

TOSHIBA Field Effect Transistor Silicon N-Channel MOS Type (MACHII  $\pi$ -MOSVI)

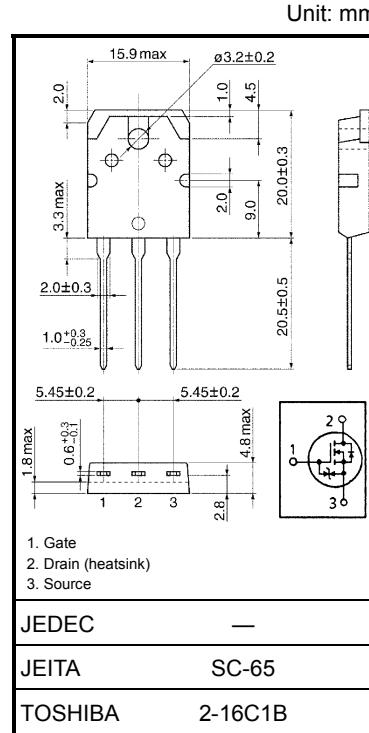
# 2SK3911

## Switching Regulator Applications

- Small gate charge:  $Q_g = 60 \text{ nC}$  (typ.)
- Low drain-source ON resistance:  $R_{DS(\text{ON})} = 0.22\Omega$  (typ.)
- High forward transfer admittance:  $|Y_{fs}| = 11 \text{ S}$  (typ.)
- Low leakage current:  $I_{DSS} = 500 \mu\text{A}$  ( $V_{DS} = 600 \text{ V}$ )
- Enhancement model:  $V_{th} = 2.0 \sim 4.0 \text{ V}$  ( $V_{DS} = 10 \text{ V}$ ,  $I_D = 1 \text{ mA}$ )

## Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

Characteristic	Symbol	Rating	Unit
Drain-source voltage	$V_{DSS}$	600	V
Drain-gate voltage ( $R_{GS} = 20 \text{ k}\Omega$ )	$V_{DGR}$	600	V
Gate-source voltage	$V_{GSS}$	$\pm 30$	V
Drain current	DC (Note 1)	$I_D$	A
	Pulse (Note 1)	$I_{DP}$	
Drain power dissipation ( $T_c = 25^\circ\text{C}$ )	$P_D$	150	W
Single pulse avalanche energy (Note 2)	$E_{AS}$	792	mJ
Avalanche current	$I_{AR}$	20	A
Repetitive avalanche energy (Note 3)	$E_{AR}$	15	mJ
Channel temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-55~150	$^\circ\text{C}$



Weight: 4.6 g (typ.)

## Thermal Characteristics

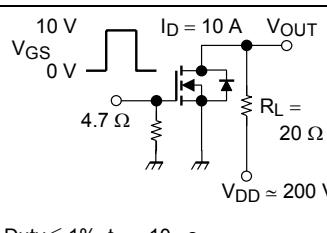
Characteristic	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th}(\text{ch-c})$	0.833	$^\circ\text{C/W}$
Thermal resistance, channel to ambient	$R_{th}(\text{ch-a})$	50	$^\circ\text{C/W}$

Note 1: Ensure that the channel temperature does not exceed  $150^\circ\text{C}$  during use of the device.Note 2:  $V_{DD} = 90 \text{ V}$ ,  $T_{ch} = 25^\circ\text{C}$  (initial),  $L = 3.46 \text{ mH}$ ,  $I_{AR} = 20 \text{ A}$ ,  $R_G = 25 \Omega$ 

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

This transistor is an electrostatic-sensitive device. Handle with care.

