

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (DTMOS)

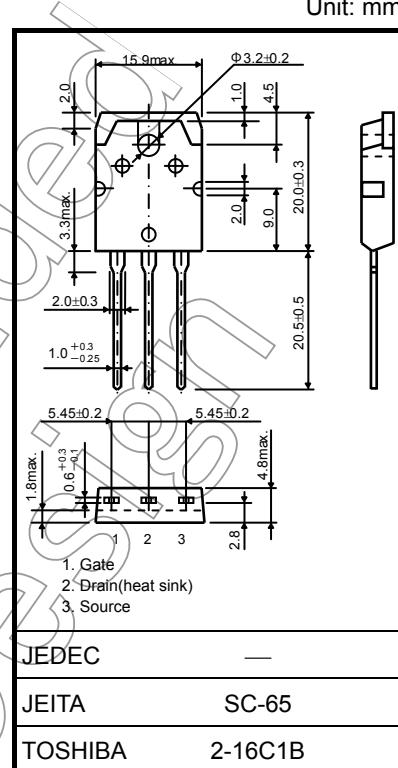
TK40J60T

Switching Regulator Applications

- Low drain-source ON-resistance: $R_{DS(ON)} = 0.068\Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 25\text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 100\text{ }\mu\text{A}$ ($V_{DS} = 600\text{ V}$)
- Enhancement-mode: $V_{th} = 3.0$ to 5.0 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	A
	Pulse ($t = 1\text{ ms}$) (Note 1)	I_{DP}	80
Drain power dissipation ($T_c = 25^\circ\text{C}$)	P_D	400	W
Single pulse avalanche energy (Note 2)	E_{AS}	576	mJ
Avalanche current (Note 3)	I_{AR}	40	A
Repetitive avalanche energy	E_{AR}	40	mJ
Channel temperature	T_{ch}	150	$^\circ\text{C}$
Storage temperature range	T_{stg}	-55 to 150	$^\circ\text{C}$



Weight : 4.6 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

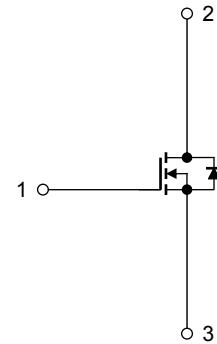
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th}(ch-c)$	0.313	$^\circ\text{C}/\text{W}$
Thermal resistance, channel to ambient	$R_{th}(ch-a)$	50	$^\circ\text{C}/\text{W}$

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

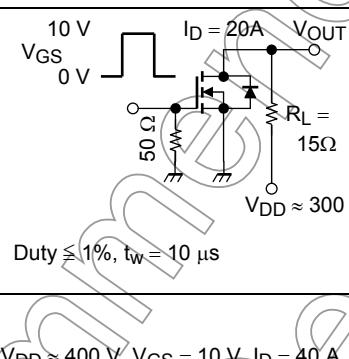
Note 2: $V_{DD} = 90\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 0.63\text{ mH}$, $R_G = 25\text{ }\Omega$, $I_{AR} = 40\text{ A}$

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

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



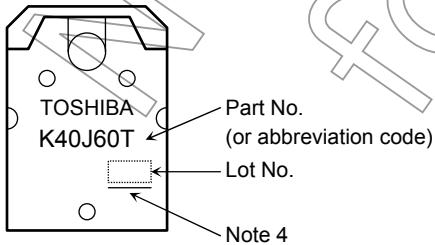
Electrical Characteristics (Ta = 25°C)

