

TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (-MOSVI)

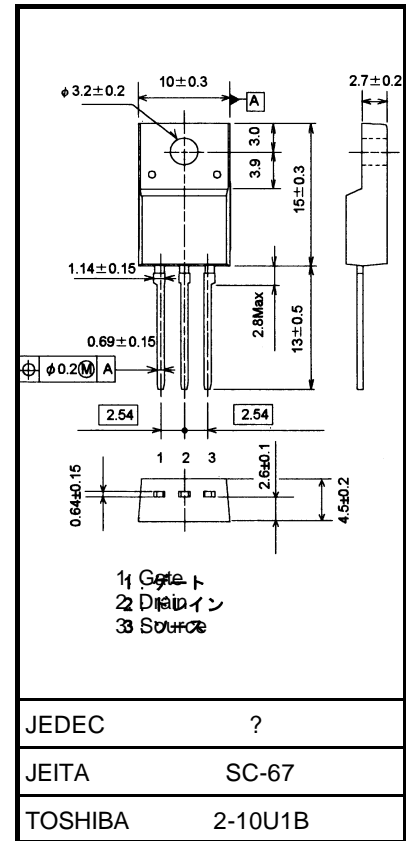
2SK3934

Switching Regulator Applications

- Low drain-source ON resistance: $R_{DS(ON)} = 0.23$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 8.2$ S (typ.)
- Low leakage current: $I_{DSS} = 100 \mu A$ ($V_{DS} = 500$ V)
- Enhancement-mode: $V_{th} = 2.0 \sim 4.0$ V ($V_{DS} = 10$ V, $I_D = 1$ mA)

Maximum Ratings ($T_a = 25^\circ C$)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	500	V
Drain-gate voltage ($R_{GS} = 20$ k Ω)		V_{DGR}	500	V
Gate-source voltage		V_{GSS}	± 30	V
Drain current	DC (Note 1)	I_D	15	A
	Pulse ($t = 1$ ms) (Note 1)	I_{DP}	60	
Drain power dissipation ($T_c = 25^\circ C$)		P_D	50	W
Single pulse avalanche energy (Note 2)		E_{AS}	1.08	J
Avalanche current		I_{AR}	15	A
Repetitive avalanche energy (Note 3)		E_{AR}	5.0	mJ
Channel temperature		T_{ch}	150	$^\circ C$
Storage temperature range		T_{stg}	$-55 \sim 150$	$^\circ C$



Weight : 1.7 g (typ.)

Thermal Characteristics

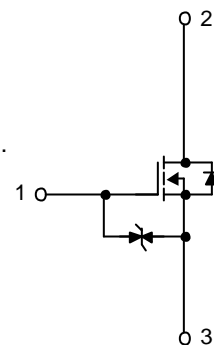
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	2.5	$^\circ C/W$
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	62.5	$^\circ C/W$

Note 1: Please use devices on conditions that the channel temperature is below $150^\circ C$.

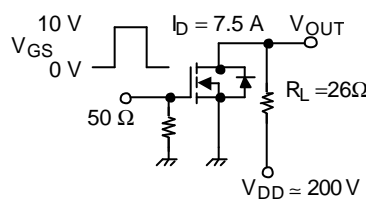
Note 2: $V_{DD} = 90$ V, $T_{ch} = 25^\circ C$ (initial), $L = 8.16$ mH, $I_{AR} = 15$ A, $R_G = 25 \Omega$

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

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



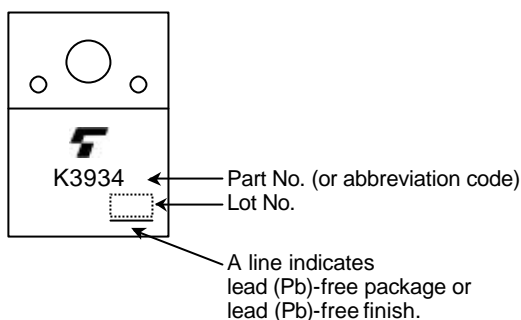
Electrical Characteristics (Ta = 25°C)

