

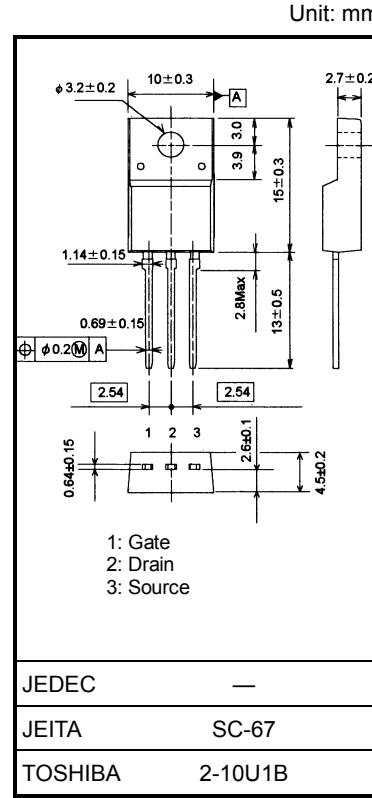
# TK15A50D

## Switching Regulator Applications

- Low drain-source ON-resistance:  $R_{DS\text{ (ON)}} = 0.24\ \Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 7.0\ \text{S}$  (typ.)
- Low leakage current:  $Id_{SS} = 10\ \mu\text{A}$  ( $V_{DS} = 500\ \text{V}$ )
- Enhancement mode:  $V_{th} = 2.0$  to  $4.0\ \text{V}$  ( $V_{DS} = 10\ \text{V}$ ,  $Id = 1\ \text{mA}$ )

### Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V <sub>DSS</sub>	500	V
Gate-source voltage		V <sub>GSS</sub>	±30	V
Drain current	DC (Note 1)	I <sub>D</sub>	15	A
	Pulse (t = 1 ms) (Note 1)	I <sub>DP</sub>	60	
Drain power dissipation (T <sub>C</sub> = 25°C)		P <sub>D</sub>	50	W
Single pulse avalanche energy (Note 2)		E <sub>AS</sub>	542	mJ
Avalanche current		I <sub>AR</sub>	15	A
Repetitive avalanche energy (Note 3)		E <sub>AR</sub>	5.0	mJ
Channel temperature		T <sub>ch</sub>	150	°C
Storage temperature range		T <sub>stg</sub>	-55 to 150	°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

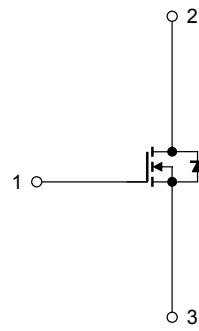
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	R <sub>th</sub> (ch-c)	2.5	°C/W
Thermal resistance, channel to ambient	R <sub>th</sub> (ch-a)	62.5	°C/W

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

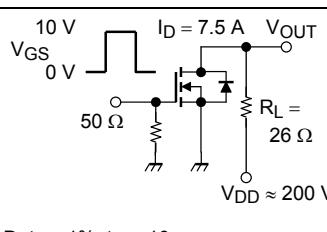
Note 2:  $V_{DD} = 90$  V,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 4.1$  mH,  $R_G = 25$   $\Omega$ ,  $I_{AR} = 15$  A

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

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



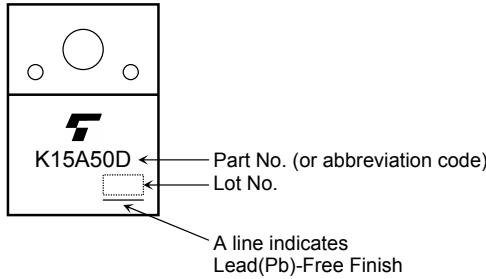
## Electrical Characteristics (Ta = 25°C)

