

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (L<sup>2</sup>-π-MOSV)

# 2SK2615

DC-DC Converter, Relay Drive and Motor Drive Applications

- Low drain-source ON resistance : R<sub>DS (ON)</sub> = 0.23 Ω (typ.)
- High forward transfer admittance : |Y<sub>fs</sub>| = 2.0 S (typ.)
- Low leakage current : I<sub>DSS</sub> = 100 μA (max) (V<sub>DS</sub> = 60 V)
- Enhancement mode : V<sub>th</sub> = 0.8 to 2.0 V (V<sub>DS</sub> = 10 V, I<sub>D</sub> = 1 mA)

## Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V <sub>DSS</sub>	60	V
Drain-gate voltage (R <sub>GS</sub> = 20 kΩ)		V <sub>DGR</sub>	60	V
Gate-source voltage		V <sub>GSS</sub>	±20	V
Drain current	DC (Note 1)	I <sub>D</sub>	2	A
	Pulse (Note 1)	I <sub>DP</sub>	6	
Drain power dissipation		P <sub>D</sub>	0.5	W
Drain power dissipation (Note 2)		P <sub>D</sub>	1.5	W
Channel temperature		T <sub>ch</sub>	150	°C
Storage temperature range		T <sub>stg</sub>	-55 to 150	°C

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

Note 2: Mounted on a ceramic substrate (25.4 mm × 25.4 mm × 0.8 mm)

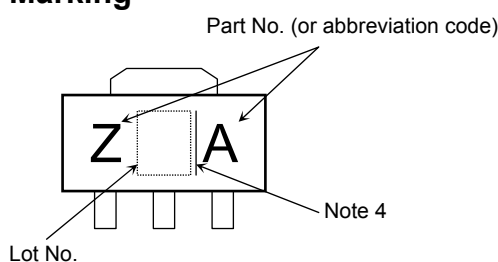
Note 3: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) 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 ambient	R <sub>th (ch-a)</sub>	250	°C / W

This transistor is an electrostatic-sensitive device. Please handle with caution.

## Marking

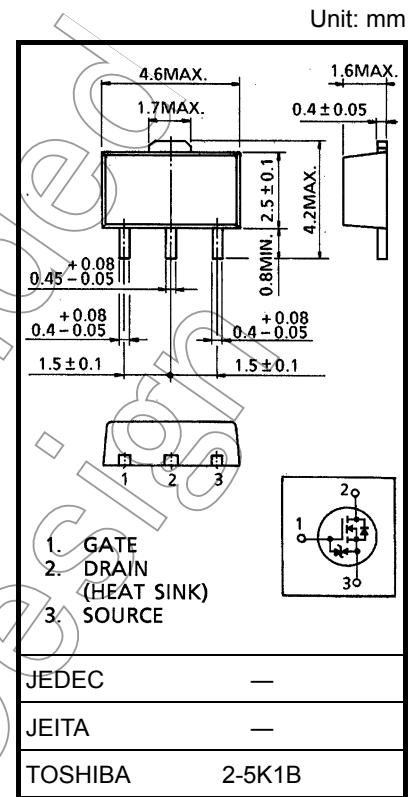


Note 4: A line to the right of a Lot No. identifies the indication of product Labels.

Without a line: [[Pb]]/INCLUDES > MCV

With a line: [[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 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment.



