

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

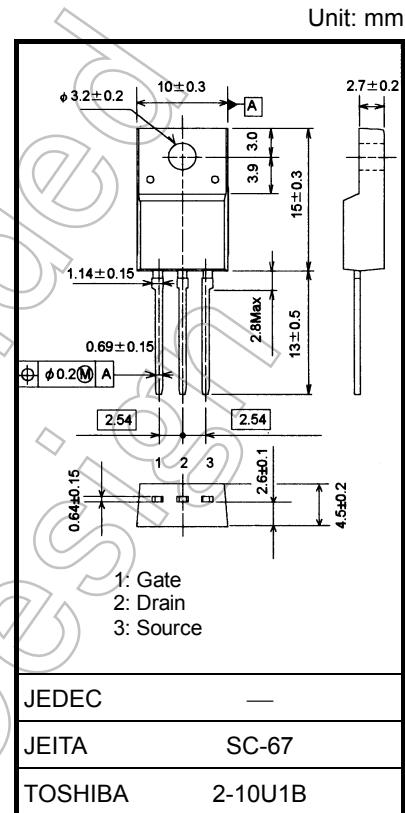
TK40A10K3

Switching Regulator Application

- Low drain-source ON resistance: $R_{DS(ON)} = 11.5 \text{ m}\Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 80 \text{ S}$
- Low leakage current: $I_{DSS} = 10 \mu\text{A}$ (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 ($T_a = 25^\circ\text{C}$)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	100	V
Gate-source voltage	V_{GSS}	± 20	V
Drain current	DC (Note 1)	I_D	A
	Pulse (Note 1)	I_{DP}	
Drain power dissipation ($T_c = 25^\circ\text{C}$)	P_D	40	W
Single pulse avalanche energy (Note 2)	E_{AS}	137	mJ
Avalanche current	I_{AR}	40	A
Repetitive avalanche energy (Note 3)	E_{AR}	3.3	mJ
Channel temperature	T_{ch}	150	$^\circ\text{C}$
Storage temperature range	T_{stg}	-55 to 150	$^\circ\text{C}$



Weight: 1.7 g (typ.)

Note: 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.).

Thermal Characteristics

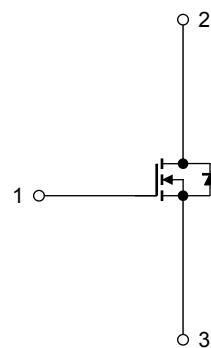
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th}(\text{ch-c})$	3.125	$^\circ\text{C/W}$
Thermal resistance, channel to ambient	$R_{th}(\text{ch-a})$	62.5	$^\circ\text{C/W}$

Note 1: Ensure that the channel & lead temperature does not exceed 150°C .Note 2: $V_{DD} = 50 \text{ V}$, $T_{ch} = 25^\circ\text{C}$, $L = 100 \mu\text{H}$, $I_{AR} = 40 \text{ A}$, $R_G = 1 \Omega$

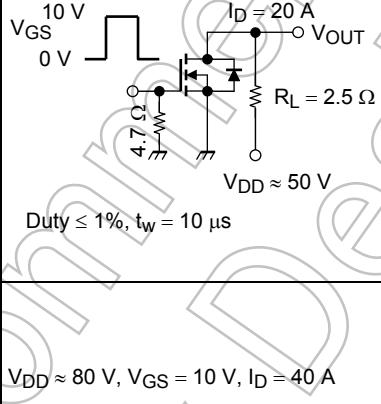
Note 3: Repetitive rating; pulse width limited by maximum channel temperature.

