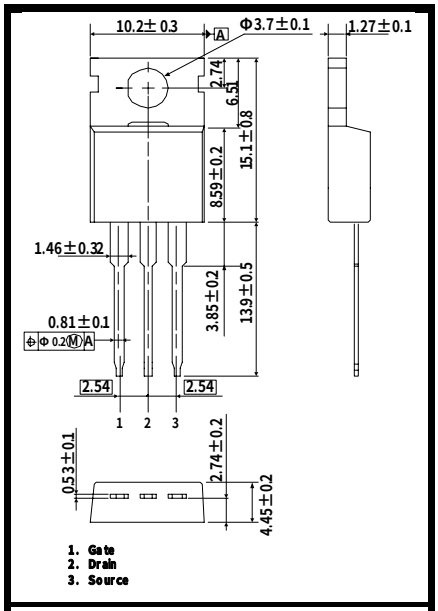
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U−MOS**Ⅳ**)

TK80E08K3

■ E-Bike/UPS/Inverter

- Low drain−source ON resistance : $R_{DS\ (ON)}$ = 7.5 mΩ (typ.)
- High forward transfer admittance : $|Y_{fs}|$ = 135 S (typ.)
- Low leakage current : I_{DSS} = 10 μA (max) (V_{DS} = 75 V)
- Enhancement mode : V_{th} = 2.0~4.0 V (V_{DS} = 10 V, I_D = 1 mA)

Unit: mm



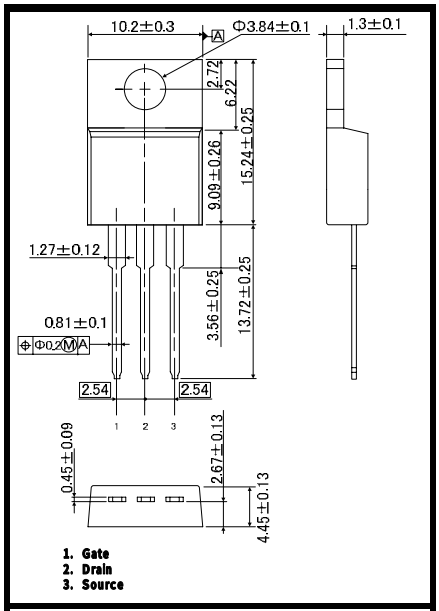
JEDEC	-
JEITA	-
TOSHIBA	2-10X1A

Weight: 1.9 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain−source voltage		V_{DSS}	75	V
Drain−gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	75	V
Gate−source voltage		V_{GSS}	±20	V
Drain current	DC (Note 1)	I_D	80	A
	DC (Note 1,4)	I_D	70	A
	Pulse (Note 1)	I_{DP}	240	A
Drain power dissipation (Tc = 25°C)		P_D	200	W
Single pulse avalanche energy (Note 2)		E_{AS}	107	mJ
Avalanche current		I_{AR}	40	A
Repetitive avalanche energy (Note 3)		E_{AR}	20	mJ
Peak diode recovery dv/dt (Note 5)		dv/dt	12	V/ns
Channel temperature (Note 4)		T_{ch}	175	°C
Storage temperature range (Note 4)		T_{stg}	−55~175	°C

Unit: mm



JEDEC	-
JEITA	-
TOSHIBA	2-11G1A

Weight: 1.9 g (typ.)

Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th\ (ch-c)}$	0.75	°C / W
Thermal resistance, channel to ambient	$R_{th\ (ch-a)}$	83.3	°C / W

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

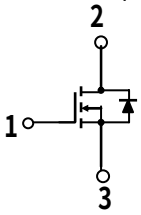
Note 2: V_{DD} = 25 V, T_{ch} = 25°C (initial), L = 100 μH, R_G = 25 Ω, I_{AR} = 40A

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

Note 4: Tc=100℃

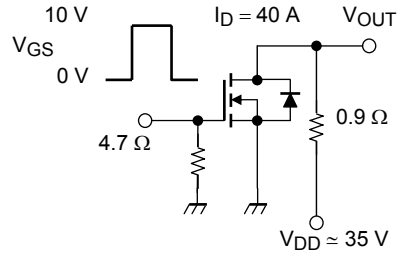
Note 5: IDR≦80A,di/dt≦160A/μs, Tch≦Tch max.

