

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type ( $\pi$ -MOSVII)

## TK6A60D

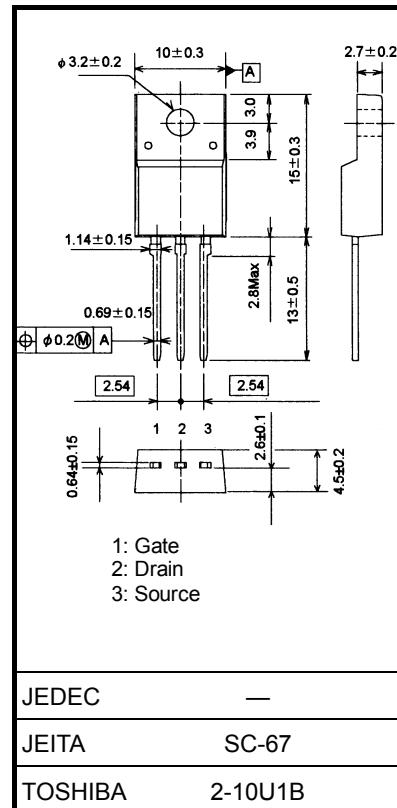
## Switching Regulator Applications

Unit: mm

- Low drain-source ON-resistance:  $R_{DS(ON)} = 1.0 \Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 3.0 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 10 \mu\text{A}$  (max) ( $V_{DS} = 600 \text{ V}$ )
- Enhancement mode:  $V_{th} = 2.0$  to  $4.0 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

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

Characteristics	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	600	V
Gate-source voltage	$V_{GSS}$	$\pm 30$	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)	$E_{AS}$	173	mJ
Avalanche current	$I_{AR}$	6	A
Repetitive avalanche energy (Note 3)	$E_{AR}$	4.0	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

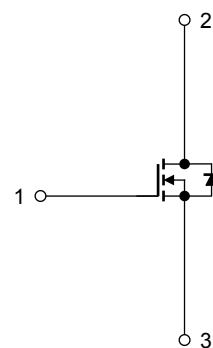
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th}(\text{ch-c})$	3.125	$^\circ\text{C/W}$
Thermal resistance, channel to ambient	$R_{th}(\text{ch-a})$	62.5	$^\circ\text{C/W}$

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

Note 2:  $V_{DD} = 90 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 8.4 \text{ mH}$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 6 \text{ A}$ 

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

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

Start of commercial production  
2008-07

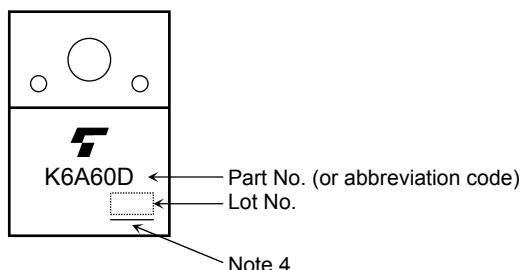
## Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 30 \text{ V}$ , $V_{DS} = 0 \text{ V}$	—	—	$\pm 1$	$\mu\text{A}$	
Drain cut-off current	$I_{DSS}$	$V_{DS} = 600 \text{ V}$ , $V_{GS} = 0 \text{ V}$	—	—	10	$\mu\text{A}$	
Drain-source breakdown voltage	$V_{(BR) DSS}$	$I_D = 10 \text{ mA}$ , $V_{GS} = 0 \text{ V}$	600	—	—	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	$R_{DS (\text{ON})}$	$V_{GS} = 10 \text{ V}$ , $I_D = 3 \text{ A}$	—	1.0	1.25	$\Omega$	
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10 \text{ V}$ , $I_D = 3 \text{ A}$	0.8	3.0	—	S	
Input capacitance	$C_{iss}$	$V_{DS} = 25 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	—	800	—	pF	
Reverse transfer capacitance	$C_{rss}$		—	4	—		
Output capacitance	$C_{oss}$		—	100	—		
Switching time	Rise time	$t_r$		—	20	—	ns
	Turn-on time	$t_{on}$		—	40	—	
	Fall time	$t_f$		—	12	—	
	Turn-off time	$t_{off}$		—	60	—	
Total gate charge	$Q_g$	$V_{DD} \approx 400 \text{ V}$ , $V_{GS} = 10 \text{ V}$ , $I_D = 6 \text{ A}$	—	16	—	nC	
Gate-source charge	$Q_{gs}$		—	10	—		
Gate-drain charge	$Q_{gd}$		—	6	—		

