

TOSHIBA Field Effect Transistor Silicon N-Channel MOS Type (π -MOS IV)

TK07H90A

Switching Regulator Applications

- Low drain-source ON resistance : $R_{DS(ON)} = 1.6\Omega$ (typ.)
- High forward transfer admittance : $|Y_{fs}| = 5.0$ S (typ.)
- Low leakage current : $I_{DSS} = 100\ \mu\text{A}$ (max) ($V_{DS} = 720\text{V}$)
- Enhancement mode : $V_{th} = 2.0\sim 4.0$ V ($V_{DS} = 10$ V, $I_D = 1$ mA)

Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

Characteristic		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	900	V
Drain-gate voltage ($R_{GS} = 20\ \text{k}\Omega$)		V_{DGR}	900	V
Gate-source voltage		V_{GSS}	± 30	V
Drain current	DC (Note 1)	I_D	7	A
	Pulse (Note 1)	I_{DP}	21	A
Drain power dissipation ($T_c = 25^\circ\text{C}$)		P_D	150	W
Single-pulse avalanche energy (Note 2)		E_{AS}	491	mJ
Avalanche current		I_{AR}	7	A
Repetitive avalanche energy (Note 3)		E_{AR}	15	mJ
Channel temperature		T_{ch}	150	$^\circ\text{C}$
Storage temperature range		T_{stg}	$-55\sim 150$	$^\circ\text{C}$

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

Characteristic	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	0.833	$^\circ\text{C} / \text{W}$
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	50	$^\circ\text{C} / \text{W}$

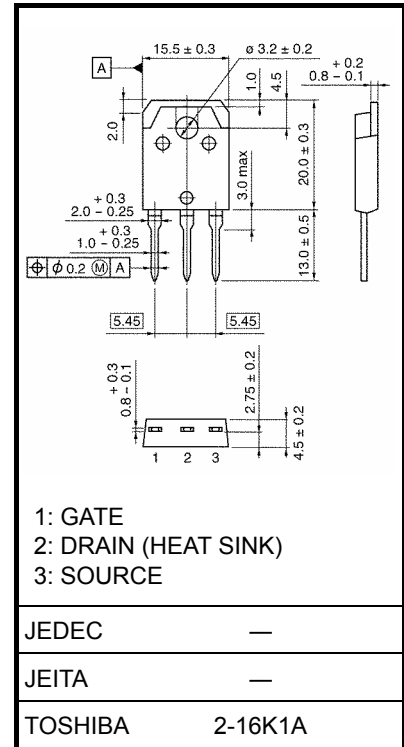
Note 1: Ensure that the channel temperature does not exceed 150°C .

Note 2: $V_{DD} = 90$ V, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 18.4$ mH, $R_G = 25\ \Omega$, $I_{AR} = 7$ A

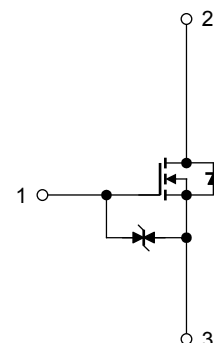
Note 3: Repetitive rating: pulse width limited by maximum channel temperature

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

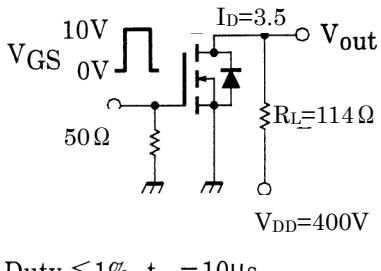
Unit: mm



Weight: 3.8 g (typ.)



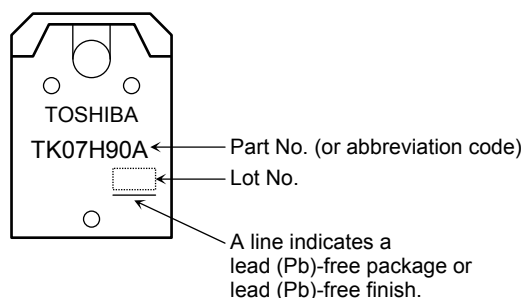
Electrical Characteristics (Ta = 25°C)