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



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

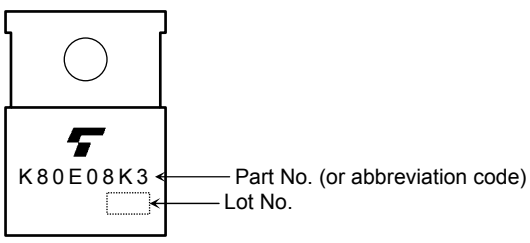
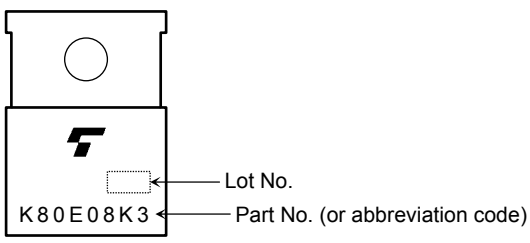
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V	—	—	±1	μA
Drain cut−off current		I_{DSS}	V_{DS} = 75 V, V_{DS} = 0 V	—	—	10	μA
Drain−source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	75	—	—	V
		$V_{(BR)\ DSX}$	I_D = 10 mA, V_{GS} = -20 V	45	—	—	V
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 1 mA	2.0	—	4.0	V
Drain−source ON resistance		$R_{DS\ (ON)}$	V_{GS} = 10 V, I_D = 40 A	—	7.5	9.0	mΩ
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 40 A	67	135	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	3600	—	pF
Reverse transfer capacitance		C_{rss}		—	350	—	
Output capacitance		C_{oss}		—	500	—	
Switching time	Rise time	t_r	 Duty ≦ 1%, t_w = 10 μs	—	16	—	ns
	Turn−on time	t_{on}		—	33	—	
	Fall time	t_f		—	13	—	
	Turn−off time	t_{off}		—	63	—	
Total gate charge (Gate−source plus gate−drain)		Q_g	V_{DD} ≈ 60 V, V_{GS} = 10 V, I_D = 80 A	—	75	—	nC
Gate−source charge		Q_{gs}		—	44	—	
Gate−drain (“miller”) charge		Q_{gd}		—	31	—	

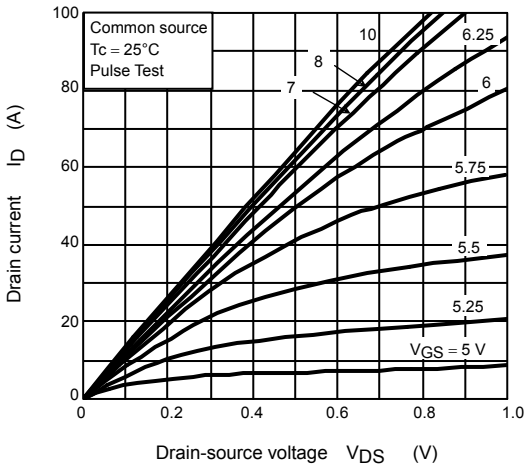
Source−Drain Ratings and Characteristics (Ta = 25°C)

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}	—	—	—	240	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 = 100 A / μs	—	45	—	ns
Reverse recovery charge	Q_{rr}		—	72	—	μC

