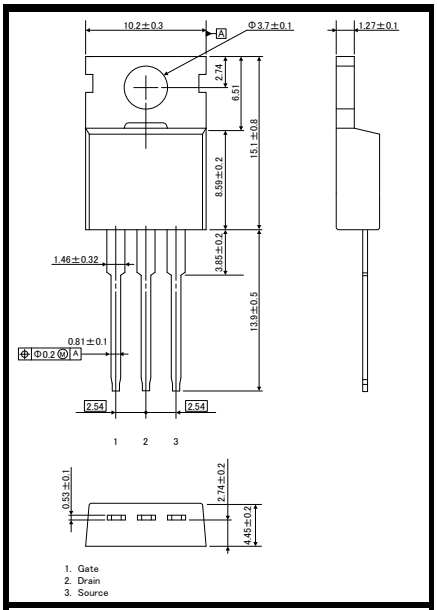
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U−MOSⅧ-H)

TK150E09NE

■ E-Bike

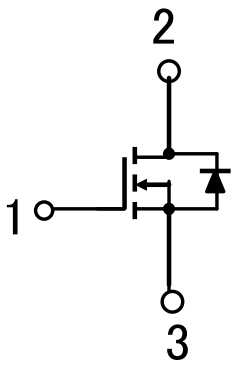
- Low drain−source ON resistance : $R_{DS\ (ON)}$ = 3.6 mΩ (typ.) (V_{GS} = 10 V)
- Low leakage current : I_{DSS} = 10 μA (max) (V_{DS} = 85 V)
- Enhancement mode : V_{th} = 2.5~4.5 V (V_{DS} = 10 V, I_D = 1.0 mA)

Unit: mm



JEDEC	TO-220AB
JEITA	SC-46
TOSHIBA	-

Weight: 1.9 g (typ.)



Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain−source voltage		V_{DSS}	85	V
Gate−source voltage		V_{GSS}	±20	
Drain current	DC (Tc = 25°C) (Note 1)	I_D	150	A
	DC (Tc = 100°C) (Note 1)	I_D	120	
	Pulse (Note 1)	I_{DP}	450	
Drain power dissipation (Tc = 25°C)		P_D	230	W
Single pulse avalanche energy (Note 2)		E_{AS}	161	mJ
Avalanche current (Note 2)		I_{AS}	72	A
Peak diode recovery dv/dt (Note 5)		dv/dt	12	V/ns
Channel temperature		T_{ch}	175	°C
Storage temperature range		T_{stg}	−55~175	

Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th\ (ch-c)}$	0.65	°C / W
Thermal resistance, channel to ambient	$R_{th\ (ch-a)}$	83.3	

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

Note 2: V_{DD} = 64 V, T_{ch} = 25°C (initial), L =24 μH, R_G = 25 Ω, I_{AS} = 72A

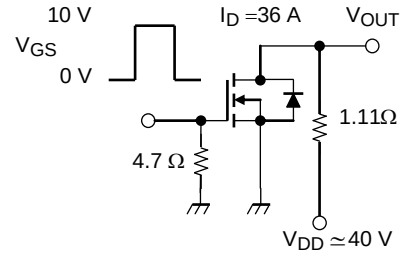
Note 3: Repetitive rating: pulse width limited by maximum channel temperature

Note 4: I_{DR}≦180A,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

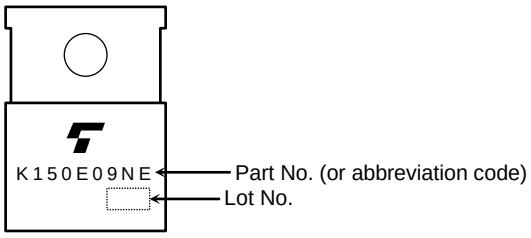
Electrical Characteristics (Ta = 25°C)

Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±20 V, V_{DS} = 0 V	—	—	±0.1	μA
Drain cut−off current		I_{DSS}	V_{DS} = 85 V, V_{DS} = 0 V	—	—	10	
Drain−source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	85	—	—	V
Drain−source breakdown voltage		$V_{(BR)\ DSX}$	I_D = 10 mA, V_{GS} = -20 V	60	—	—	
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 1.0 mA	2.5	—	4.5	
Drain−source ON resistance		$R_{DS\ (ON)}$	V_{GS} = 10 V, I_D = 75 A	—	3.65	5.0	mΩ
Input capacitance		C_{iss}	V_{DS} = 40 V, V_{GS} = 0 V, f = 1 MHz	—	5500	—	pF
Reverse transfer capacitance		C_{rss}		—	38	—	
Output capacitance		C_{oss}		—	1300	—	
Switching time	Rise time	t_r	 Duty ≦ 1%, t_w = 10 μs	—	19	—	ns
	Turn−on time	t_{on}		—	42	—	
	Fall time	t_f		—	28	—	
	Turn−off time	t_{off}		—	93	—	
Total gate charge (Gate−source plus gate−drain)		Q_g	V_{DD} ≈ 64 V, V_{GS} = 10 V, I_D = 72 A	—	81	—	nC
Gate−source charge 1		Q_{gs1}		—	29	—	
Gate−drain charge		Q_{gd}		—	21	—	
Gate switch charge		Q_{SW}			33		

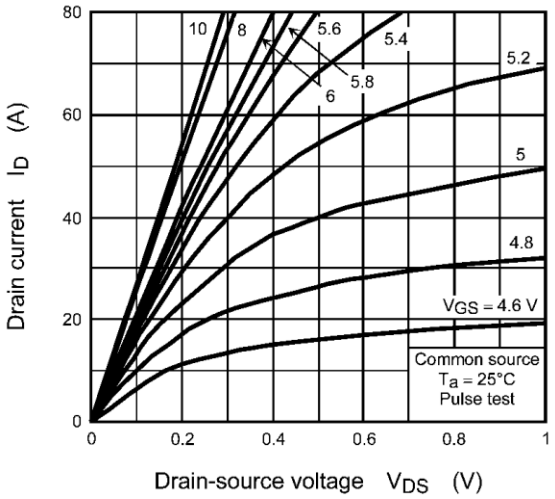
Source−Drain Ratings and Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Tc = 25°C) (Note 1)	I_{DR}	—	—	—	150	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	450	A
Forward voltage (diode)	V_{DSF}	I_{DR} = 150 A, V_{GS} = 0 V	—	—	−1.3	V
Reverse recovery time	t_{rr}	I_{DR} = 72 A, V_{GS} = 0 V $-dI_{DR}$ / dt = 100 A / μs	—	77	—	ns
Reverse recovery charge	Q_{rr}		—	150	—	nC

