

2SK3544

Switching Regulator Applications

- Low drain-source ON-resistance: $R_{DS(ON)} = 0.29 \Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 5.8 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 100 \mu\text{A}$ (max) ($V_{DSS} = 450 \text{ V}$)
- Enhancement mode: $V_{th} = 3.0$ to 5.0 V ($V_{DSS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

Absolute Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain–source voltage		V _{DSS}	450	V
Drain–gate voltage ($R_{GS} = 20\text{ k}\Omega$)		V _{DGR}	450	V
Gate–source voltage		V _{GSS}	±30	V
Drain current	DC (Note 1)	I _D	13	A
	Pulse (Note 1)	I _{DP}	52	
Drain power dissipation ($T_c = 25^\circ\text{C}$)		P _D	100	W
Single-pulse avalanche energy (Note 2)		E _{AS}	350	mJ
Avalanche current		I _{AR}	13	A
Repetitive avalanche energy (Note 3)		E _{AR}	4.5	mJ
Channel temperature		T _{ch}	150	°C
Storage temperature range		T _{stg}	−55 to 150	°C

Unit: mm

9.2 max

7.0 ± 0.2

4

0.8 max

0.4 ± 0.1

9.2 max

0.7 max

2.0 1.5 2.0 2.5

1 2 3

3.0 max

1.0 ± 0.2 1.0 ± 0.2

3.6 ± 0.2

0.4 ± 0.1

1. GATE : G
2. N.C.
3. SOURCE : S
4. DRAIN : D

JEDEC

JEITA

TOSHIBA 2-9F1C

Weight: 0.74 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

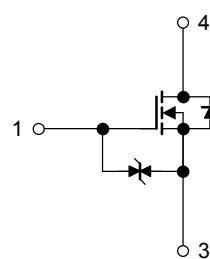
Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	R_{th} (ch-c)	1.25	°C/W

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

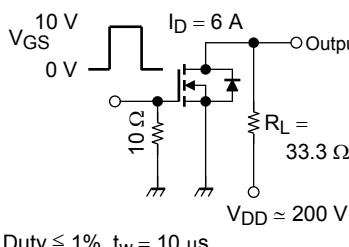
Note 2: $V_{DD} = 90$ V, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 3.46$ mH, $R_G = 25$ Ω , $I_{AR} = 13$ A

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

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



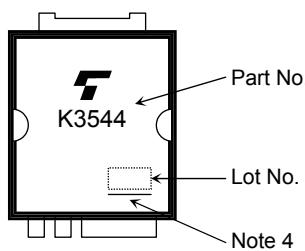
Electrical Characteristics ($T_a = 25^\circ\text{C}$)

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	$V_{(\text{BR})\text{GSS}}$	$I_G = \pm 10\text{ }\mu\text{A}$, $V_{DS} = 0\text{ V}$	± 30	—	—	V
Drain cutoff current	I_{DSS}	$V_{DS} = 450\text{ V}$, $V_{GS} = 0\text{ V}$	—	—	100	μA
Drain-source breakdown voltage	$V_{(\text{BR})\text{DSS}}$	$I_D = 10\text{ mA}$, $V_{GS} = 0\text{ V}$	450	—	—	V
Gate threshold voltage	V_{th}	$V_{DS} = 10\text{ V}$, $I_D = 1\text{ mA}$	3.0	—	5.0	V
Drain-source ON-resistance	$R_{DS\text{ (ON)}}$	$V_{GS} = 10\text{ V}$, $I_D = 6\text{ A}$	—	0.29	0.4	Ω
Forward transfer admittance	$ Y_{fs} $	$V_{DS} = 10\text{ V}$, $I_D = 6\text{ A}$	3.0	5.8	—	S
Input capacitance	C_{iss}	$V_{DS} = 25\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	—	1600	—	pF
Reverse transfer capacitance	C_{rss}		—	17	—	
Output capacitance	C_{oss}		—	220	—	
Switching time	Rise time	t_r	 V_{GS} 10 V 0 V $I_D = 6\text{ A}$ $R_L = 33.3\Omega$ $V_{DD} \approx 200\text{ V}$ Duty $\leq 1\%$, $t_w = 10\text{ }\mu\text{s}$	—	28	—
	Turn-on time	t_{on}		—	45	—
	Fall time	t_f		—	10	—
	Turn-off time	t_{off}		—	56	—
Total gate charge	Q_g	$V_{DD} \approx 360\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 13\text{ A}$	—	34	—	nC
Gate-source charge	Q_{gs}		—	19	—	
Gate-drain charge	Q_{gd}		—	15	—	