Marking

2−10X1A	2−11G1A
	

$I_D - V_{DS}$



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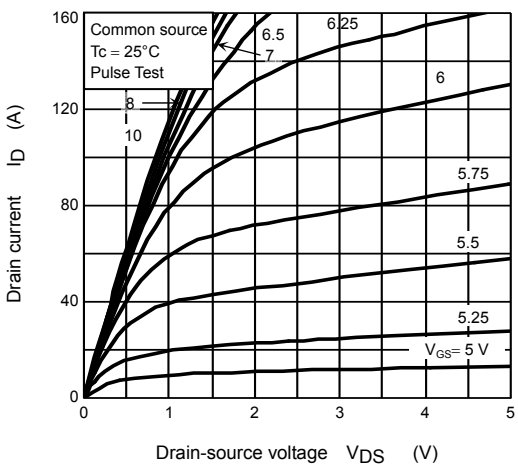
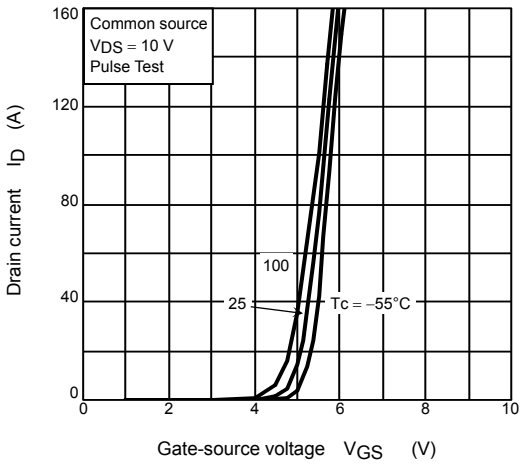
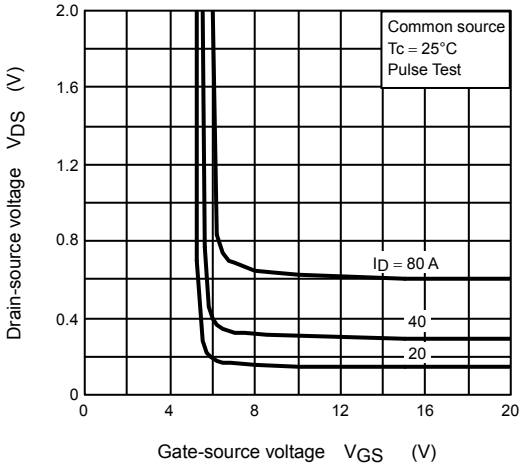
$I_D - V_{DS}$



