

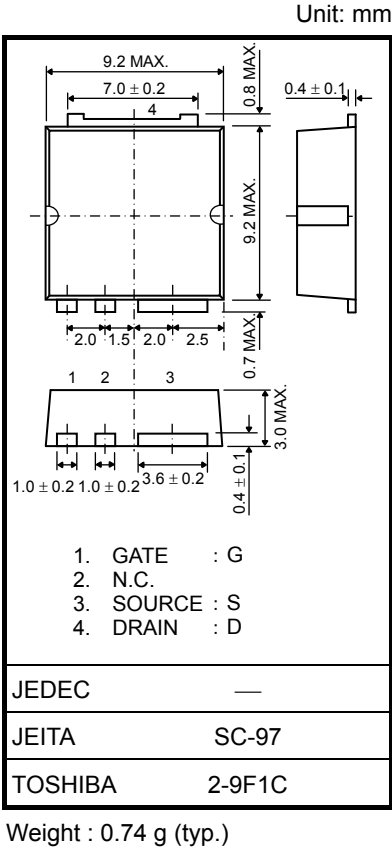
TK12X53D

Switching Regulator Applications

- Low drain-source ON resistance: $R_{DS(ON)} = 0.5 \Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 6.0 S$ (typ.)
- Low leakage current: $I_{DSS} = 10 \mu A$ (max) ($V_{DS} = 525 V$)
- Enhancement-mode: $V_{th} = 2.0$ to $4.0 V$ ($V_{DS} = 10 V, I_D = 1 mA$)

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

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	525	V
Gate-source voltage		V_{GSS}	± 30	V
Drain current	DC (Note 1)	I_D	12	A
	Pulse (Note 1)	I_{DP}	48	
Drain power dissipation ($T_c = 25^{\circ}C$)		P_D	150	W
Single pulse avalanche energy (Note 2)		E_{AS}	378	mJ
Avalanche current		I_{AR}	12	A
Repetitive avalanche energy (Note 3)		E_{AR}	15	mJ
Channel temperature		T_{ch}	150	$^{\circ}C$
Storage temperature range		T_{stg}	-55 to 150	$^{\circ}C$



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	$R_{th(ch-c)}$	0.833	$^{\circ}C/W$

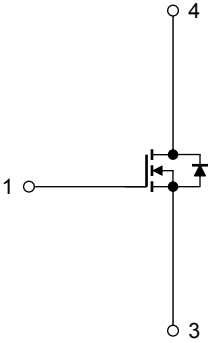
Note 1: Please use devices on conditions that the channel temperature is below $150^{\circ}C$.

Note 2: $V_{DD} = 90 V, T_{ch} = 25^{\circ}C$ (initial), $L = 4.5 mH, R_G = 25 \Omega, I_{AR} = 12 A$

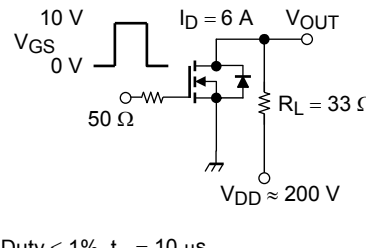
Note 3: Repetitive rating: pulse width limited by maximum channel temperature

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

Internal Connection



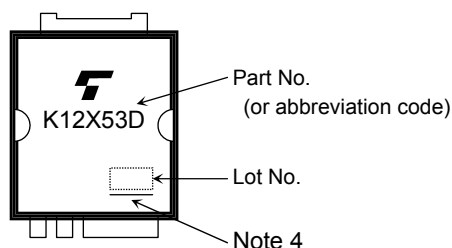
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 30 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	± 1	μA
Drain cut-off current		I_{DSS}	$V_{DS} = 525 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	10	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	525	—	—	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		$R_{DS(ON)}$	$V_{GS} = 10 \text{ V}, I_D = 6 \text{ A}$	—	0.50	0.58	Ω
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10 \text{ V}, I_D = 6 \text{ A}$	1.5	6.0	—	S
Input capacitance		C_{iss}	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	1350	—	pF
Reverse transfer capacitance		C_{rss}		—	6	—	
Output capacitance		C_{oss}		—	135	—	
Switching time	Rise time	t_r		—	22	—	ns
	Turn-on time	t_{on}		—	55	—	
	Fall time	t_f		—	15	—	
	Turn-off time	t_{off}		—	100	—	
Total gate charge		Q_g	$V_{DD} \approx 400 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 12 \text{ A}$	—	25	—	nC
Gate-source charge		Q_{gs}		—	16	—	
Gate-drain charge		Q_{gd}		—	9	—	