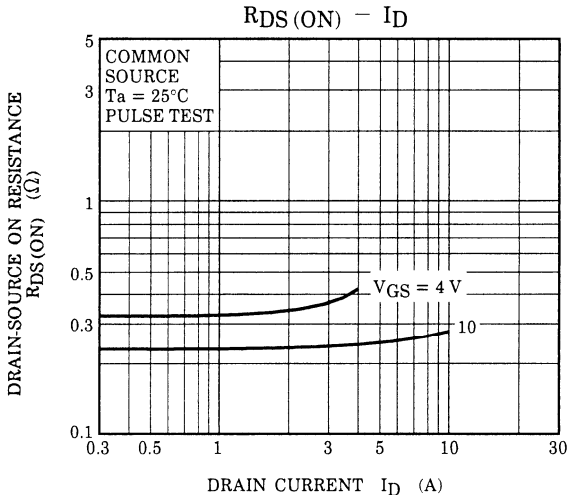
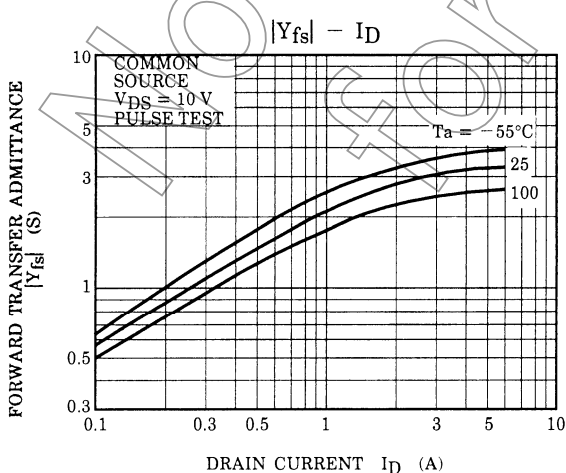
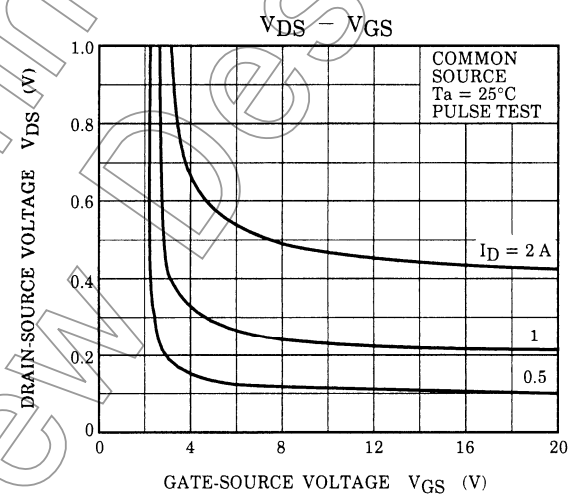
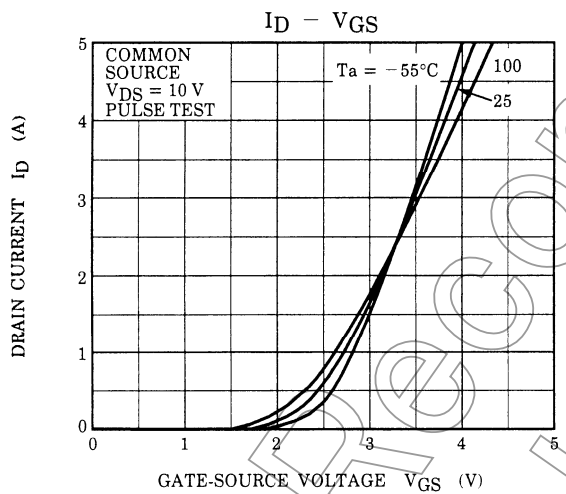
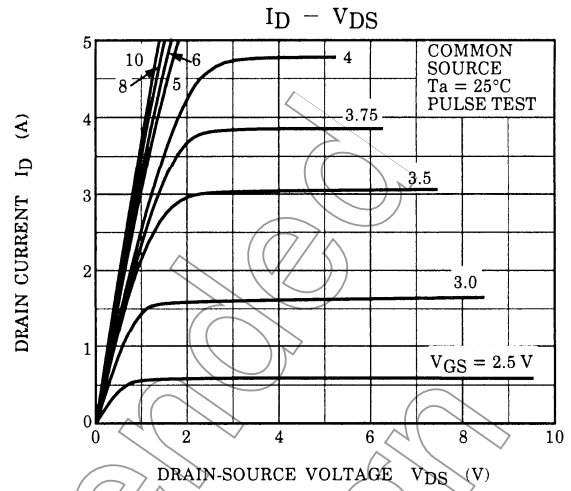
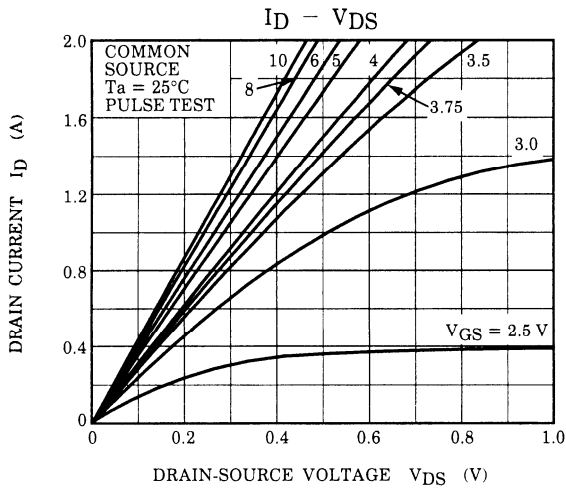
Weight: 0.05 g (typ.)