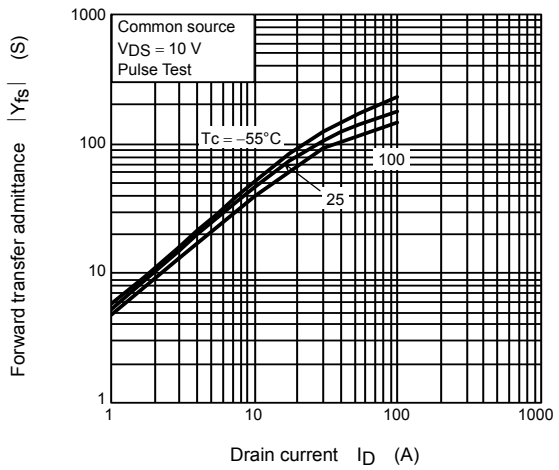
$I_D - V_{GS}$



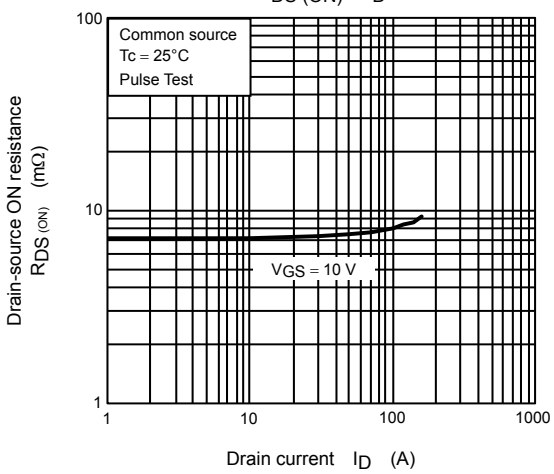
$V_{DS} - V_{GS}$



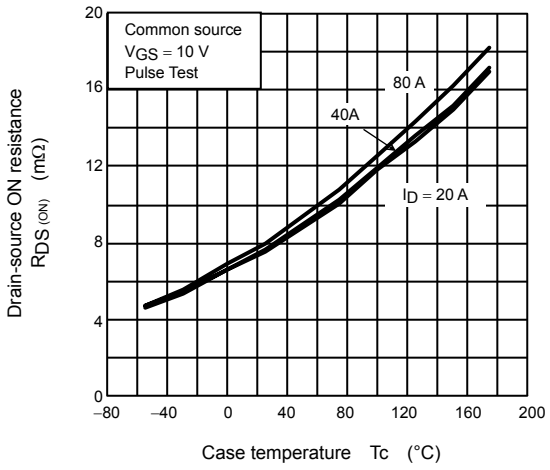
$|Y_{fs}| - I_D$



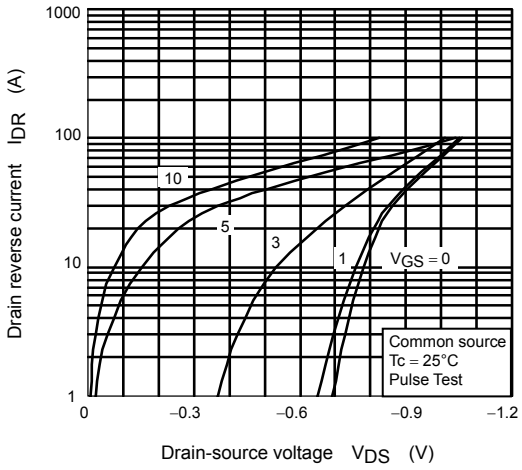
$R_{DS\ (ON)} - I_D$



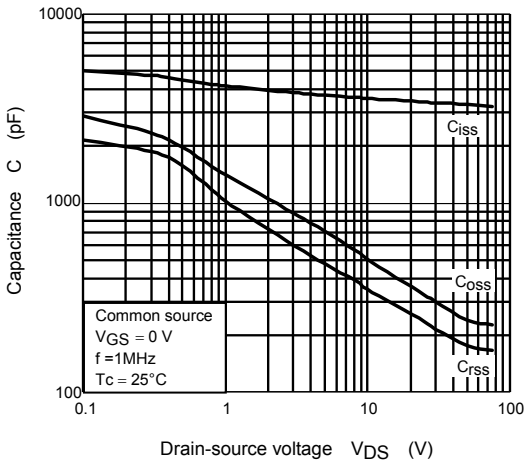
$R_{DS\ (ON)}$ – Tc



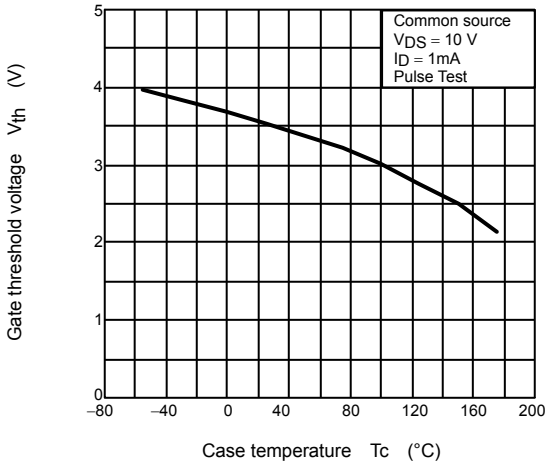
I_{DR} – V_{DS}



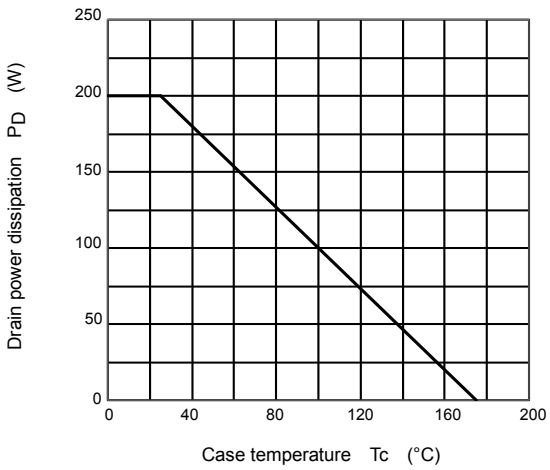
Capacitance – V_{DS}



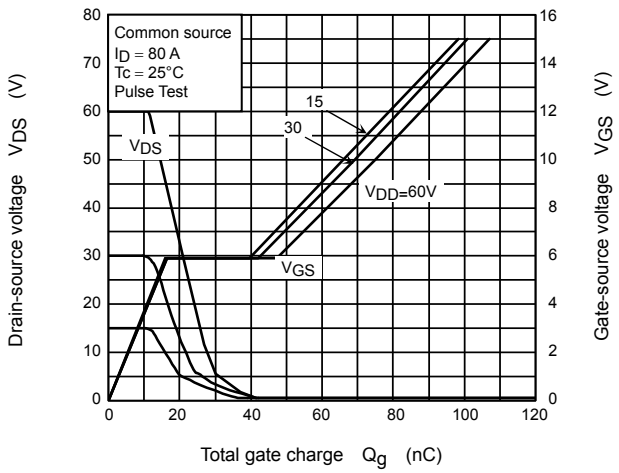