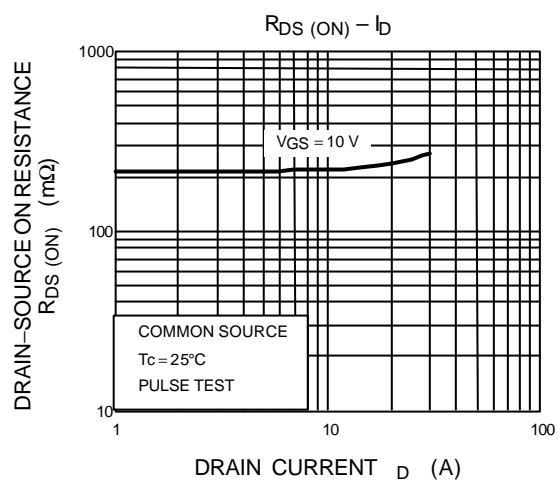
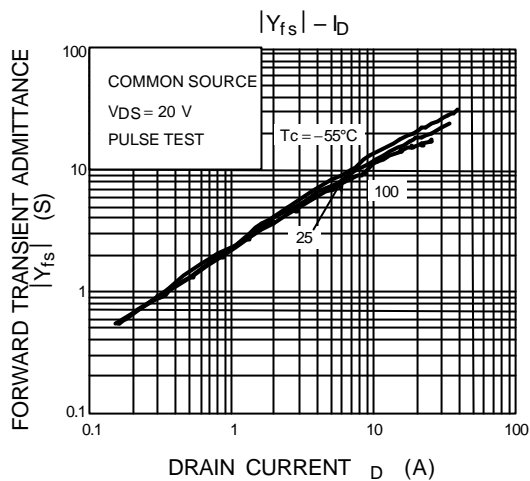
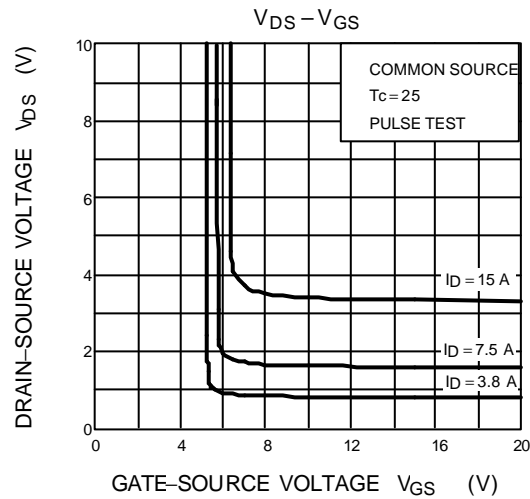
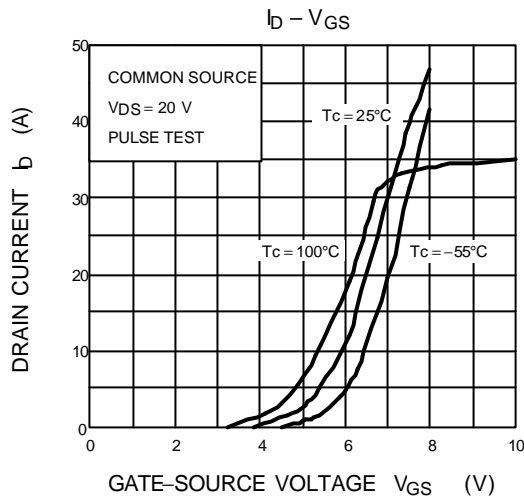
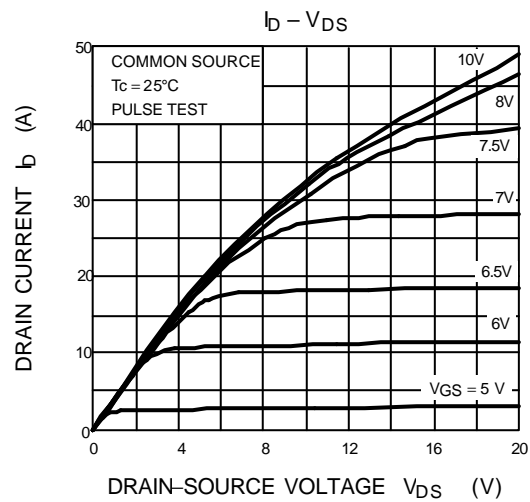
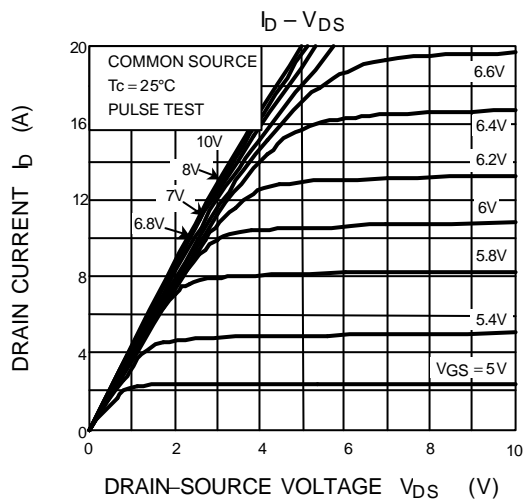
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	$V_{GS} = \pm 25 \text{ V}, V_{DS} = 0 \text{ V}$	—	—	± 10	μA
Gate-source breakdown voltage		$V_{(BR) GSS}$	$I_G = \pm 10 \mu\text{A}, V_{DS} = 0 \text{ V}$	± 30	—	—	V
Drain cut-off current		I_{DSS}	$V_{DS} = 500 \text{ V}, V_{GS} = 0 \text{ V}$	—	—	100	μA
Drain-source breakdown voltage		$V_{(BR) DSS}$	$I_D = 10 \text{ mA}, V_{GS} = 0 \text{ V}$	500	—	—	V
Gate threshold voltage		V_{th}	$V_{DS} = 10 \text{ V}, I_D = 1 \text{ mA}$	2.0	—	4.0	V