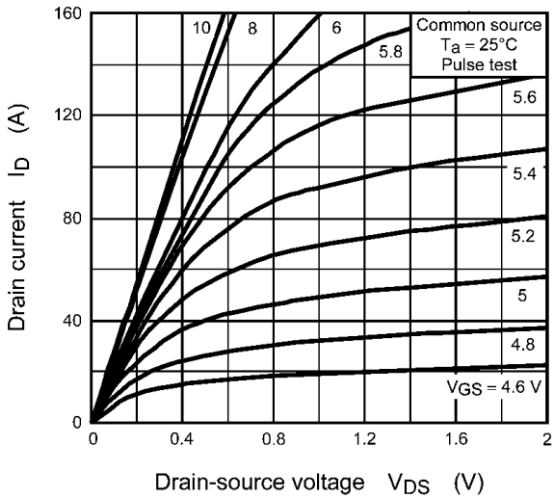
Marking



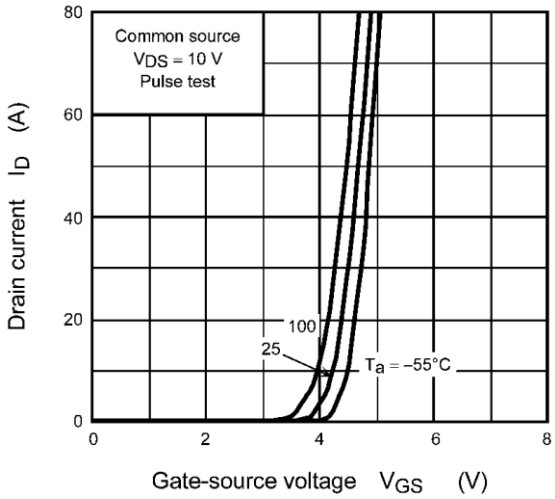
$I_D - V_{DS}$



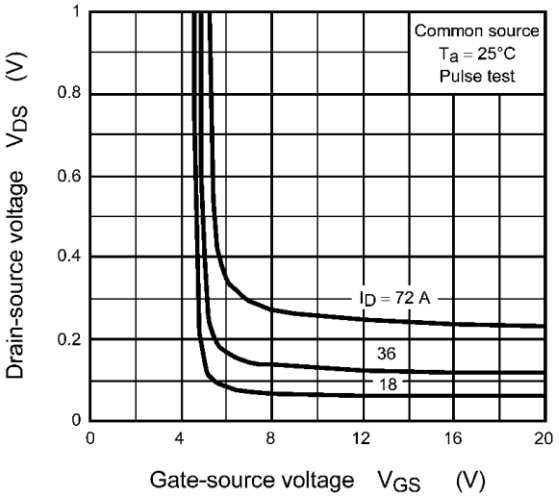
$I_D - V_{DS}$



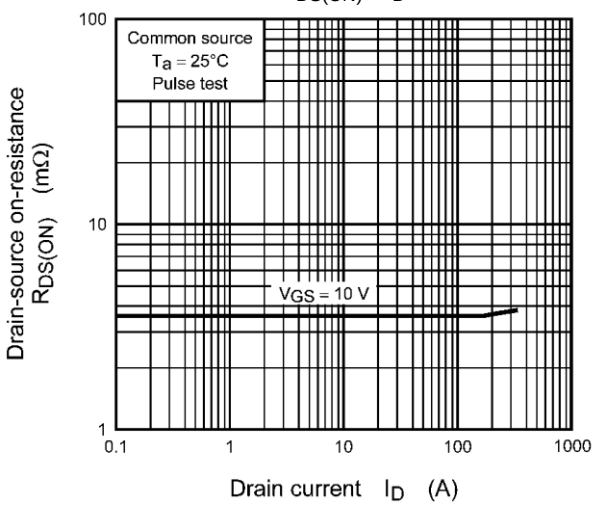
$I_D - V_{GS}$



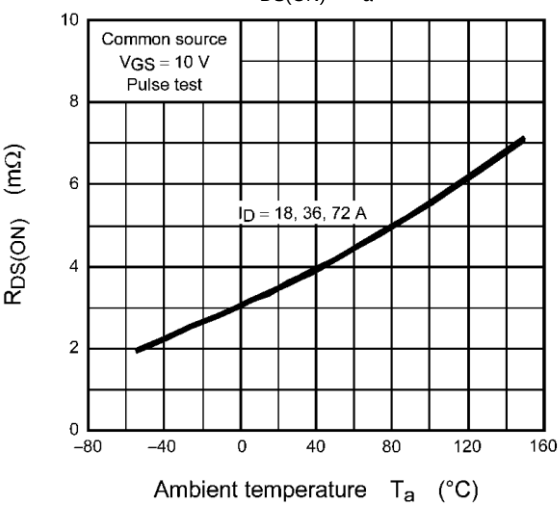
$V_{DS} - V_{GS}$



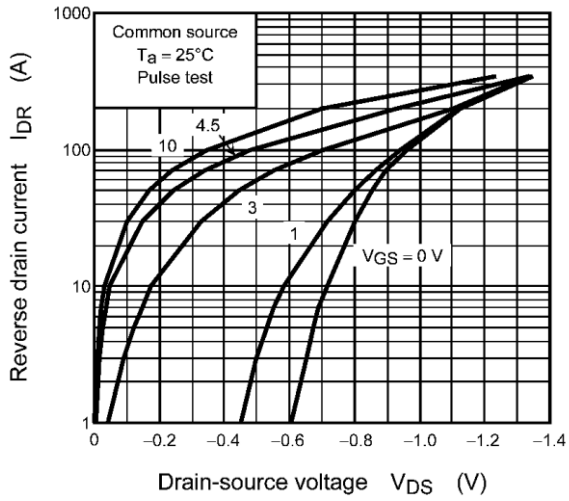
$R_{DS(ON)} - I_D$



