

# TK60A08J1

## Switching Regulator Application

- High-Speed switching
- Small gate charge:  $Q_g = 86 \text{ nC}$  (typ.)
- Low drain-source ON resistance:  $R_{DS(ON)} = 6.2 \text{ m}\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 120 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 10 \text{ }\mu\text{A}$  (max) ( $V_{DS} = 75 \text{ V}$ )
- Enhancement-mode:  $V_{th} = 1.1 \text{ to } 2.3 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

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

Characteristics		Symbol	Rating	Unit
Drain-source voltage		$V_{DSS}$	75	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )		$V_{DGR}$	75	V
Gate-source voltage		$V_{GSS}$	$\pm 20$	V
Drain current	DC (Note 1)	$I_D$	60	A
	Pulse (Note 1)	$I_{DP}$	240	
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )		$P_D$	45	W
Single pulse avalanche energy (Note 2)		$E_{AS}$	498	mJ
Avalanche current		$I_{AR}$	60	A
Repetitive avalanche energy (Note 3)		$E_{AR}$	2.9	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

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	2.78	$^\circ\text{C}/\text{W}$
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	62.5	$^\circ\text{C}/\text{W}$

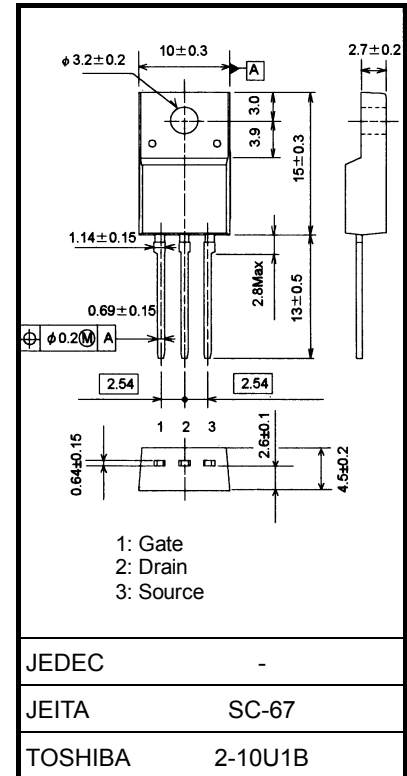
Note 1: Ensure that the channel & lead temperature does not exceed  $150^\circ\text{C}$ .

Note 2:  $V_{DD} = 25 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$ ,  $L = 200 \text{ }\mu\text{H}$ ,  $I_{AR} = 60 \text{ A}$ ,  $R_G = 1 \text{ }\Omega$

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

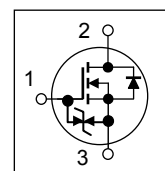
This transistor is an electrostatic sensitive device. Handle with care.

Unit: mm



Weight: 1.7 g (typ.)

## Internal Connection



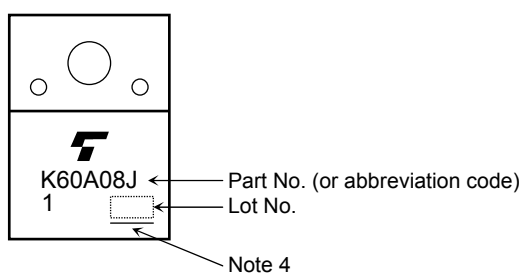
## Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-OFF current	$I_{DSS}$	$V_{DS} = 75\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	$\mu\text{A}$
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	75	—	—	V
	$V_{(BR)DSX}$	$I_D = 10\text{ mA}, V_{GS} = -20\text{ V}$	60	—	—	
Gate threshold voltage	$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	1.1	—	2.3	V
Drain-source ON resistance	$R_{DS(ON)}$	$V_{GS} = 4.5\text{ V}, I_D = 30\text{ A}$	—	7.1	9.3	m $\Omega$
		$V_{GS} = 10\text{ V}, I_D = 30\text{ A}$	—	6.2	7.8	
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 30\text{ A}$	60	120	—	S
Input capacitance	$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	5450	—	pF
Reverse transfer capacitance	$C_{rss}$		—	320	—	
Output capacitance	$C_{oss}$		—	1260	—	
Switching time	Rise time	$t_r$		5	—	ns
	Turn-ON time	$t_{on}$		20	—	
	Fall time	$t_f$		15	—	
	Turn-OFF time	$t_{off}$		96	—	
Total gate charge (gate-source plus gate-drain)	$Q_g$	$V_{DD} \approx 60\text{ V}, V_{GS} = 5\text{ V}, I_D = 60\text{ A}$	—	48	—	nC
		$V_{DD} \approx 60\text{ V}, V_{GS} = 10\text{ V}, I_D = 60\text{ A}$	—	86	—	
Gate-source charge 1	$Q_{gs1}$	$V_{DD} \approx 60\text{ V}, V_{GS} = 10\text{ V}, I_D = 60\text{ A}$	—	16	—	
Gate-drain ("miller") charge	$Q_{gd}$		—	20	—	
Gate switch charge	$Q_{sw}$		—	27	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	60	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	240	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 60\text{ A}, V_{GS} = 0\text{ V}$	—	-0.9	-1.2	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 60\text{ A}, V_{GS} = 0\text{ V},$	—	63	—	ns
Reverse recovery charge	$Q_{rr}$	$dI_{DR}/dt = 50\text{ A}/\mu\text{s}$	—	63	—	nC