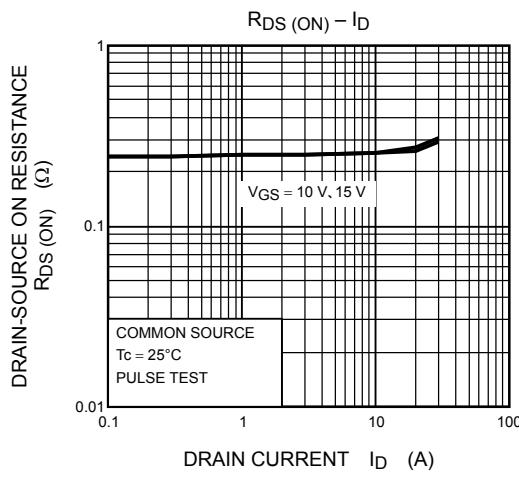
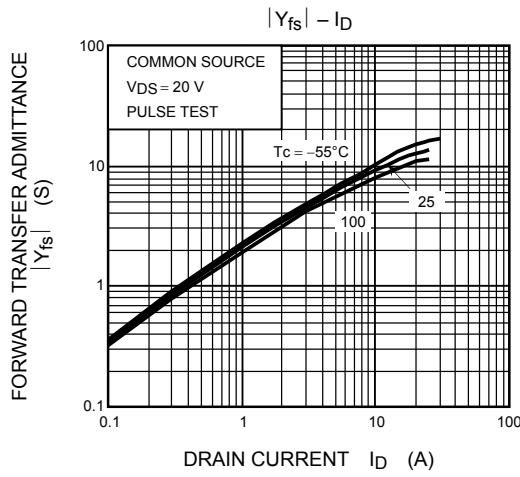
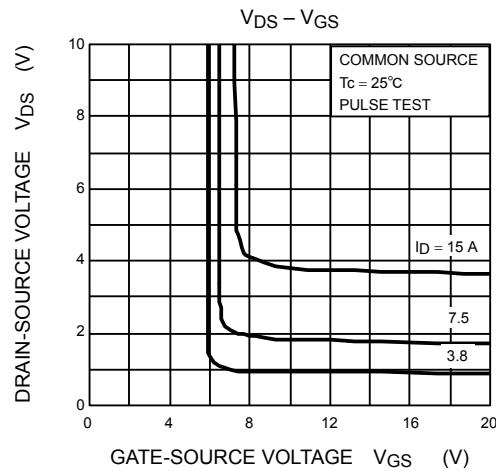
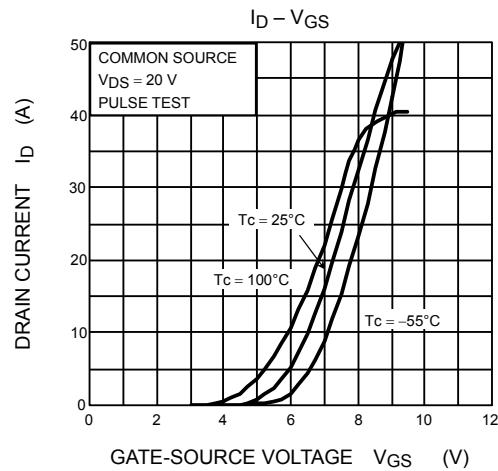
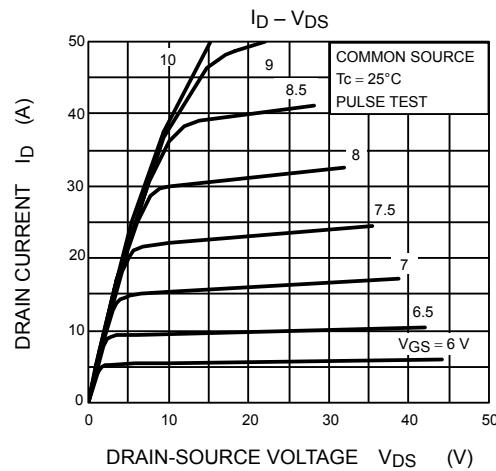
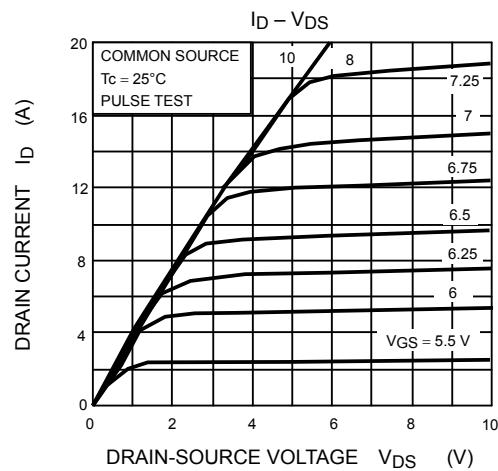
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I <sub>GSS</sub>	V <sub>GS</sub> = ±30 V, V <sub>DS</sub> = 0 V	—	—	±1	μA
Drain cut-off current	I <sub>DSS</sub>	V <sub>DS</sub> = 500 V, V <sub>GS</sub> = 0 V	—	—	10	μA
Drain-source breakdown voltage	V <sub>(BR) DSS</sub>	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V	500	—	—	V
Gate threshold voltage	V <sub>th</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	2.0	—	4.0	V
Drain-source ON-resistance	R <sub>DS</sub> (ON)	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 7.5 A	—	0.24	0.3	Ω
Forward transfer admittance	Y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 7.5 A	2.0	7.0	—	S
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz	—	2300	—	pF
Reverse transfer capacitance	C <sub>rss</sub>		—	10	—	
Output capacitance	C <sub>oss</sub>		—	250	—	
Switching time	Rise time	t <sub>r</sub>	 Duty ≤ 1%, t <sub>W</sub> = 10 μs	—	50	—
	Turn-on time	t <sub>on</sub>		—	100	—
	Fall time	t <sub>f</sub>		—	25	—
	Turn-off time	t <sub>off</sub>		—	140	—
Total gate charge	Q <sub>g</sub>	V <sub>DD</sub> ≈ 400 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 15 A	—	40	—	nC
Gate-source charge	Q <sub>gs</sub>		—	25	—	
Gate-drain charge	Q <sub>gd</sub>		—	15	—	