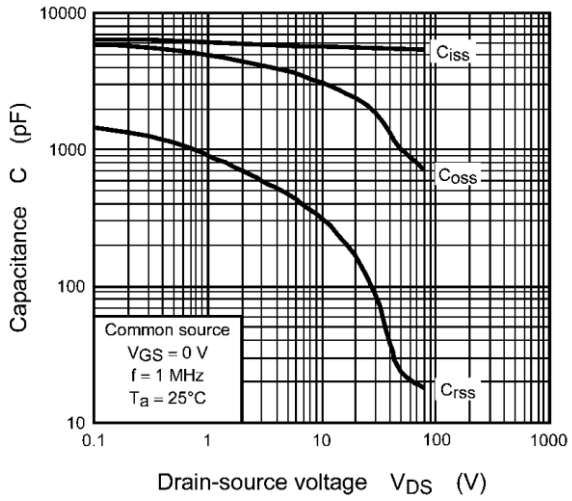
$R_{DS(ON)} - T_a$



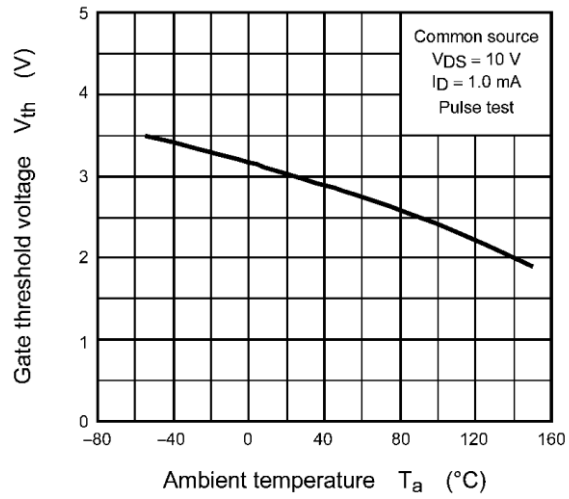
I_{DR} – V_{DS}



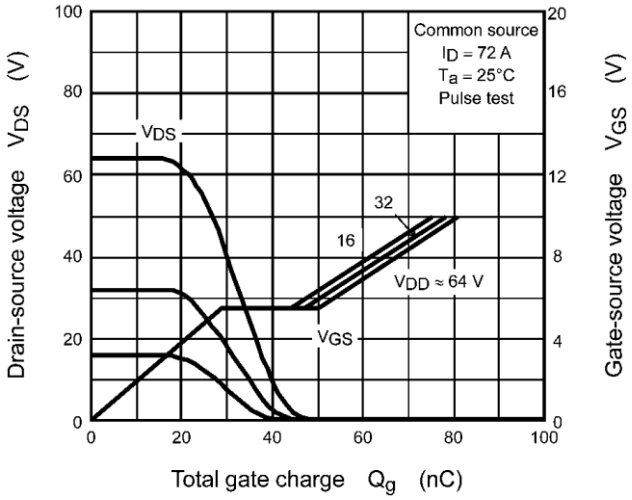
Capacitance – V_{DS}



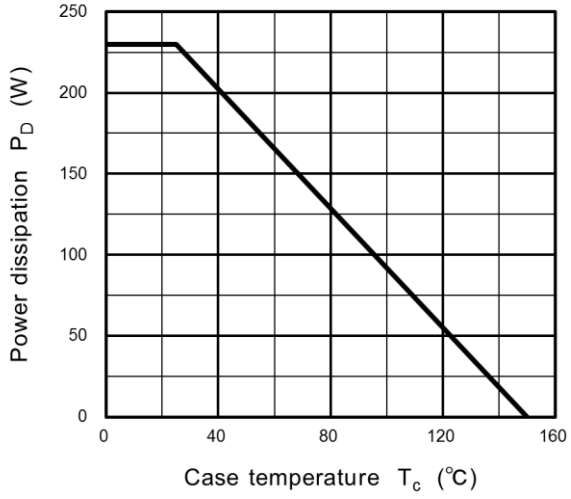
V_{th} – T_a



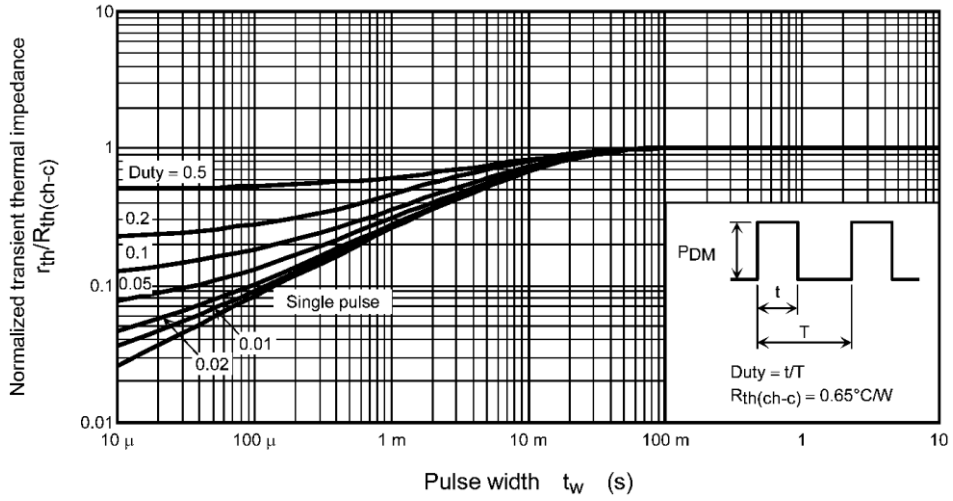
Dynamic input/output characteristics



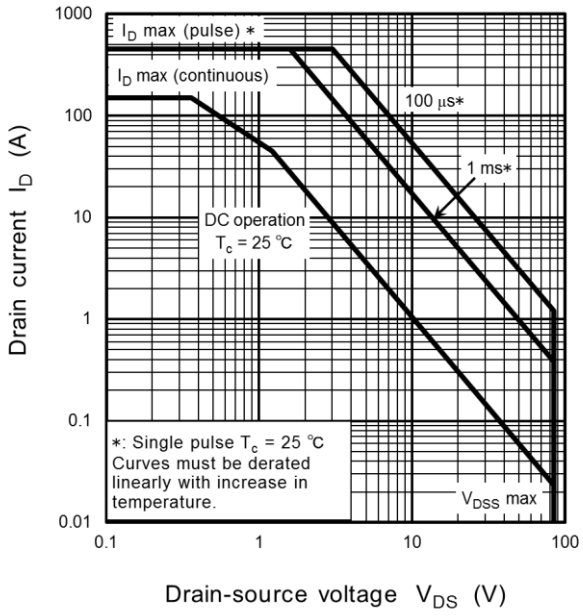
