

MOSFETs Silicon N-Channel MOS (DTMOSIV)

TK31J60W

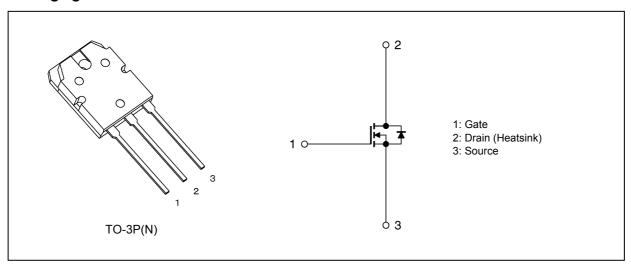
1. Applications

• Switching Voltage Regulators

2. Features

- (1) Low drain-source on-resistance: $R_{DS(ON)}$ = 0.073 Ω (typ.) by used to Super Junction Structure: DTMOS
- (2) Easy to control Gate switching
- (3) Enhancement mode: $V_{th} = 2.7$ to 3.7 V ($V_{DS} = 10$ V, $I_D = 1.5$ mA)

3. Packaging and Internal Circuit



4. Absolute Maximum Ratings (Note) (Ta = 25°C unless otherwise specified)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	600	V
Gate-source voltage		V _{GSS}	±30	
Drain current (DC)	(Note 1)	I _D	30.8	Α
Drain current (pulsed)	(Note 1)	I _{DP}	123	
Power dissipation (T _c = 25°C	()	P_{D}	230	W
Single-pulse avalanche energy	(Note 2)	E _{AS}	437	mJ
Avalanche current		I _{AR}	7.7	Α
Reverse drain current (DC)	(Note 1)	I _{DR}	30.8]
Reverse drain current (pulsed)	(Note 1)	I _{DRP}	123	
Channel temperature		T _{ch}	150	°C
Storage temperature		T _{stg}	-55 to 150]
Mounting torque		TOR	0.8	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).

Start of commercial production



5. Thermal Characteristics

Characteristics	Symbol	Max	Unit
Channel-to-case thermal resistance	R _{th(ch-c)}	0.543	°C/W
Channel-to-ambient thermal resistance	R _{th(ch-a)}	50	

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

Note 2: V_{DD} = 90 V, T_{ch} = 25°C (initial), L = 12.9 mH, R_G = 25 Ω , I_{AR} = 7.7 A

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



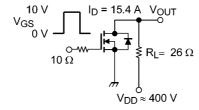
6. Electrical Characteristics

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

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Gate leakage current	I _{GSS}	$V_{GS} = \pm 30 \text{ V}, V_{DS} = 0 \text{ V}$	_	_	±1	μА
Drain cut-off current	I _{DSS}	V _{DS} = 600 V, V _{GS} = 0 V	_	_	10	
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 = 1.5 mA	2.7	_	3.7	
Drain-source on-resistance	R _{DS(ON)}	V _{GS} = 10 V, I _D = 15.4 A	_	0.073	0.088	Ω

6.2. Dynamic Characteristics (T_a = 25°C unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Input capacitance	C _{iss}	V _{DS} = 300 V, V _{GS} = 0 V, f = 100 kHz	_	3000	_	pF
Reverse transfer capacitance	C _{rss}		_	9.5	_	
Output capacitance	C _{oss}		_	70	_	
Effective output capacitance	C _{o(er)}	V _{DS} = 0 to 400 V, V _{GS} = 0 V	_	123	_	
Gate resistance	r _g	V _{DS} = OPEN, f = 1 MHz	_	2	_	Ω
Switching time (rise time)	t _r	See Figure 6.2.1	_	32	_	ns
Switching time (turn-on time)	t _{on}		_	70	_	
Switching time (fall time)	t _f		_	8.5	_	
Switching time (turn-off time)	t _{off}		_	165	_	
MOSFET dv/dt ruggedness	dv/dt	V _{DD} = 0 to 400 V, I _D = 7.7 A	50	_	_	V/ns



