

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U-MOSIV)

TK80X04K3

Switching Regulator, DC-DC Converter Applications
Motor Drive Applications

- Low drain-source ON-resistance: $R_{DS(ON)} = 2.7 \text{ m}\Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 150 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 10 \text{ }\mu\text{A}$ (max) ($V_{DS} = 40 \text{ V}$)
- Enhancement mode: $V_{th} = 3.0$ to 4.0 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}	40	V
Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)		V_{DGR}	40	V
Gate-source voltage		V_{GSS}	± 20	V
Drain current	DC (Note 1)	I_D	80	A
	Pulse (Note 1)	I_{DP}	320	
Drain power dissipation ($T_c = 25^\circ\text{C}$)		P_D	125	W
Single pulse avalanche energy (Note 2)		E_{AS}	123	mJ
Avalanche current		I_{AR}	80	A
Repetitive avalanche energy (Note 3)		E_{AR}	12.5	mJ
Channel temperature (Note 4)		T_{ch}	175	$^\circ\text{C}$
Storage temperature range (Note 4)		T_{stg}	-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	1.2	$^\circ\text{C/W}$

Note 1: Ensure that the channel temperature does not exceed 175°C .

Note 2: $V_{DD} = 25 \text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 20 \text{ }\mu\text{H}$, $I_{AR} = 80 \text{ A}$, $R_G = 25 \text{ }\Omega$

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

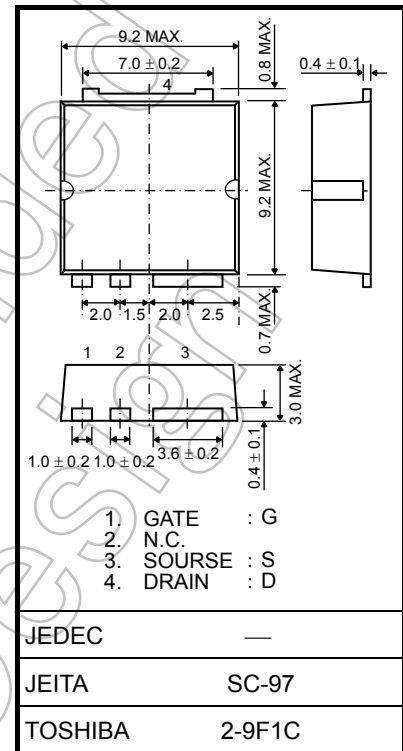
Note 4: The definitions of the absolute maximum channel temperature and storage temperatures are based on AEC-Q101.

Note 5: 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.

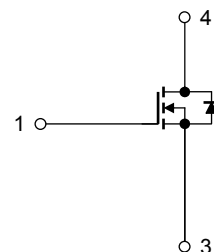
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc.).

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

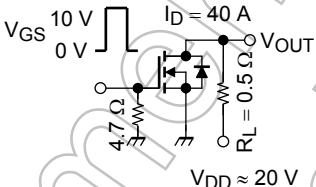
Unit: mm



Weight: 0.74 g (typ.)



