



# TK13A60D

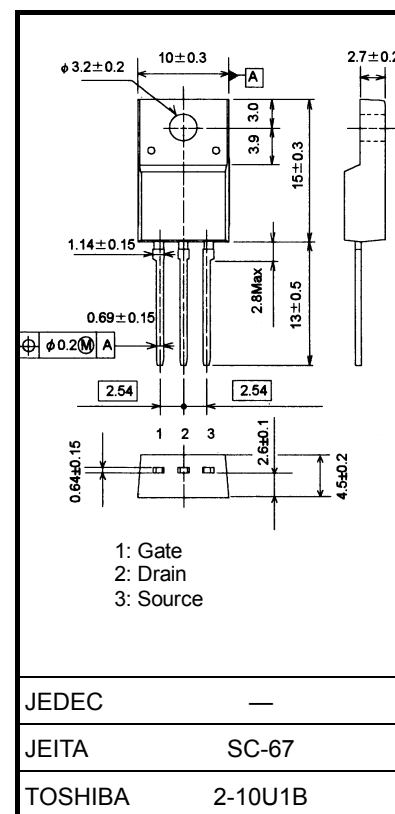
## Switching Regulator Applications

Unit: mm

- Low drain-source ON-resistance:  $R_{DS(ON)} = 0.33 \Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 6.5 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 10 \mu\text{A}$  ( $V_{DS} = 600 \text{ V}$ )
- 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)	$I_D$	13	A
	Pulse ( $t = 1 \text{ ms}$ ) (Note 1)	$I_{DP}$	52	
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )		$P_D$	50	W
Single pulse avalanche energy (Note 2)		$E_{AS}$	511	mJ
Avalanche current		$I_{AR}$	13	A
Repetitive avalanche energy (Note 3)		$E_{AR}$	5.0	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

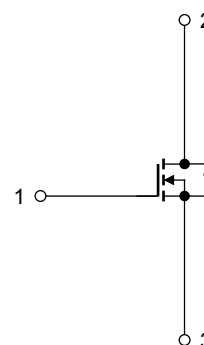
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	2.5	$^\circ\text{C/W}$
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	62.5	$^\circ\text{C/W}$

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

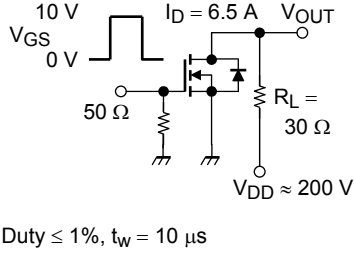
Note 2:  $V_{DD} = 90 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 5.3 \text{ mH}$ ,  $R_G = 25 \Omega$ ,  $I_{AR} = 13 \text{ A}$

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		$I_{GSS}$	$V_{GS} = \pm 30 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	$\pm 1$	$\mu\text{A}$
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		$R_{DS(ON)}$	$V_{GS} = 10 \text{ V}, I_D = 6.5 \text{ A}$	—	0.33	0.43	$\Omega$
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10 \text{ V}, I_D = 6.5 \text{ A}$	1.8	6.5	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	2300	—	pF
Reverse transfer capacitance		$C_{rss}$		—	10	—	
Output capacitance		$C_{oss}$		—	250	—	
Switching time	Rise time	$t_r$		—	50	—	ns
	Turn-on time	$t_{on}$		—	100	—	
	Fall time	$t_f$		—	25	—	
	Turn-off time	$t_{off}$		—	140	—	
Total gate charge		$Q_g$	$V_{DD} \approx 400 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 13 \text{ A}$	—	40	—	nC
Gate-source charge		$Q_{gs}$		—	25	—	
Gate-drain charge		$Q_{gd}$		—	15	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	13	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	52	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 13 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.7	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 13 \text{ A}, V_{GS} = 0 \text{ V},$	—	1600	—	ns
Reverse recovery charge	$Q_{rr}$	$dI_{DR}/dt = 100 \text{ A}/\mu\text{s}$	—	20	—	$\mu\text{C}$

## Marking

