

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

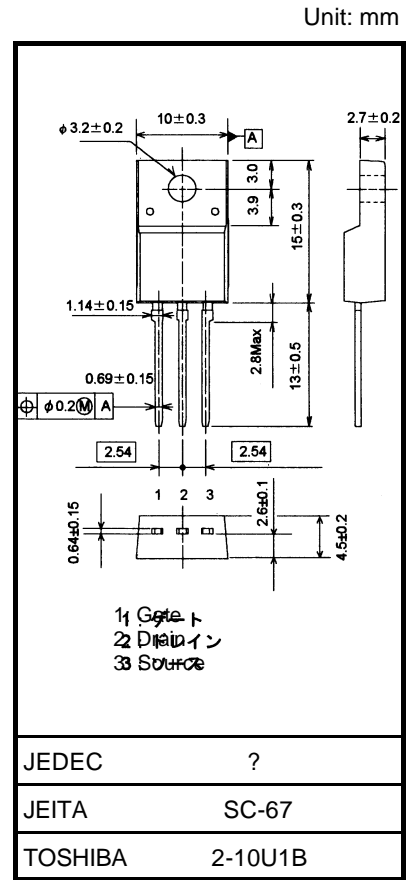
# 2SK3934

## 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 $\Omega$ )		$V_{DGR}$	500	V
Gate-source voltage		$V_{GSS}$	$\pm 30$	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		$T_{stg}$	-55~150	$^\circ C$



Weight : 1.7 g (typ.)

## Thermal Characteristics

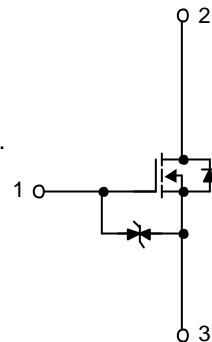
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th(ch-c)}$	2.5	$^\circ C/W$
Thermal resistance, channel to ambient	$R_{th(ch-a)}$	62.5	$^\circ C/W$

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.



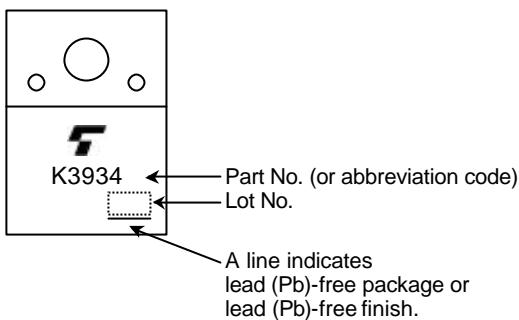
**Electrical Characteristics (Ta = 25°C)**