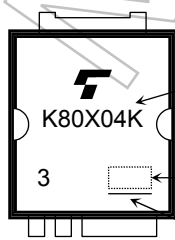
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I _{GSS}	V _{GS} = ±20 V, V _{DS} = 0 V	—	—	±10	μA
Drain cut-off current		I _{DSS}	V _{DS} = 40 V, V _{GS} = 0 V	—	—	10	μA
Drain-source breakdown voltage		V (BR) DSS	I _D = 10 mA, V _{GS} = 0 V	40	—	—	V
		V (BR) DSX	I _D = 10 mA, V _{GS} = -20 V	20	—	—	V
Gate threshold voltage		V _{th}	V _{DS} = 10 V, I _D = 1 mA	3.0	—	4.0	V
Drain-source ON-resistance		R _{DS (ON)}	V _{GS} = 10 V, I _D = 40 A	—	2.7	3.5	mΩ
Forward transfer admittance		Y _{fs}	V _{DS} = 10 V, I _D = 40 A	75	150	—	S
Input capacitance		C _{iss}	V _{DS} = 10 V, V _{GS} = 0 V, f = 1 MHz	—	4600	—	pF
Reverse transfer capacitance		C _{rss}		—	850	—	
Output capacitance		C _{oss}		—	1150	—	
Switching time	Rise time	t _r	 V _{GS} 10 V, 0 V, I _D = 40 A, V _{OUT} , 47 Ω, R _L = 0.5 Ω, V _{DD} ≈ 20 V	—	28	—	ns
	Turn-on time	t _{on}		—	60	—	
	Fall time	t _f		—	35	—	
	Turn-off time	t _{off}		—	90	—	
Total gate charge (gate-source plus gate-drain)		Q _g	V _{DD} ≈ 32 V, V _{GS} = 10 V, I _D = 80 A	—	100	—	nC
Gate-source charge		Q _{gs}		—	60	—	
Gate-drain ("miller") charge		Q _{gd}		—	40	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I _{DR}	—	—	—	80	A
Pulse drain reverse current (Note 1)	I _{DRP}	—	—	—	320	A
Forward voltage (diode)	V _{DSF}	I _{DR} = 80 A, V _{GS} = 0 V	—	—	-1.5	V
Reverse recovery time	t _{rr}	I _{DR} = 80 A, V _{GS} = 0 V, dI _{DR} /dt = 30 A/μs	—	80	—	ns
Reverse recovery charge	Q _{rr}		—	60	—	nC