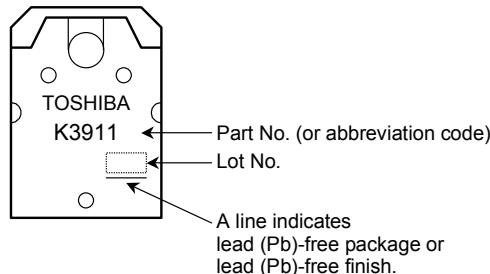
## Electrical Characteristics (Ta = 25°C)

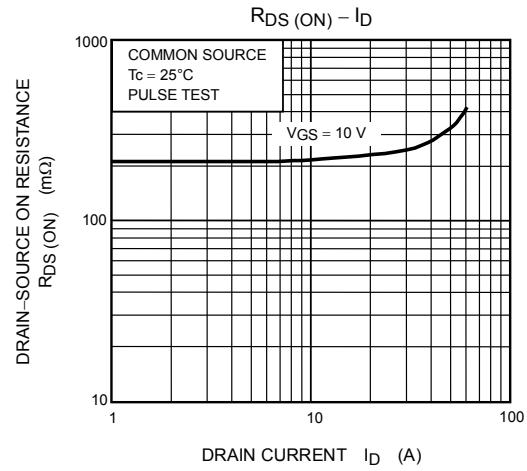
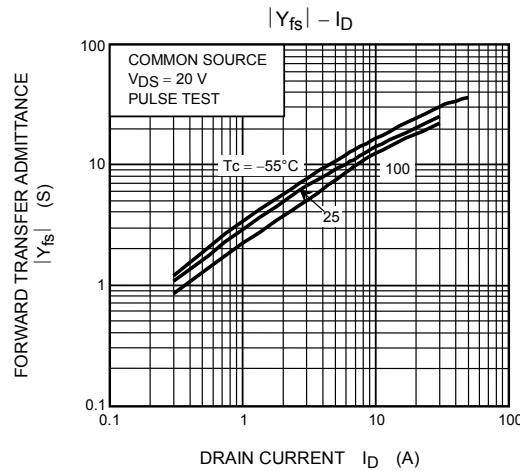
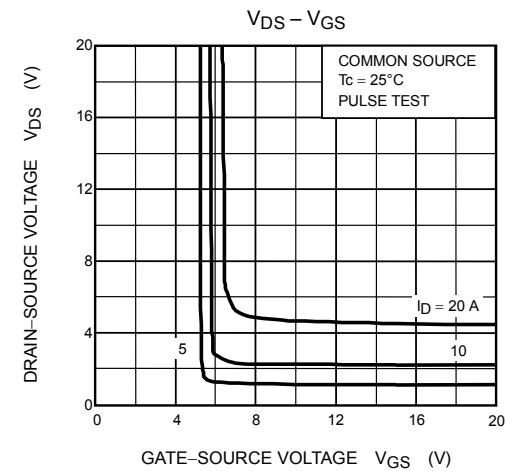
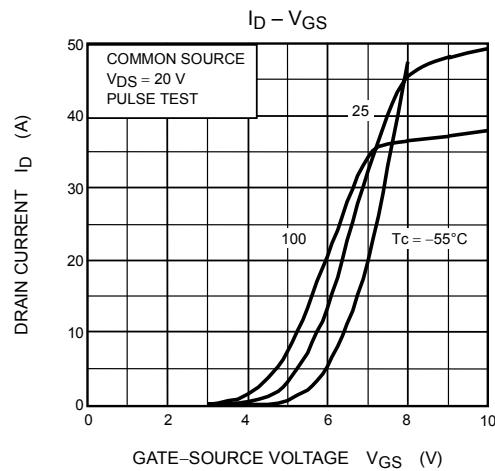
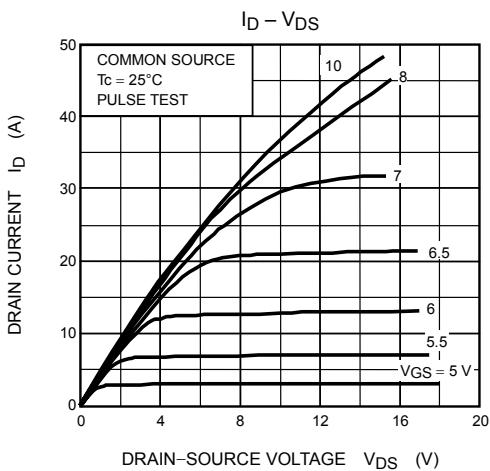
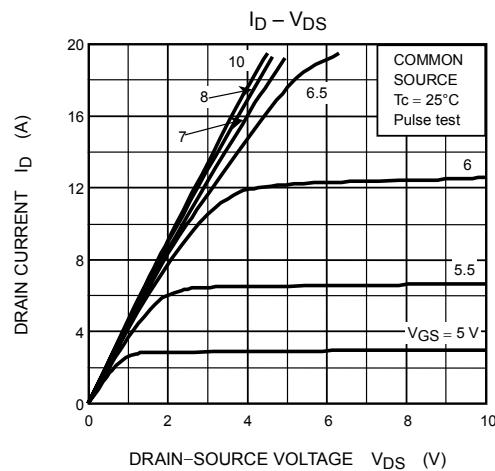
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	I <sub>GSS</sub>	V <sub>GS</sub> = ±25 V, V <sub>DS</sub> = 0 V	—	—	±10	μA	
Gate-source breakdown voltage	V <sub>(BR) GSS</sub>	I <sub>D</sub> = 10 μA, V <sub>DS</sub> = 0 V	±30	—	—	V	
Drain cutoff current	I <sub>DSS</sub>	V <sub>DS</sub> = 600 V, V <sub>GS</sub> = 0 V	—	—	500	μA	
Drain-source breakdown voltage	V <sub>(BR) DSS</sub>	I <sub>D</sub> = 10 mA, V <sub>GS</sub> = 0 V	600	—	—	V	
Gate threshold voltage	V <sub>th</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	2.0	—	4.0	V	
Drain-source ON resistance	R <sub>DS (ON)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 10 A	—	0.22	0.32	Ω	
Forward transfer admittance	Y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 10 A	3.0	11	—	S	
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz	—	4250	—	pF	
Reverse transfer capacitance	C <sub>rss</sub>		—	10	—		
Output capacitance	C <sub>oss</sub>		—	420	—		
Switching time	Rise time	t <sub>r</sub>	 Duty ≤ 1%, t <sub>w</sub> = 10 μs	—	12	—	ns
	Turn-on time	t <sub>on</sub>		—	45	—	
	Fall time	t <sub>f</sub>		—	12	—	
	Turn-off time	t <sub>off</sub>		—	80	—	
Total gate charge	Q <sub>g</sub>	V <sub>DD</sub> ≈ 400 V, V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A	—	60	—	nC	
Gate-source charge	Q <sub>gs</sub>		—	50	—		
Gate-drain charge	Q <sub>gd</sub>		—	10	—		

