

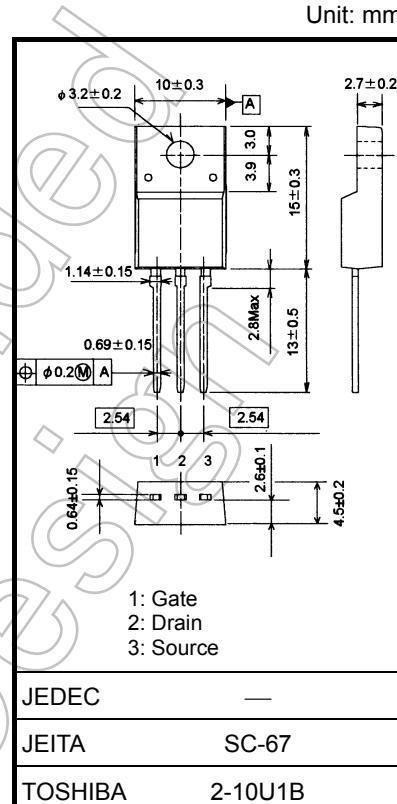
TK4A60DA

Switching Regulator Applications

- Low drain-source ON resistance: $R_{DS(ON)} = 1.7 \Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 2.2 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 10 \mu\text{A}$ (max) ($V_{DS} = 600 \text{ V}$)
- Enhancement-mode: $V_{th} = 2.4$ to 4.4 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}	600	V
Gate-source voltage		V_{GSS}	± 30	V
Drain current	DC (Note 1)	I_D	3.5	A
	Pulse (Note 1)	I_{DP}	14	
Drain power dissipation ($T_c = 25^\circ\text{C}$)		P_D	35	W
Single pulse avalanche energy (Note 2)		E_{AS}	158	mJ
Avalanche current		I_{AR}	3.5	A
Repetitive avalanche energy (Note 3)		E_{AR}	3.5	mJ
Channel temperature		T_{ch}	150	$^\circ\text{C}$
Storage temperature range		T_{stg}	-55 to 150	$^\circ\text{C}$



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

Internal Connection

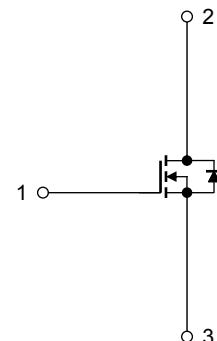
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th}(\text{ch-c})$	3.57	$^\circ\text{C/W}$
Thermal resistance, channel to ambient	$R_{th}(\text{ch-a})$	62.5	$^\circ\text{C/W}$

Note 1: Please use devices on conditions that the channel temperature is below 150°C .

Note 2: $V_{DD} = 90 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 22.5 \text{ mH}$, $R_G = 25 \Omega$, $I_{AR} = 3.5 \text{ A}$

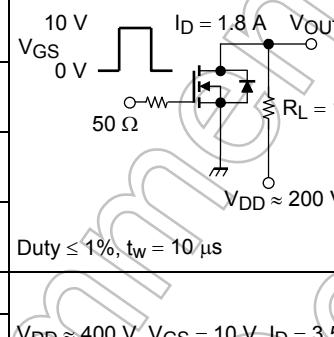
Note 3: Repetitive rating: pulse width limited by maximum channel temperature