Marking



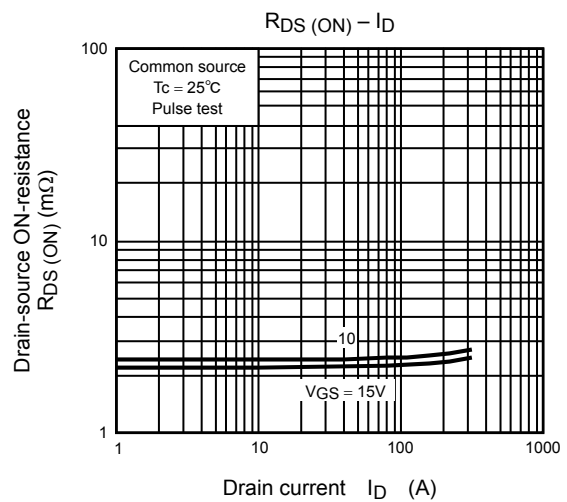
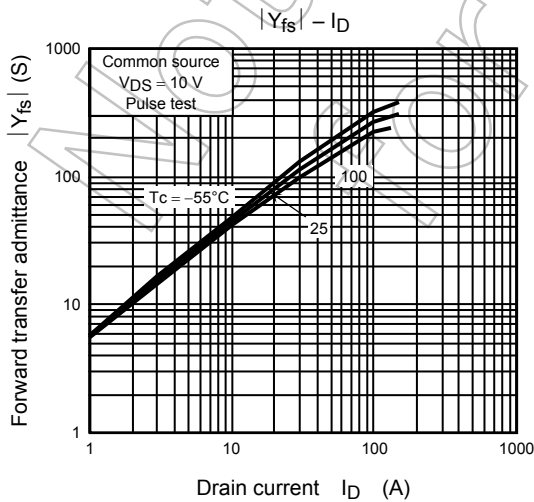
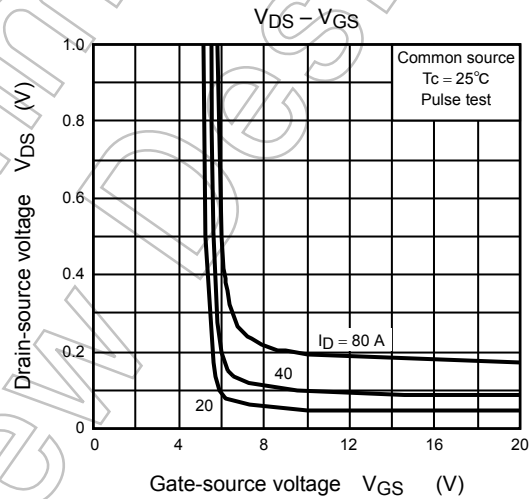
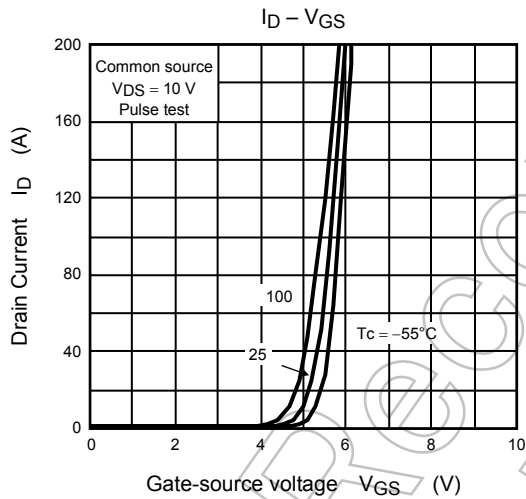
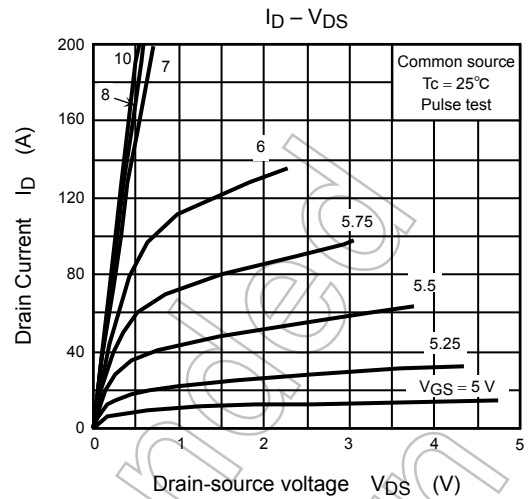
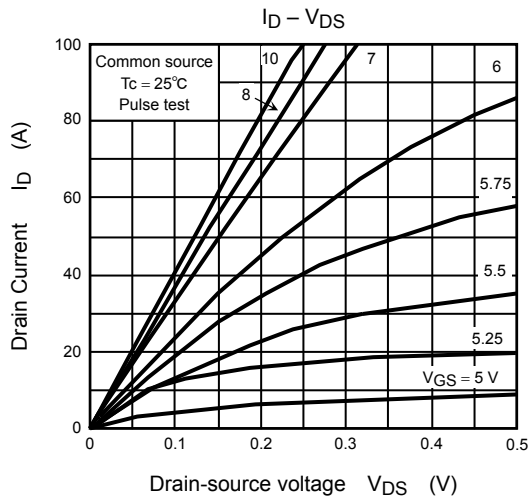
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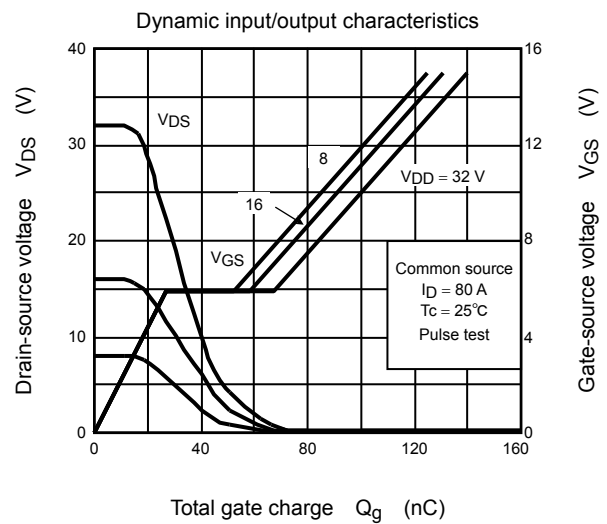
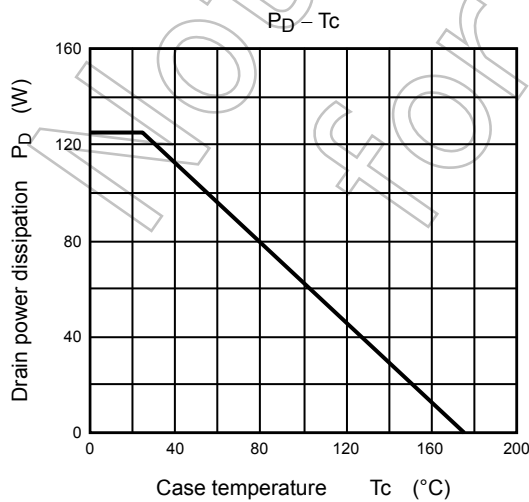