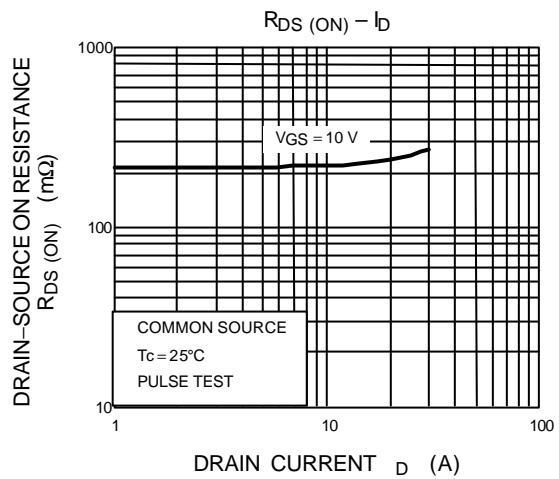
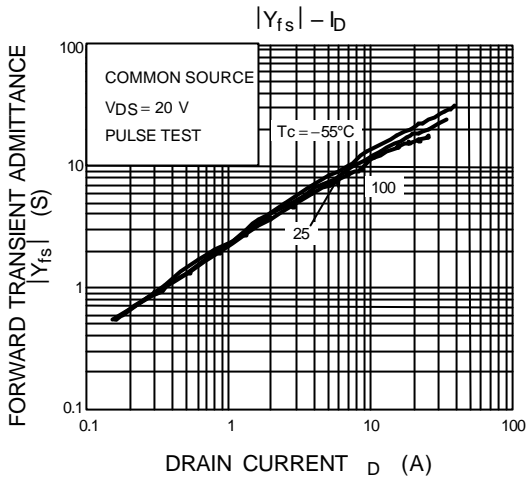
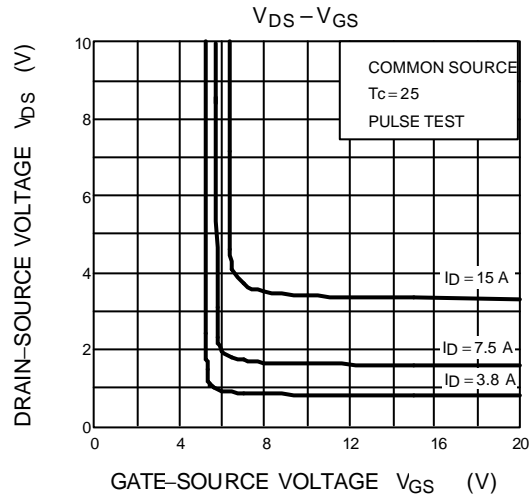
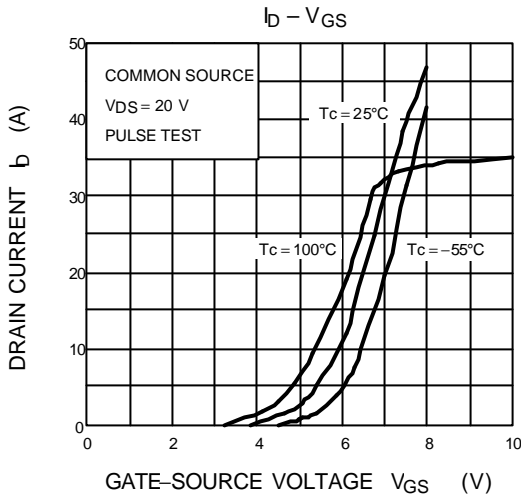
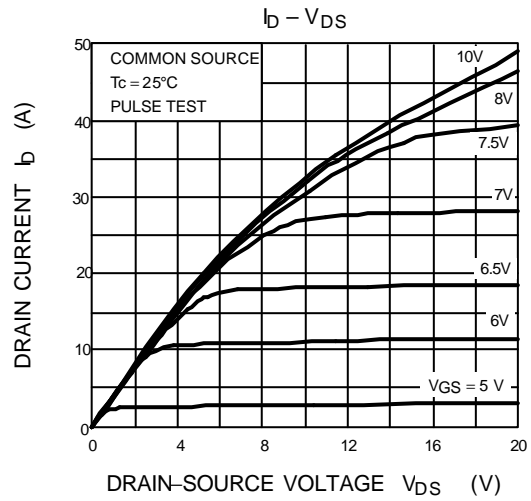
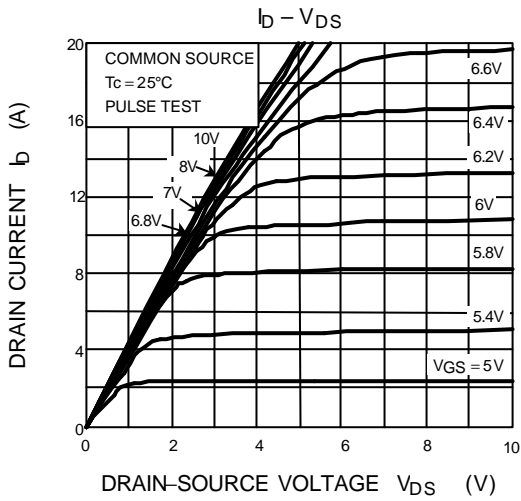
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		$I_{GSS}$	$V_{GS} = \pm 25\text{ V}, V_{DS} = 0\text{ V}$	—	—	$\pm 10$	$\mu\text{A}$
Gate-source breakdown voltage		$V_{(BR)GSS}$	$I_G = \pm 10\ \mu\text{A}, V_{DS} = 0\text{ V}$	$\pm 30$	—	—	V
Drain cut-off current		$I_{DSS}$	$V_{DS} = 500\text{ V}, V_{GS} = 0\text{ V}$	—	—	100	$\mu\text{A}$
Drain-source breakdown voltage		$V_{(BR)DSS}$	$I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$	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	$\Omega$
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	$t_r$		—	70	—	ns
	Turn-on time	$t_{on}$		—	130	—	
	Fall time	$t_f$		—	70	—	
	Turn-off time	$t_{off}$		Duty $\leq 1\%$ , $t_w = 10\ \mu\text{s}$	—	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	—	

