TK6P60W

This material is for a technological examination material to aim at the product introduction. The change in the content of the characteristic might be accompanied at the final specification process. The latest specification will be able to be gotten in the brokerage department when the product of an equipment is designed and to get the confirmation.

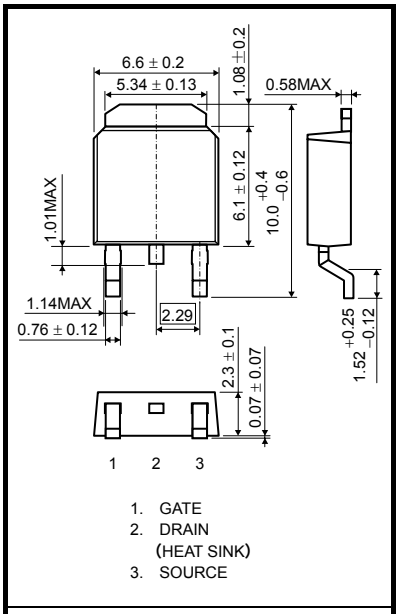
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (DTMOS**IV**)

TK6P60W

Switching Regulator Applications

- Low drain-source ON-resistance : $R_{DS\ (ON)}$ = 0.64 Ω (typ.)
  by used to Super Junction Structure : DTMOS
- Easy to control Gate switching
- Enhancement-mode: V_{th} = 2.5 to 3.5 V (V_{DS} = 10 V, I_D = 0.31 mA)

Unit: mm



JEDEC	―
JEITA	―
TOSHIBA	2-7K1A

Weight : 0.36 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	600	V
Gate-source voltage	V_{GSS}	±30	V
Drain current (Continuous) (Note 1)	I_D	6.2	A
Drain current (Pulsed) (Note 1)	I_{DP}	24.8	A
Drain power dissipation (Tc = 25°C)	P_D	60	W
Single pulse avalanche energy (Note 2)	E_{AS}	43	mJ
Avalanche current	I_{AR}	3.1	A
Drain reverse current (Continuous) (Note 1)	I_{DR}	6.2	A
Drain reverse current (Pulsed) (Note 1)	I_{DRP}	24.8	A
Channel temperature	T_{ch}	150	°C
Storage temperature range	T_{stg}	-55 to 150	°C

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

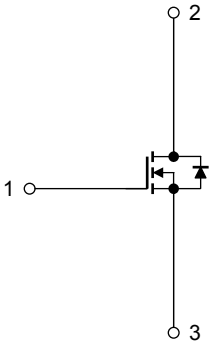
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th\ (ch\text{-}c)}$	2.09	°C/W

Note 1: Ensure that the channel temperature does not exceed 150°C.

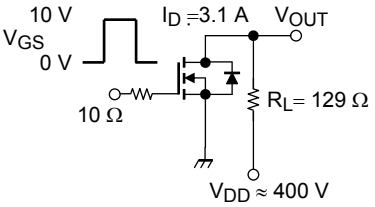
Note 2: V_{DD} = 90 V, T_{ch} = 25°C (initial), L = 7.91 mH, R_G = 25 Ω, I_{AR} = 3.1 A

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

Internal Connection



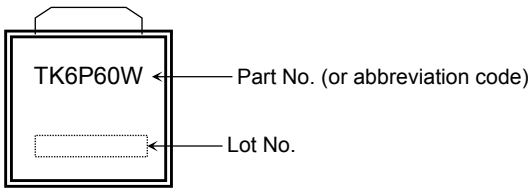
Electrical Characteristics (Ta = 25°C)