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

Internal Connection



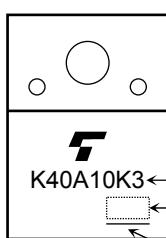
Electrical Characteristics ($T_a = 25^\circ C$)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I_{GSS}	$V_{GS} = \pm 20 V, V_{DS} = 0 V$	—	—	± 1	μA
Drain cut-OFF current	I_{DSS}	$V_{DS} = 100 V, V_{GS} = 0 V$	—	—	10	μA
Drain-source breakdown voltage	$V_{(BR) DSS}$	$I_D = 10 mA, V_{GS} = 0 V$	100	—	—	V
	$V_{(BR) DSX}$	$I_D = 10 mA, V_{GS} = -20 V$	65	—	—	
Gate threshold voltage	V_{th}	$V_{DS} = 10 V, I_D = 1 mA$	2.0	—	4.0	V
Drain-source ON resistance	$R_{DS (ON)}$	$V_{GS} = 10 V, I_D = 20 A$	—	11.5	15	$m\Omega$
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10 V, I_D = 20 A$	40	80	—	S
Input capacitance	C_{iss}	$V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz$	—	4000	—	pF
Reverse transfer capacitance	C_{rss}		—	330	—	
Output capacitance	C_{oss}		—	480	—	
Switching time	Rise time	t_r		—	85	—
	Turn-ON time	t_{on}		—	130	—
	Fall time	t_f		—	70	—
	Turn-OFF time	t_{off}		—	260	—
Total gate charge (gate-source plus gate-drain)	Q_g	$V_{DD} \approx 80 V, V_{GS} = 10 V, I_D = 40 A$	—	85	—	nC
Gate-source charge 1	Q_{gs1}		—	20	—	
Gate-drain ("miller") charge	Q_{gd}		—	35	—	
Gate switch charge	Q_{sw}		—	40	—	

Source-Drain Ratings and Characteristics ($T_a = 25^\circ C$)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	40	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	160	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 40 A, V_{GS} = 0 V$	—	-0.9	-1.2	V
Reverse recovery time	t_{rr}	$I_{DR} = 40 A, V_{GS} = 0 V,$ $dI_{DR} / dt = 50 A / \mu s$	—	55	—	ns
Reverse recovery charge	Q_{rr}	$dI_{DR} / dt = 50 A / \mu s$	—	55	—	nC