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

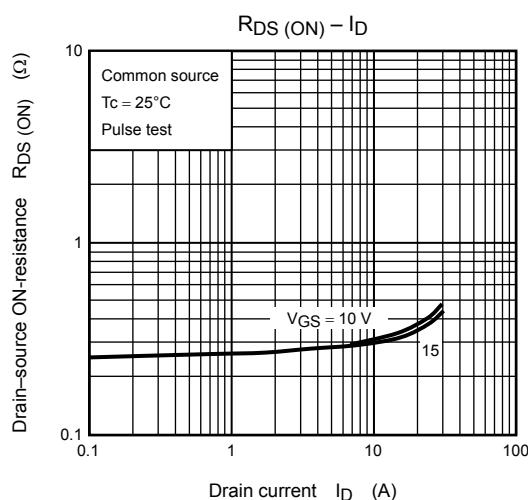
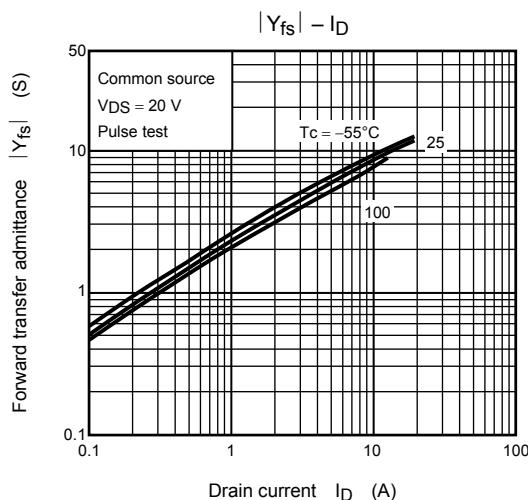
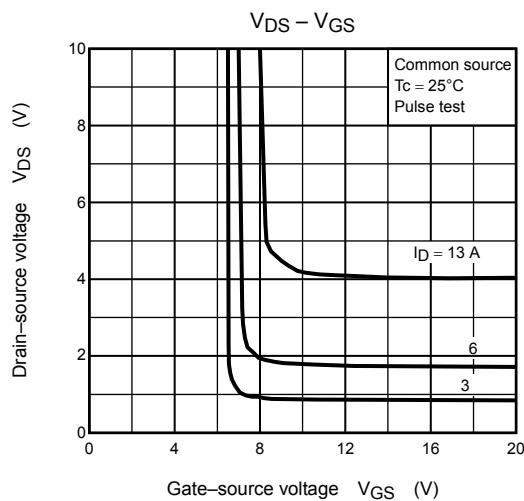
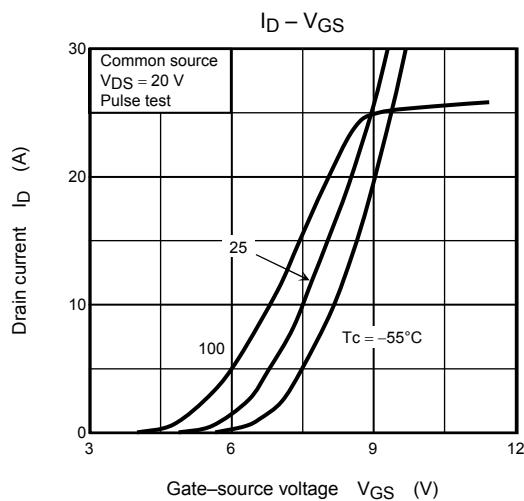
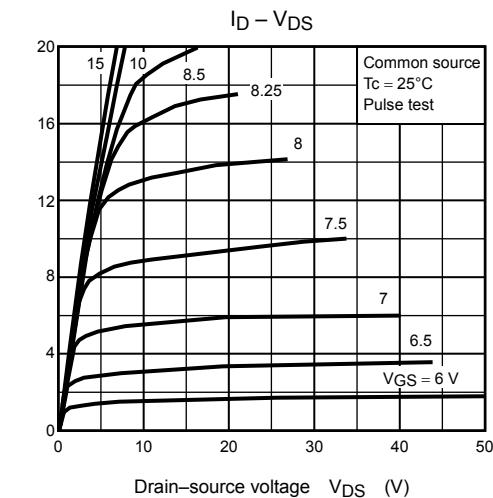
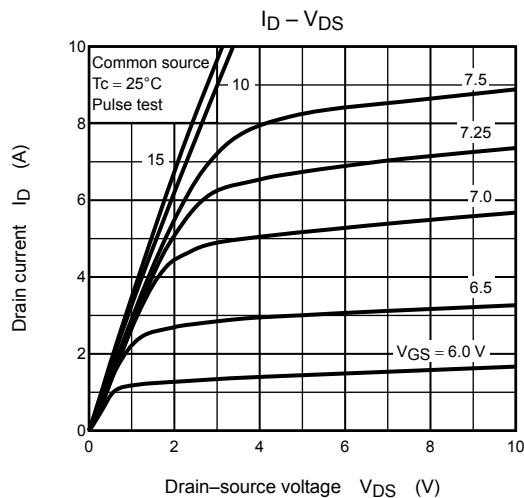
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	13	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	52	A
Forward voltage (diode)	V_{DSF}	$I_{DR} = 13\text{ A}$, $V_{GS} = 0\text{ V}$	—	—	-1.7	V
Reverse recovery time	t_{rr}	$I_{DR} = 13\text{ A}$, $V_{GS} = 0\text{ V}$, $dI_{DR}/dt = 100\text{ A}/\mu\text{s}$	—	300	—	ns
Reverse recovery charge	Q_{rr}		—	3.4	—	μC