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

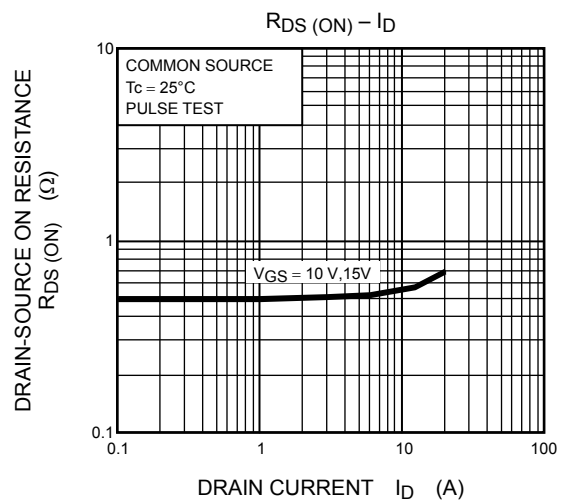
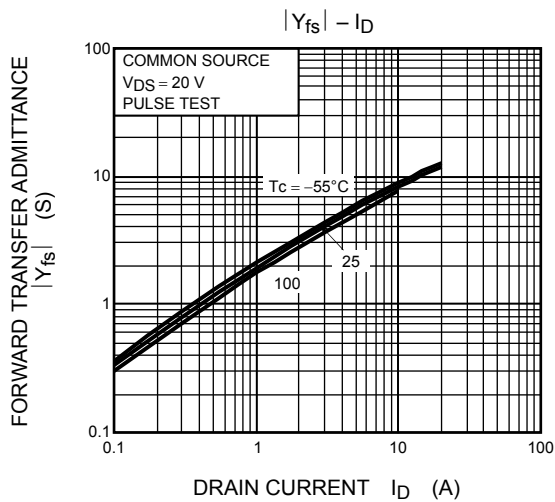
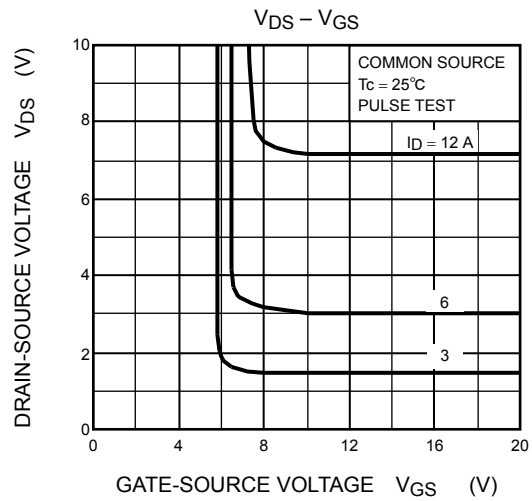
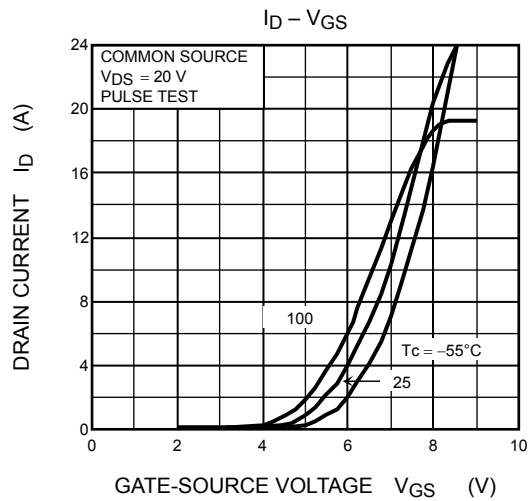
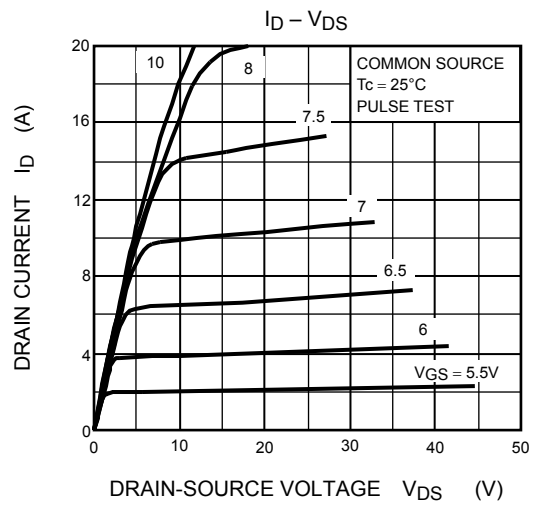
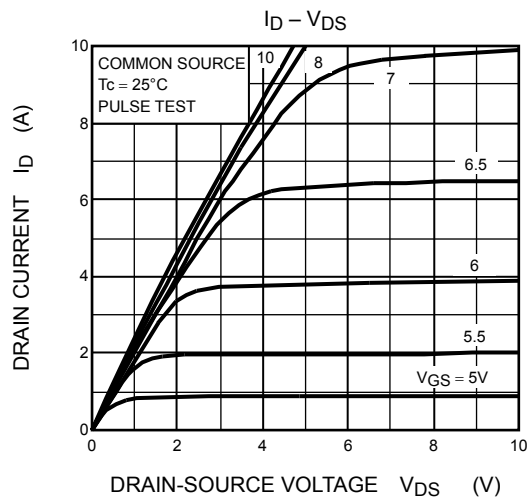
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	12	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	48	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 12 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = 12 \text{ A}, V_{GS} = 0 \text{ V},$ $dI_{DR}/dt = 100 \text{ A}/\mu\text{s}$	—	1300	—	ns
Reverse recovery charge	Q_{rr}		—	12	—	μC

