

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (L²-π-MOSV)

2SK2391

Chopper Regulator, DC-DC Converter and Motor Drive Applications

- 4-V gate drive
- Low drain-source ON resistance : R_{DS (ON)} = 66 mΩ (typ.)
- High forward transfer admittance : |Y_{fs}| = 16 S (typ.)
- Low leakage current : I_{DSS} = 100 μA (max) (V_{DS} = 100 V)
- Enhancement mode : V_{th} = 0.8~2.0 V (V_{DS} = 10 V, I_D = 1 mA)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V _{DSS}	100	V
Drain-gate voltage (R _{GS} = 20 kΩ)		V _{DGR}	100	V
Gate-source voltage		V _{GSS}	±20	V
Drain current	DC (Note 1)	I _D	20	A
	Pulse (Note 1)	I _{DP}	80	A
Drain power dissipation (T _c = 25°C)		P _D	35	W
Single pulse avalanche energy (Note 2)		E _{AS}	208	mJ
Avalanche current		I _{AR}	20	A
Repetitive avalanche energy (Note 3)		E _{AR}	3.5	mJ
Channel temperature		T _{ch}	150	°C
Storage temperature range		T _{stg}	-55~150	°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

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	R _{th (ch-c)}	3.57	°C / W
Thermal resistance, channel to ambient	R _{th (ch-a)}	62.5	°C / W

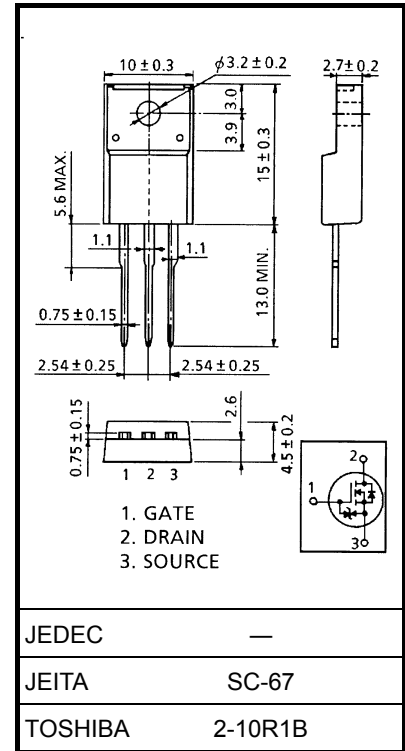
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: V_{DD} = 25 V, T_{ch} = 25°C (initial), L = 840 μH, R_G = 25 Ω, I_{AR} = 20 A

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

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

Unit: mm



Weight: 1.9 g (typ.)

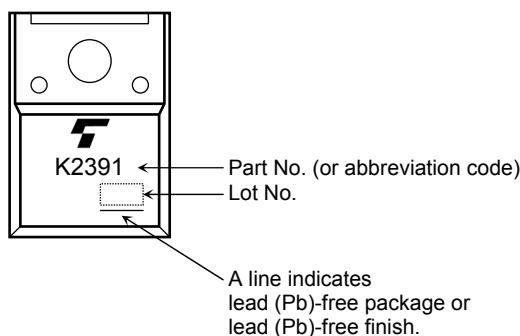
Electrical Characteristics (Ta = 25°C)