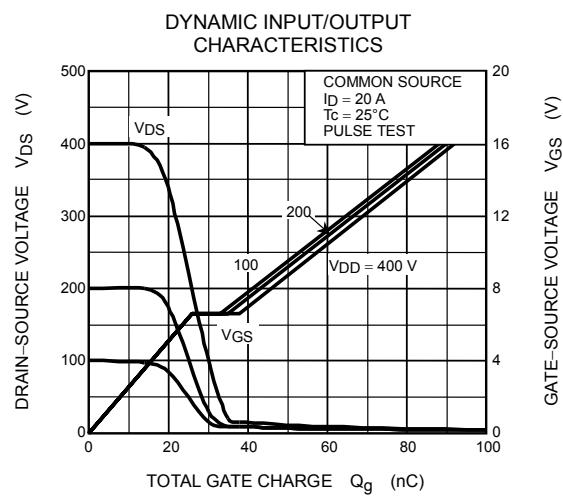
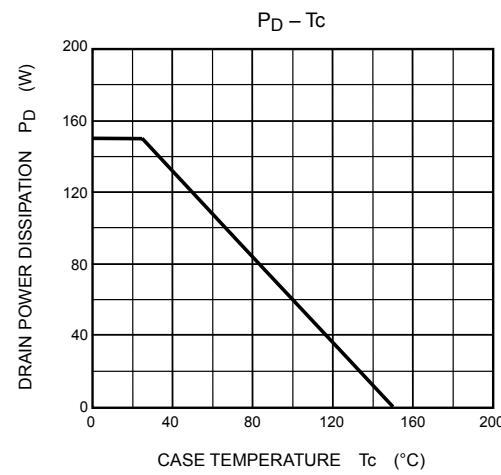
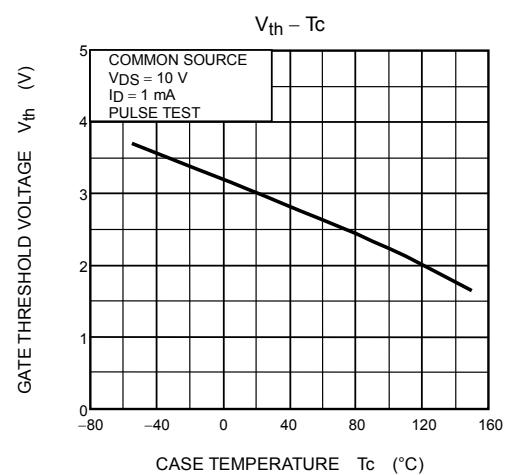
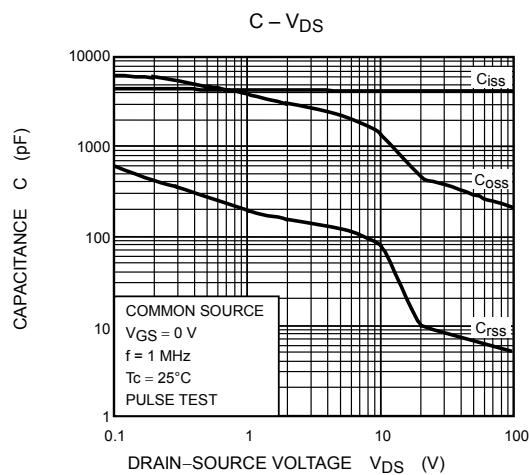
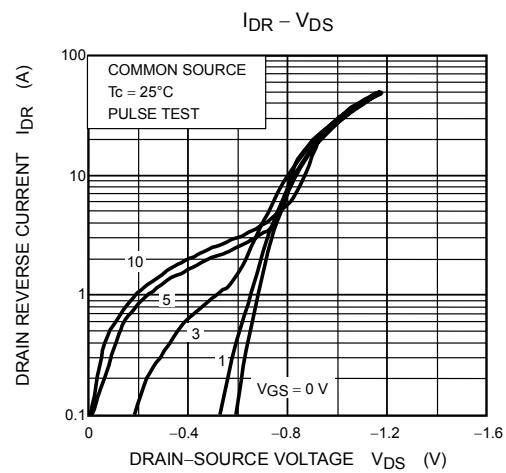
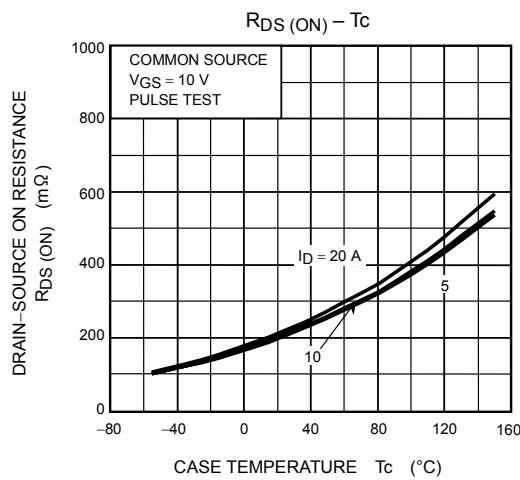
## Source-Drain Ratings and Characteristics (Ta = 25°C)