## Marking

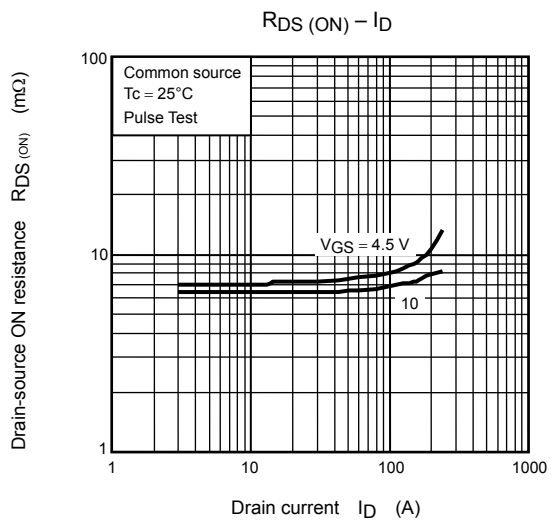
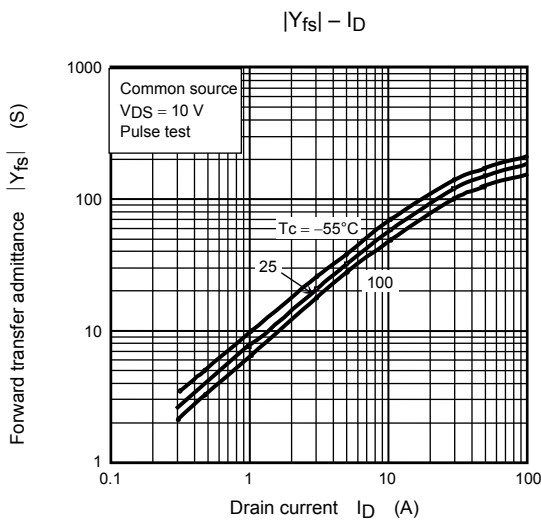
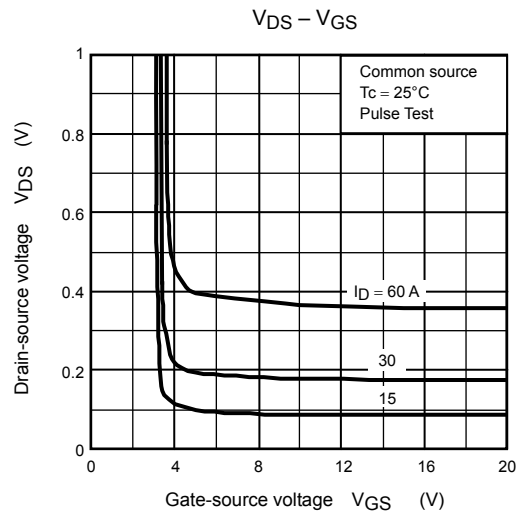
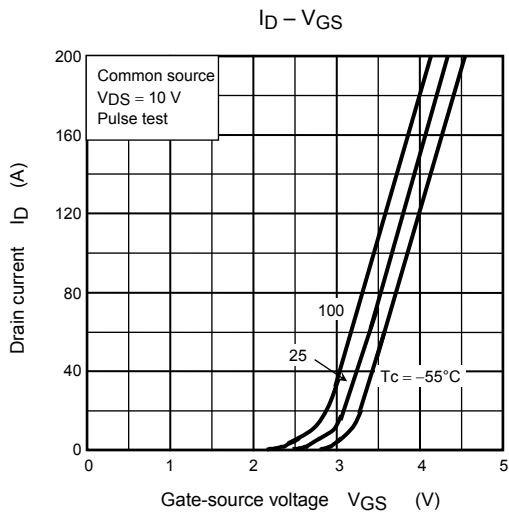
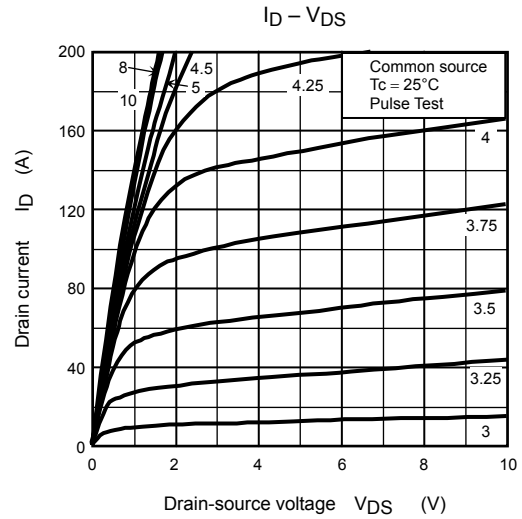
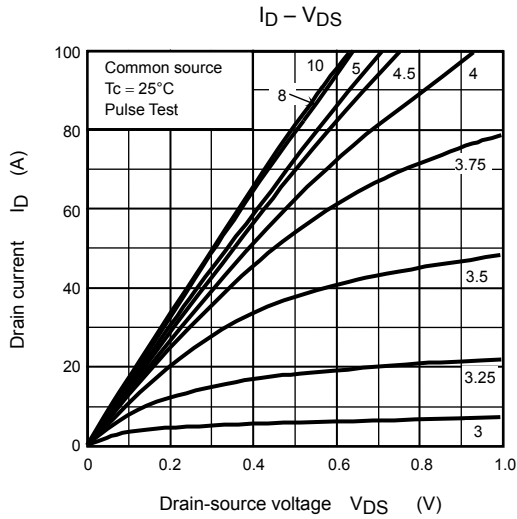