Drain-source ON resistance		$R_{DS(ON)}$	$V_{GS} = 10 \text{ V}, I_D = 7.5 \text{ A}$	—	0.23	0.3	Ω
Forward transfer admittance		$ Y_{fs} $	$V_{DS} = 10 \text{ V}, I_D = 7.5 \text{ A}$	2.3	8.2	—	S
Input capacitance		C_{iss}	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$	—	3100	—	pF
Reverse transfer capacitance		C_{rss}		—	20	—	
Output capacitance		C_{oss}		—	270	—	
Switching time	Rise time	t_r	 <p>$V_{GS} = 10 \text{ V}$ 0 V 50Ω $I_D = 7.5 \text{ A}$ V_{OUT} $R_L = 26 \Omega$ $V_{DD} \approx 200 \text{ V}$ Duty $\leq 1\%$, $t_w = 10 \mu\text{s}$</p>	—	70	—	ns
	Turn-on time	t_{on}		—	130	—	
	Fall time	t_f		—	70	—	
	Turn-off time	t_{off}		—	280	—	
Total gate charge		Q_g	$V_{DD} \approx 400 \text{ V}, V_{GS} = 10 \text{ V}, I_D = 15 \text{ A}$	—	62	—	nC
Gate-source charge		Q_{gs}		—	40	—	
Gate-drain charge		Q_{gd}		—	22	—	