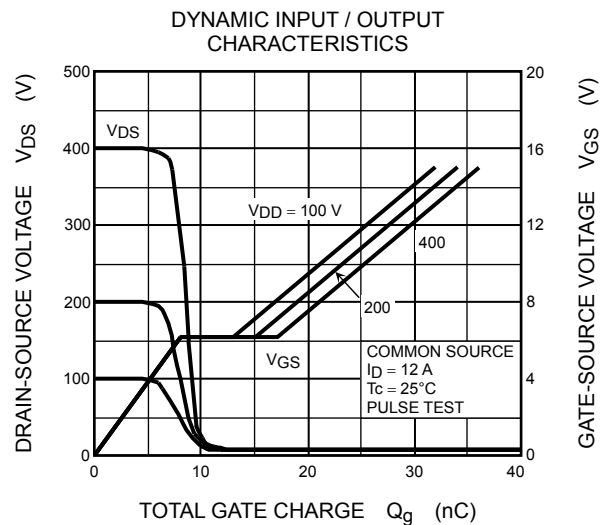
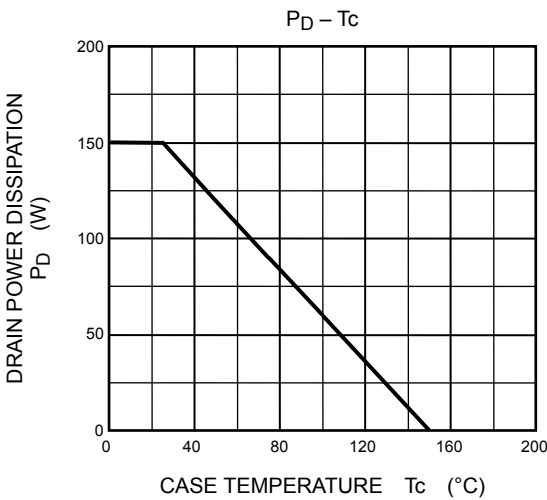
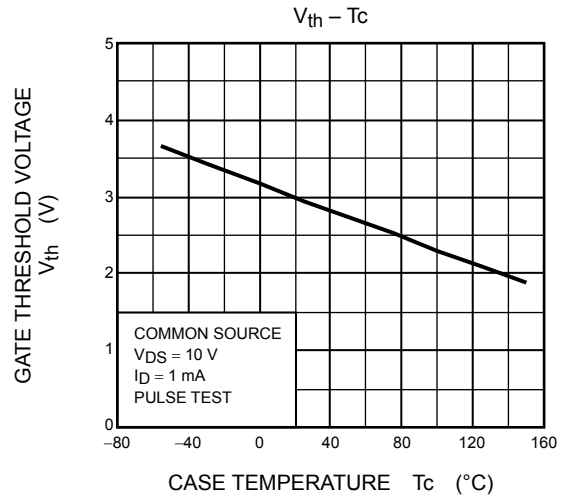
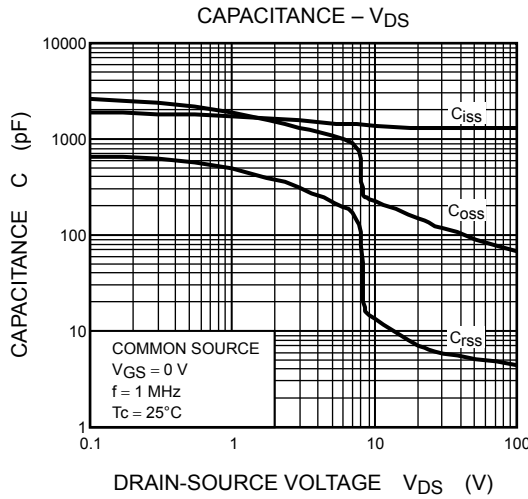
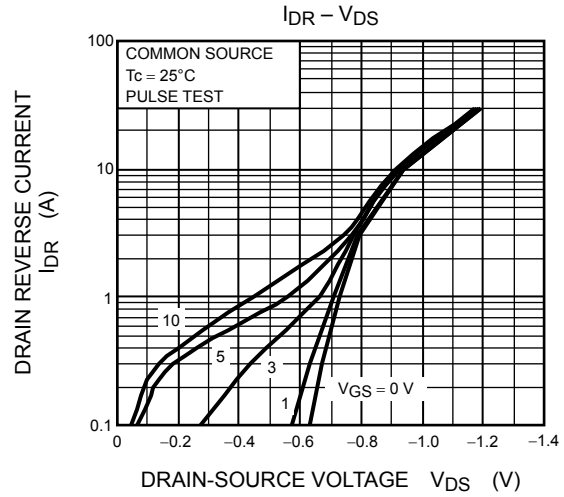
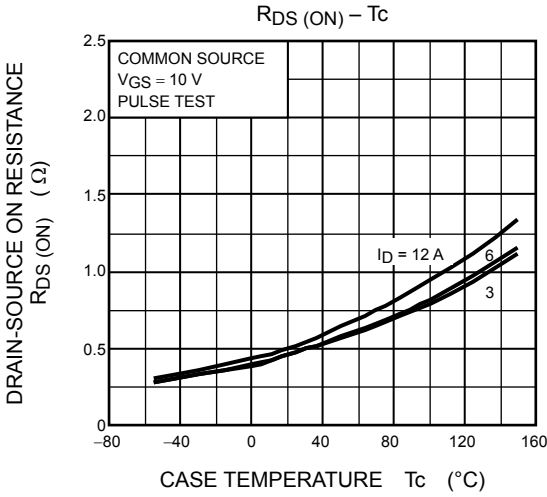
Marking