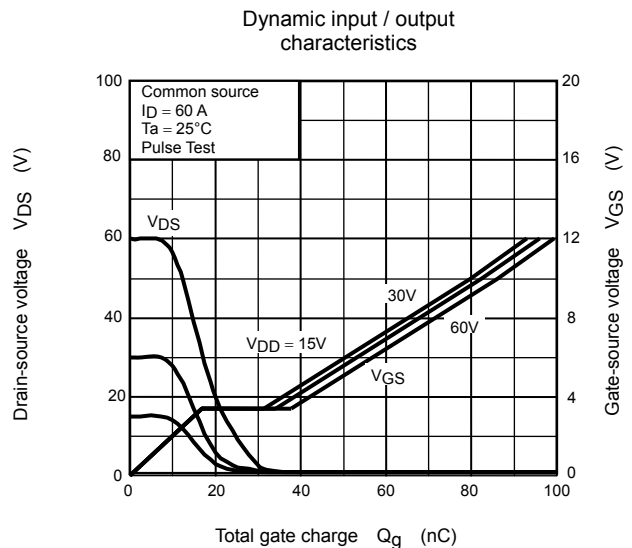
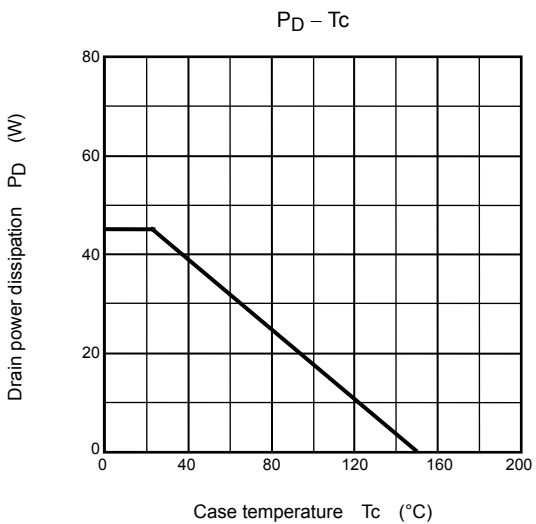
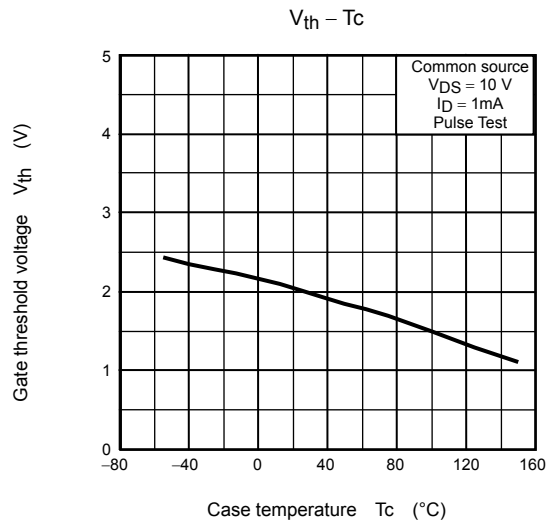
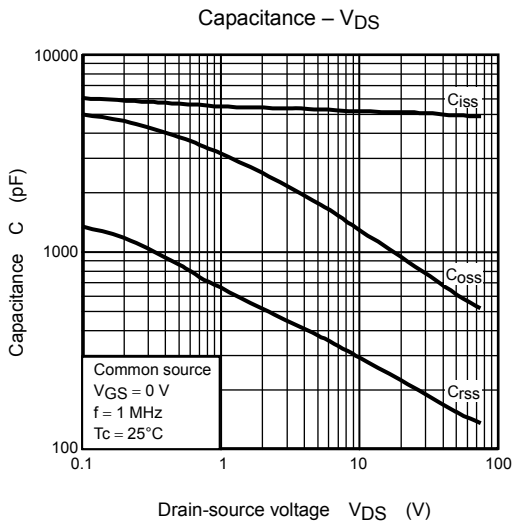
