

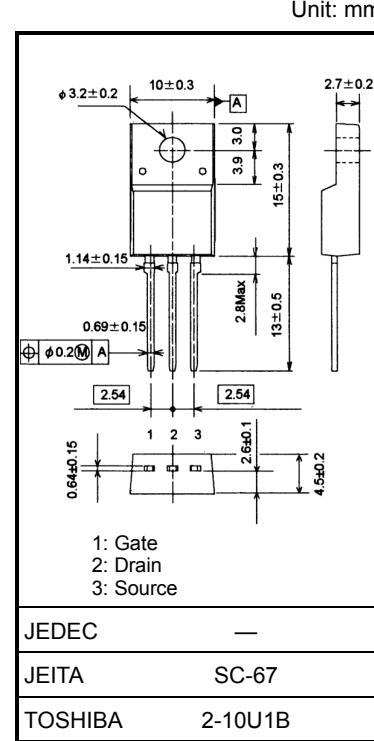
2SK3868

Switching Regulator Applications

- Low drain-source ON resistance: $R_{DS(ON)} = 1.3\ \Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 3S$ (typ.)
- Low leakage current: $I_{DSS} = 100\ \mu A$ ($V_{DS} = 500\ V$)
- Enhancement model: $V_{th} = 2.0\sim 4.0\ V$ ($V_{DS} = 10\ V$, $I_D = 1\ mA$)

Absolute Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Drain-source voltage	V _{DSS}	500	V
Drain-gate voltage (R _{GS} = 20 kΩ)	V _{DGR}	500	V
Gate-source voltage	V _{GSS}	±30	V
Drain current	DC (Note 1)	I _D	5
	Pulse (t = 1 ms) (Note 1)	I _{DP}	20
Drain power dissipation (T _c = 25°C)	P _D	35	W
Single pulse avalanche energy (Note 2)	E _{AS}	180	mJ
Avalanche current	I _{AR}	5	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



Weight: 1.7 g (typ.)

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

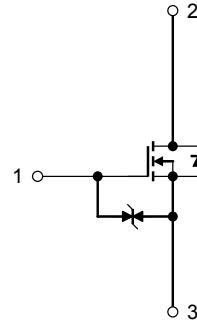
Characteristic	Symbol	Max	Unit
Thermal resistance, channel to case	R _{th} (ch-c)	3.57	°C/W
Thermal resistance, channel to ambient	R _{th} (ch-a)	62.5	°C/W

Note 1: Ensure that the channel temperature does not exceed 150°C during use of the device.

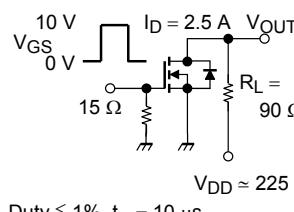
Note 2: $V_{DD} = 90$ V, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 12.2$ mH, $I_{AR} = 5$ A, $R_G = 25$ Ω

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

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



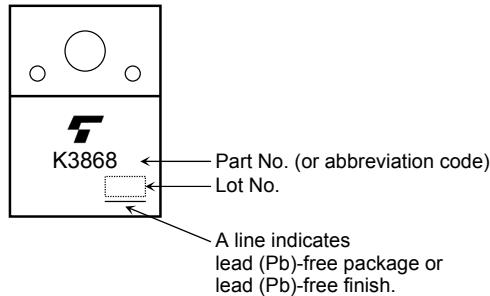
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