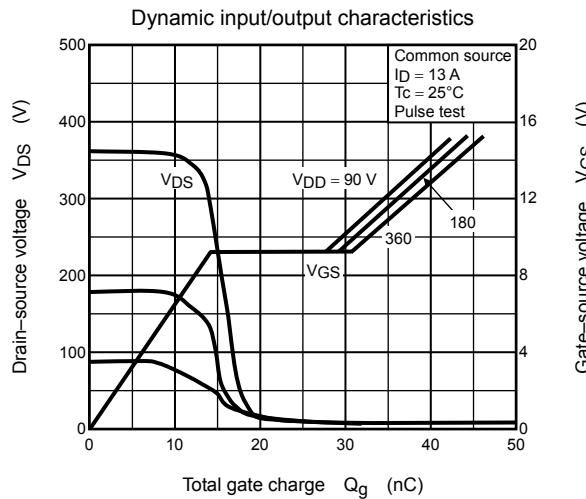
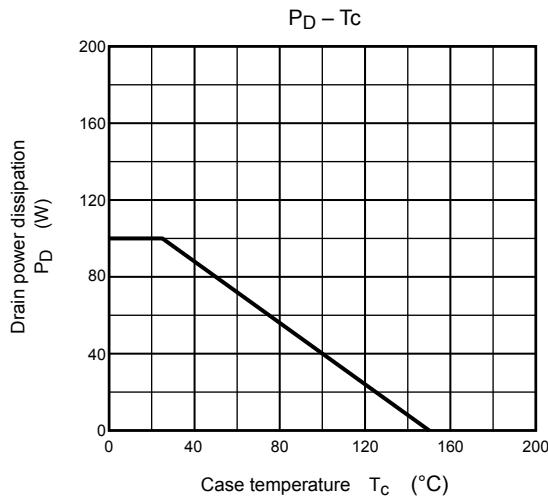
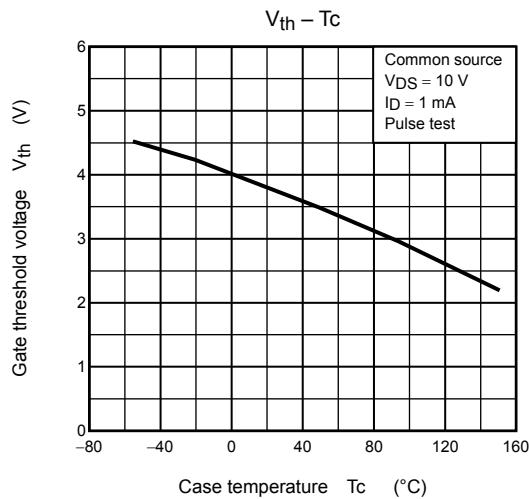
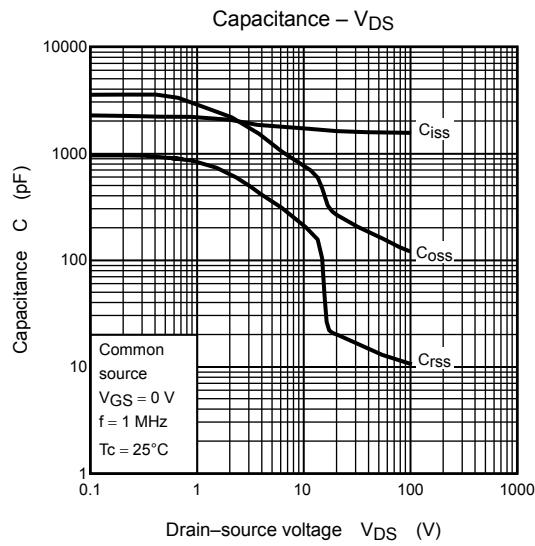
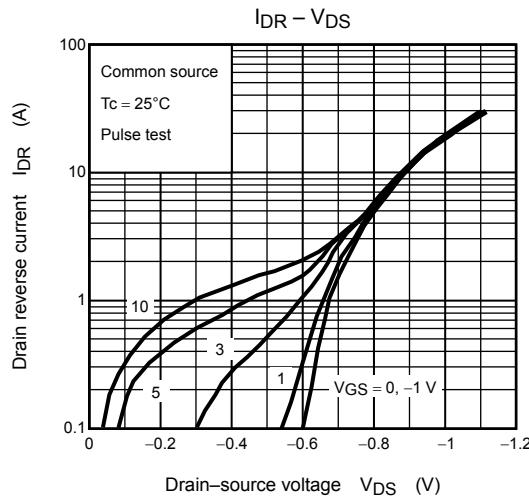
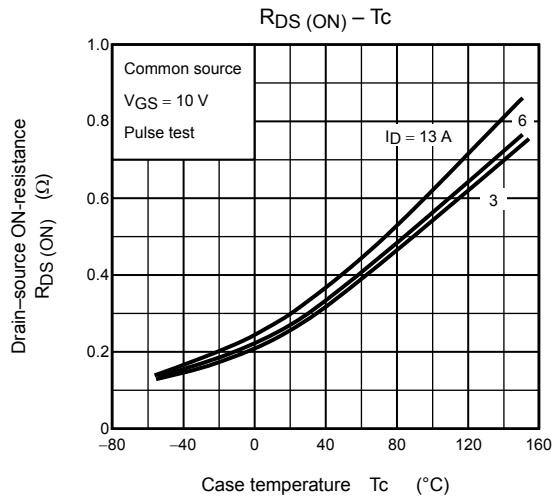
Marking

