

TK7A90E

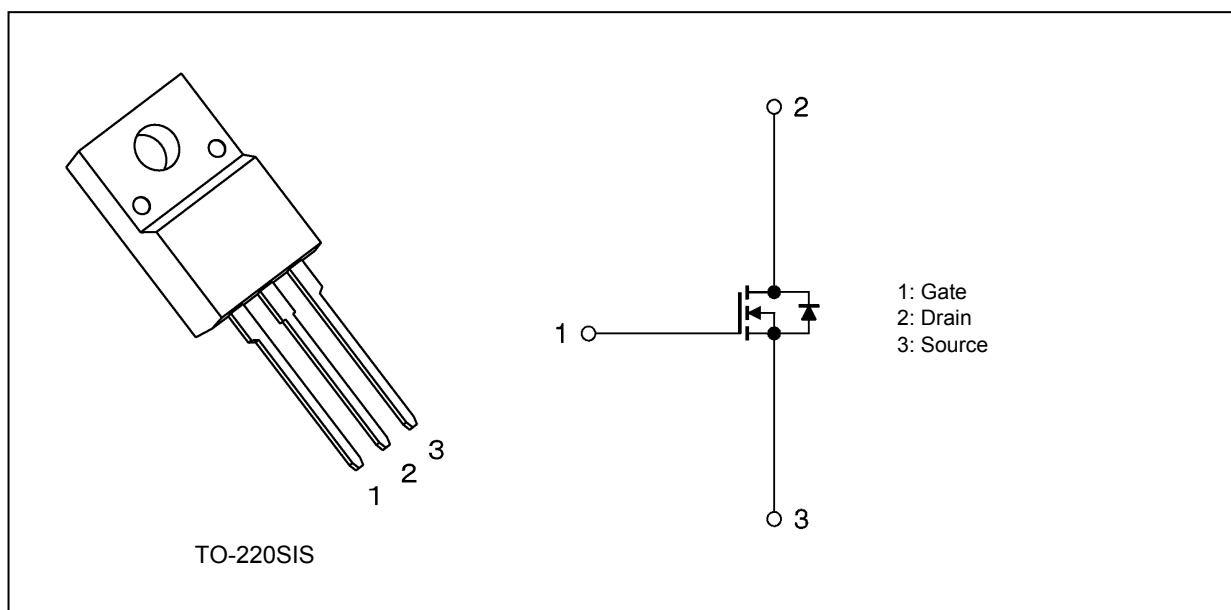
1. Applications

- Switching Voltage Regulators

2. Features

- (1) Low drain-source on-resistance: $R_{DS(ON)} = 1.6 \Omega$ (typ.)
- (2) Low leakage current : $I_{DSS} = 10 \mu A$ (max) ($V_{DS} = 720 V$)
- (3) Enhancement mode: $V_{th} = 2.5$ to $4.0 V$ ($V_{DS} = 10 V$, $I_D = 0.7 mA$)

3. Packaging and Internal Circuit



4. Absolute Maximum Ratings (Note) ($T_a = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Characteristics	Symbol	Rating	Unit
Drain-source voltage	V_{DSS}	900	V
Gate-source voltage	V_{GSS}	± 30	
Drain current (DC) (Note 1)	I_D	7	A
Drain current (pulsed) (Note 1)	I_{DP}	21	
Power dissipation ($T_c = 25^{\circ}\text{C}$)	P_D	45	W
Single-pulse avalanche energy (Note 2)	E_{AS}	235	mJ
Avalanche current	I_{AR}	7	A
Reverse drain current (DC) (Note 1)	I_{DR}	7	
Reverse drain current (pulsed) (Note 1)	I_{DRP}	21	
Channel temperature	T_{ch}	150	$^{\circ}\text{C}$
Storage temperature	T_{stg}	-55 to 150	
Isolation voltage (RMS)	$V_{ISO(RMS)}$	2000	V
Mounting torque	TOR	0.6	N · m

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).

5. Thermal Characteristics

Characteristics	Symbol	Max	Unit
Channel-to-case thermal resistance	$R_{th(ch-c)}$	2.78	$^{\circ}\text{C/W}$
Channel-to-ambient thermal resistance	$R_{th(ch-a)}$	62.5	

Note 1: Ensure that the channel temperature does not exceed $150\text{ }^{\circ}\text{C}$.

Note 2: $V_{DD} = 90\text{ V}$, $T_{ch} = 25^{\circ}\text{C}$ (initial), $L = 8.8\text{ mH}$, $R_G = 25\text{ }\Omega$, $I_{AR} = 7\text{ A}$

6. Electrical Characteristics

6.1. Static Characteristics ($T_a = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I_{GSS}	$V_{GS} = \pm 30\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 1	μA
Drain cut-off current	I_{DSS}	$V_{DS} = 720\text{ V}, V_{GS} = 0\text{ V}$	—	—	10	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	900	—	—	V
Gate threshold voltage	V_{th}	$V_{DS} = 10\text{ V}, I_D = 0.7\text{ mA}$	2.5	—	4.0	
Drain-source on-resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{ V}, I_D = 3.5\text{ A}$	—	1.6	2.0	Ω

6.2. Dynamic Characteristics ($T_a = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input capacitance	C_{iss}	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	1350	—	pF
Reverse transfer capacitance	C_{rss}		—	10	—	
Output capacitance	C_{oss}		—	110	—	
Gate resistance	r_g	$V_{DS} = \text{OPEN}, f = 1\text{ MHz}$	—	4.0	—	Ω
Switching time (rise time)	t_r	See Fig. 6.2.1.	—	20	—	ns
Switching time (turn-on time)	t_{on}		—	55	—	
Switching time (fall time)	t_f		—	15	—	
Switching time (turn-off time)	t_{off}		—	85	—	
MOSFET dv/dt ruggedness	dv/dt	$V_{DD} = 0\text{ to }400\text{ V}, I_D = 7\text{ A}$	20	—	—	V/ns

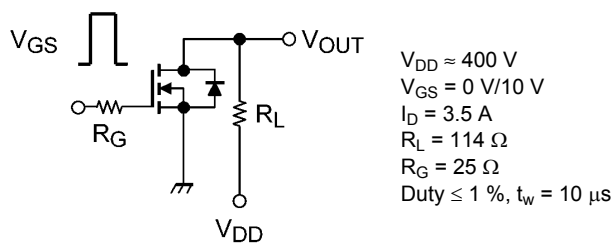


Fig. 6.2.1 Switching Time Test Circuit

6.3. Gate Charge Characteristics ($T_a = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Total gate charge (gate-source plus gate-drain)	Q_g	$V_{DD} \approx 400\text{ V}, V_{GS} = 10\text{ V}, I_D = 7\text{ A}$	—	32	—	nC
Gate-source charge 1	Q_{gs1}		—	10	—	
Gate-drain charge	Q_{gd}		—	12	—	

6.4. Source-Drain Characteristics ($T_a = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Diode forward voltage	V_{DSF}	$I_{DR} = 7\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = 7\text{ A}, V_{GS} = 0\text{ V}$ $-dI_{DR}/dt = 100\text{ A}/\mu\text{s}$	—	1100	—	ns
Reverse recovery charge	Q_{rr}		—	8	—	μC
Peak reverse recovery current	I_{rr}		—	18	—	A