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	—	—	100	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	3.0	—	5.0	V	
Drain-source ON-resistance	R _{DS} (ON)	V _{GS} = 10 V, I _D = 20 A	—	0.068	0.08	Ω	
Forward transfer admittance	Y _{fs}	V _{DS} = 10 V, I _D = 20 A	6	25	—	S	
Input capacitance	C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	3900	—	—	pF	
Reverse transfer capacitance	C _{rss}		280	—	—		
Output capacitance	C _{oss}		9200	—	—		
Switching time	Rise time	t _r	 10 V 0 V V _{GS} ID = 20A V _{OUT} RL = 15Ω V _{DD} ≈ 300 V Duty ≤ 1%, t _W = 10 µs	—	60	—	ns
	Turn-on time	t _{on}		—	120	—	
	Fall time	t _f		—	15	—	
	Turn-off time	t _{off}		—	200	—	
Total gate charge	Q _g	V _{DD} ≈ 400 V, V _{GS} = 10 V, I _D = 40 A	—	67	—	nC	
Gate-source charge	Q _{gs}		—	45	—		
Gate-drain charge	Q _{gd}		—	22	—		

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

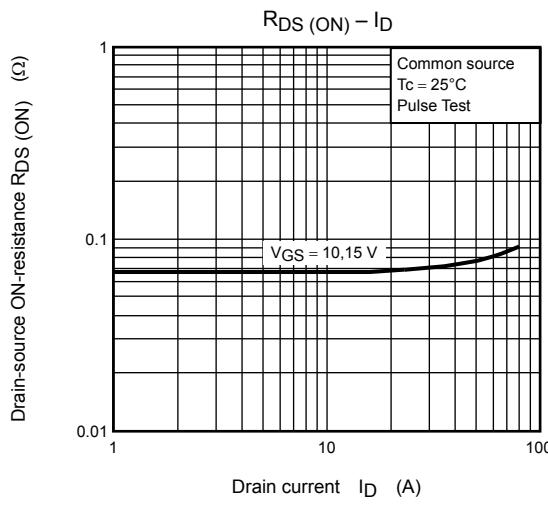
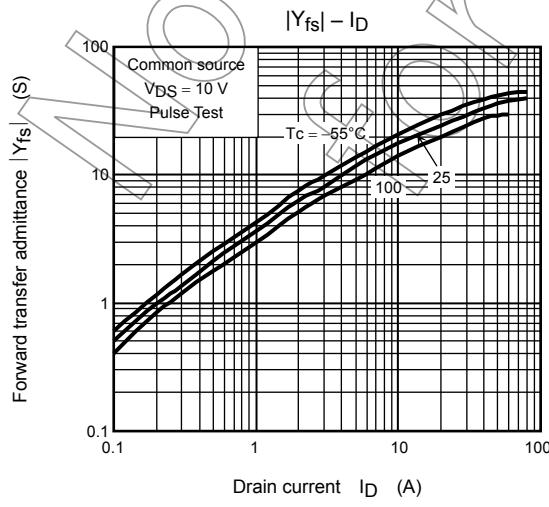
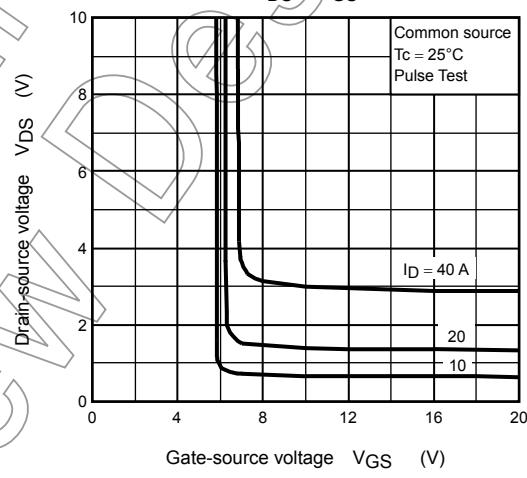
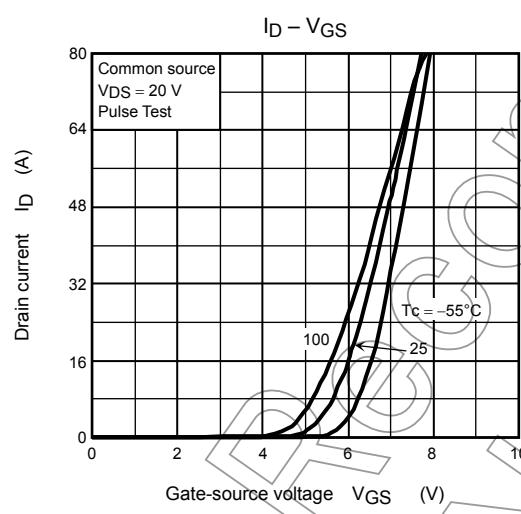
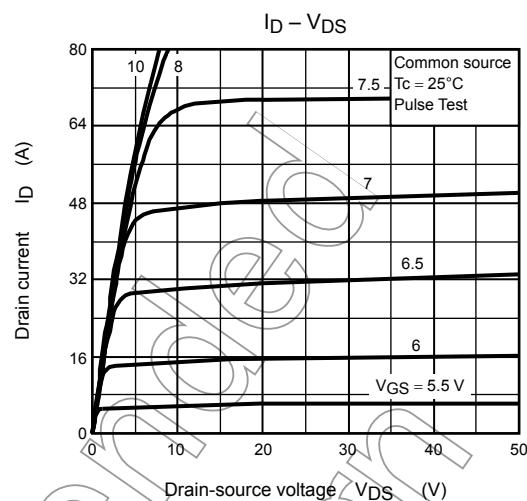
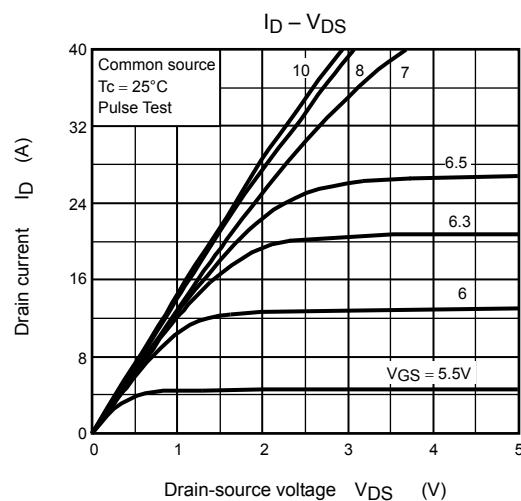
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I _{DR}	—	—	—	40	A
Pulse drain reverse current (Note 1)	I _{DRP}	—	—	—	80	A
Forward voltage (diode)	V _{DSF}	I _{DR} = 40 A, V _{GS} = 0 V	—	—	-1.7	V
Reverse recovery time	t _{rr}	I _{DR} = 40 A, V _{GS} = 0 V, dI _{DR} /dt = 100 A/µs	—	550	—	ns
Reverse recovery charge	Q _{rr}	dI _{DR} /dt = 100 A/µs	—	14	—	µC

