MOSFETs Silicon N-channel MOS (U-MOSⅧ-H)

TK40E10N1

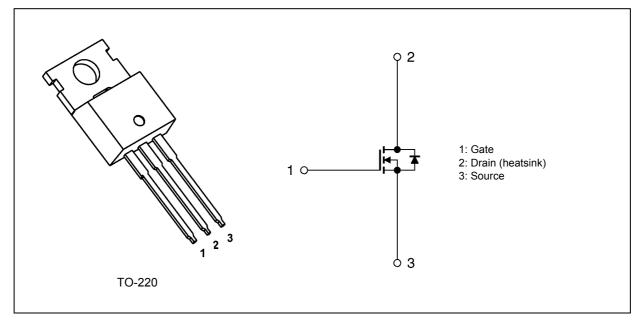
1. Applications

• Switching Voltage Regulators

2. Features

- (1) Low drain-source on-resistance: $R_{DS(ON)} = 6.8 \text{ m}\Omega \text{ (typ.)} (V_{GS} = 10 \text{ V})$
- (2) Low leakage current: $I_{DSS} = 10 \ \mu A \ (max) \ (V_{DS} = 100 \ V)$
- (3) Enhancement mode: V_{th} = 2.0 to 4.0 V (V_{DS} = 10 V, I_{D} = 0.5 mA)

3. Packaging and Internal Circuit



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

Characteris	Symbol	Rating	Unit		
Drain-source voltage			V _{DSS}	100	V
Gate-source voltage			V _{GSS}	±20	
Drain current (DC)	(T _c = 25°C)	(Note 1)	Ι _D	90	Α
Drain current (DC)		(Note 1,2)	Ι _D	40	
Drain current (pulsed)	(t = 1 ms)	(Note 1)	I _{DP}	171	
Power dissipation	(T _c = 25°C)		PD	126	W
Single-pulse avalanche energy		(Note 3)	E _{AS}	74	mJ
Avalanche current			I _{AR}	40	Α
Channel temperature			T _{ch}	150	°C
Storage temperature			T _{stg}	-55 to 150	

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).

Start of commercial production

5. Thermal Characteristics

Characteristics	Symbol	Max	Unit
Channel-to-case thermal resistance	R _{th(ch-c)}	0.99	°C/W
Channel-to-ambient thermal resistance	R _{th(ch-a)}	83.3	

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

Note 2: Device mounted with heatsink so that $R_{th(ch-a)}$ becomes 3.57°C/W.

Note 3: V_DD = 80 V, T_ch = 25°C (initial), L = 35.9 $\mu H, I_{AR}$ = 40 A

Note: This transistor is sensitive to electrostatic discharge and should be handled with care.

6. Electrical Characteristics

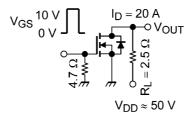
6.1. Static Characteristics (T_a = 25°C unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Тур.	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} = 100 V, V _{GS} = 0 V	-	—	10	
Drain-source breakdown voltage	V _{(BR)DSS}	I _D = 10 mA, V _{GS} = 0 V	100		_	V
Drain-source breakdown voltage (Note 4)	V _{(BR)DSX}	I _D = 10 mA, V _{GS} = -20 V	65	_	_	
Gate threshold voltage	V _{th}	V _{DS} = 10 V, I _D = 0.5 mA	2.0	—	4.0	
Drain-source on-resistance	R _{DS(ON)}	V _{GS} = 10 V, I _D = 20 A	_	6.8	8.2	mΩ

Note 4: If a reverse bias is applied between gate and source, this device enters V_{(BR)DSX} mode. Note that the drainsource breakdown voltage is lowered in this mode.

