

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

TPC8053-H

Switching Regulator Applications

Motor Drive Applications

DC-DC Converter Applications

- Small footprint due to a small and thin package
- High-speed switching
- Small gate charge: $Q_{SW} = 6.7 \text{ nC (typ.)}$
- Low drain-source ON-resistance:
 $R_{DS(ON)} = 14.1 \text{ m}\Omega \text{ (typ.)}$
- High forward transfer admittance: $|Y_{fs}| = 30 \text{ S (typ.)}$
- Low leakage current: $I_{DSS} = 10 \text{ }\mu\text{A (max) (}V_{DS} = 60 \text{ V)}$
- 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 (Ta = 25°C)

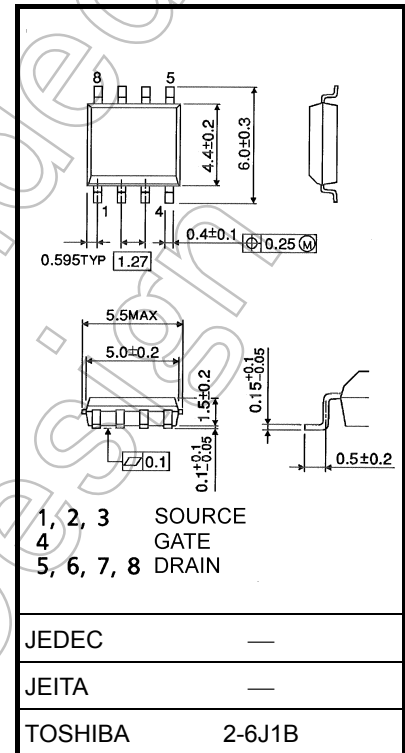
Characteristic		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	60	V
Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)		V_{DGR}	60	V
Gate-source voltage		V_{GSS}	± 20	V
Drain current	DC (Note 1)	I_D	9	A
	Pulsed (Note 1)	I_{DP}	36	
Drain power dissipation (t = 10 s) (Note 2a)		P_D	1.9	W
Drain power dissipation (t = 10 s) (Note 2b)		P_D	1.0	W
Single-pulse avalanche energy (Note 3)		E_{AS}	29	mJ
Avalanche current		I_{AR}	9	A
Repetitive avalanche energy ($T_c = 25^\circ\text{C}$) (Note 4)		E_{AR}	0.06	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	-55 to 150	°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).

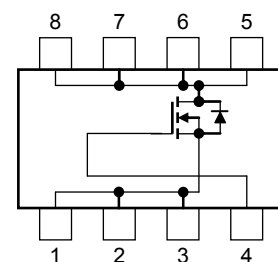
This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm



Weight: 0.085g (typ.)

Circuit Configuration

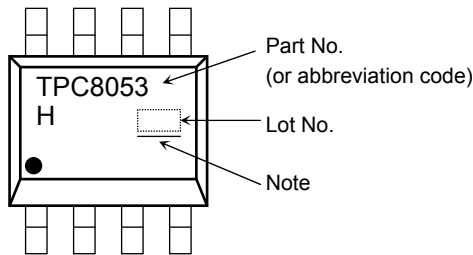


Start of commercial production
2009-03

Thermal Characteristics

Characteristic	Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	$R_{th(ch-a)}$	65.8	°C/W
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	$R_{th(ch-a)}$	125	°C/W

Marking (Note 5)

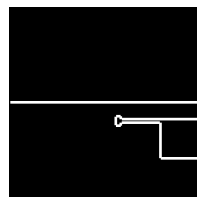


Note: A line under a Lot No. identifies the indication of product Labels [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

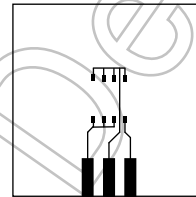
Note 1: Ensure that the channel temperature does not exceed 150°C.