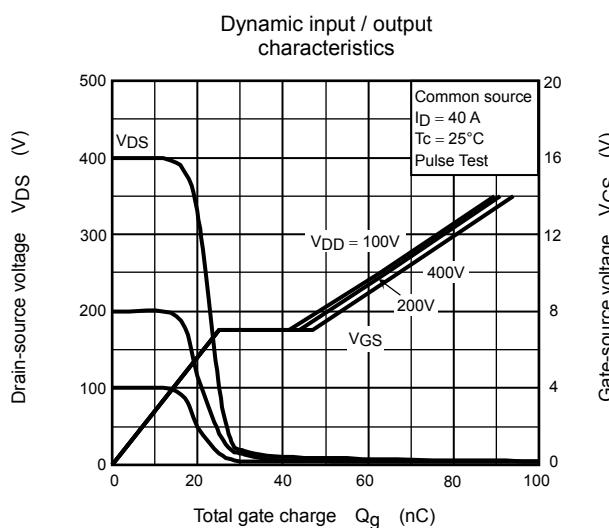
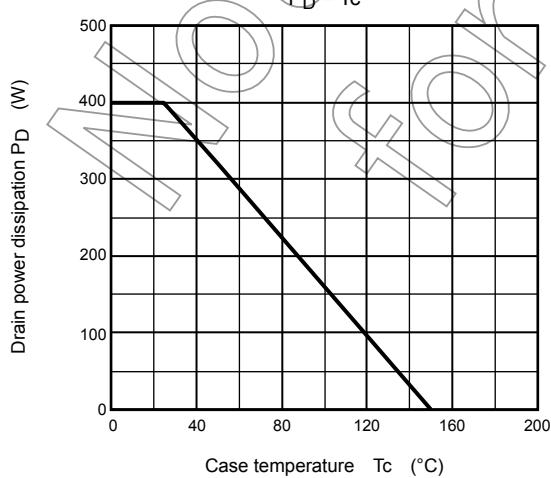
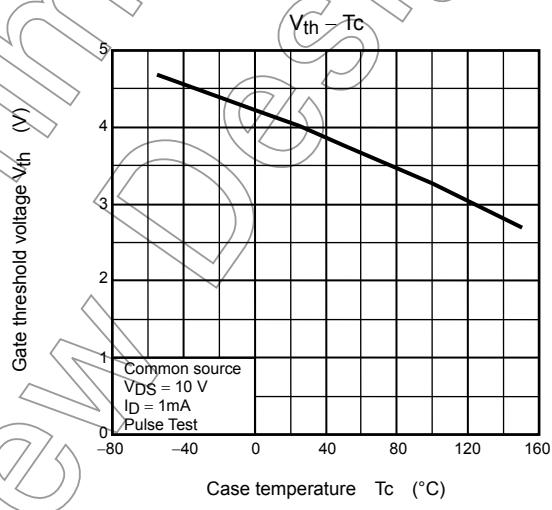
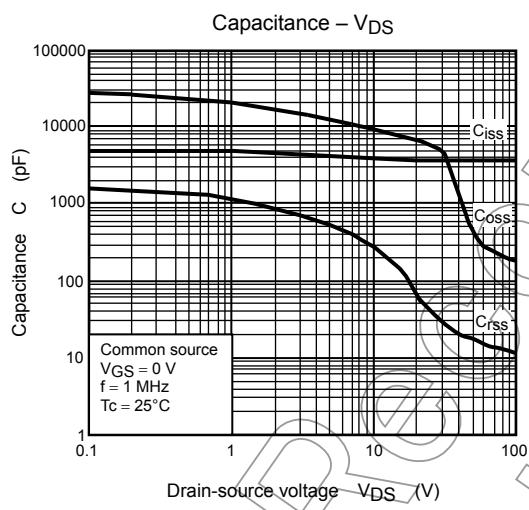
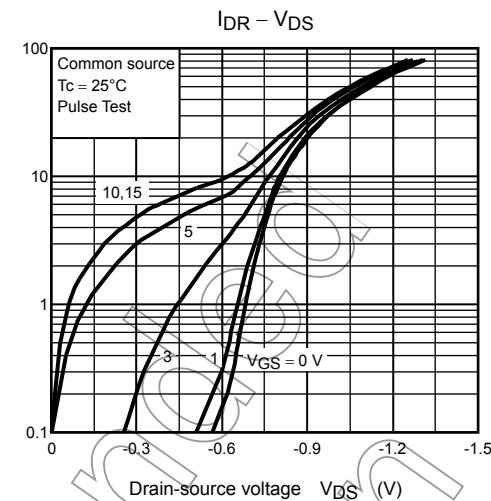
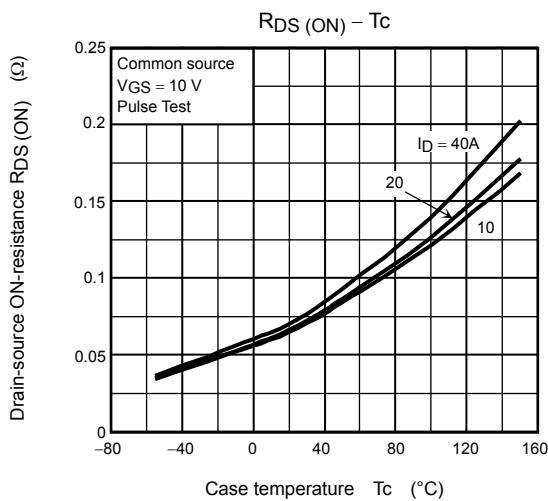
Marking