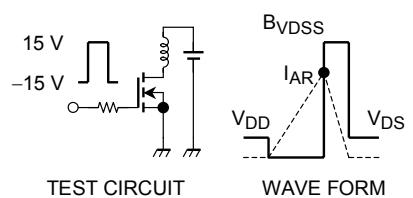
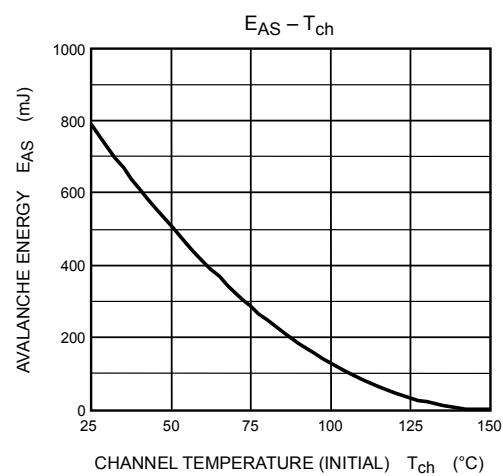
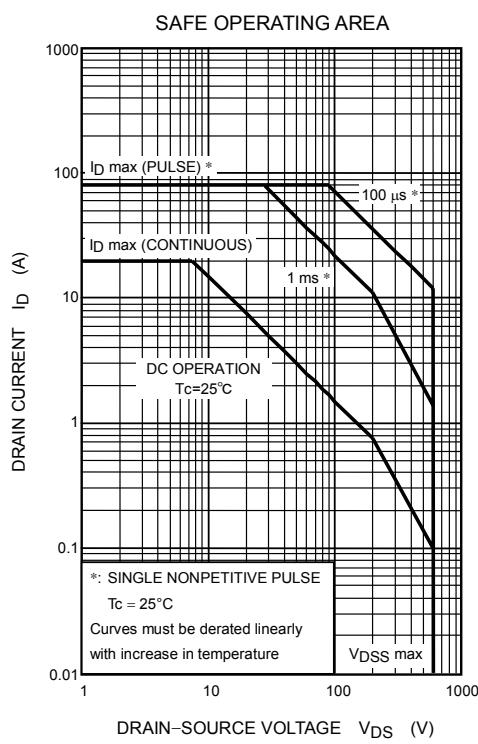
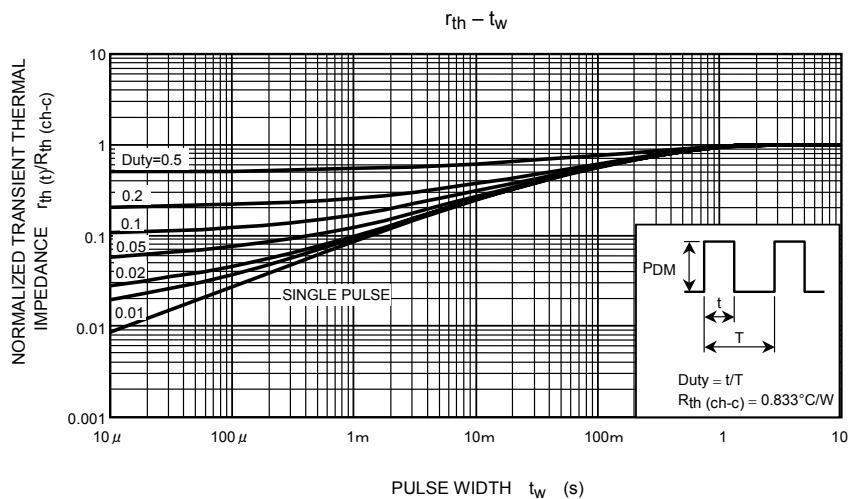
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I <sub>DR</sub>	—	—	—	20	A
Pulse drain reverse current (Note 1)	I <sub>DRP</sub>	—	—	—	80	A
Forward voltage (diode)	V <sub>DSF</sub>	I <sub>DR</sub> = 20 A, V <sub>GS</sub> = 0 V	—	—	—1.7	V
Reverse recovery time	t <sub>rr</sub>	I <sub>DR</sub> = 20 A, V <sub>GS</sub> = 0 V, dI <sub>DR</sub> /dt = 100 A/μs	—	1350	—	ns
Reverse recovery charge	Q <sub>rr</sub>		—	24	—	μC

## Marking









$$R_G = 25\ \Omega, V_{DD} = 90\ \text{V}, L = 3.46\ \text{mH}$$

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

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