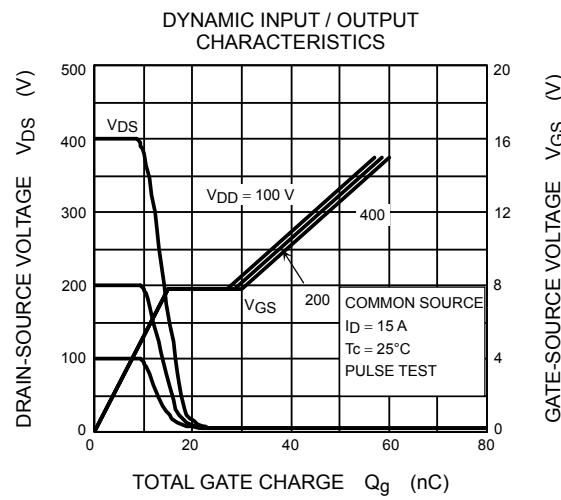
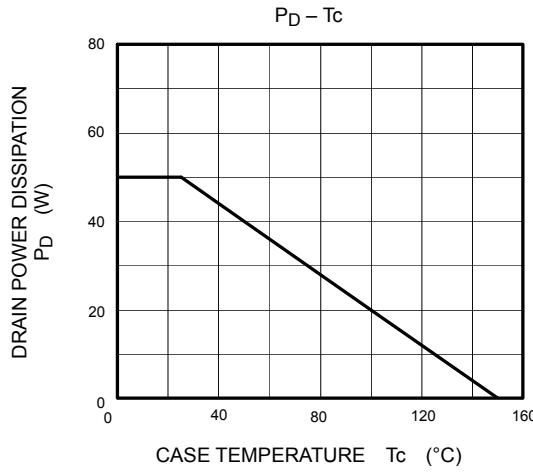
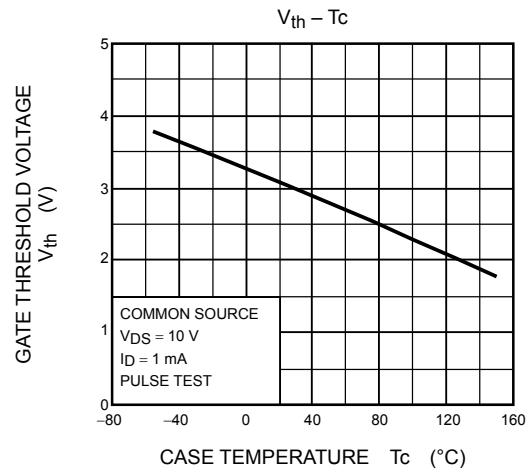
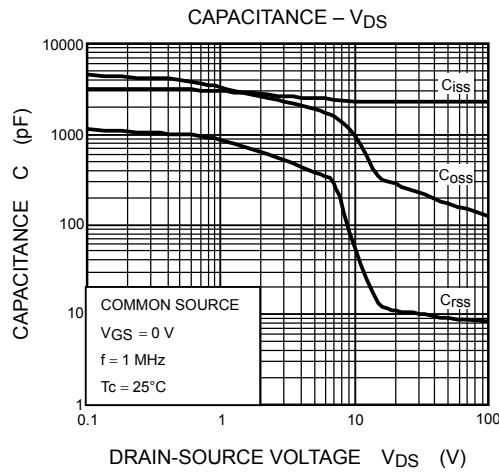
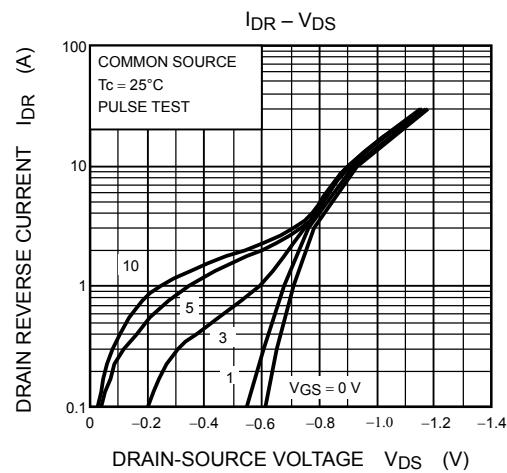
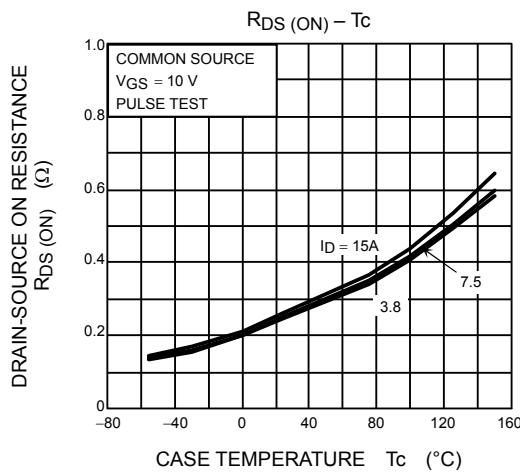
## Source-Drain Ratings and Characteristics (Ta = 25°C)