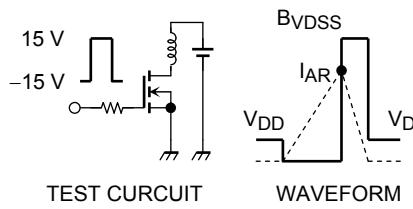
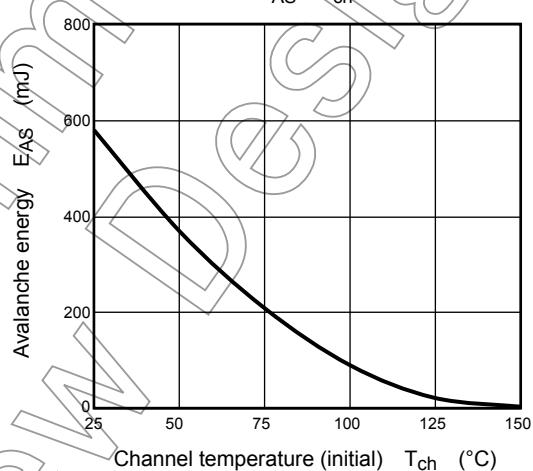
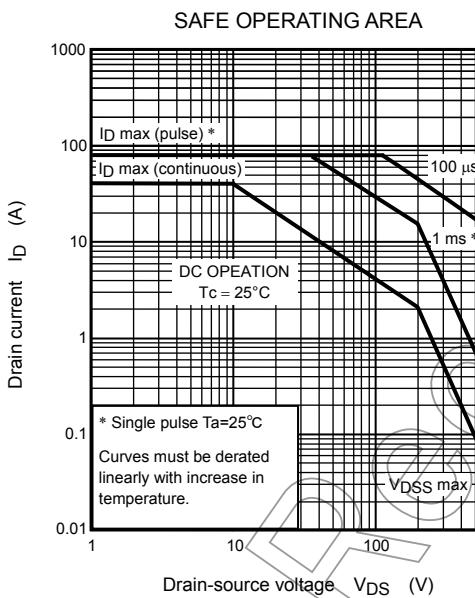
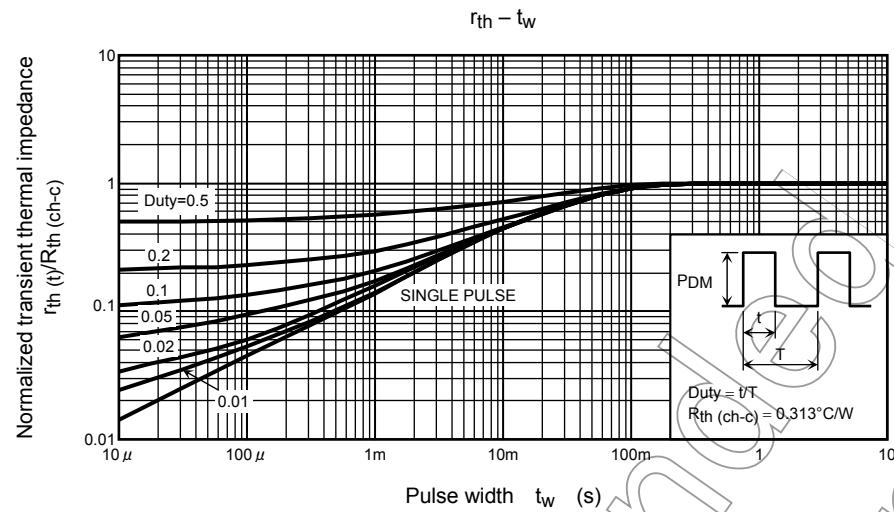


Note 4: A line under a Lot No. identifies the indication of product Labels
[[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

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$$R_G = 25 \Omega$$

$$V_{DD} = 90 \text{ V}, L = 0.63 \text{ mH}$$

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

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