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 = 0.31 mA	2.7	—	3.7	V
Drain-source ON-resistance		$R_{DS\ (ON)}$	V_{GS} = 10 V, I_D = 3.1 A	—	0.64	0.75	Ω
Input capacitance		C_{iss}	V_{DS} = 300 V, V_{GS} = 0 V, f = 1 MHz	—	380	—	pF
Reverse transfer capacitance		C_{rss}		—	2	—	
Output capacitance		C_{oss}		—	13	—	
Effective output capacitance		$C_{o(er)}$	V_{DS} = 0 to 400 V, V_{GS} = 0 V	—	20	—	pF
Gate resistance		Rg	V_{DS} = OPEN, f = 1MHz	—	7.5	—	Ω
Switching time	Rise time	t_r		—	20	—	ns
	Turn-on time	t_{on}		—	40	—	
	Fall time	t_f		—	5.5	—	
	Turn-off time	t_{off}	Duty ≤ 1%, t_w = 10 μs	—	55	—	
Total gate charge		Q_g	V_{DD} ≈ 400 V, V_{GS} = 10 V, I_D = 6.2 A	—	12	—	nC
Gate-source charge1		Q_{gs1}		—	2.5	—	
Gate-drain charge		Q_{gd}		—	6	—	
MOSFET turn-off dv/dt capability		dv/dt	V_{DD} = 0 to 400 V, I_D = 3.1 A	50	—	—	V/ns

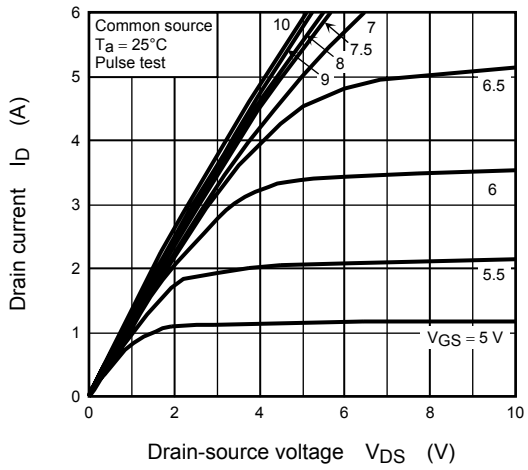
Source-Drain Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Forward voltage (diode)	V_{DSF}	I_{DR} = −6.2 A, V_{GS} = 0 V	—	—	−1.7	V
Reverse recovery time	t_{rr}	I_{DR} = 6.2 A, V_{GS} = 0 V, $-dI_{DR}/dt$ = 100 A/μs	—	220	—	ns
Reverse recovery charge	Q_{rr}		—	2.4	—	μC
Reverse recovery peak current	I_{rr}		—	19	—	A
Reverse Diode dv/dt capability	dv/dt	I_{DR} = 6.2 A, V_{GS} = 0 V, V_{DD} = 400 V	15	—	—	V/ns