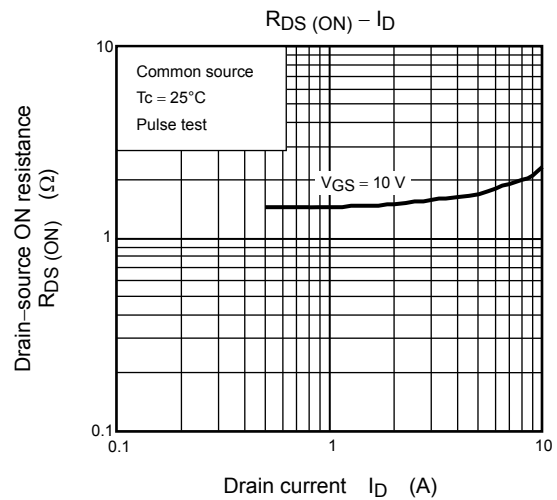
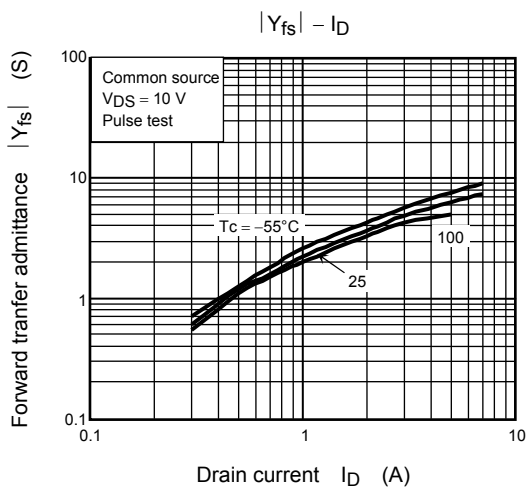
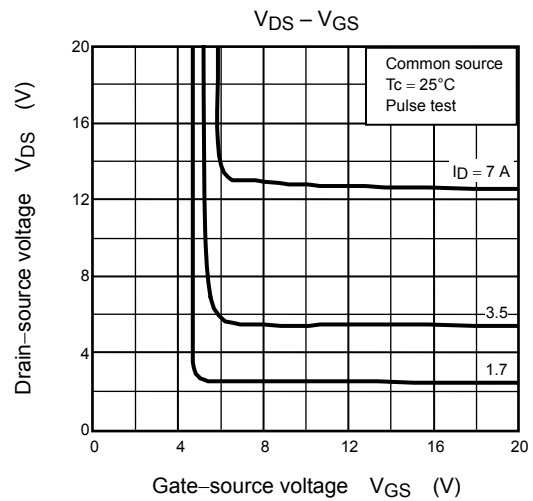
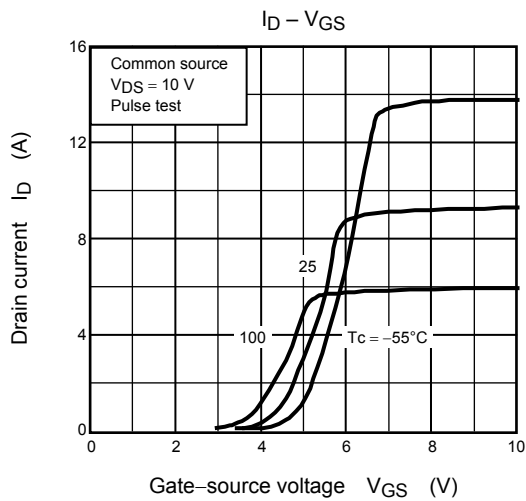
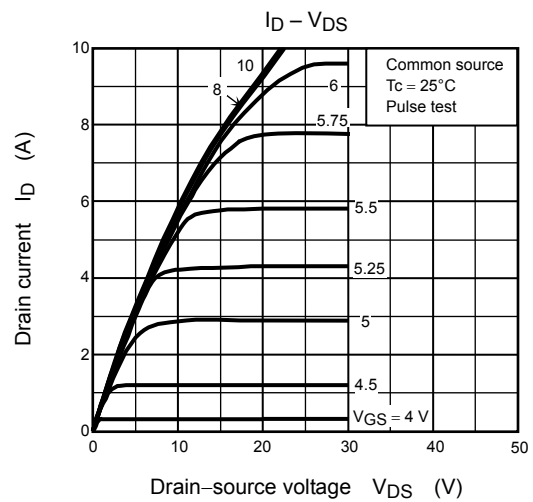
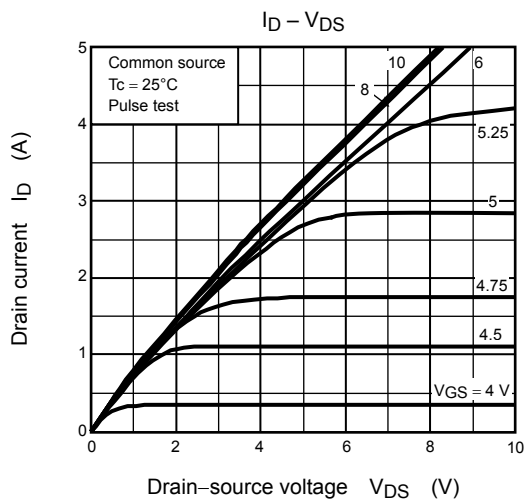
Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 30 \text{ V}$, $V_{DS} = 0 \text{ V}$	—	—	± 10	μA
Gate-source breakdown voltage		$V_{(BR)GSS}$	$I_G = \pm 10 \mu\text{A}$, $V_{DS} = 0 \text{ V}$	± 30	—	—	V
Drain cutoff current		I_{DSS}	$V_{DS} = 720 \text{ V}$, $V_{GS} = 0 \text{ V}$	—	—	100	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10 \text{ mA}$, $V_{GS} = 0 \text{ V}$	900	—	—	V
Gate threshold voltage		V_{th}	$V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$	2.0	—	4.0	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 10 \text{ V}$, $I_D = 3.5 \text{ A}$	—	1.6	2.0	Ω
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10 \text{ V}$, $I_D = 3.5 \text{ A}$	3.5	5.0	—	S
Input capacitance		C_{iss}	$V_{DS} = 25 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 1 \text{ MHz}$	—	1650	—	pF
Reverse transfer capacitance		C_{rss}		—	30	—	
Output capacitance		C_{oss}		—	140	—	
Switching time	Rise time	t_r	 $I_D = 3.5 \text{ A}$ $V_{GS} = 10 \text{ V}$ $V_{DS} = 400 \text{ V}$ $R_L = 114 \Omega$ V_{out} $Duty \leq 1\%$, $t_w = 10 \mu\text{s}$	—	50	—	ns
	Turn on time	t_{on}		—	90	—	
	Fall time	t_f		—	70	—	
	Turn off time	t_{off}		—	240	—	
Total gate charge (gate-source plus gate-drain)		Q_g	$V_{DD} \approx 400 \text{ V}$, $V_{GS} = 10 \text{ V}$, $I_D = 7 \text{ A}$	—	45	—	nC
Gate-source charge		Q_{gs}		—	24	—	
Gate-drain ("Miller") charge		Q_{gd}		—	21	—	