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

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Input capacitance	C _{iss}	V _{DS} = 50 V, V _{GS} = 0 V, f = 1 MHz	_	3000	—	pF
Reverse transfer capacitance	C _{rss}			29	_	
Output capacitance	C _{oss}		_	520	—	
Gate resistance	r _g	_	_	2.8	—	Ω
Switching time (rise time)	t _r	See Figure 6.2.1	_	14	—	ns
Switching time (turn-on time)	t _{on}		_	35	—	
Switching time (fall time)	t _f]		21	_	
Switching time (turn-off time)	t _{off}		_	57	_	



Duty \leq 1%, t_w = 10 μ s

Fig. 6.2.1 Switching Time Test Circuit

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

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Total gate charge (gate-source plus gate-drain)	Qg	$V_{DD} \approx 80$ V, V_{GS} = 10 V, I_D = 40 A	—	49	—	nC
Gate-source charge 1	Q _{gs1}		_	18	_	
Gate-drain charge	Q _{gd}		_	14	_	
Gate switch charge	Q _{SW}		_	21	_	

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

Characteristics		Symbol	Test Condition	Min	Тур.	Max	Unit
Reverse drain current (DC)	(Note 5)	I _{DR}	—	_	_	40	А
Reverse drain current (pulsed)	(Note 5)	I _{DRP}	—	_	—	171	
Diode forward voltage		V _{DSF}	I _{DR} = 40 A, V _{GS} = 0 V	_	—	-1.2	V
Reverse recovery time	(Note 6)	t _{rr}	I _{DR} = 40 A, V _{GS} = 0 V		67	_	ns
Reverse recovery charge	(Note 6)	Q _{rr}	-dI _{DR} /dt = 100 A/µs	_	130	_	nC

Note 5: Ensure that the channel temperature does not exceed 150°C. Note 6: Ensure that V_{DS} peak does not exceed V_{DSS} .

7. Marking

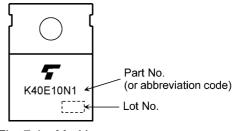
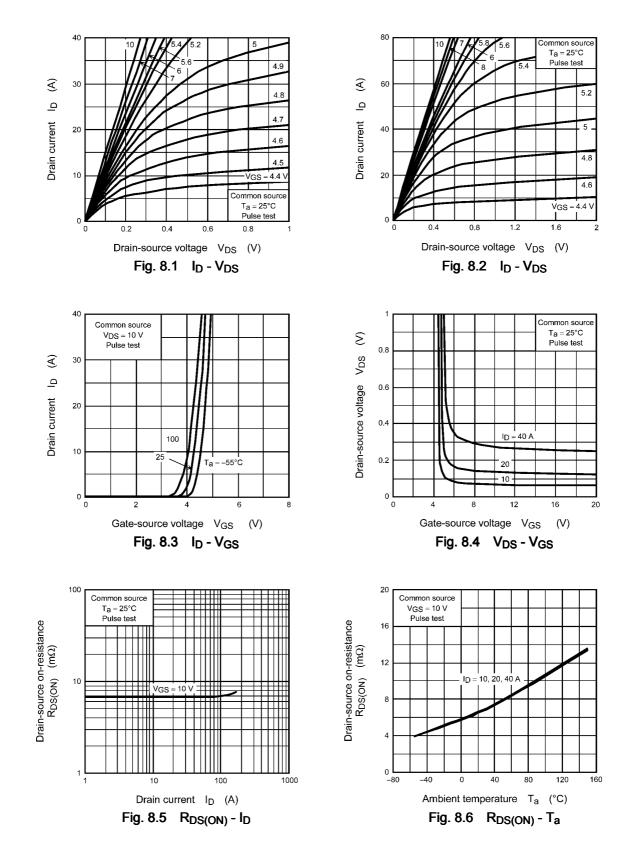
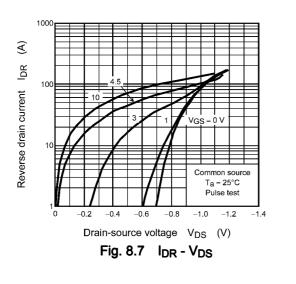