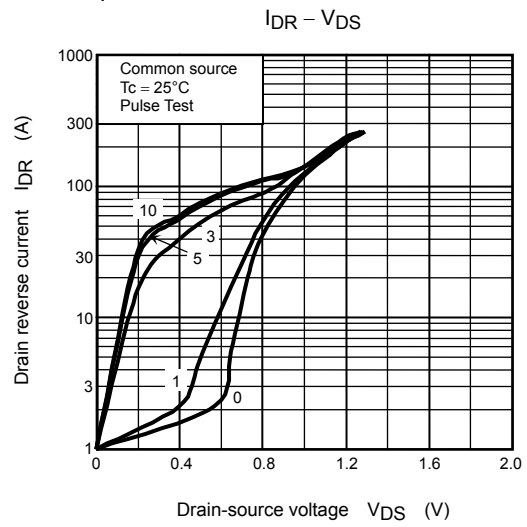
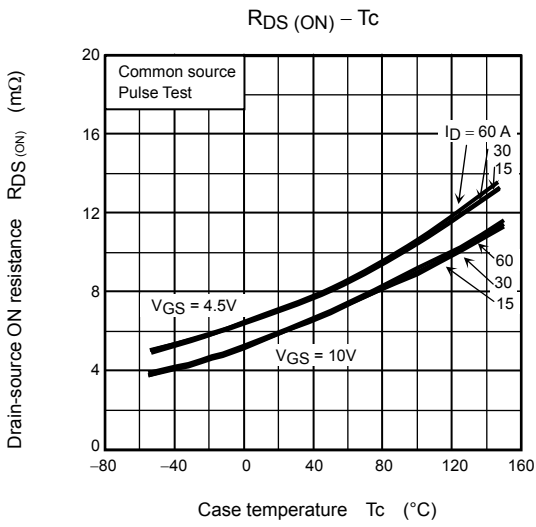
Note 4: A line under a Lot No. identifies the indication of product Labels.