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	6	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	24	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 6 \text{ A}$ , $V_{GS} = 0 \text{ V}$	—	—	-1.7	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 6 \text{ A}$ , $V_{GS} = 0 \text{ V}$ , $dI_{DR}/dt = 100 \text{ A}/\mu\text{s}$	—	1200	—	ns
Reverse recovery charge	$Q_{rr}$		—	10	—	$\mu\text{C}$

## Marking

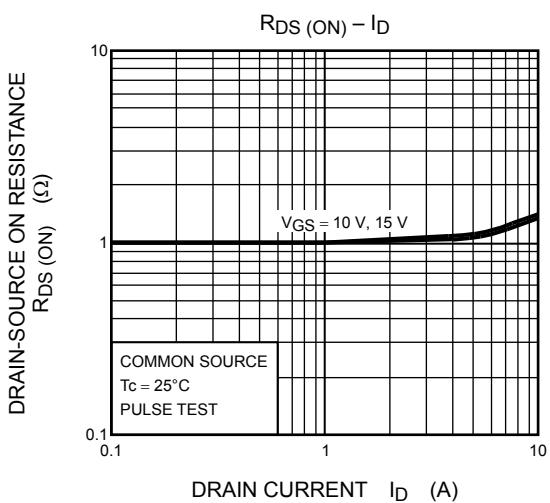
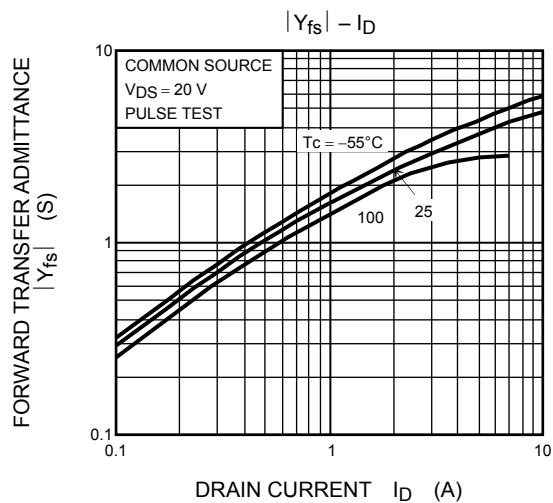
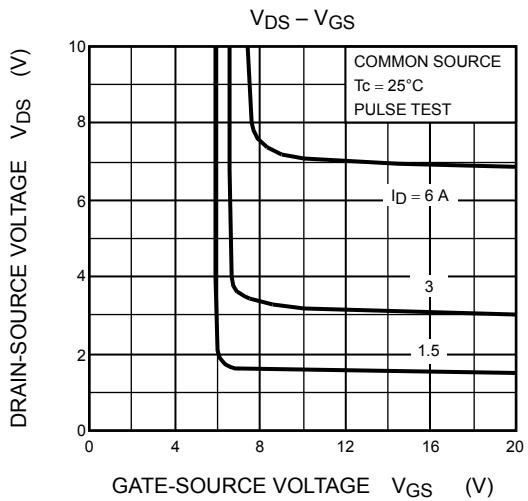
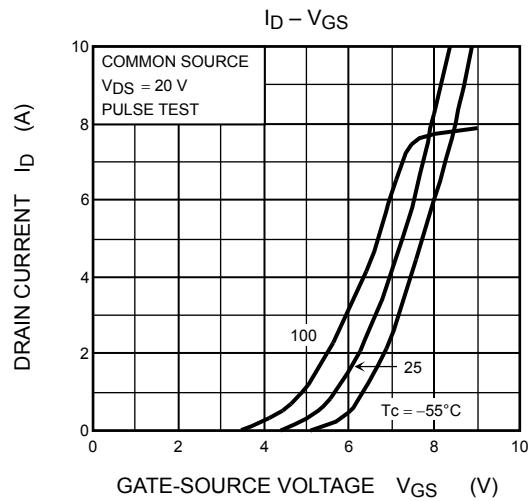
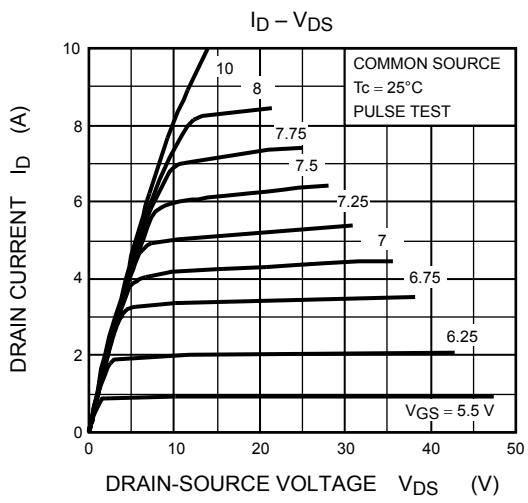
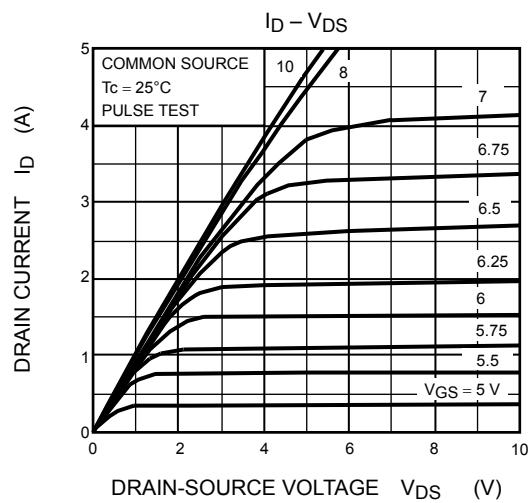