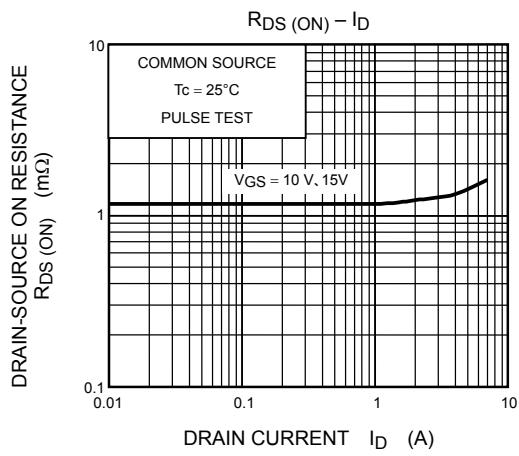
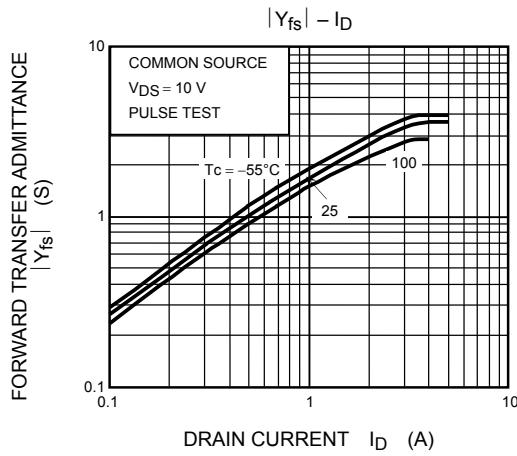
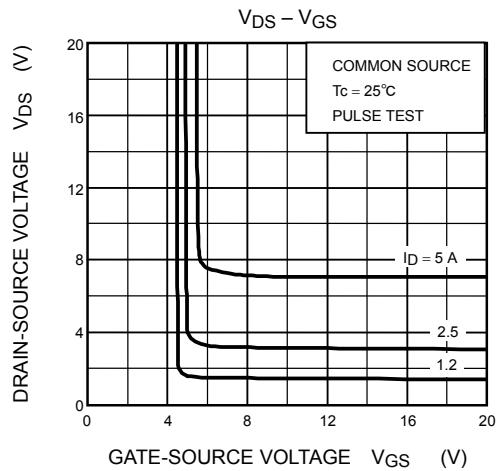
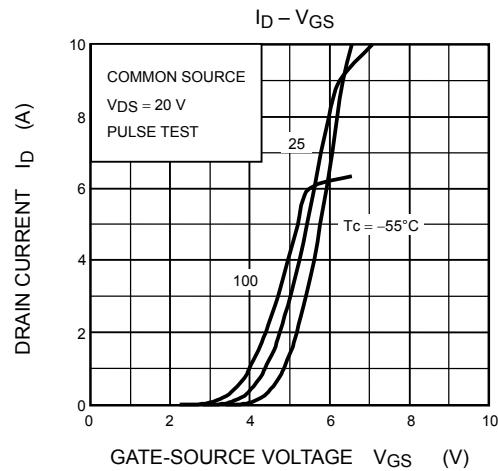
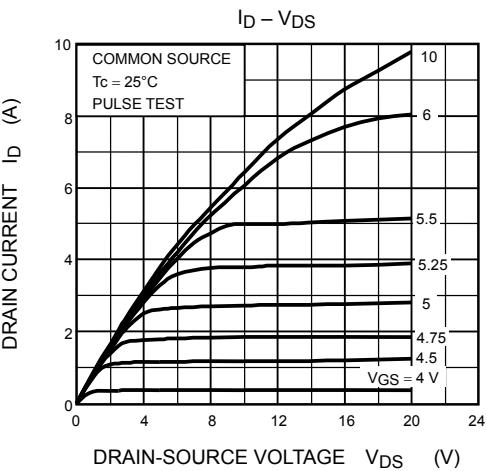
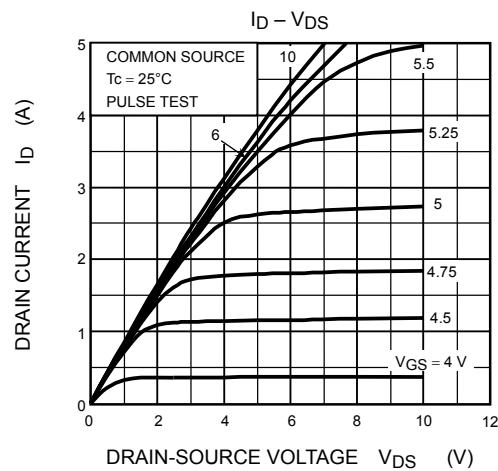
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit	
Gate leakage current	I_{GSS}	$V_{GS} = \pm 25\text{ V}$, $V_{DS} = 0\text{ V}$	—	—	± 10	μA	
Gate-source breakdown voltage	$V_{(\text{BR})\text{GSS}}$	$I_G = \pm 10\text{ }\mu\text{A}$, $V_{DS} = 0\text{ V}$	± 30	—	—	V	
Drain cutoff current	I_{DSS}	$V_{DS} = 500\text{ V}$, $V_{GS} = 0\text{ V}$	—	—	100	μA	
Drain-source breakdown voltage	$V_{(\text{BR})\text{DSS}}$	$I_D = 10\text{ mA}$, $V_{GS} = 0\text{ V}$	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	$R_{DS\text{ (ON)}}$	$V_{GS} = 10\text{ V}$, $I_D = 2.5\text{ A}$	—	1.3	1.7	Ω	
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10\text{ V}$, $I_D = 2.5\text{ A}$	1.5	3.0	—	S	
Input capacitance	C_{iss}	$V_{DS} = 25\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	—	550	—	pF	
Reverse transfer capacitance	C_{rss}		—	7	—		
Output capacitance	C_{oss}		—	70	—		
Switching time	Rise time	t_r	 V_{GS} 10 V V_{GS} 0 V $I_D = 2.5\text{ A}$ $R_L = 90\Omega$ $V_{DD} \approx 225\text{ V}$ Duty $\leq 1\%$, $t_W = 10\text{ }\mu\text{s}$	—	10	—	ns
	Turn-on time	t_{on}		—	20	—	
	Fall time	t_f		—	10	—	
	Turn-off time	t_{off}		—	50	—	
Total gate charge	Q_g	$V_{DD} \approx 400\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 5\text{ A}$	—	16	—	nC	
Gate-source charge	Q_{gs}		—	10	—		
Gate-drain charge	Q_{gd}		—	6	—		