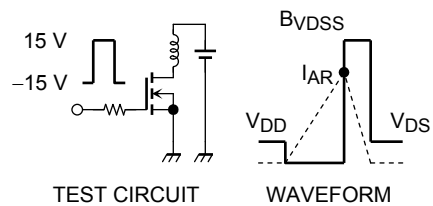
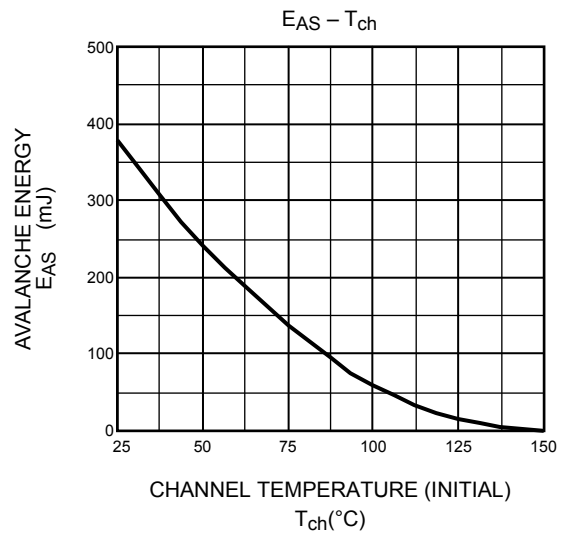
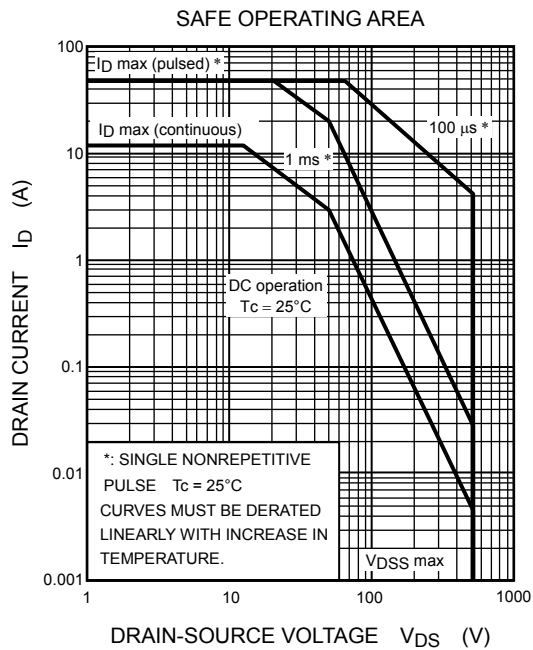
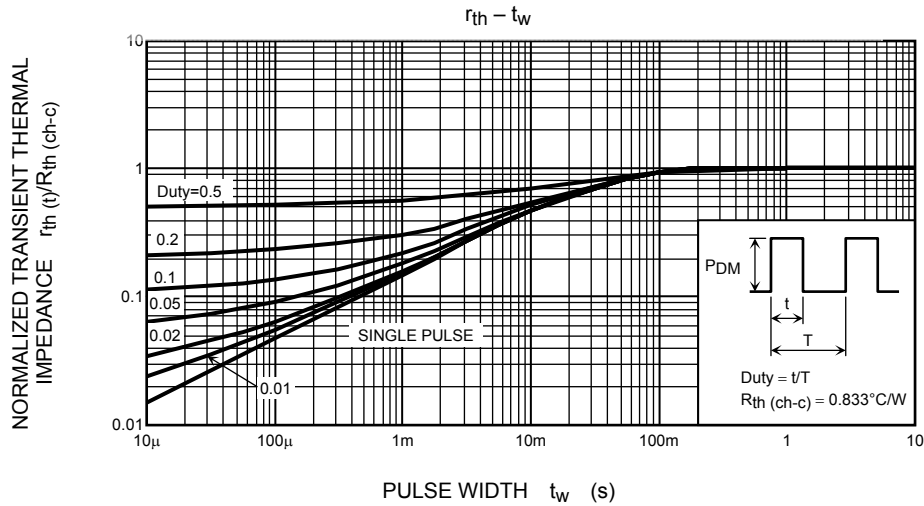


Note 4 : A line under a Lot No. identifies the indication of product Labels
[[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

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$$R_G = 25 \, \Omega$$

$$V_{DD} = 90 \, V, L = 4.5 \, mH$$

$$E_{AS} = \frac{1}{2} \cdot L \cdot I^2 \cdot \left(\frac{B_{VDS}}{B_{VDS} - V_{DD}} \right)$$

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