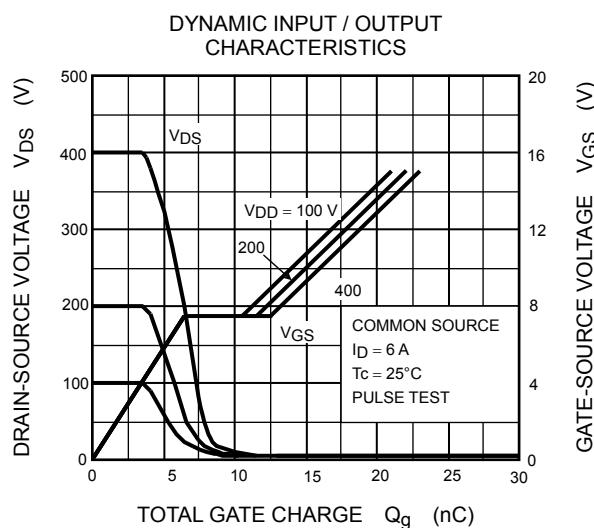
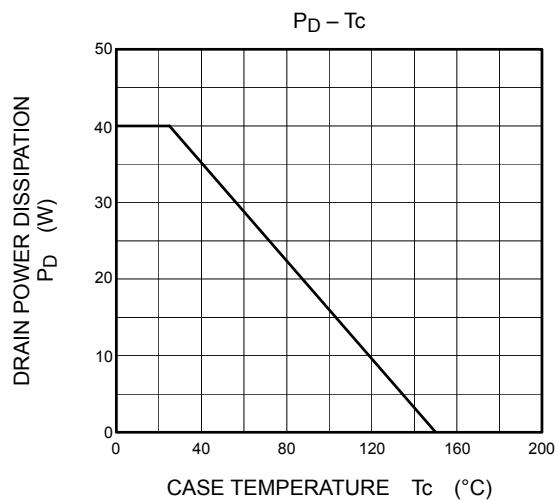
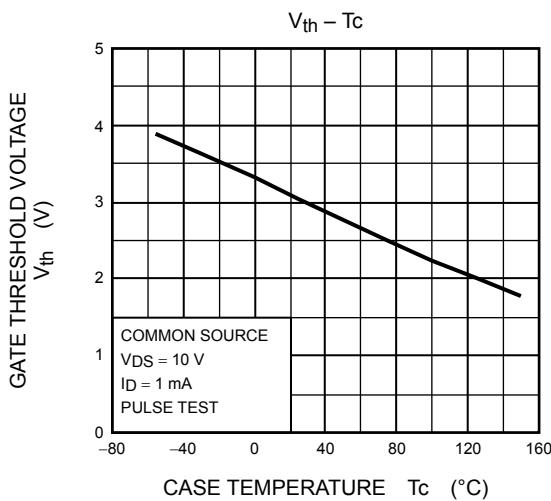
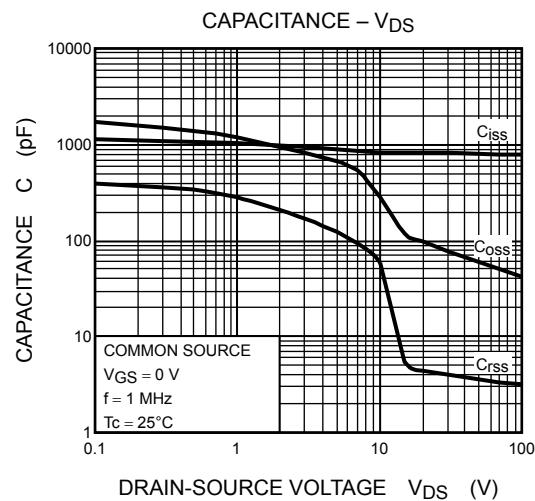
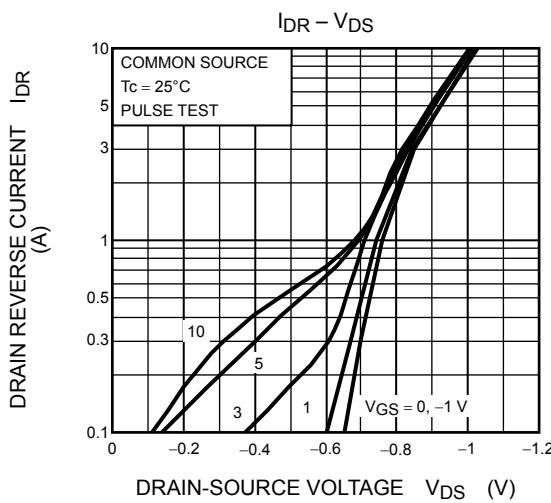
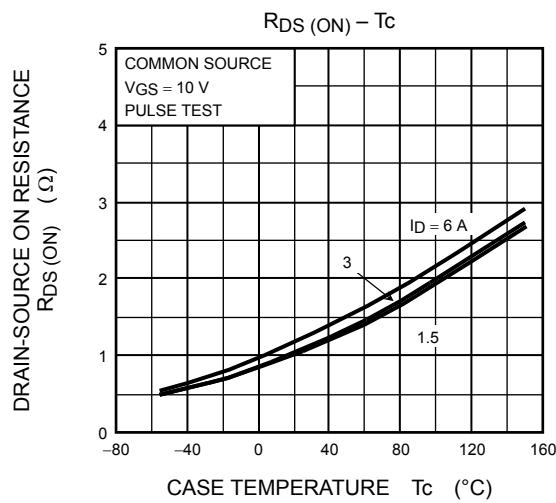
Note 4: A line under a Lot No. identifies the indication of product Labels.