Marking



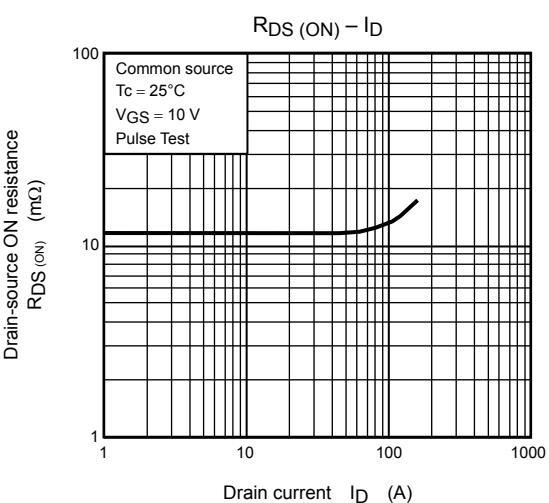
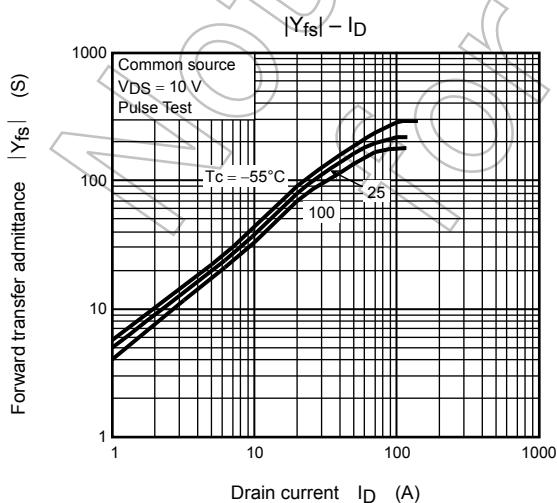
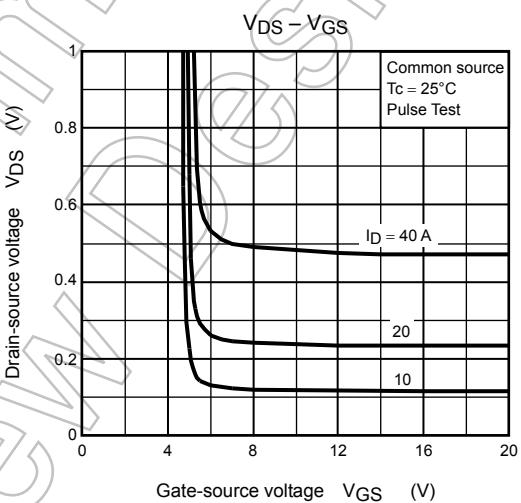
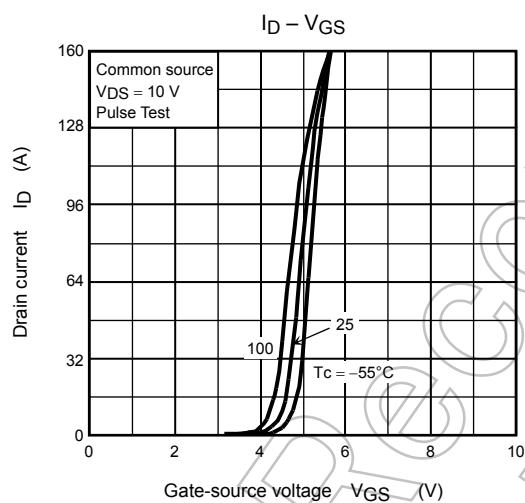
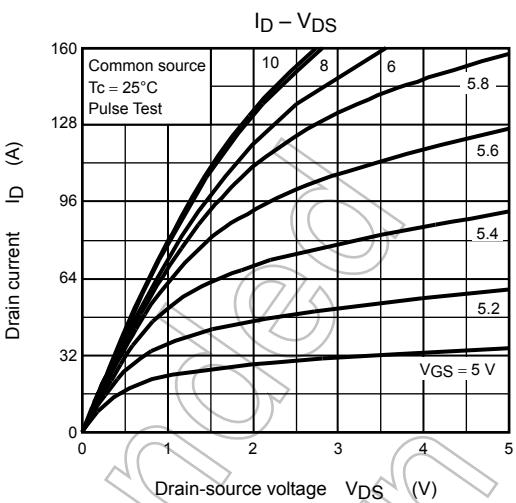
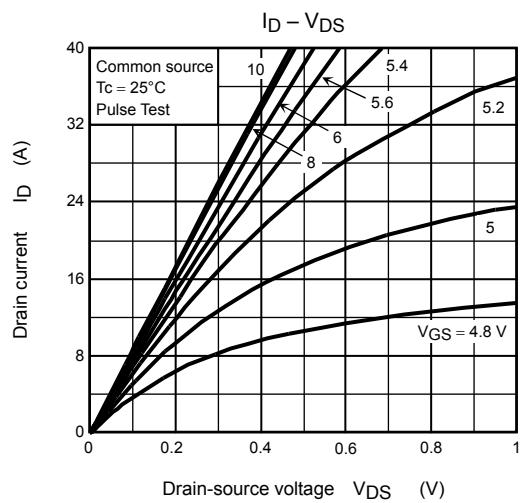
Part No. (or abbreviation code)
K40A10K3
Lot No.
Note 4