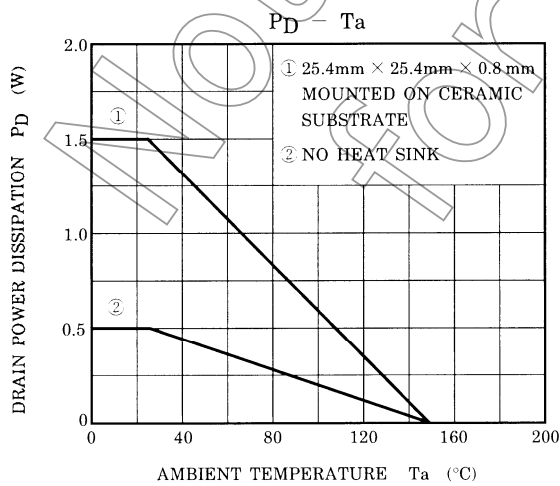
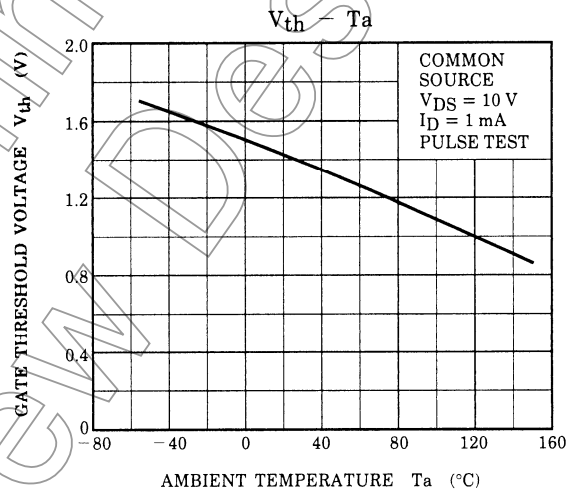
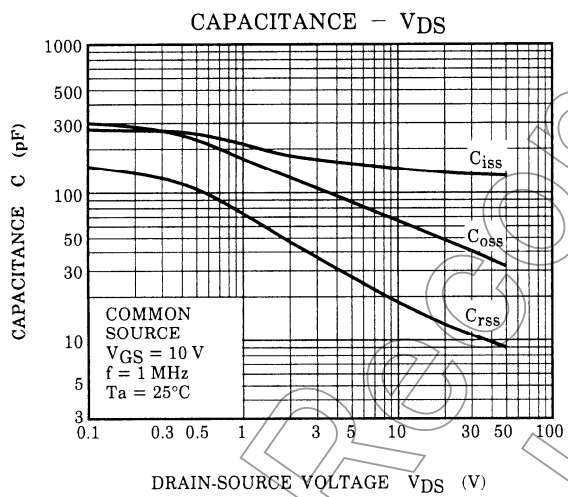
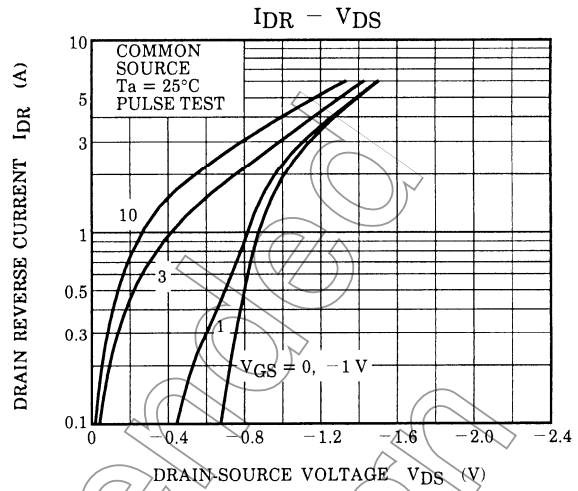
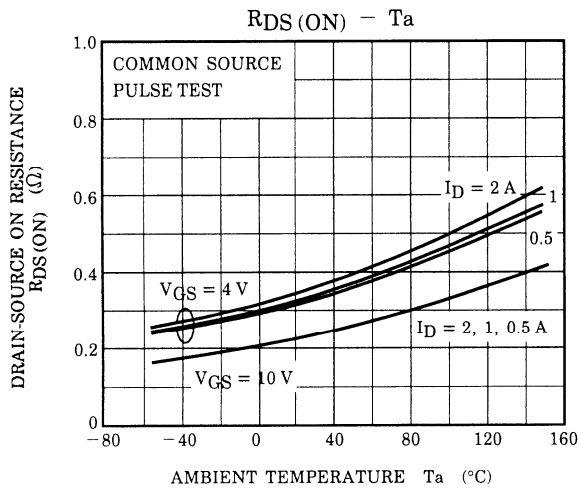
## Electrical Characteristics (Ta = 25°C)