Duty \leq 1%, $t_W=10~\mu s$

Fig. 6.2.1 Switching Time Test Circuit

6.3. Gate Charge Characteristics (T_a = 25°C unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Total gate charge (gate-source plus gate-drain)	Qg	$V_{DD} \approx 400 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 30.8 \text{ A}$	_	86		nC
Gate-source charge 1	Q _{gs1}			18		
Gate-drain charge	Q_{gd}		_	41		

6.4. Source-Drain Characteristics (T_a = 25°C unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Тур.	Max	Unit
Diode forward voltage	V_{DSF}	I _{DR} = 30.8 A, V _{GS} = 0 V	_		-1.7	V
Reverse recovery time	t _{rr}	I _{DR} = 15.4 A, V _{GS} = 0 V	_	410	_	ns
Reverse recovery charge	Q_{rr}	-dI _{DR} /dt = 50 A/μs		3.5	_	μС
Peak reverse recovery current	I _{rr}			17	_	Α
Diode dv/dt ruggedness	dv/dt	I _{DR} = 15.4 A, V _{GS} = 0 V, V _{DD} = 400 V	15	_	_	V/ns



7. Marking (Note)

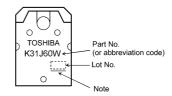


Fig. 7.1 Marking

Note: A line under a Lot No. identifies the indication of product Labels.

Not underlined: [[Pb]]/INCLUDES > MCV

Underlined: [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

Please contact your TOSHIBA sales representative for details as to environmental matters such as the RoHS compatibility of Product.

The RoHS is the Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

8. Characteristics Curves (Note)

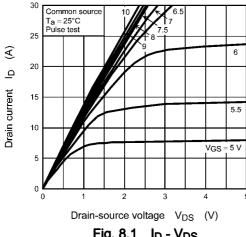
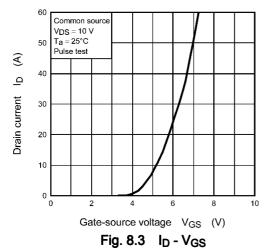


Fig. 8.1 I_D - V_{DS}



Drain-source voltage V_{DSS} 580 540

Common source VGS = 0 V ID = 10 mA Pulse test

 $\widehat{\mathbf{S}}$

660

620

Ambient temperature T_a (°C) Fig. 8.5 V_{DSS} - T_a

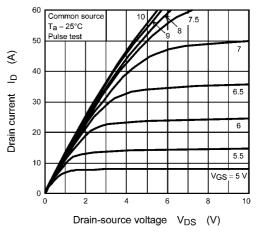


Fig. 8.2 I_D - V_{DS}

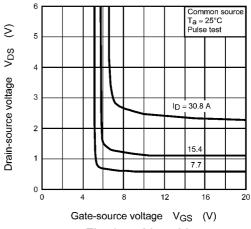


Fig. 8.4 V_{DS} - V_{GS}

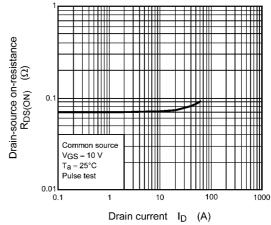


Fig. 8.6 $R_{DS(ON)}$ - I_D

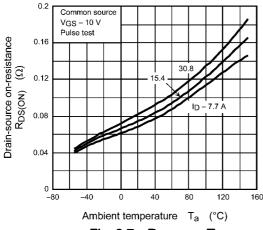
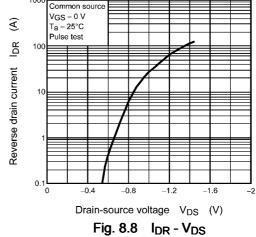