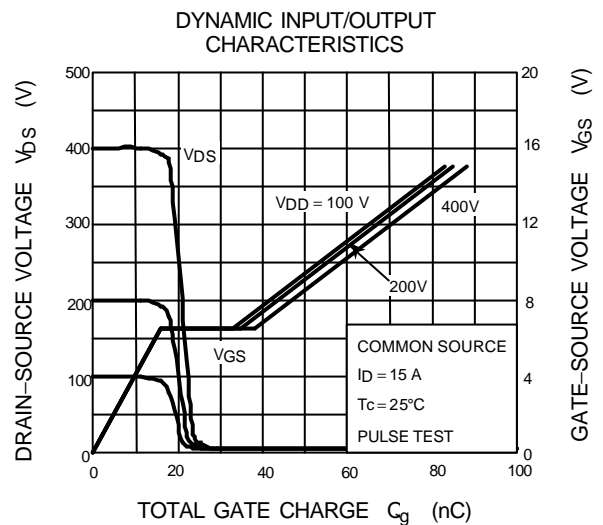
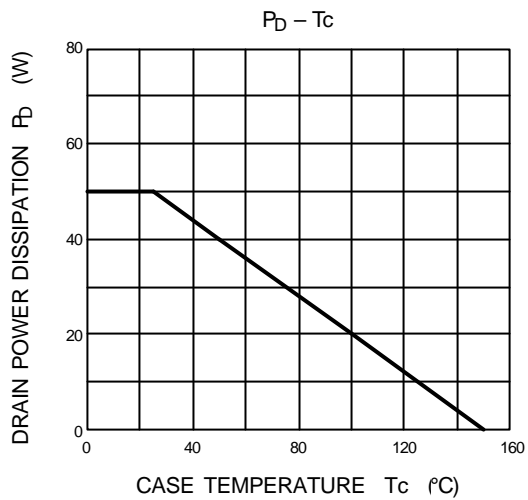
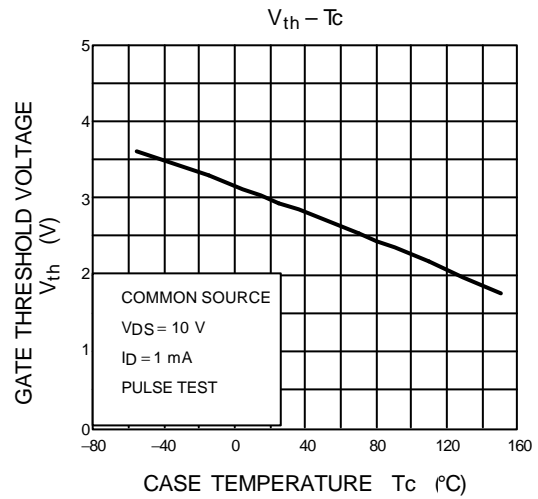
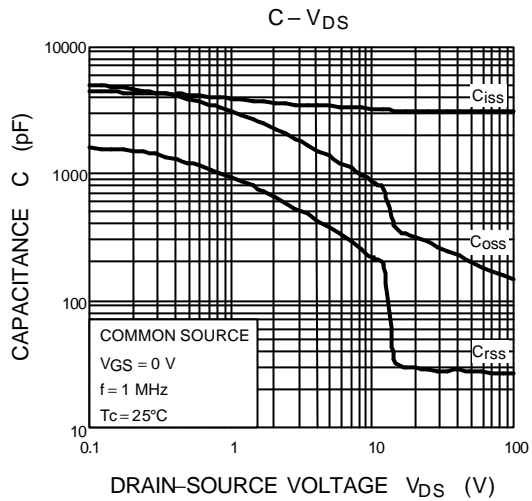
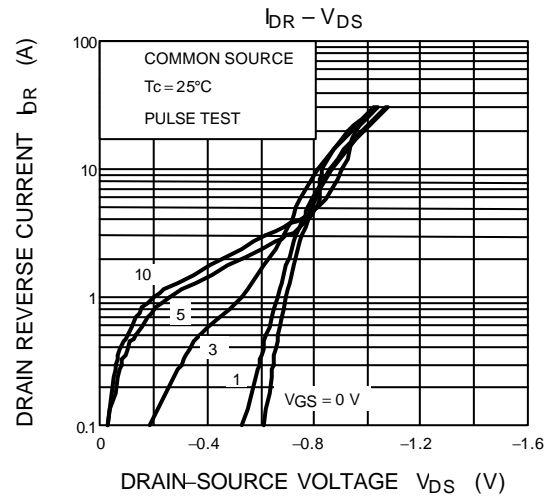
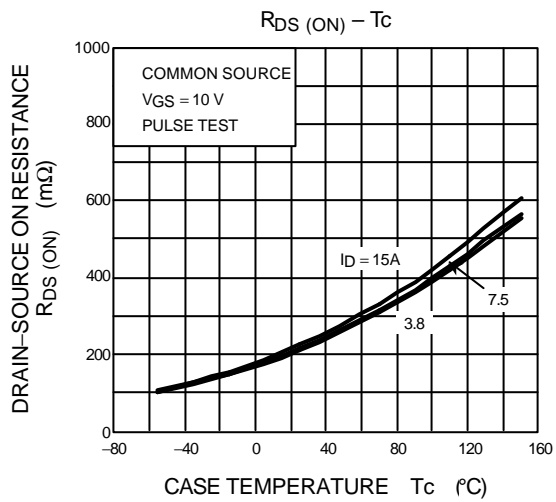
Source-Drain Ratings and Characteristics (Ta = 25°C)