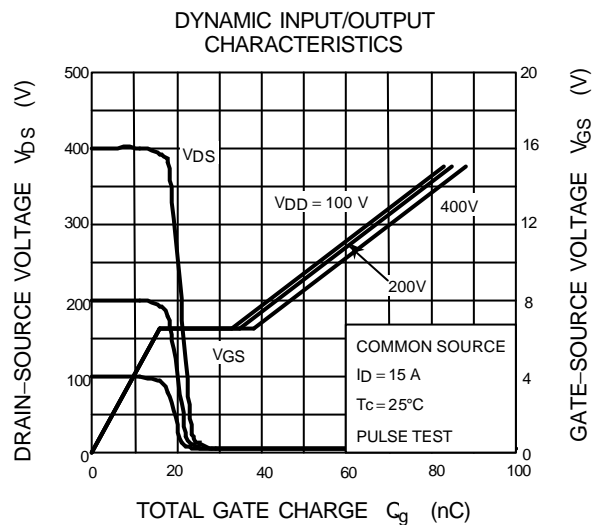
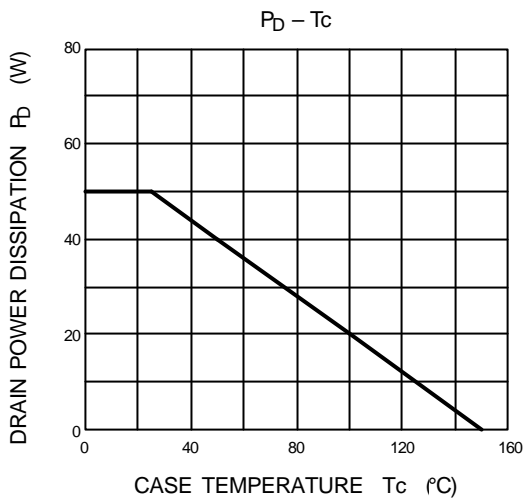
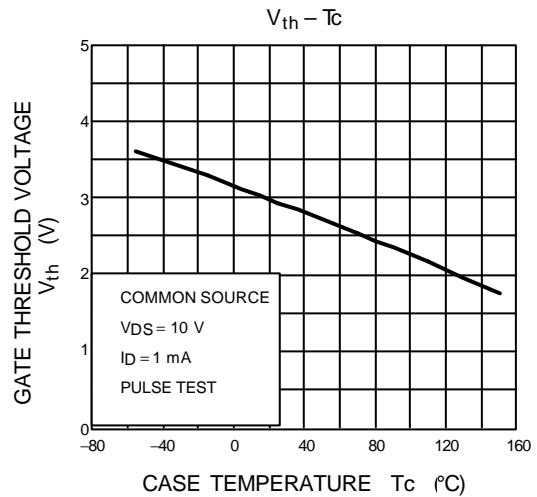
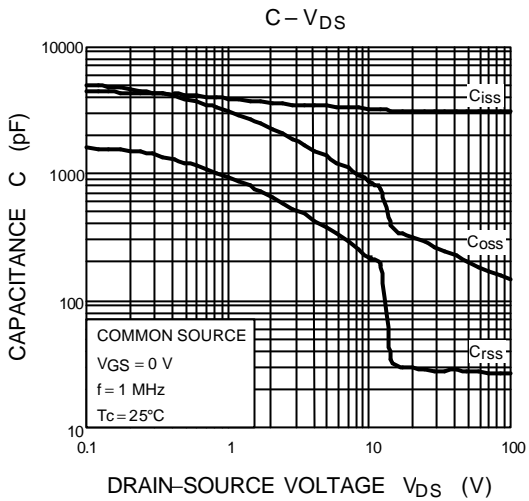
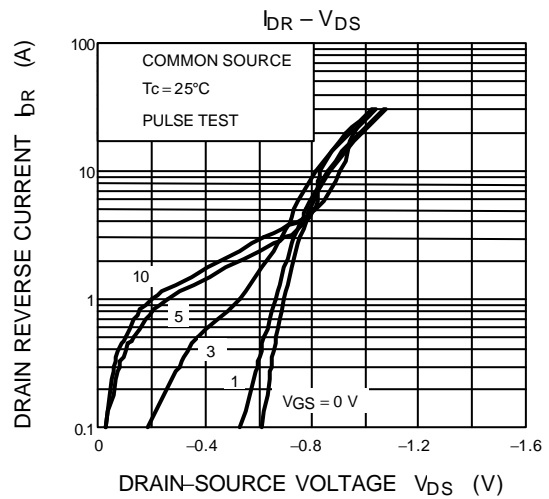
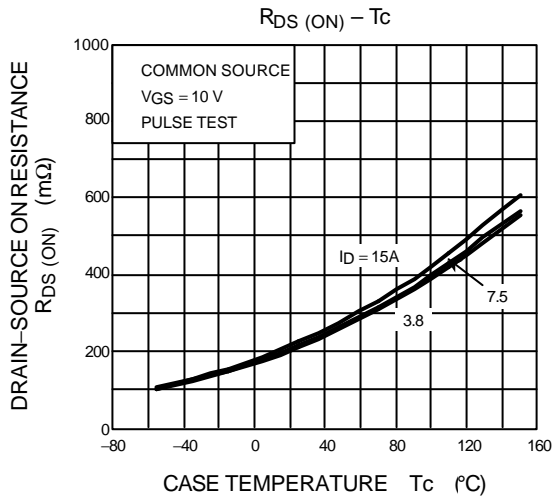
**Source-Drain Ratings and Characteristics (Ta = 25°C)**