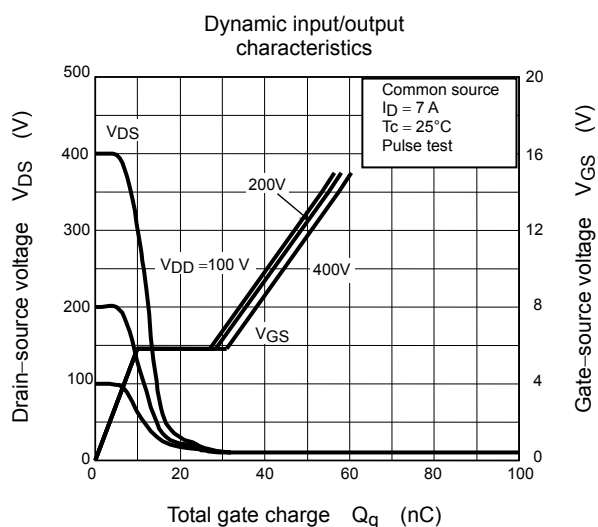
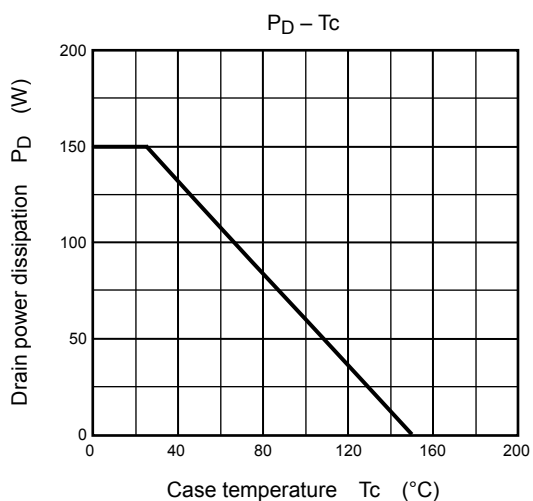
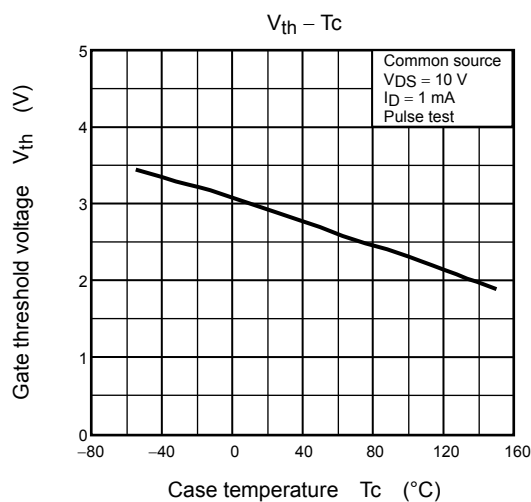
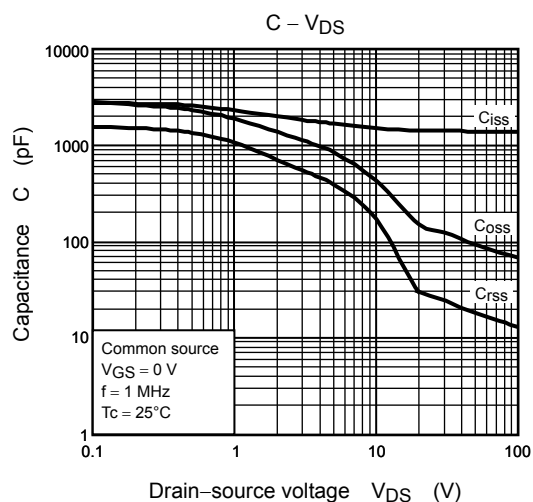
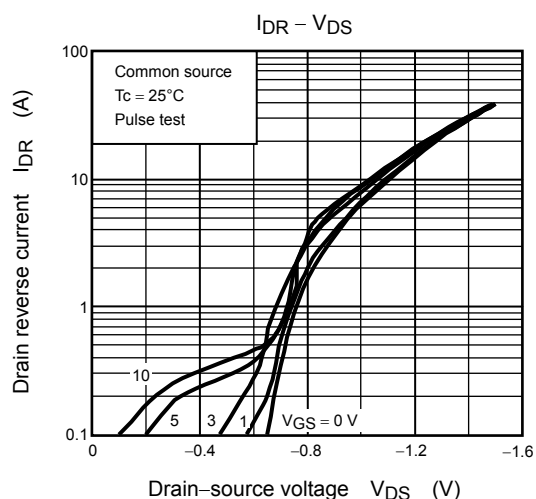
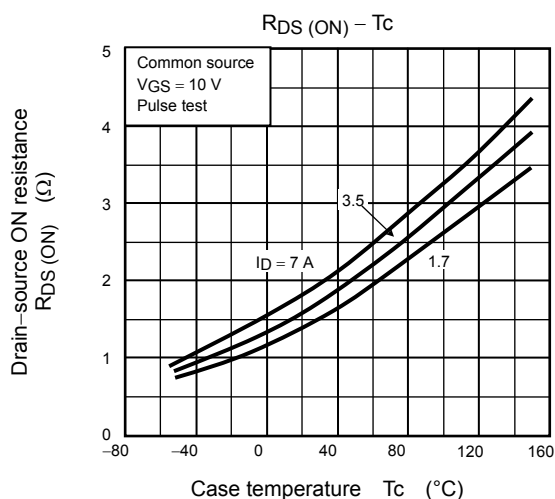
Source-Drain Ratings and Characteristics (Ta = 25°C)