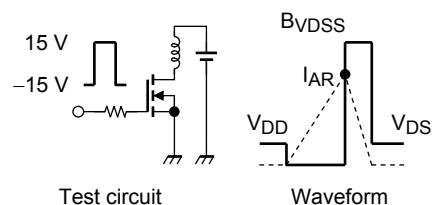
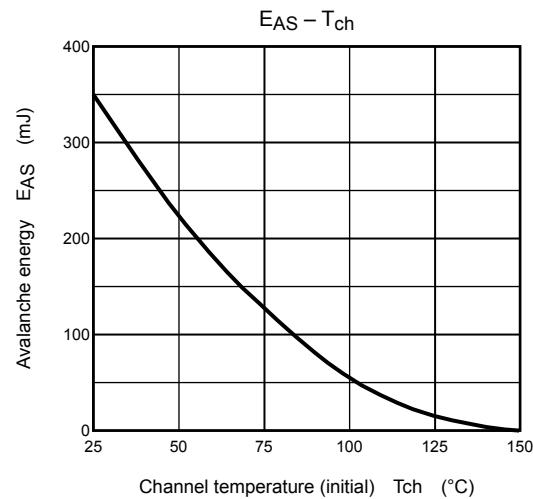
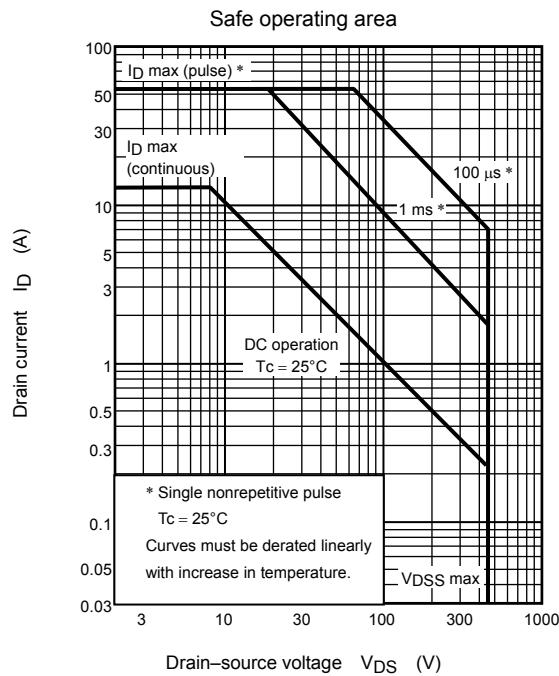
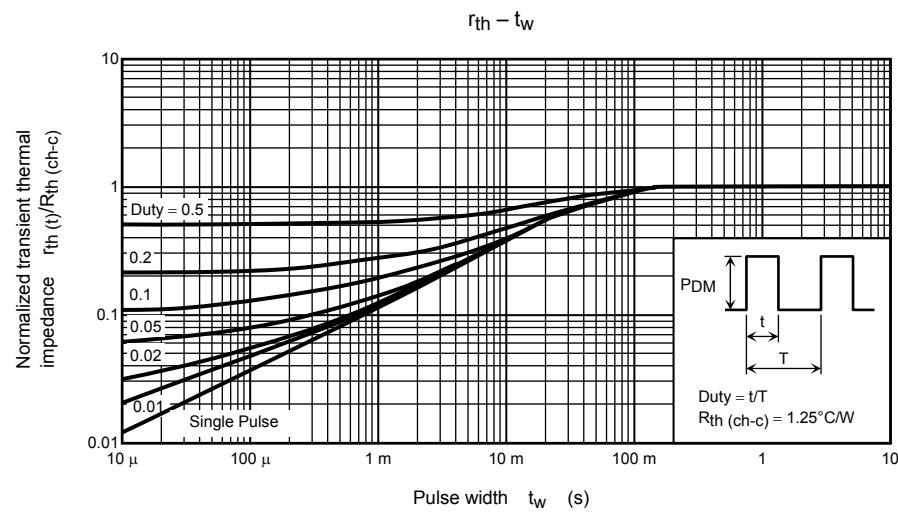


Note 4: A dot marking for identifying the indication of product Labels.
 [[G]]/RoHS COMPATIBLE or [[G]]/RoHS [[Pb]]

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$$R_G = 25 \Omega$$

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

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

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