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



Start of commercial production
2008-09

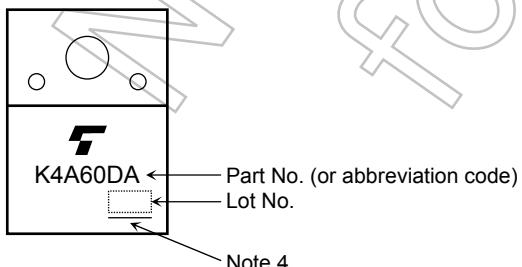
Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I _{GSS}	V _{GS} = ±30 V, V _{DS} = 0 V	—	—	±1	µA
Drain cut-off current	I _{DSS}	V _{DS} = 600 V, V _{GS} = 0 V	—	—	10	µA
Drain-source breakdown voltage	V _{(BR) DSS}	I _D = 10 mA, V _{GS} = 0 V	600	—	—	V
Gate threshold voltage	V _{th}	V _{DS} = 10 V, I _D = 1 mA	2.4	—	4.4	V
Drain-source ON resistance	R _{DS} (ON)	V _{GS} = 10 V, I _D = 1.8 A	—	1.7	2.2	Ω
Forward transfer admittance	Y _{fs}	V _{DS} = 10 V, I _D = 1.8 A	0.6	2.2	—	S
Input capacitance	C _{iss}	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz	—	490	—	pF
Reverse transfer capacitance	C _{rss}		—	3	—	
Output capacitance	C _{oss}		—	55	—	
Switching time	Rise time	t _r		—	18	ns
	Turn-on time	t _{on}		40	—	
	Fall time	t _f		8	—	
	Turn-off time	t _{off}		55	—	
Total gate charge	Q _g	V _{DD} ≈ 400 V, V _{GS} = 10 V, I _D = 3.5 A	—	11	—	nC
Gate-source charge	Q _{gs}		—	6	—	
Gate-drain charge	Q _{gd}		—	5	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I _{DR}	—	—	—	3.5	A
Pulse drain reverse current (Note 1)	I _{DRP}	—	—	—	14	A
Forward voltage (diode)	V _{DSF}	I _{DR} = 3.5 A, V _{GS} = 0 V	—	—	-1.7	V
Reverse recovery time	t _{rr}	I _{DR} = 3.5 A, V _{GS} = 0 V, dI _{DR} /dt = 100 A/µs	—	1000	—	ns
Reverse recovery charge	Q _{rr}	dI _{DR} /dt = 100 A/µs	—	5.0	—	µC