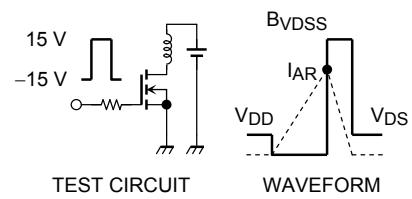
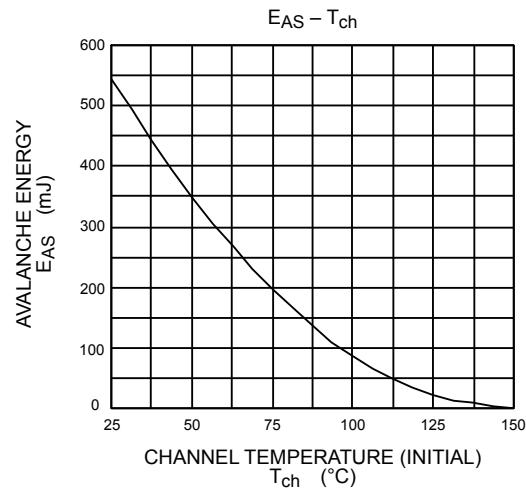
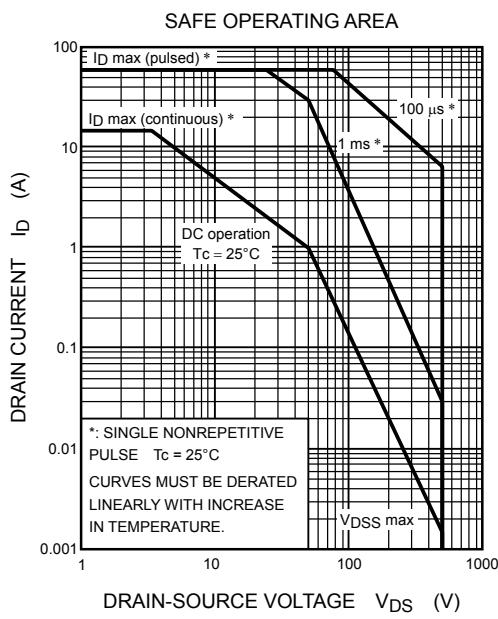
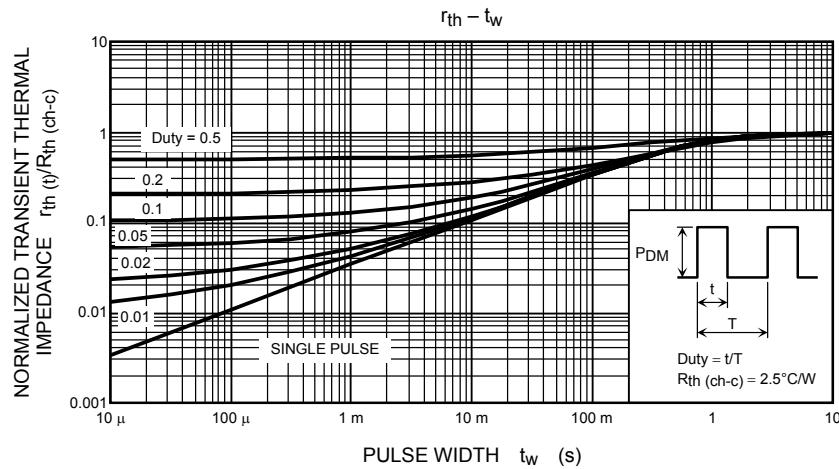
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I <sub>DR</sub>	—	—	—	15	A
Pulse drain reverse current (Note 1)	I <sub>DRP</sub>	—	—	—	60	A
Forward voltage (diode)	V <sub>DSF</sub>	I <sub>DR</sub> = 15 A, V <sub>GS</sub> = 0 V	—	—	-1.7	V
Reverse recovery time	t <sub>rr</sub>	I <sub>DR</sub> = 15 A, V <sub>GS</sub> = 0 V, dI <sub>DR</sub> /dt = 100 A/μs	—	1600	—	ns
Reverse recovery charge	Q <sub>rr</sub>		—	20	—	μC

## Marking









$$R_G = 25 \Omega$$

$$V_{DD} = 90 \text{ V}, L = 4.1 \text{ mH}$$

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

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20070701-EN GENERAL

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