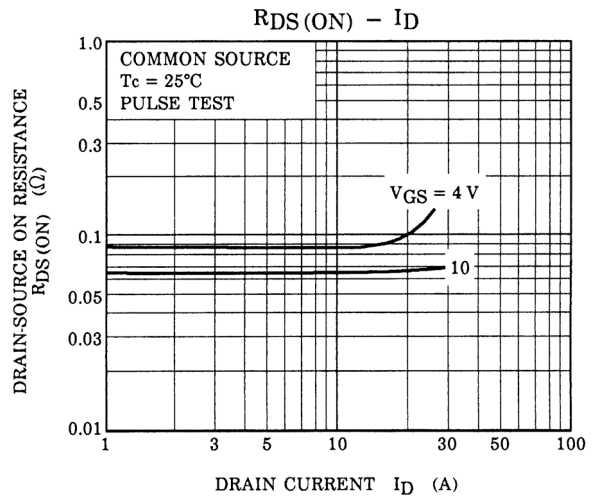
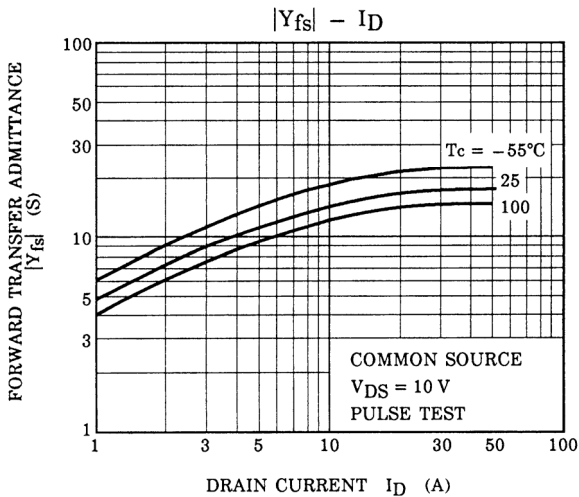
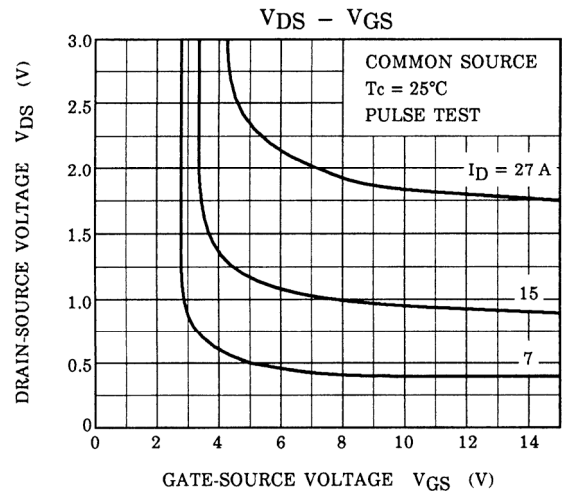
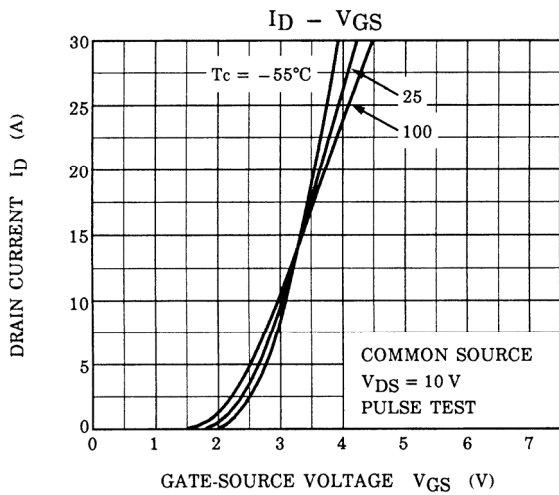
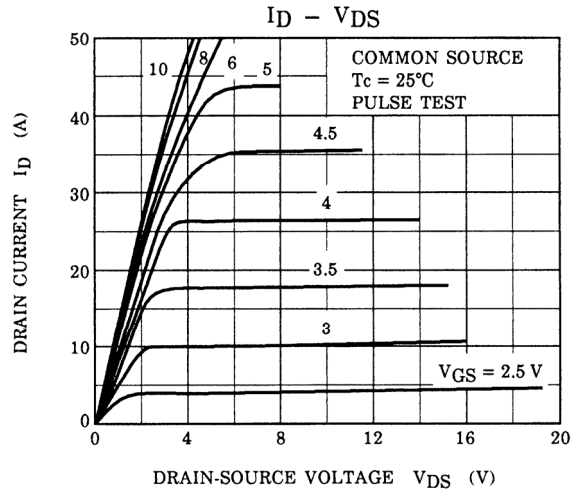
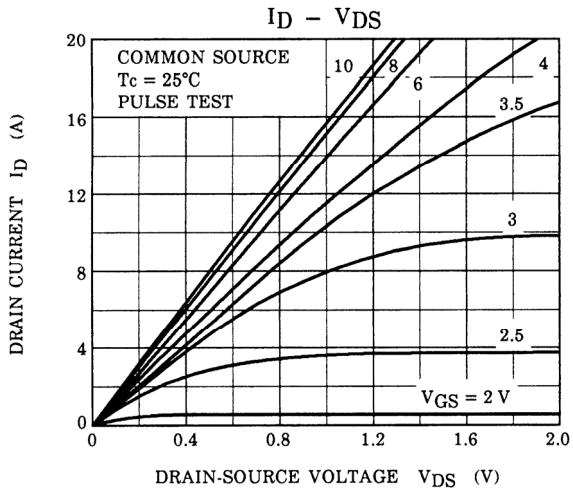
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$	—	—	± 10	μA
Drain cut-off current		I_{DSS}	$V_{DS} = 100\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	100	—	—	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		$R_{DS(ON)}$	$V_{GS} = 4\text{ V}, I_D = 10\text{ A}$	—	0.09	0.13	Ω
			$V_{GS} = 10\text{ V}, I_D = 10\text{ A}$	—	0.066	0.085	
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10\text{ V}, I_D = 10\text{ A}$	8	16	—	S
Input capacitance		C_{iss}	$V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	—	1100	—	pF
Reverse transfer capacitance		C_{rss}		—	180	—	
Output capacitance		C_{oss}		—	400	—	
Switching time	Rise time	t_r	<p>$I_D = 10\text{ A}$ $V_{GS} = 10\text{ V}, 0\text{ V}$ $R_L = 5\ \Omega$ $V_{DD} = 50\text{ V}$ $4.7\ \Omega$ V_{OUT} $Duty \leq 1\%, t_w = 10\ \mu s$</p>	—	20	—	ns
	Turn-on time	t_{on}		—	30	—	
	Fall time	t_f		—	50	—	
	Turn-off time	t_{off}		—	140	—	
Total gate charge (Gate-source plus gate-drain)		Q_g	$V_{DD} \approx 80\text{ V}, V_{GS} = 10\text{ V}, I_D = 27\text{ A}$	—	50	—	nC
Gate-source charge		Q_{gs}		—	34	—	
Gate-drain ("miller") charge		Q_{gd}		—	16	—	