Marking

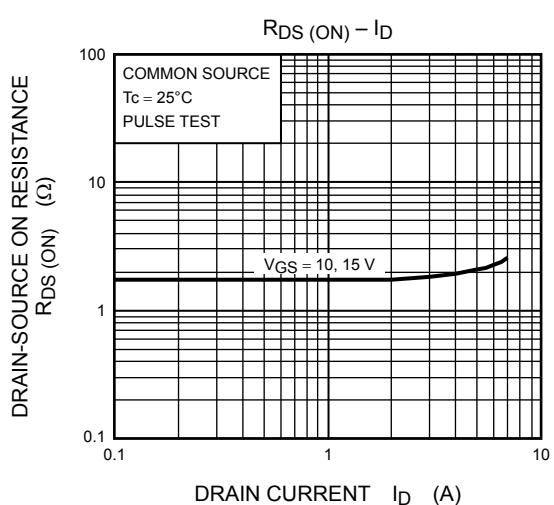
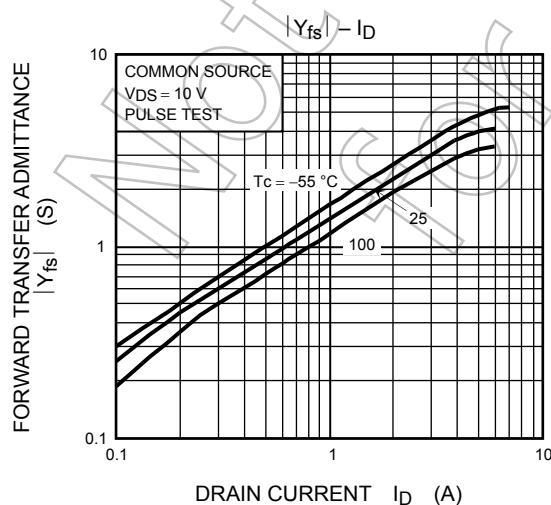
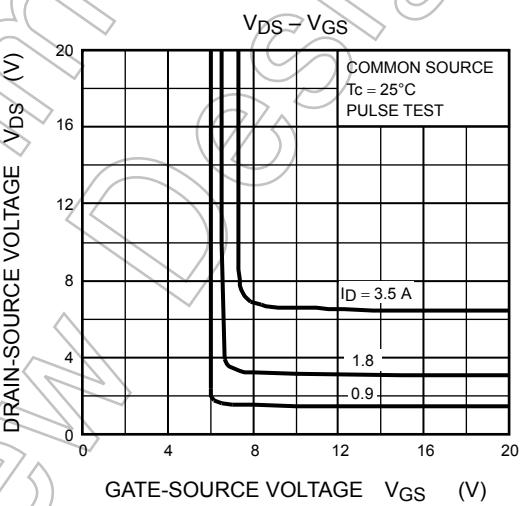
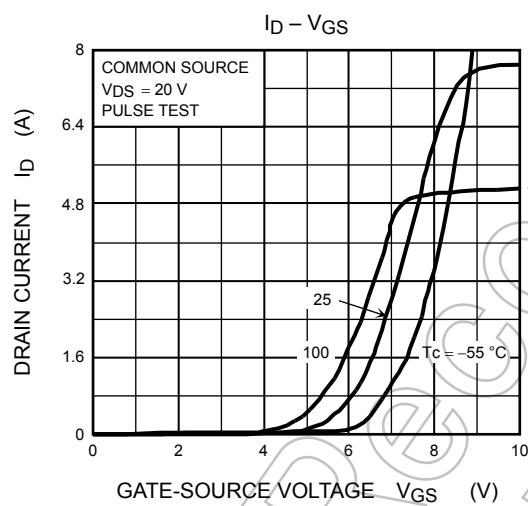
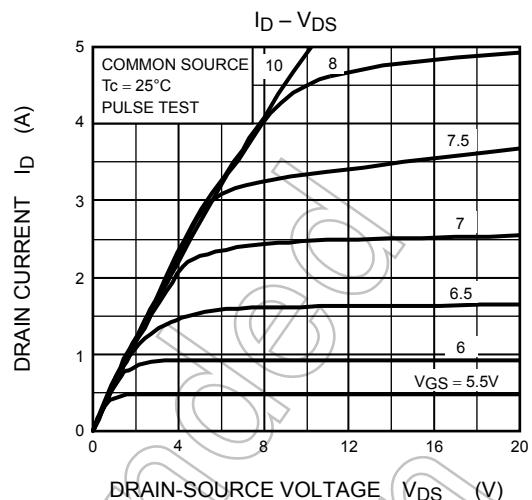
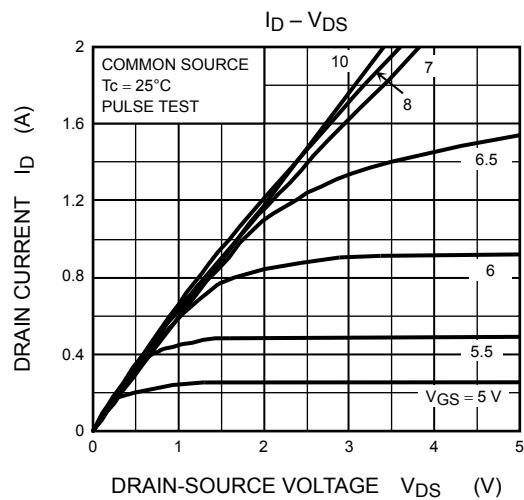