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



(a)

FR-4
25.4 × 25.4 × 0.8
(Unit: mm)



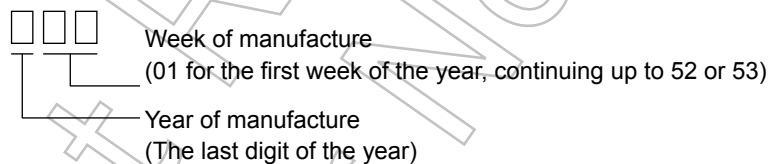
(b)

FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

Note 3: $V_{DD} = 24\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 500\ \mu\text{H}$, $R_G = 25\ \Omega$, $I_{AR} = 9\ \text{A}$

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

Note 5: * Weekly code: (Three digits)

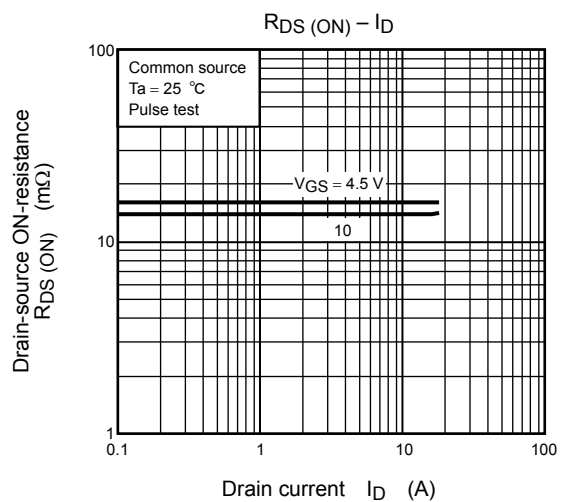
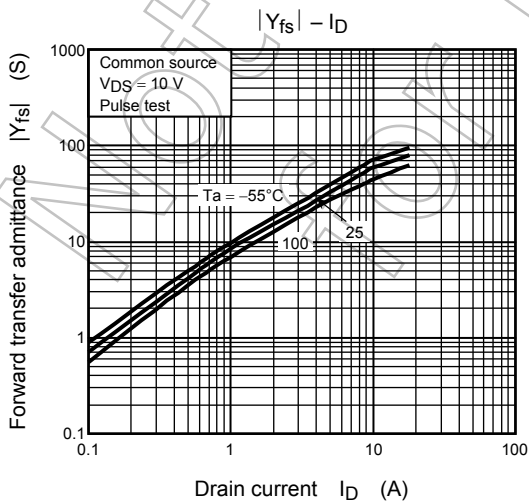
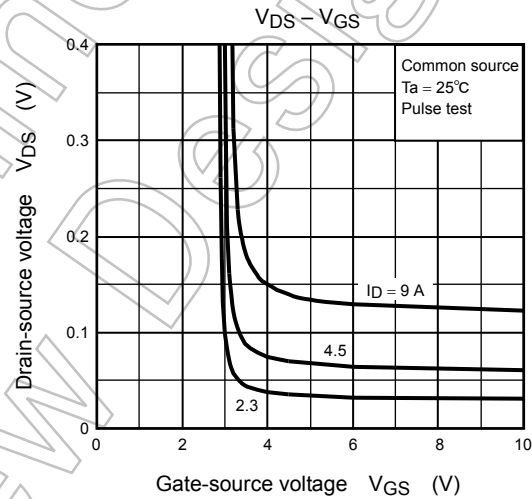
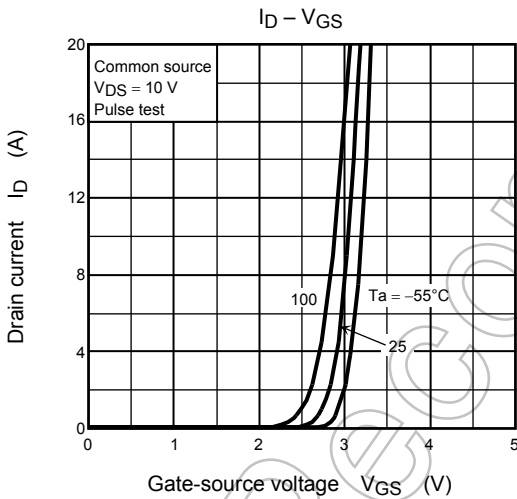
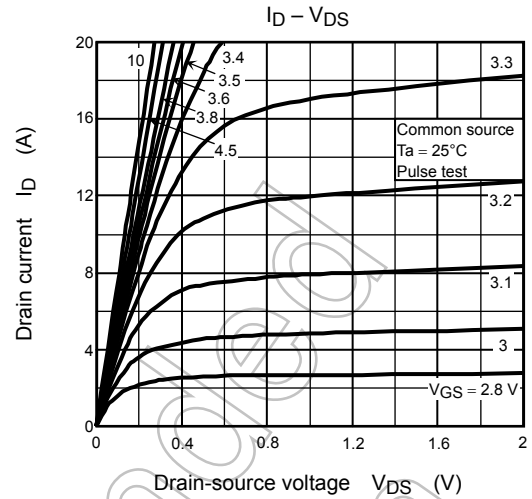
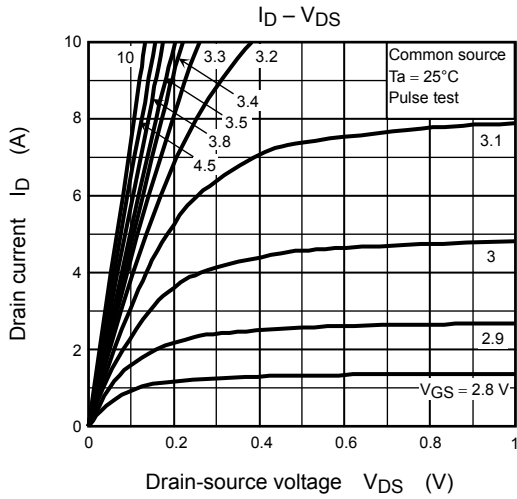