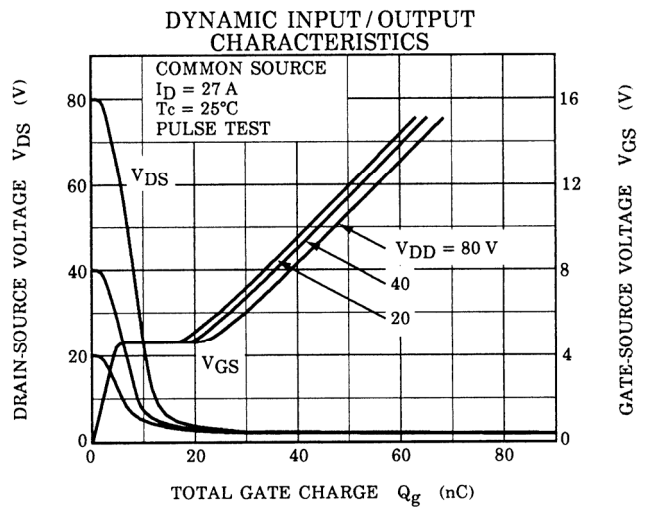
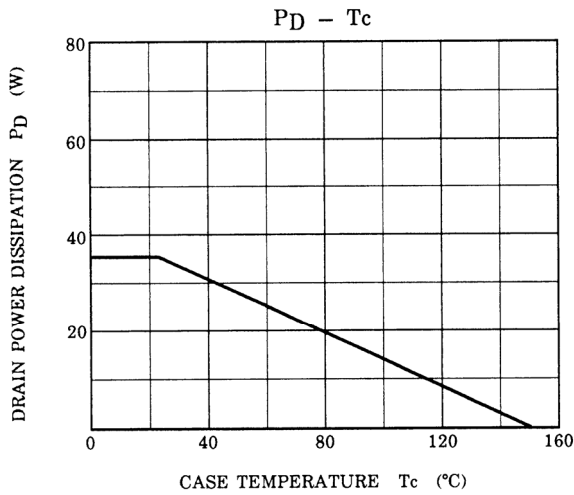
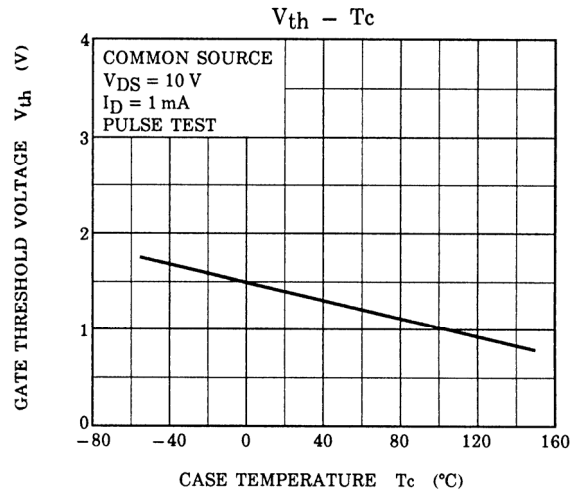
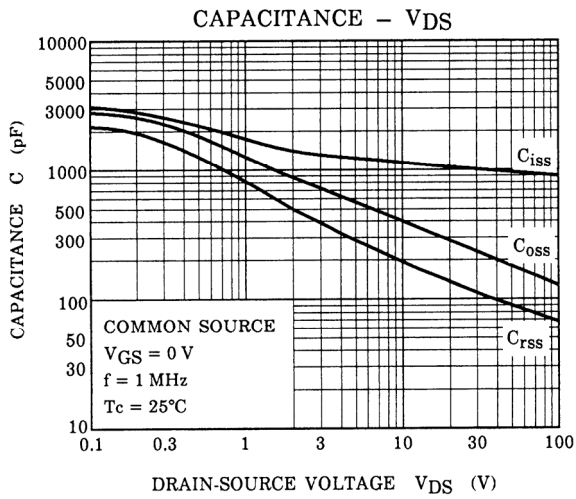
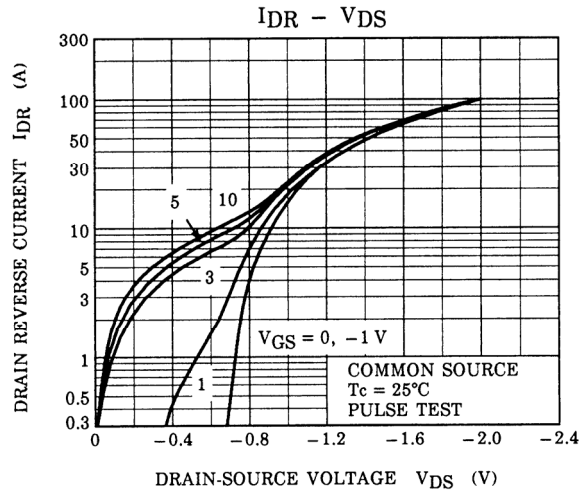
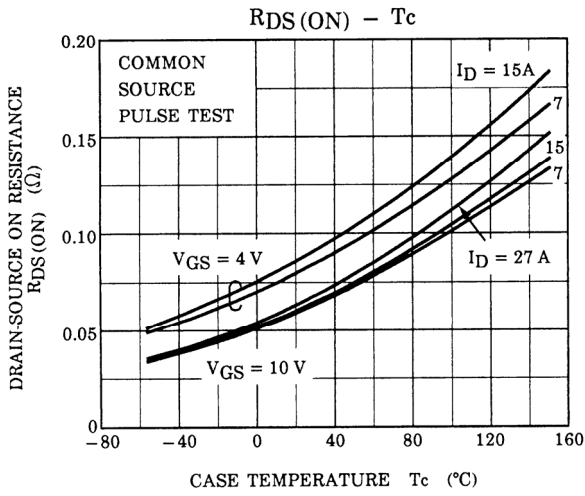
Source-Drain Ratings and Characteristics (Ta = 25°C)