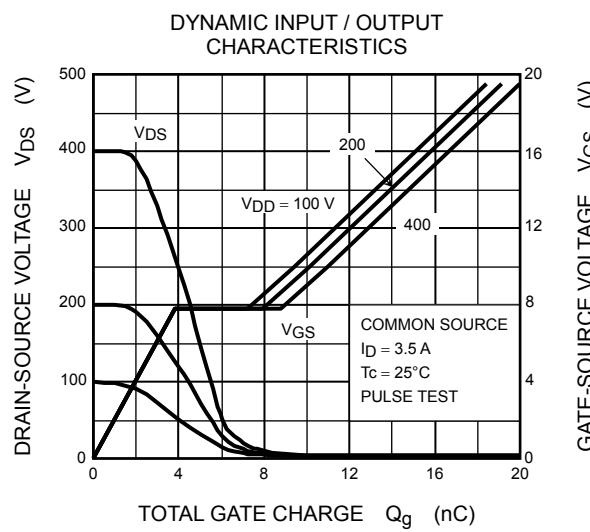
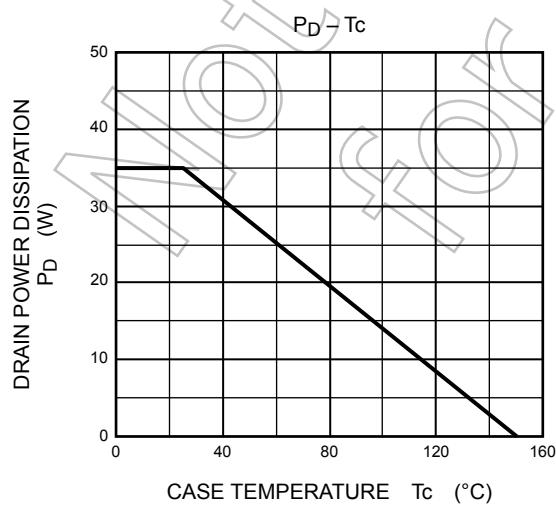
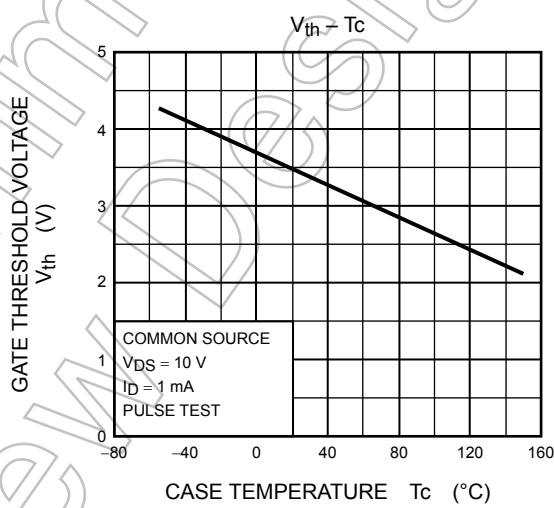
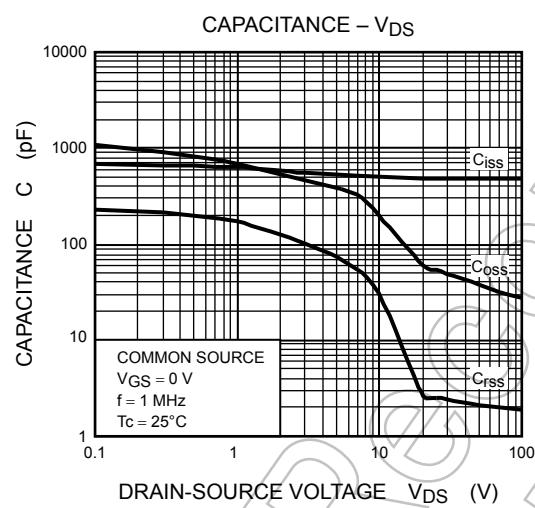
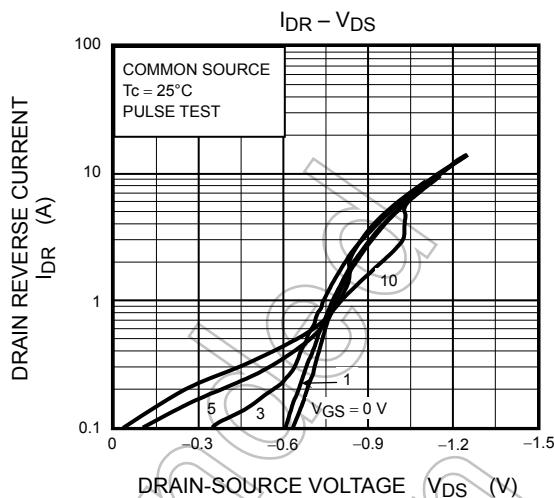
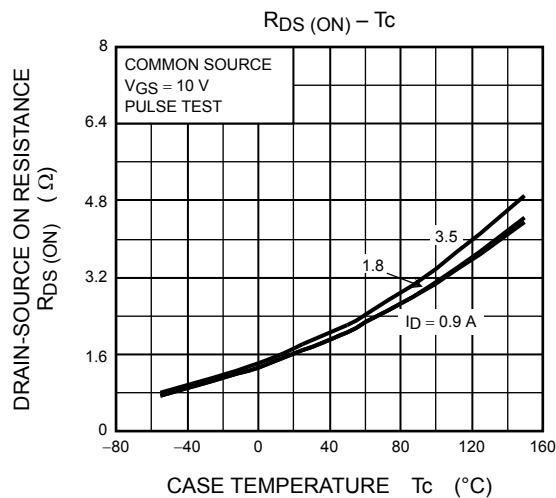
Note 4: A line under a Lot No. identifies the indication of product Labels.