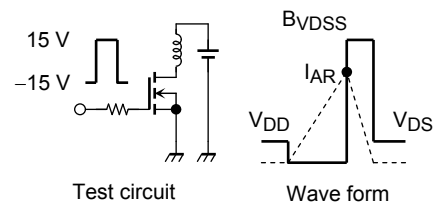
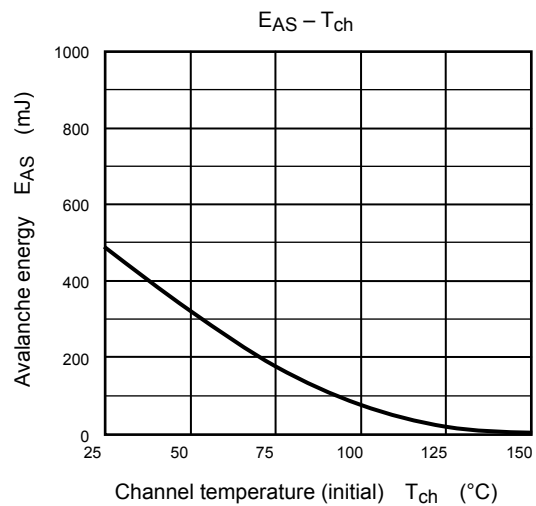
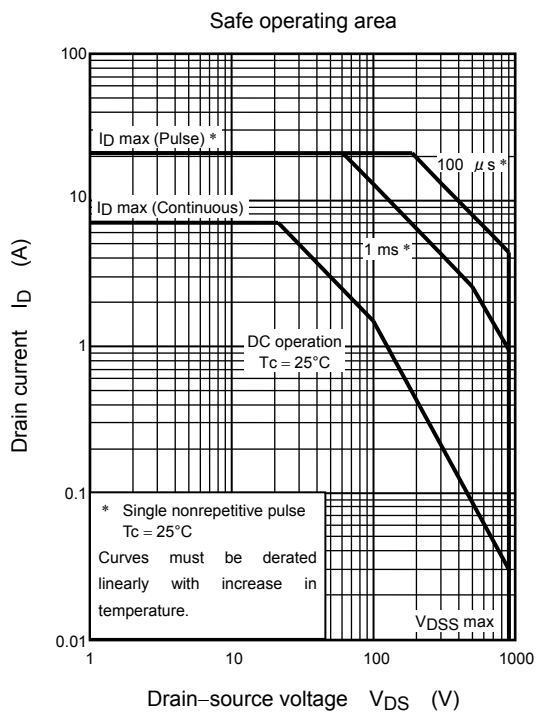
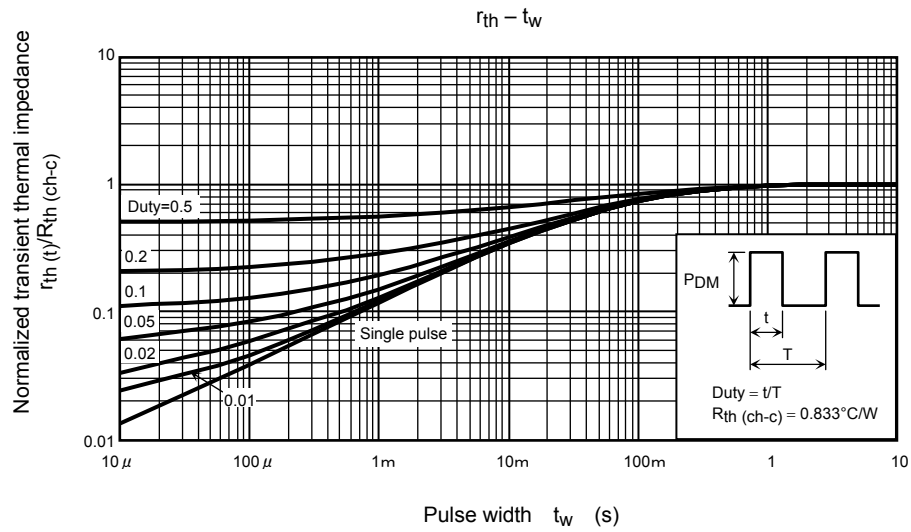
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	7	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	21	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 7 \text{ A}$, $V_{GS} = 0 \text{ V}$	—	—	-1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = 7 \text{ A}$, $V_{GS} = 0 \text{ V}$ $dI_{DR} / dt = 100 \text{ A} / \mu\text{s}$	—	1400	—	ns
Reverse recovery charge	Q_{rr}		—	12	—	μC

Marking









$$R_G = 25 \Omega$$

$$V_{DD} = 90 \text{ V}, L = 18.4 \text{ mH}$$

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

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