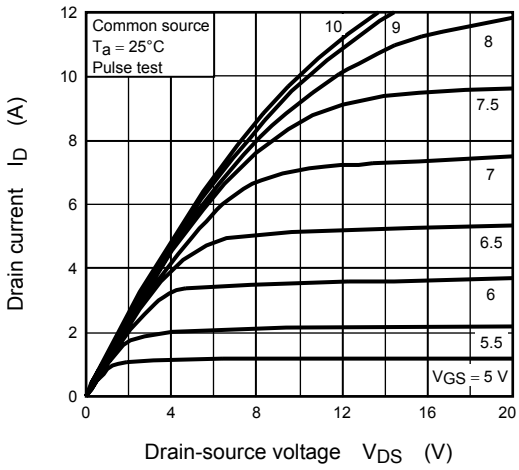
Marking



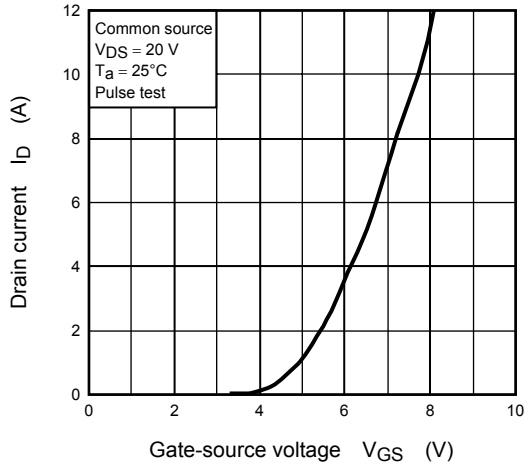
$I_D - V_{DS}$



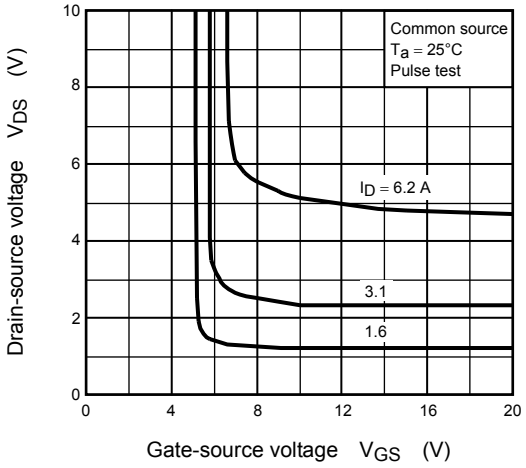
$I_D - V_{DS}$



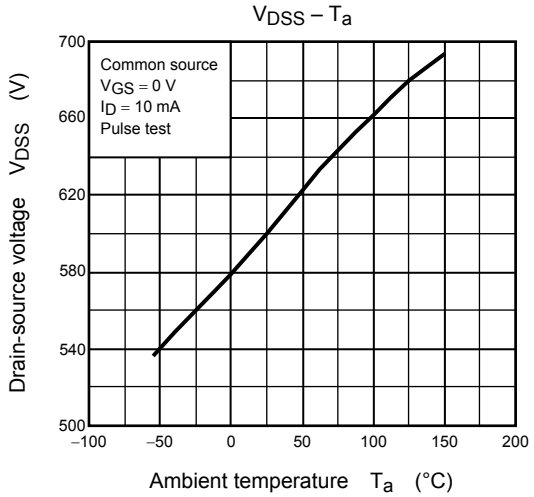
$I_D - V_{GS}$



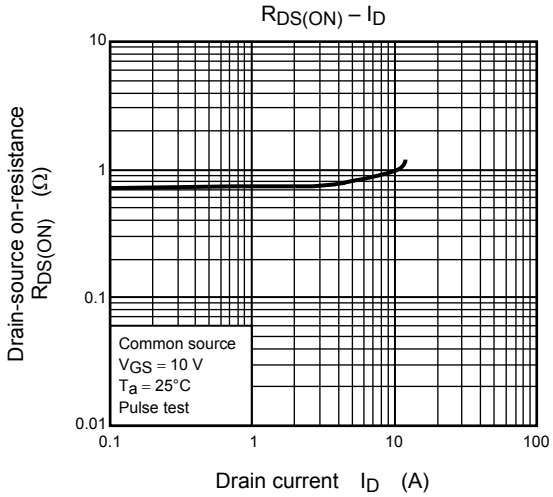
$V_{DS} - V_{GS}$



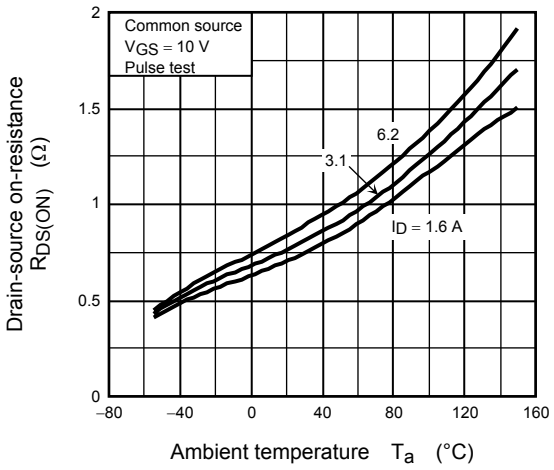
$V_{DSS} - T_a$



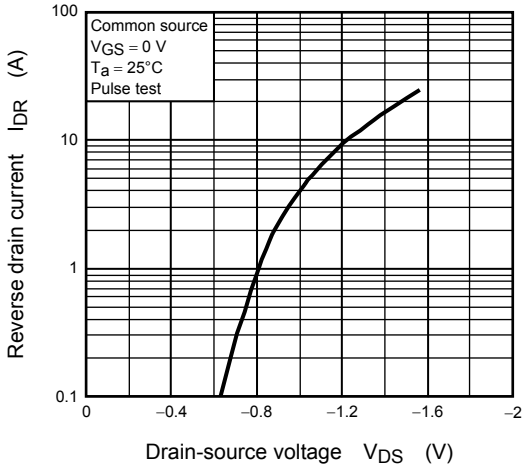