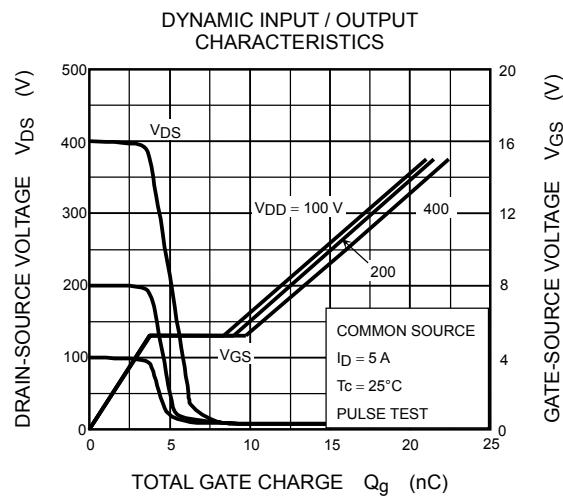
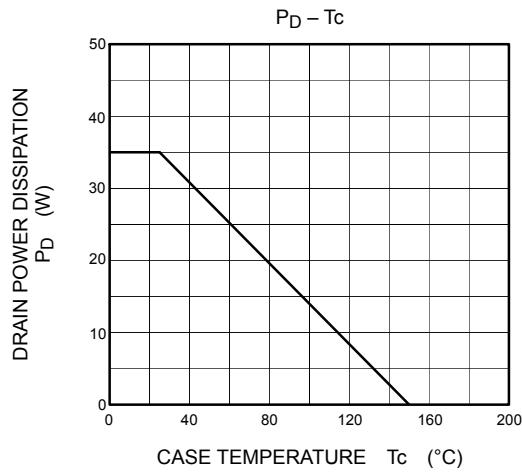
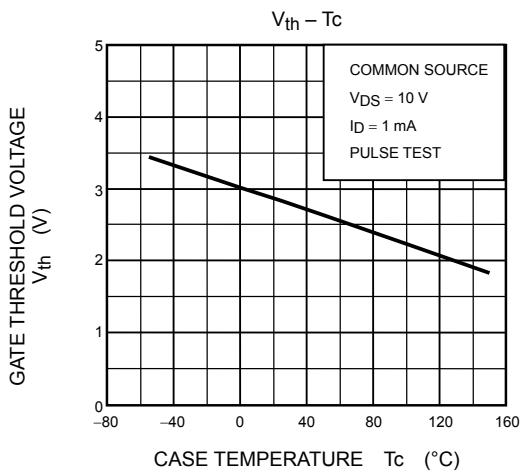
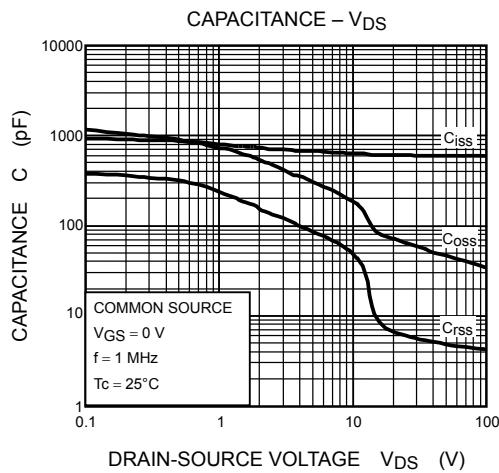
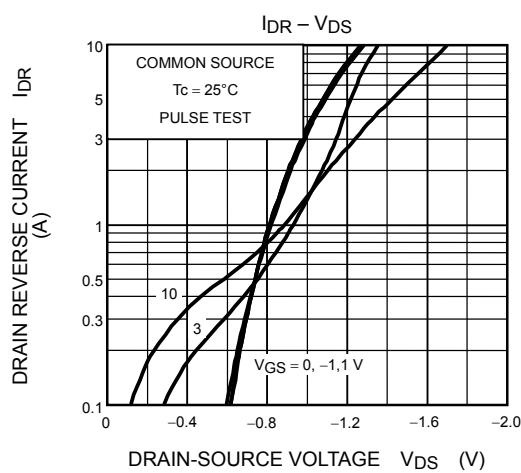
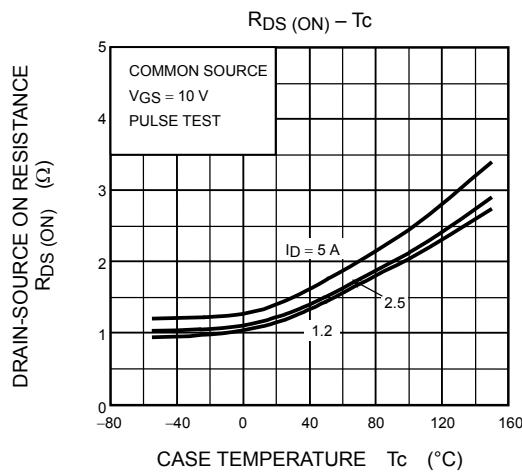
Source-Drain Ratings and Characteristics ($T_a = 25^\circ\text{C}$)