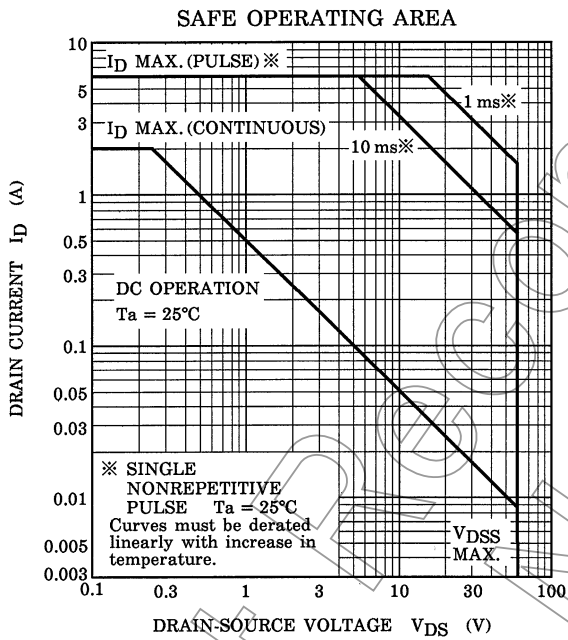
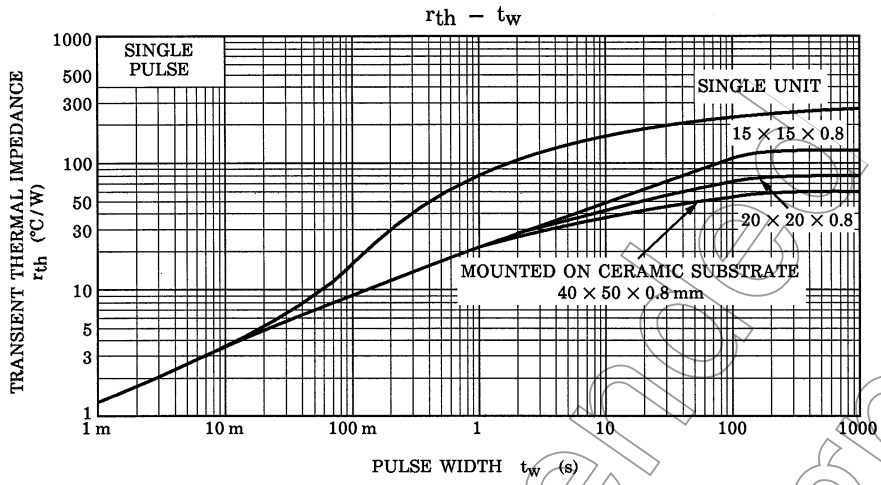
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Drain cut-off current		$I_{DSS}$	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	60	—	—	V
Gate threshold voltage		$V_{th}$	$V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$	0.8	—	2.0	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 4\text{ V}, I_D = 1\text{ A}$	—	0.33	0.44	$\Omega$
			$V_{GS} = 10\text{ V}, I_D = 1\text{ A}$	—	0.23	0.30	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 1\text{ A}$	1.0	2.0	—	S
Input capacitance		$C_{iss}$	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	150	—	pF
Reverse transfer capacitance		$C_{rss}$		—	25	—	
Output capacitance		$C_{oss}$		—	70	—	
Switching time	Rise time	$t_r$	<p><math>I_D = 1\text{ A}</math> <math>V_{GS} = 10\text{ V}</math> <math>V_{DD} = 30\text{ V}</math> <math>R_L = 30\ \Omega</math> <math>Duty \leq 1\%, t_w = 10\ \mu\text{s}</math></p>	—	25	—	ns
	Turn-on time	$t_{on}$		—	30	—	
	Fall time	$t_f$		—	50	—	
	Turn-off time	$t_{off}$		—	150	—	
Total gate charge (gate-source plus gate-drain)		$Q_g$	$V_{DD} = 48\text{ V}, V_{GS} = 10\text{ V}, I_D = 2\text{ A}$	—	6.0	—	nC
Gate-source charge		$Q_{gs}$		—	4.6	—	
Gate-drain ("miller") Charge		$Q_{gd}$		—	1.4	—	

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

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	$I_{DR}$	—	—	—	2	A
Pulse drain reverse current (Note 1)	$I_{DRP}$	—	—	—	6	A
Forward voltage (diode)	$V_{DSF}$	$I_{DR} = 2\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.5	V
Reverse recovery time	$t_{rr}$	$I_{DR} = 2\text{ A}, V_{GS} = 0\text{ V}$	—	100	—	ns
Reverse recovery charge	$Q_{rr}$	$dI_{DR} / dt = 50\text{ A} / \mu\text{s}$	—	40	—	nC







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