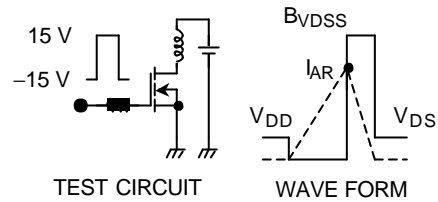
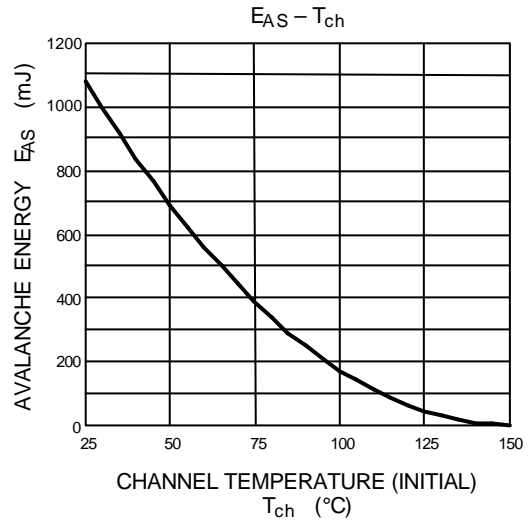
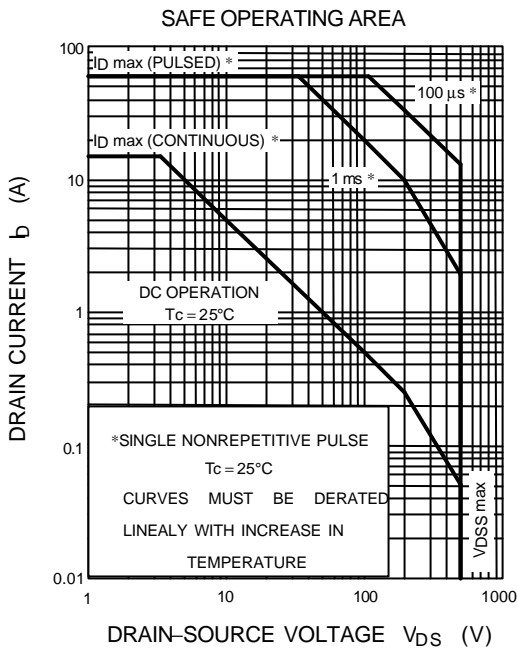
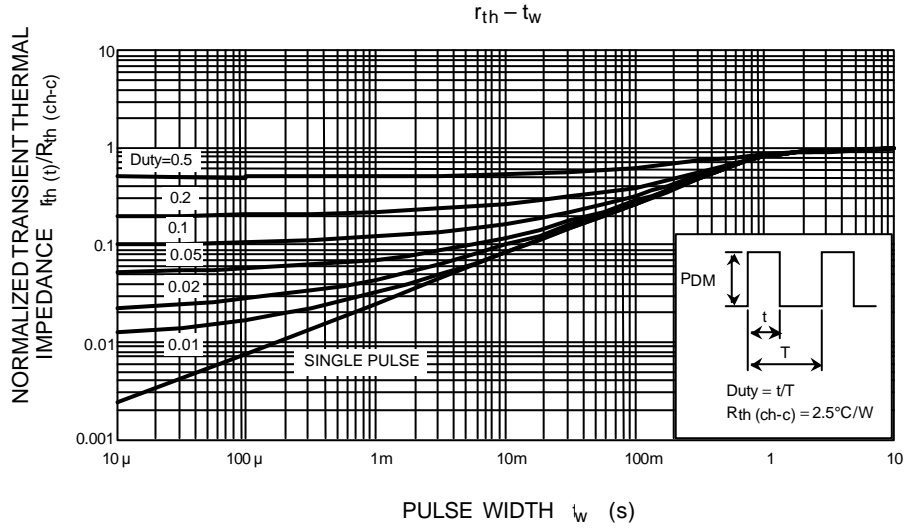
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)		$I_{DR}$	—	—	—	15	A
Pulse drain reverse current (Note 1)		$I_{DRP}$	—	—	—	60	A
Forward voltage (diode)		$V_{DSF}$	$I_{DR} = 15\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.7	V
Reverse recovery time		$t_{rr}$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

**Marking**









$R_G = 25 \Omega$   
 $V_{DD} = 90 \text{ V}, L = 8.13 \text{ mH}$

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

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