P_D – T_c



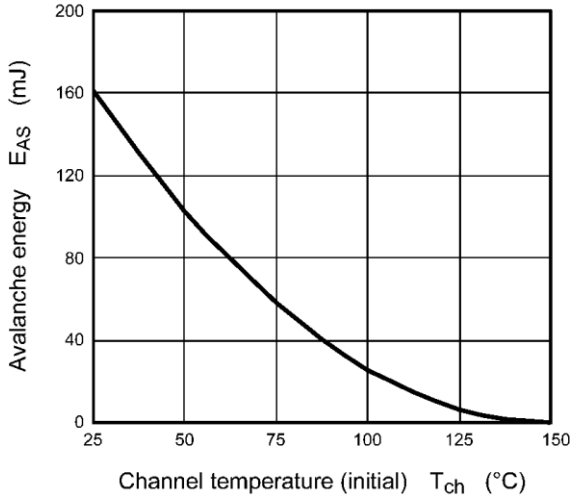
$r_{th} - t_w$

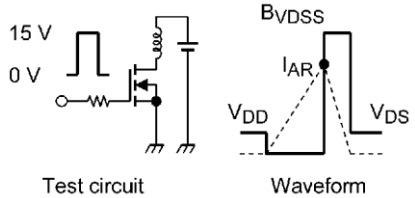


Safe operating area



$E_{AS} - T_{ch}$





V_{DD} = 64 V, I_{AR} = 72 A $\quad E_{AS} = \frac{1}{2} \cdot L \cdot I_{AR}^2 \cdot \left(\frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$

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