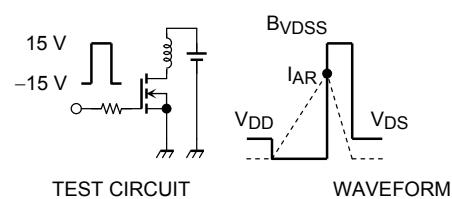
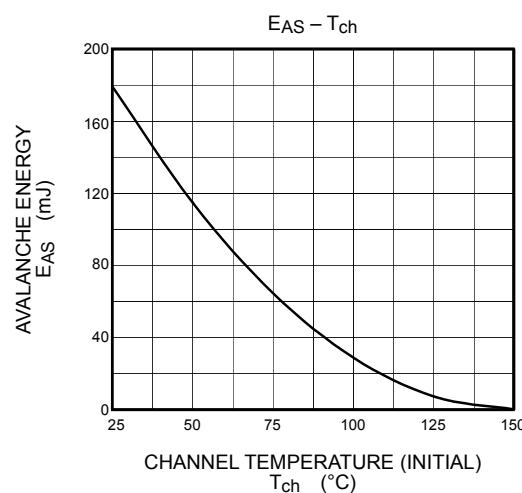
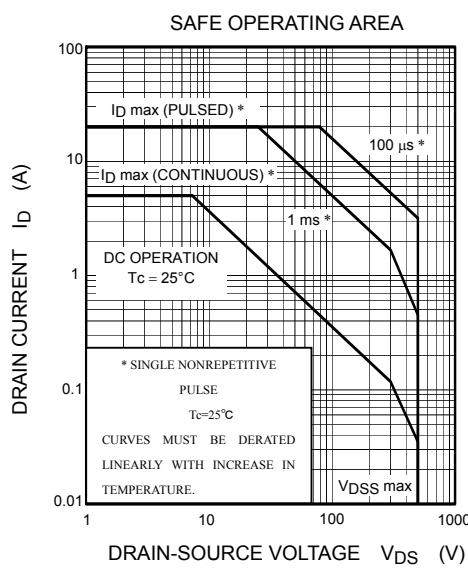
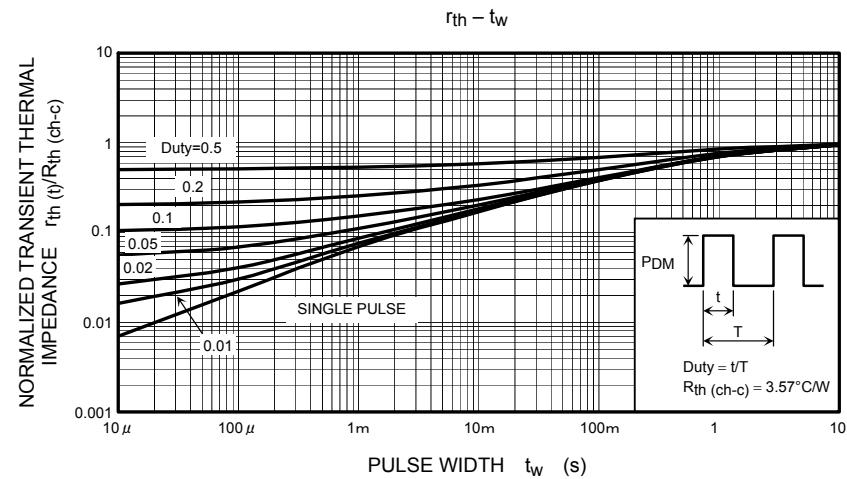
Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	5	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	20	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 5\text{ A}$, $V_{GS} = 0\text{ V}$	—	—	-1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = 5\text{ A}$, $V_{GS} = 0\text{ V}$, $dI_{DR}/dt = 100\text{ A}/\mu\text{s}$	—	150	—	ns
Reverse recovery charge	Q_{rr}		—	0.3	—	μC

Marking









$$R_G = 25\ \Omega$$

$$V_{DD} = 90\ \text{V}, L = 12.2\ \text{mH}$$

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

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