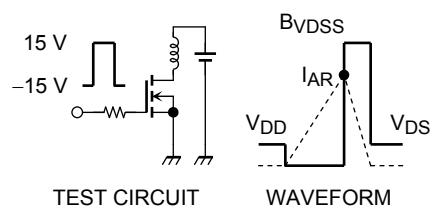
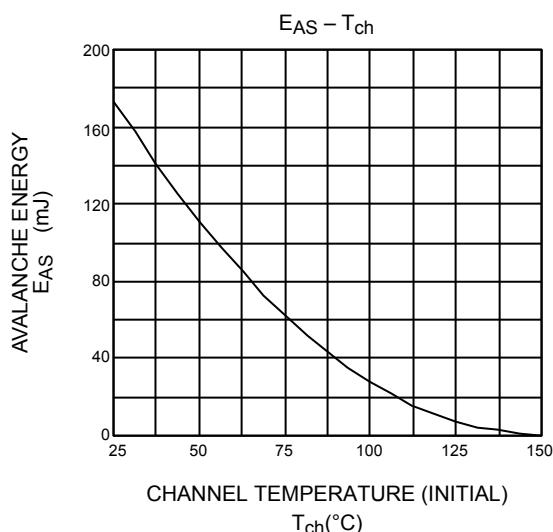
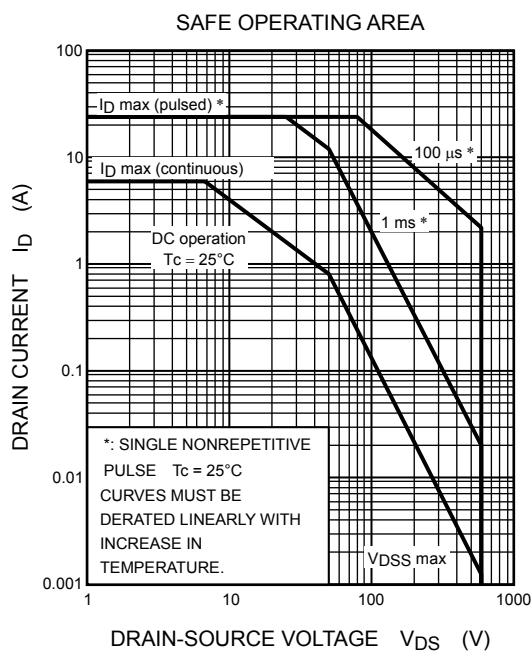
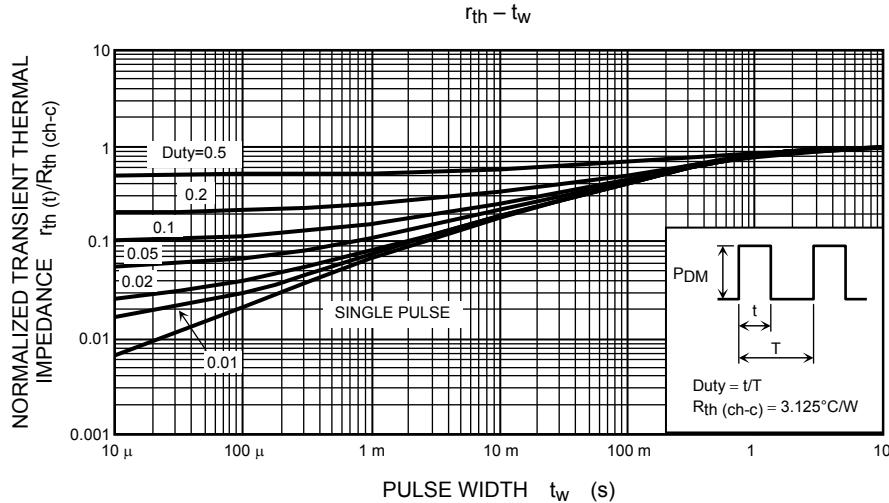
Not underlined: [[Pb]]/INCLUDES > MCV

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

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$$R_G = 25 \Omega$$

$$V_{DD} = 90 \text{ V}, L = 8.4 \text{ mH}$$

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

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