Fig. 7.1 Marking

8. Characteristics Curves (Note)





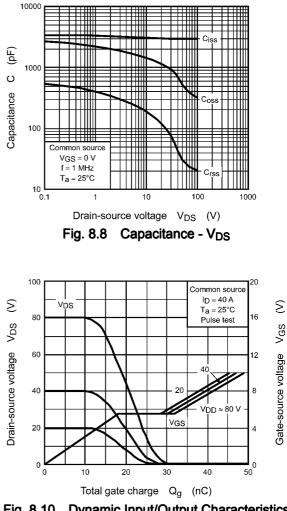
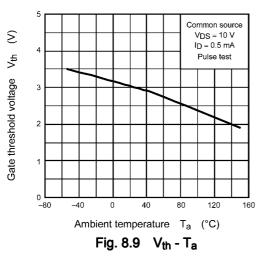
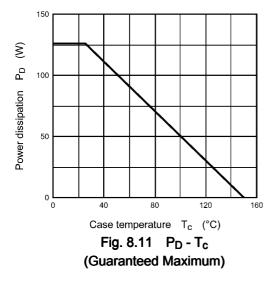
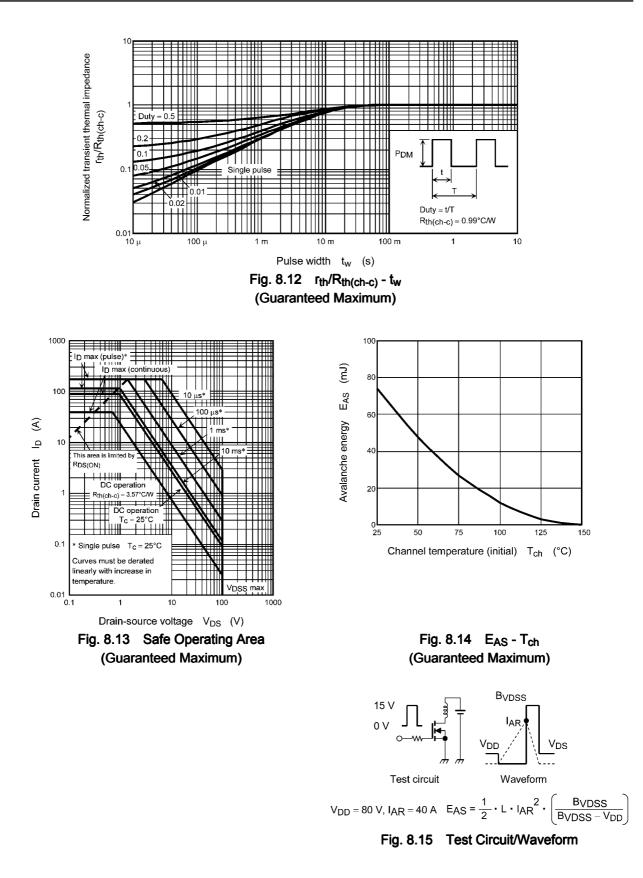


Fig. 8.10 Dynamic Input/Output Characteristics







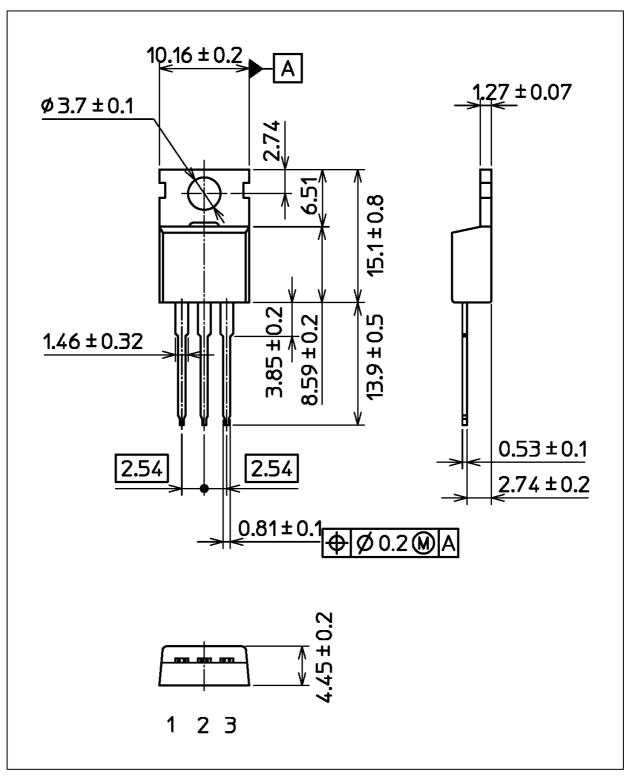
Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



Package Dimensions

TK40E10N1

Unit: mm



Weight: 1.93 g (typ.)

	Package Name(s)
TOSHIBA: 2-10X1A	
Nickname: TO-220	

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