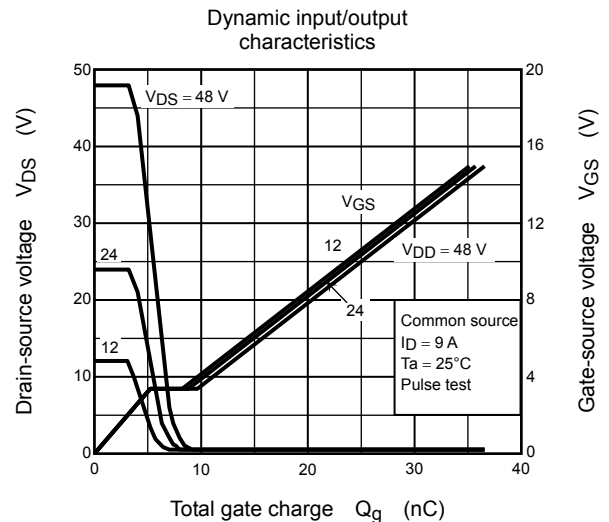
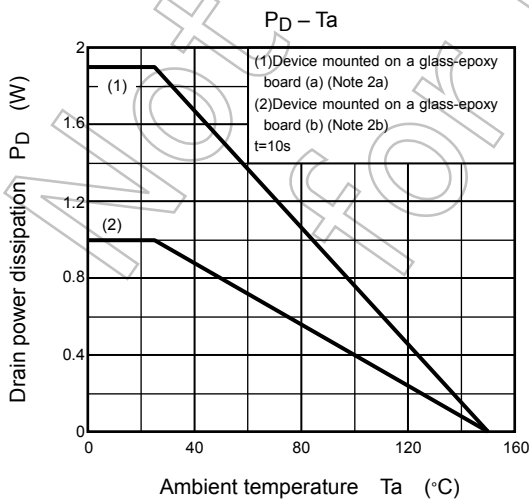
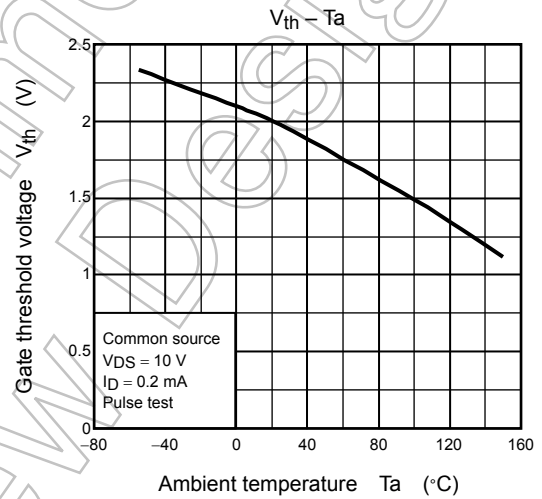
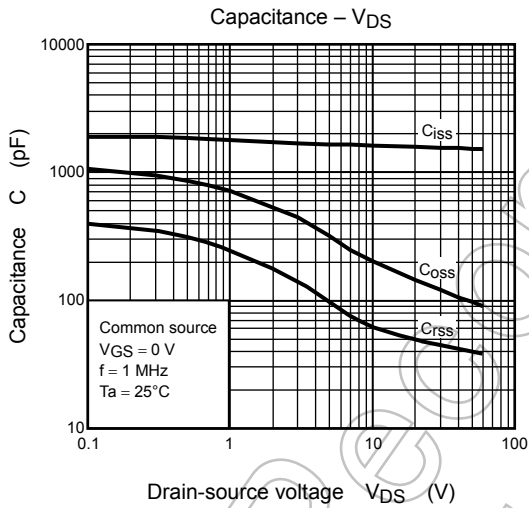
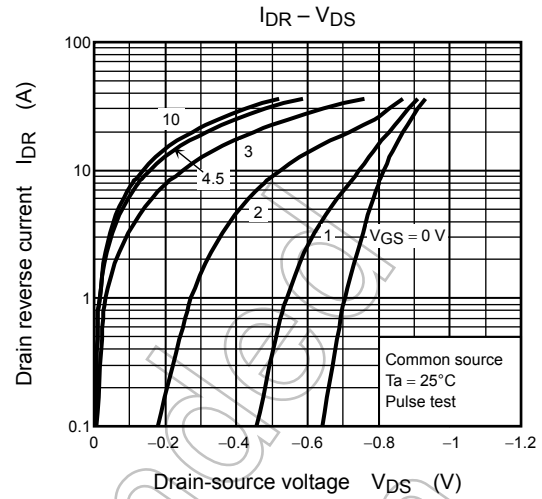
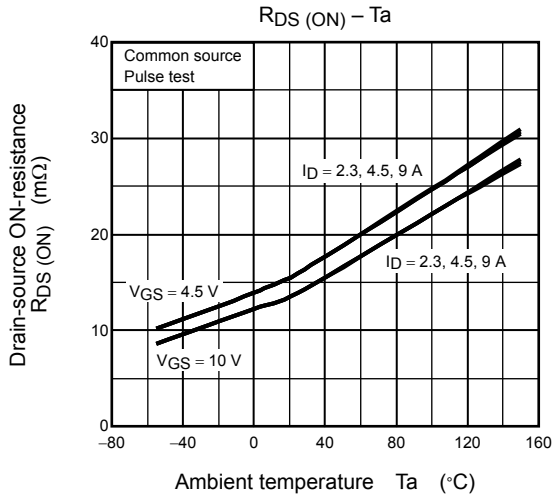
Electrical Characteristics (Ta = 25°C)