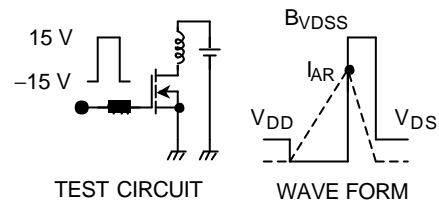
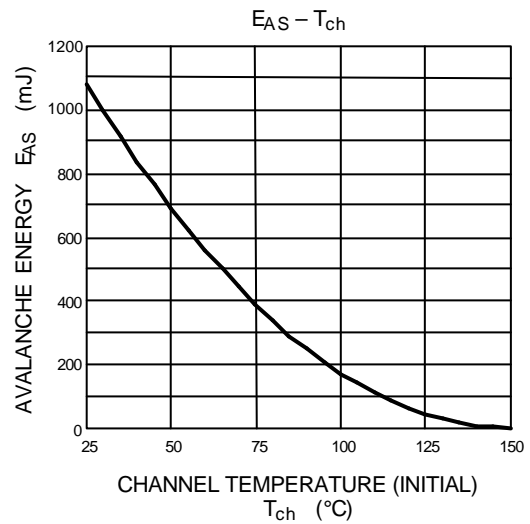
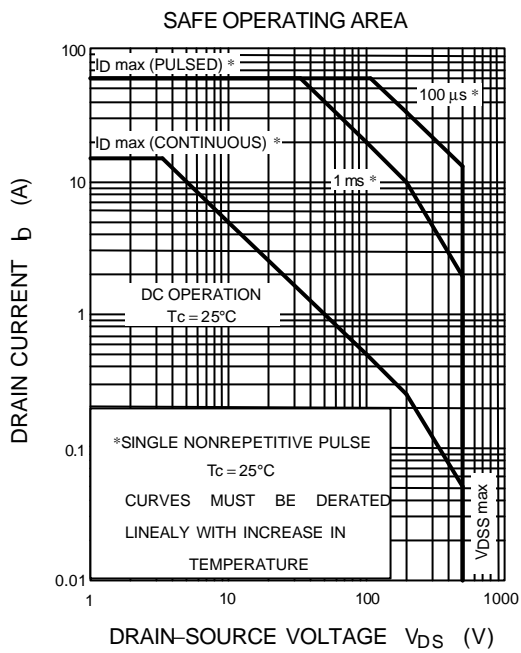
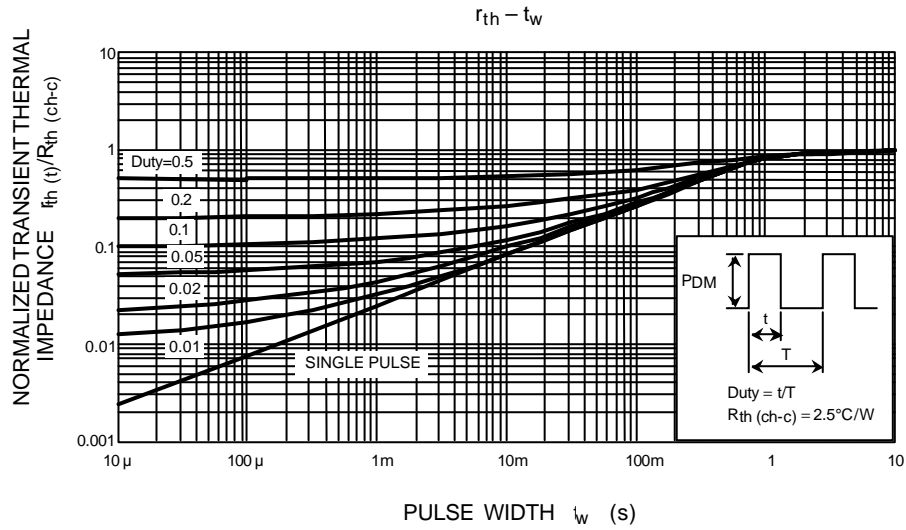
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	15	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	60	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 15 \text{ A}, V_{GS} = 0 \text{ V}$	—	—	-1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = 15 \text{ A}, V_{GS} = 0 \text{ V},$	—	1.3	—	μs
Reverse recovery charge	Q_{rr}	$dI_{DR}/dt = 100 \text{ A}/\mu\text{s}$	—	18	—	μC

Marking









$$R_G = 25 \, \Omega$$

$$V_{DD} = 90 \, V, L = 8.13 \, mH$$

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

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