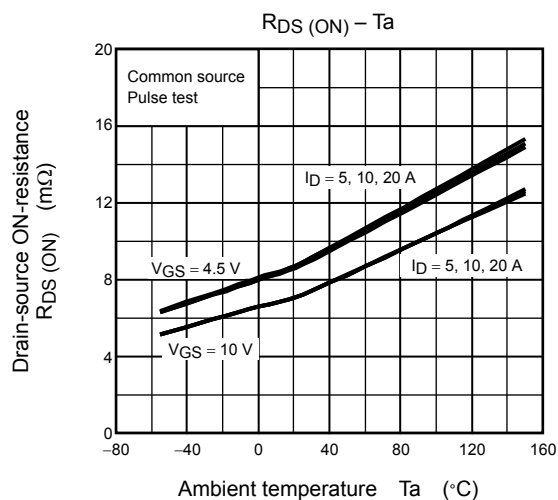
Electrical Characteristics (Ta = 25°C)

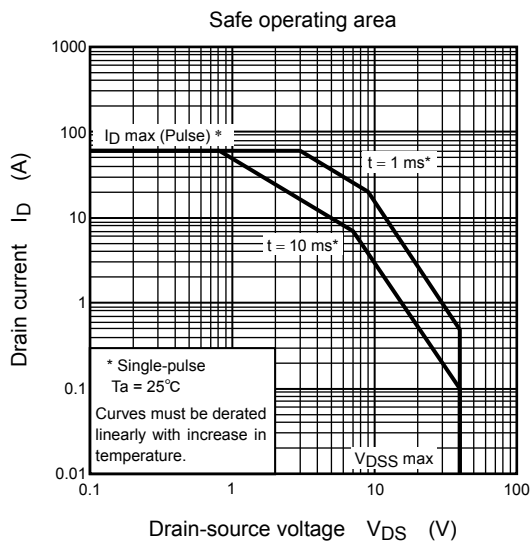
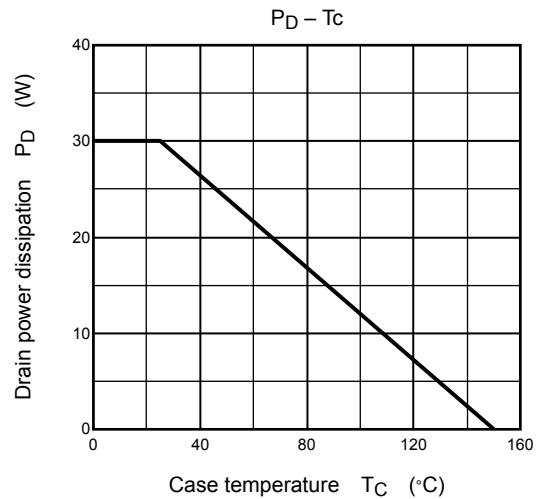
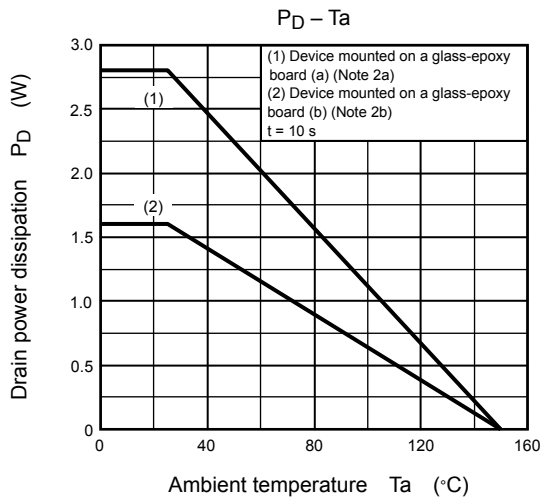
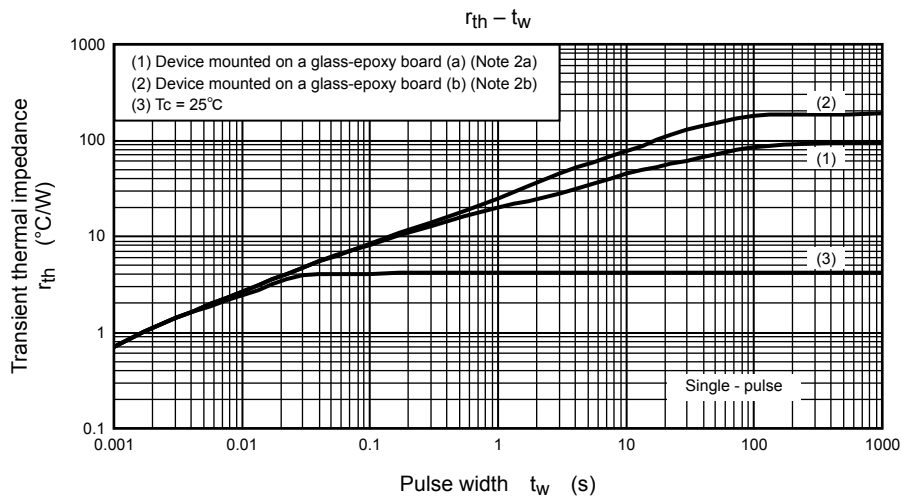
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I _{GSS}	V _{GS} = ±20 V, V _{DS} = 0 V	—	—	±100	nA
Drain cutoff current		I _{DSS}	V _{DS} = 40 V, V _{GS} = 0 V	—	—	10	μA
Drain-source breakdown voltage		V _(BR) DSS	I _D = 10 mA, V _{GS} = 0 V	40	—	—	V
		V _(BR) DSX	I _D = 10 mA, V _{GS} = −20 V	23	—	—	
Gate threshold voltage		V _{th}	V _{DS} = 10 V, I _D = 0.2 mA	1.3	—	2.3	V
Drain-source ON-resistance		R _{DS} (ON)	V _{GS} = 4.5 V, I _D = 10 A	—	9.1	13.1	mΩ
			V _{GS} = 10 V, I _D = 10 A	—	7.2	11.3	
Forward transfer admittance		Y _{fs}	V _{DS} = 10 V, I _D = 10 A	29	58	—	S
Input capacitance		C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	—	1620	2110	pF
Reverse transfer capacitance		C _{rss}		—	85	130	
Output capacitance		C _{oss}		—	280	—	
Gate resistance		r _g	V _{DS} = 10 V, V _{GS} = 0 V, f = 5 MHz	—	2.3	3.5	Ω
Switching time	Rise time	t _r	 V_{GS} 10 V 0 V I_D = 10 A V_{OUT} 4.7 Ω R_L = 20 Ω V_{DD} ≈ 20 V Duty ≤ 1%, t_w = 10 μs	—	2.4	—	ns
	Turn-on time	t _{on}		—	8.4	—	
	Fall time	t _f		—	8.0	—	
	Turn-off time	t _{off}		—	35	—	
Total gate charge (gate-source plus gate-drain)		Q _g	V _{DD} ≈ 32 V, V _{GS} = 10 V, I _D = 20 A	—	25	—	nC
			V _{DD} ≈ 32 V, V _{GS} = 5 V, I _D = 20 A	—	13	—	
Gate-source charge 1		Q _{gs1}	V _{DD} ≈ 32 V, V _{GS} = 10 V, I _D = 20 A	—	5.6	—	
Gate-drain (“Miller”) charge		Q _{gd}		—	3.8	—	
Gate switch charge		Q _{SW}		—	6.8	—	

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

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	60	A
Forward voltage (diode)		V_{DSF}	$I_{DR} = 20 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.2	V







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