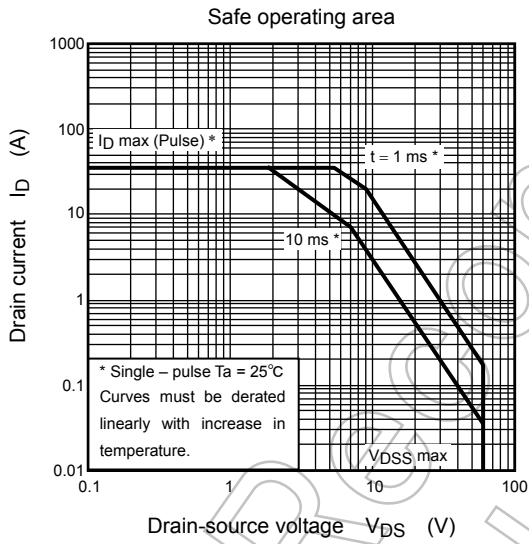
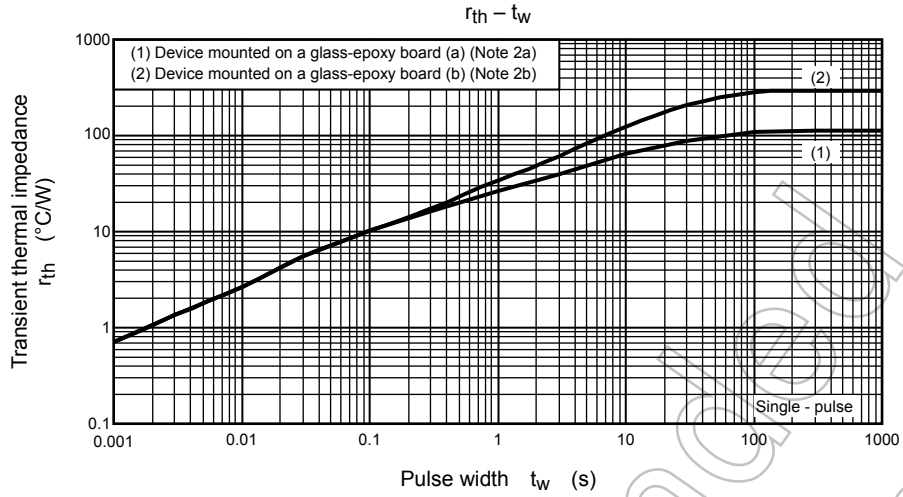
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 100	nA
Drain cutoff current		I_{DSS}	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	60	—	—	V
		$V_{(BR)DSX}$	$I_D = 10\text{ mA}, V_{GS} = -20\text{ V}$	43	—	—	
Gate threshold voltage		V_{th}	$V_{DS} = 10\text{ V}, I_D = 0.2\text{ mA}$	1.3	—	2.3	V
Drain-source ON-resistance		$R_{DS(ON)}$	$V_{GS} = 4.5\text{ V}, I_D = 4.5\text{ A}$	—	15.8	24.2	m Ω
			$V_{GS} = 10\text{ V}, I_D = 4.5\text{ A}$	—	14.1	22.5	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 4.5\text{ A}$	15	30	—	S
Input capacitance		C_{iss}	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	1620	2110	pF
Reverse transfer capacitance		C_{rss}		—	60	90	
Output capacitance		C_{oss}		—	200	—	
Gate resistance		r_g	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 5\text{ MHz}$	—	2.3	3.5	Ω
Switching time	Rise time	t_r	<p>$V_{GS} = 10\text{ V}$ 0 V $I_D = 4.5\text{ A}$ $V_{DD} \approx 30\text{ V}$ Duty $\leq 1\%$, $t_w = 10\ \mu\text{s}$</p>	—	2.4	—	ns
	Turn-on time	t_{on}		—	9.1	—	
	Fall time	t_f		—	7.0	—	
	Turn-off time	t_{off}		—	34	—	
Total gate charge (gate-source plus gate-drain)		Q_g	$V_{DD} \approx 48\text{ V}, V_{GS} = 10\text{ V}, I_D = 9\text{ A}$	—	25	—	nC
			$V_{DD} \approx 48\text{ V}, V_{GS} = 5\text{ V}, I_D = 9\text{ A}$	—	13	—	
Gate-source charge 1		Q_{gs1}	$V_{DD} \approx 48\text{ V}, V_{GS} = 10\text{ V}, I_D = 9\text{ A}$	—	5.2	—	
Gate-drain ("Miller") charge		Q_{gd}		—	4.5	—	
Gate switch charge		Q_{sw}		—	6.7	—	

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

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Peak forward current	Pulse (Note 1)	I_{FP}	—	—	—	36	A
Forward voltage (diode)		V_{DSF}	$I_{DR} = 9\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.2	V







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