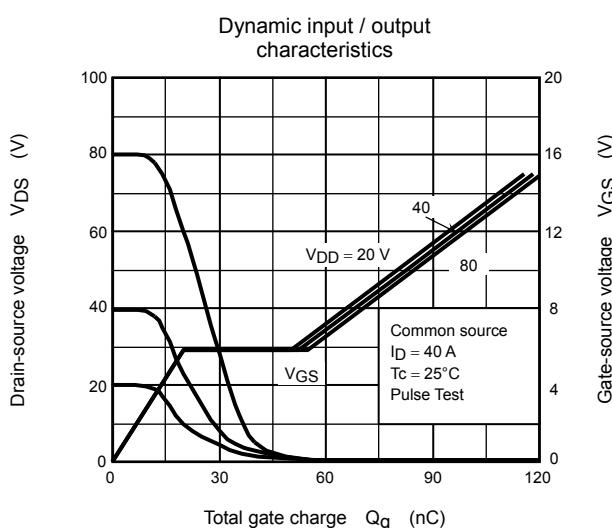
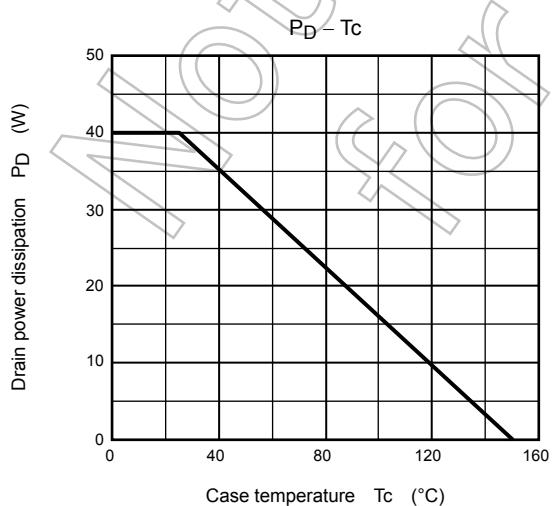
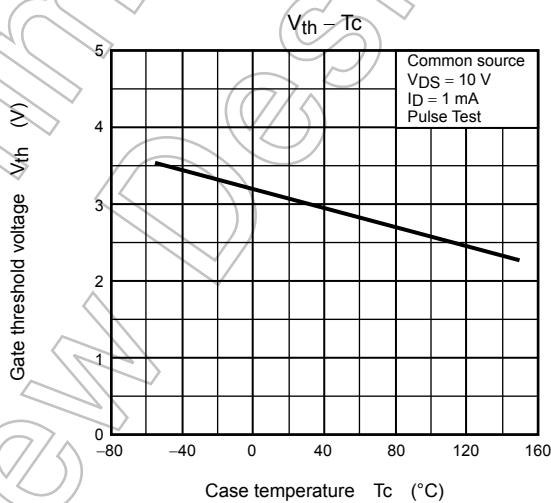
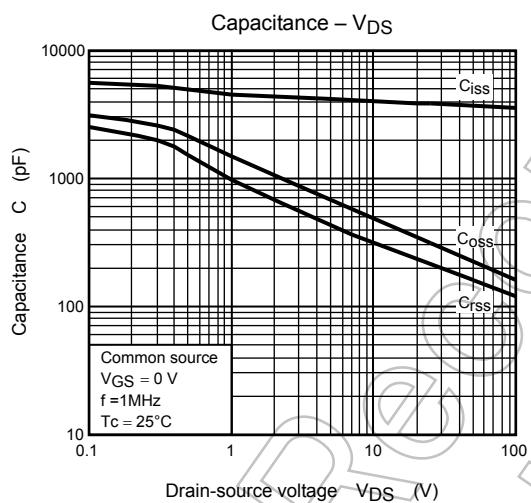
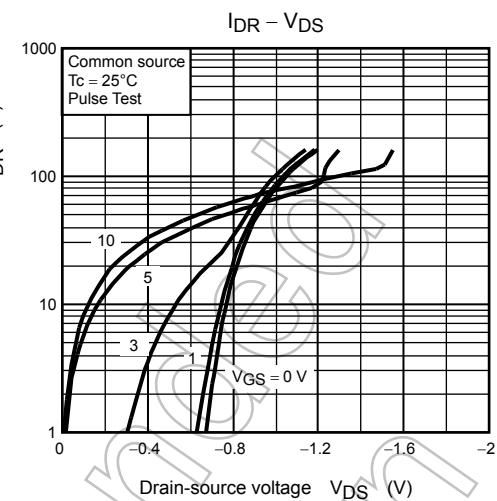
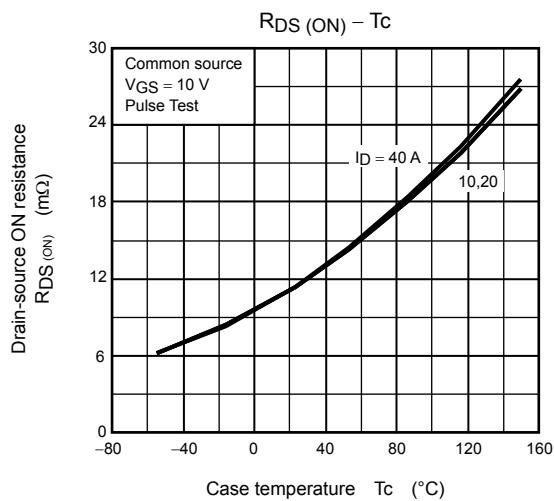
Note 4: A line under a Lot No. identifies the indication of product Labels.