Fig. 8.7 $R_{DS(ON)}$ - T_a



15

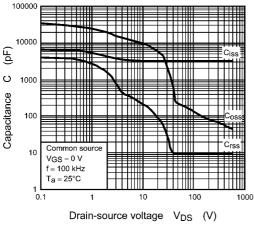


Fig. 8.9 C - V_{DS}

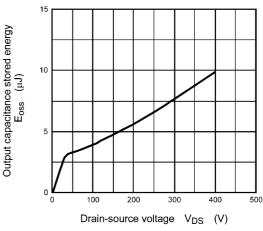


Fig. 8.10 E_{OSS} - V_{DS}

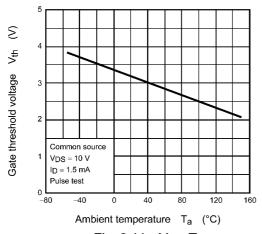


Fig. 8.11 V_{th} - T_a

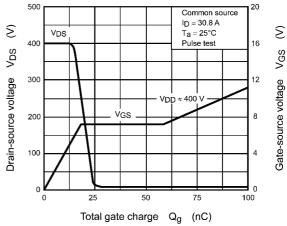


Fig. 8.12 Dynamic Input/Output Characteristics

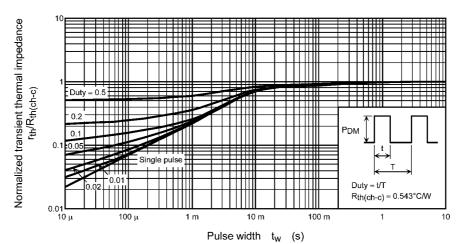


Fig. 8.13 r_{th} - t_w (Guaranteed Maximum)

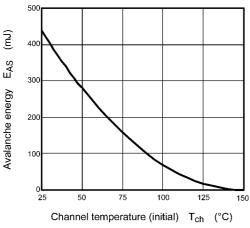


Fig. 8.14 E_{AS} - T_{ch} (Guaranteed Maximum)

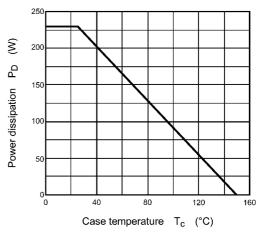


Fig. 8.15 P_D - T_c (Guaranteed Maximum)

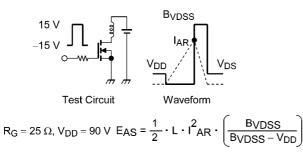


Fig. 8.16 Test Circuit/Waveform

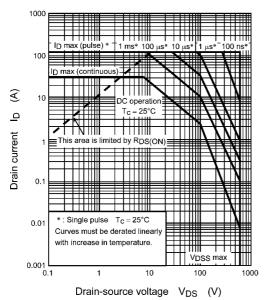


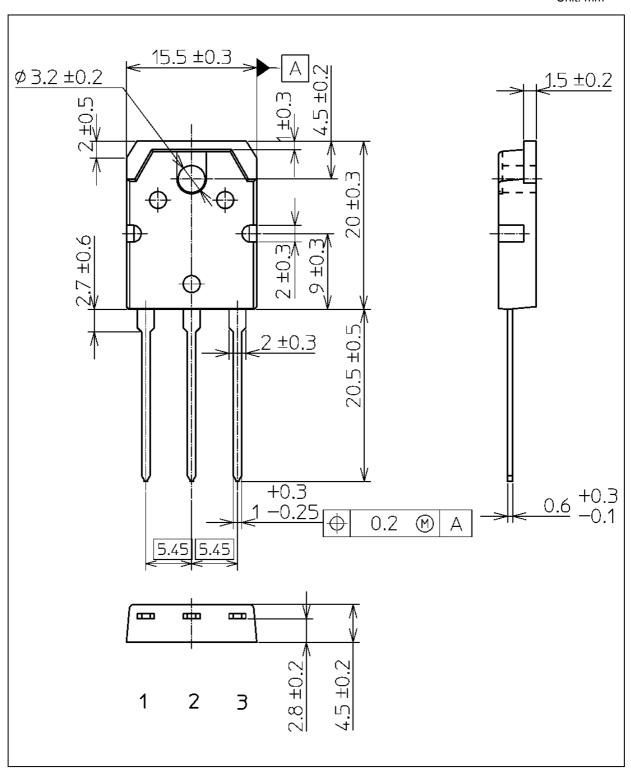
Fig. 8.17 Safe Operating Area (Guaranteed Maximum)

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



Package Dimensions

Unit: mm



Weight: 4.6 g (typ.)

	Package Name(s)
JEITA: SC-65	
TOSHIBA: 2-16C1S	
Nickname: TO-3P(N)	



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