$R_{DS(ON)} - I_D$



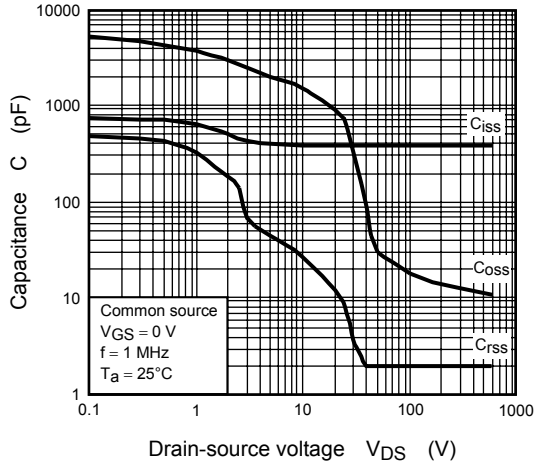
$R_{DS(ON)} - T_a$



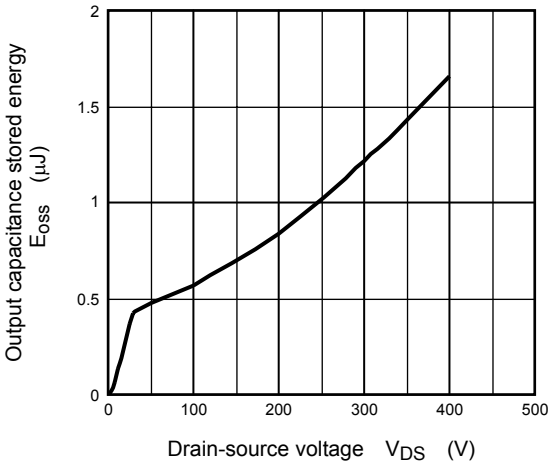
$I_{DR} - V_{DS}$



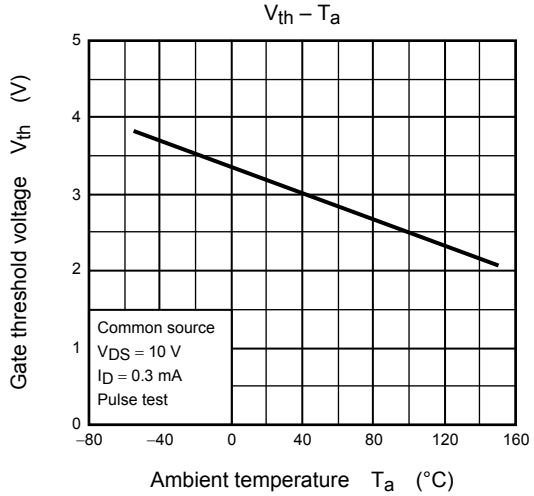
$C - V_{DS}$



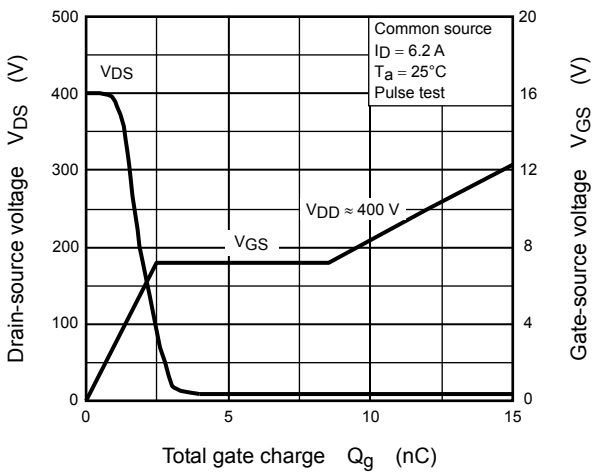
$E_{oss} - V_{DS}$



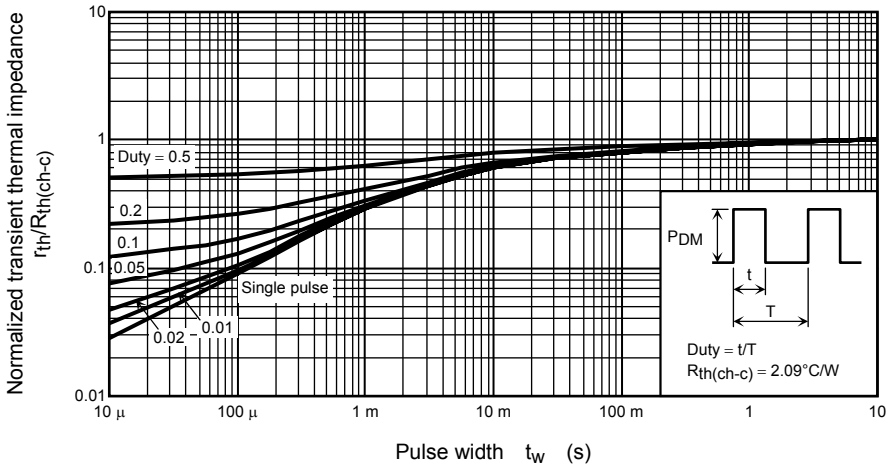
$V_{th} - T_a$



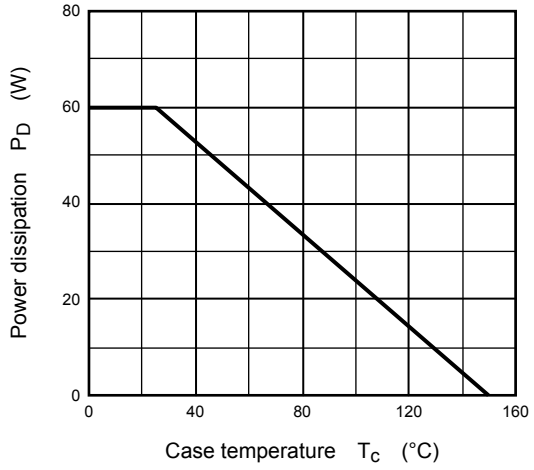
Dynamic input/output characteristics