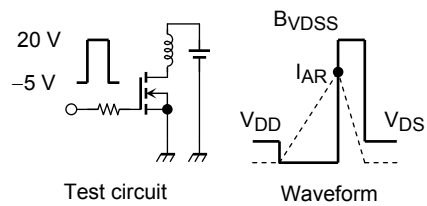
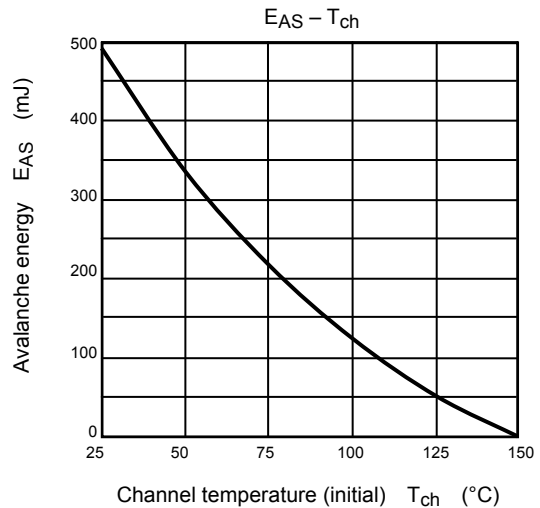
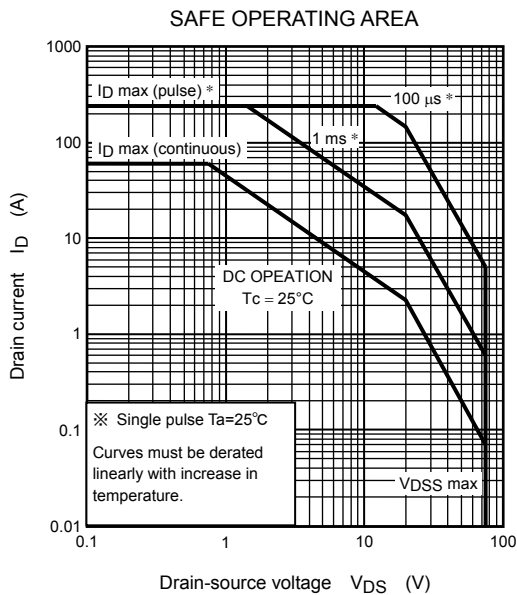
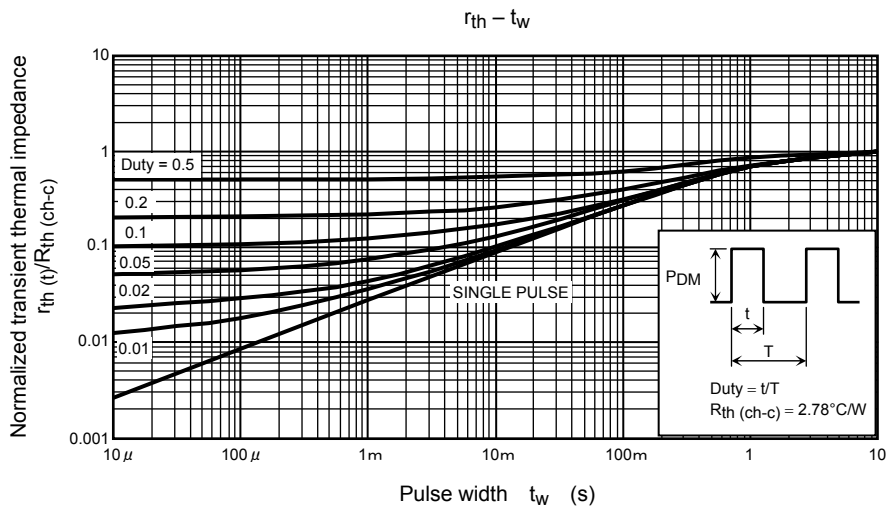
Not underlined:  $[[Pb]]/INCLUDES > MCV$

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

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$R_G = 1 \Omega$   
 $V_{DD} = 25 \text{ V}, L = 200 \mu\text{H}$

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

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