V_{th} – Tc



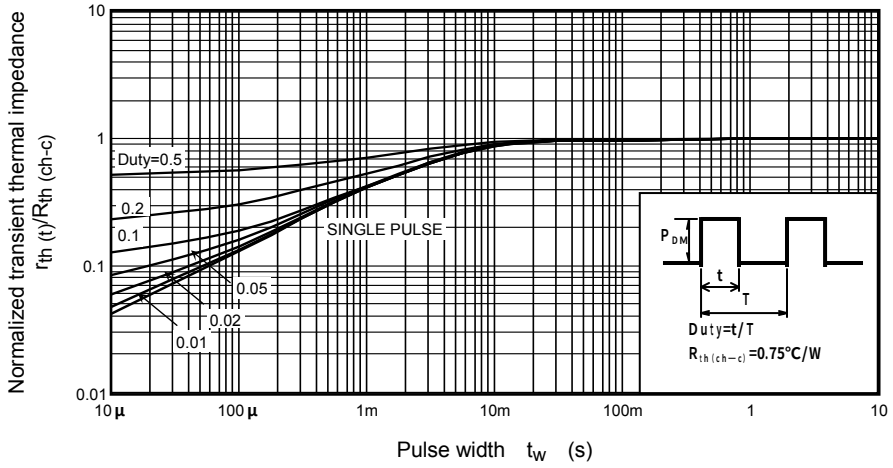
P_D – Tc



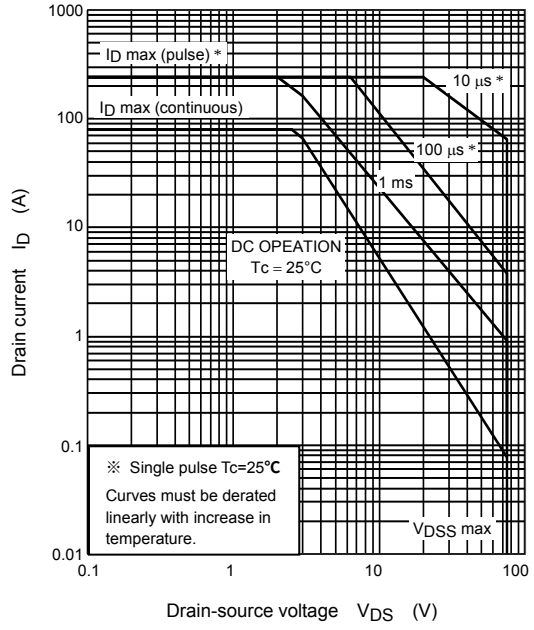
Dynamic input / output characteristics



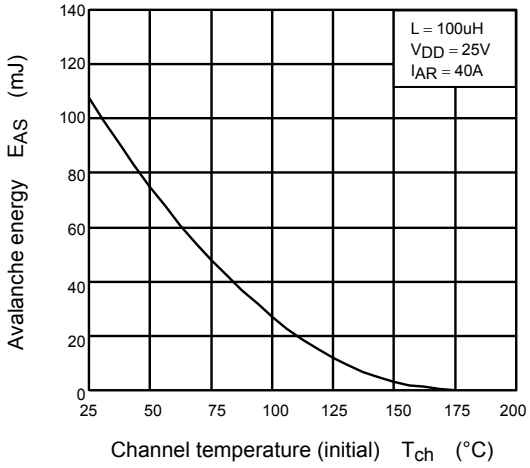
$r_{th} - t_w$

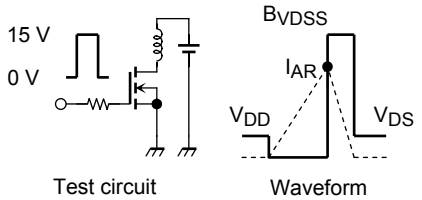


SAFE OPERATING AREA



$E_{AS} - T_{ch}$





$R_G = 25\ \Omega$
V_{DD} = 25 V, L = 100 μH

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

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