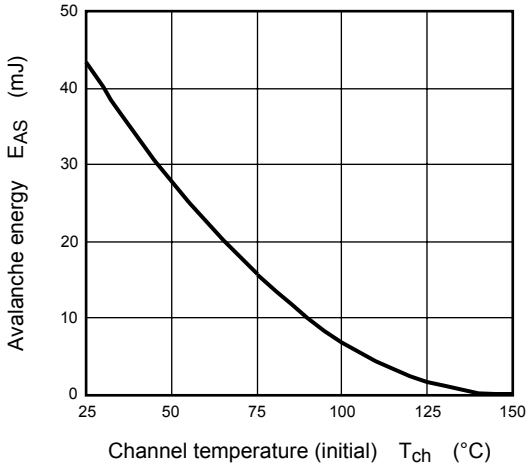
$r_{th} - t_w$



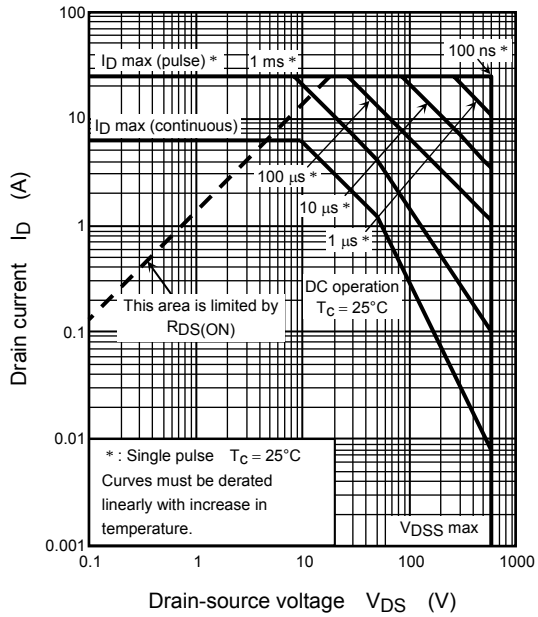
$P_D - T_c$

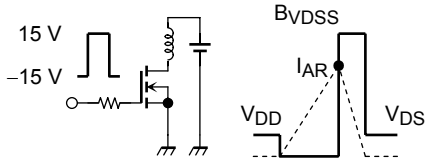


$E_{AS} - T_{ch}$



Safe operating area





Waveform

$R_G = 25\ \Omega$, $V_{DD} = 90$ V $E_{AS} = \frac{1}{2} \cdot L \cdot I^2_{AR} \cdot \left(\frac{B_{VDSS}}{B_{VDSS} - V_{DD}} \right)$

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