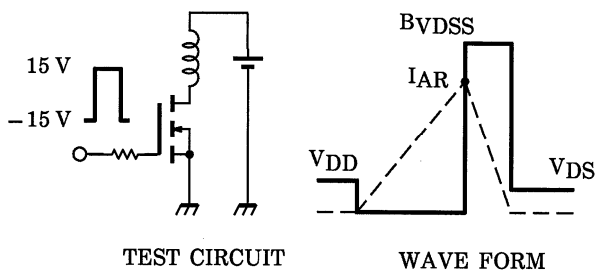
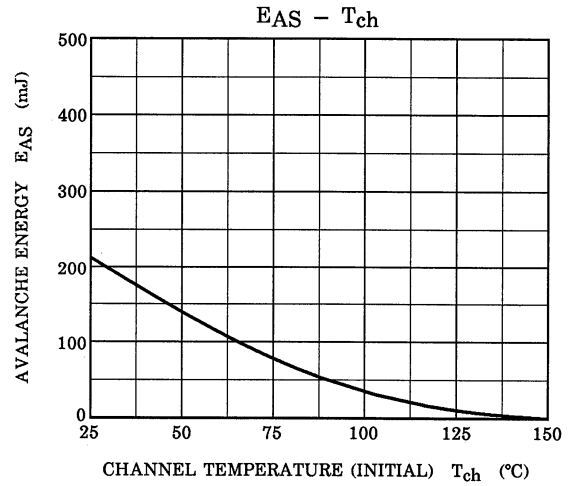
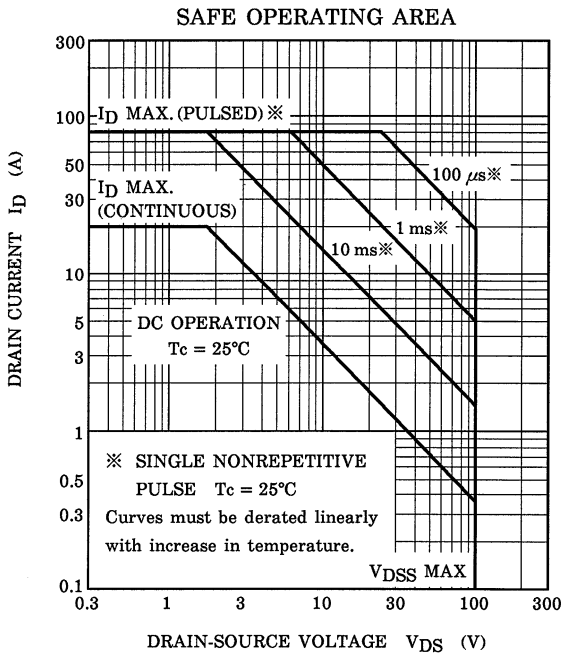
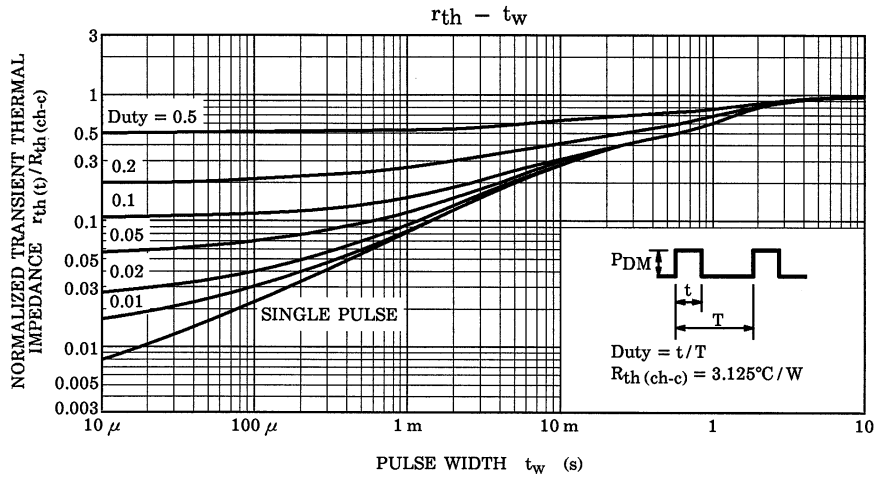
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	20	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	80	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 20\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = 20\text{ A}, V_{GS} = 0\text{ V}, dI_{DR}/dt = 50\text{ A}/\mu s$	—	155	—	ns
Reverse recovery charge	Q_{rr}		—	0.31	—	μC

Marking









$R_G = 25 \Omega$
 $V_{DD} = 25 \text{ V}, L = 840 \mu\text{H}$

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

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