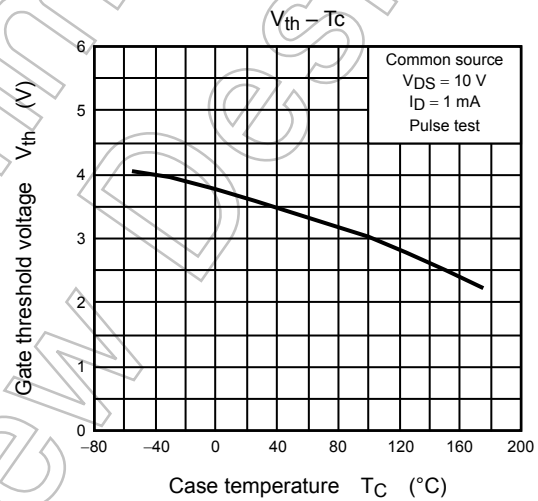
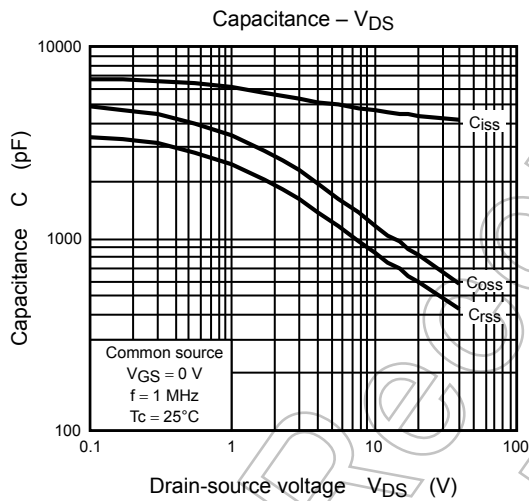
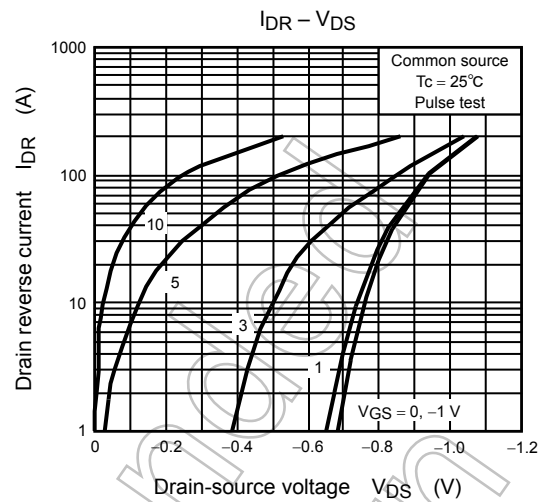
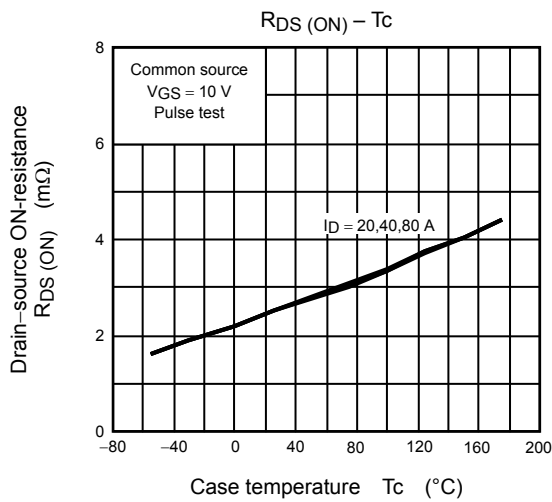
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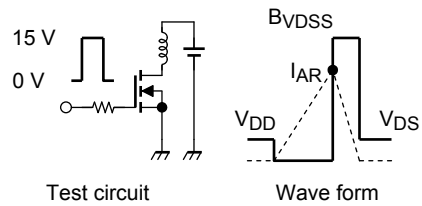
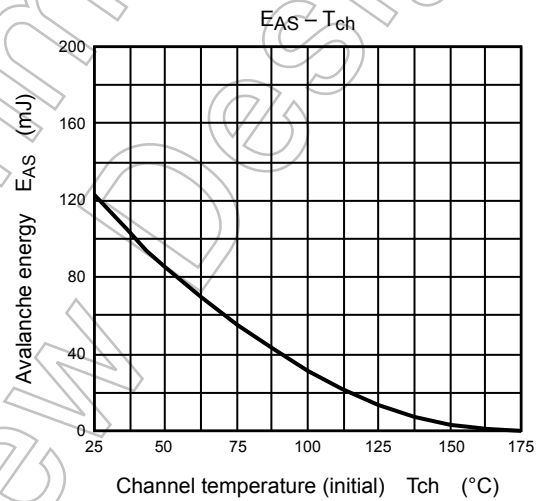
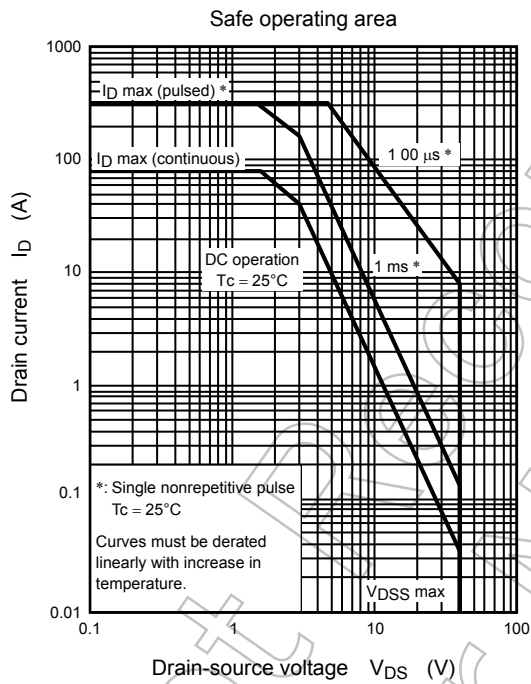
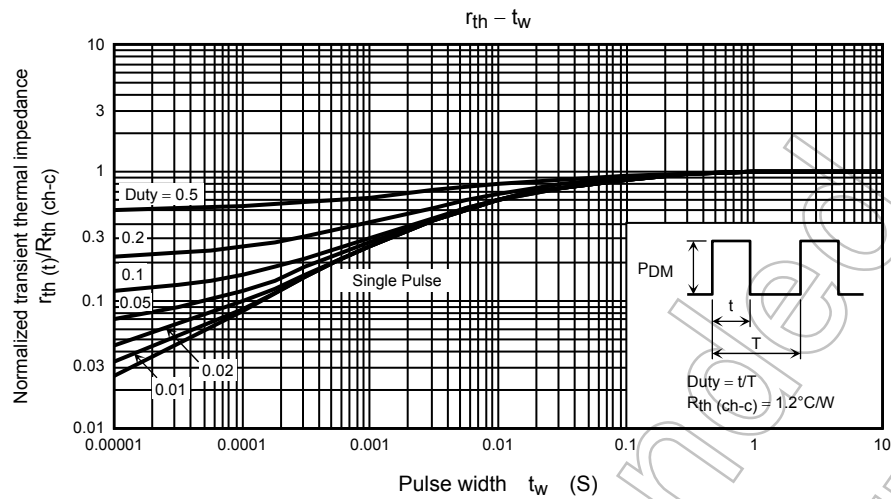
Note 6

Note 6: A line under a Lot No. identifies the indication of product Labels [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product. The RoHS is Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment







$$R_G = 25 \, \Omega$$

$$V_{DD} = 25 \, V, L = 20 \, \mu H$$

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

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