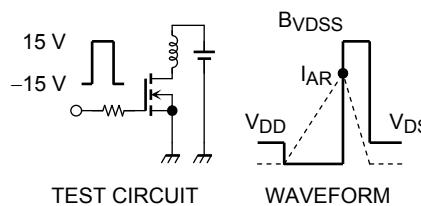
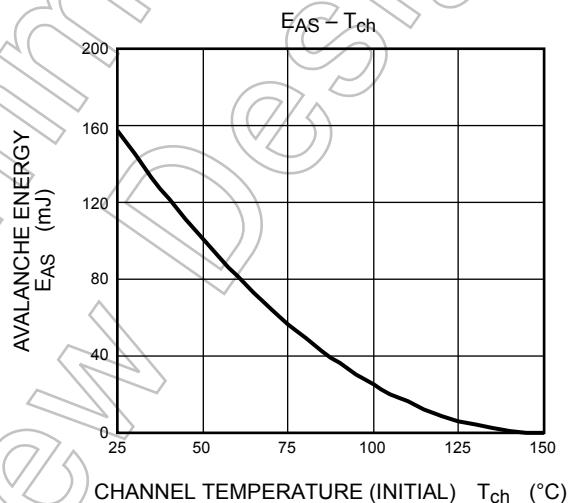
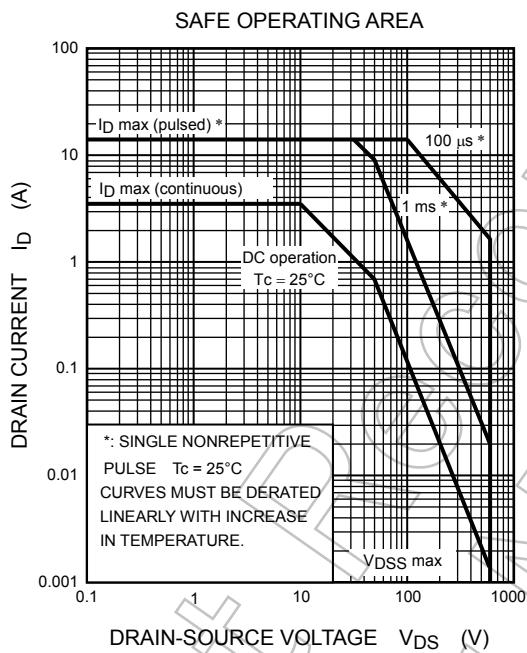
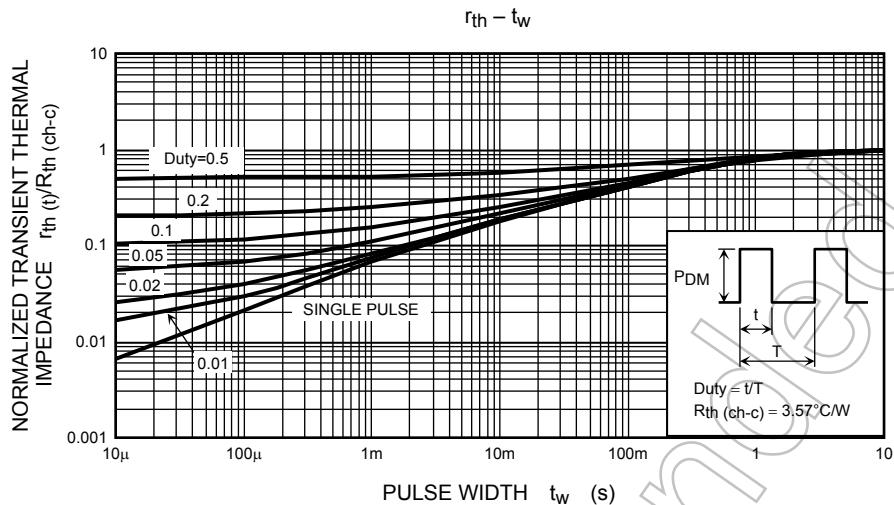
Not underlined: [[Pb]]/INCLUDES > MCV

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

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$$R_G = 25 \Omega$$

$$V_{DD} = 90 \text{ V}, L = 22.5 \text{ mH}$$

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

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