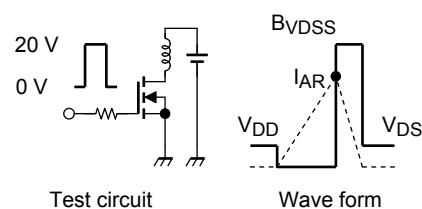
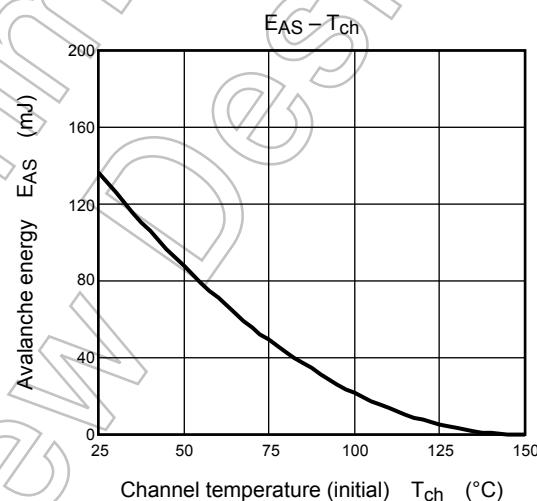
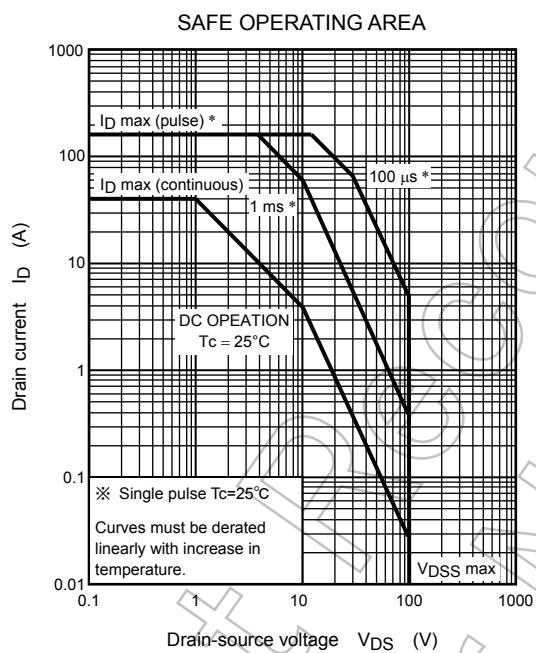
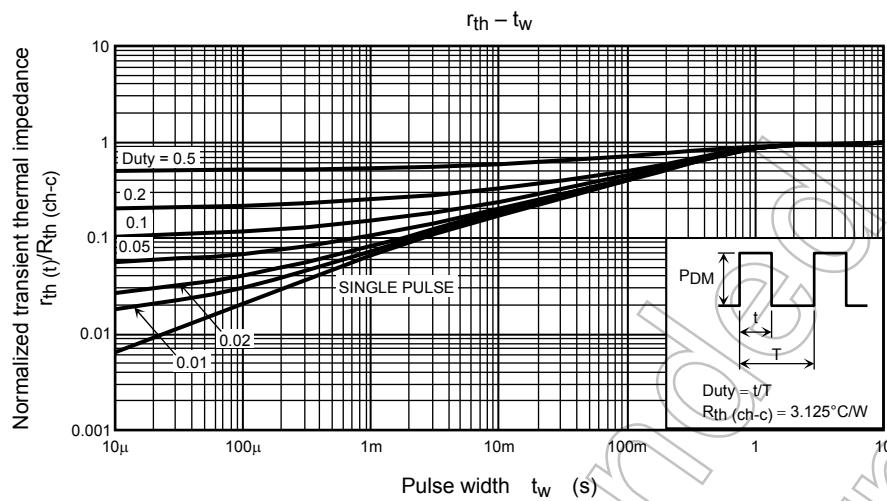
Not underlined: [[Pb]]/INCLUDES > MCV

Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

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$$R_G = 1 \Omega$$

$$V_{DD} = 50 \text{ V}, L = 100 \mu\text{H}$$

$$EAS = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{BVDSS}{BVDSS - V_{DD}} \right)$$

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