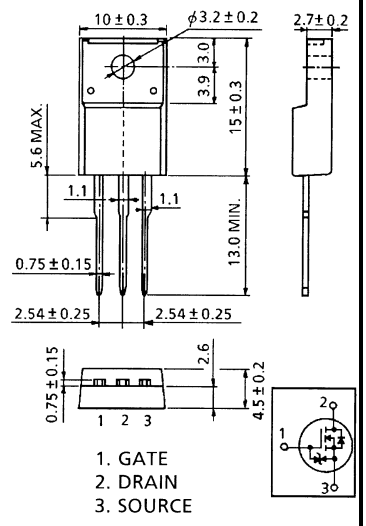
TOSHIBA Field Effect Transistor Silicon N-Channel MOS Type (π-MOSIV)

2SK4114

Switching Regulator Applications

- Low drain-source ON resistance: $R_{DS\ (ON)}$ = 2.2 Ω (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 3.5 S (typ.)
- Low leakage current: I_{DSS} = 100 μA (V_{DS} = 720 V)
- Enhancement model: V_{th} = 4.0~5.0 V (V_{DS} = 10 V, I_D = 1 mA)

Unit: mm



JEDEC	—
JEITA	SC-67
TOSHIBA	2-10R1B

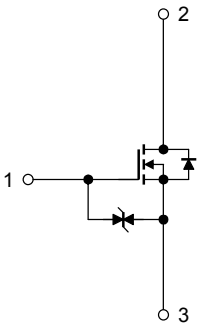
Weight: 1.9 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	900	V
Drain-gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	900	V
Gate-source voltage		V_{GSS}	±30	V
Drain current	DC (Note 1)	I_D	5	A
	Pulse (t = 1 ms) (Note 1)	I_{DP}	15	
Drain power dissipation (Tc = 25°C)		P_D	45	W
Single pulse avalanche energy (Note 2)		E_{AS}	595	mJ
Avalanche current		I_{AR}	5	A
Repetitive avalanche energy (Note 3)		E_{AR}	4.5	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	-55~150	°C

Thermal Characteristics

Characteristic	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th\ (ch-c)}$	2.78	°C/W
Thermal resistance, channel to ambient	$R_{th\ (ch-a)}$	62.5	°C/W



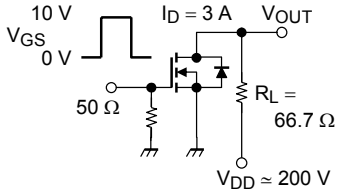
Note 1: Ensure that the channel temperature does not exceed 150°C during use of the device.

Note 2: V_{DD} = 90 V, T_{ch} = 25°C (initial), L = 43.6 mH, I_{AR} = 5.0 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.

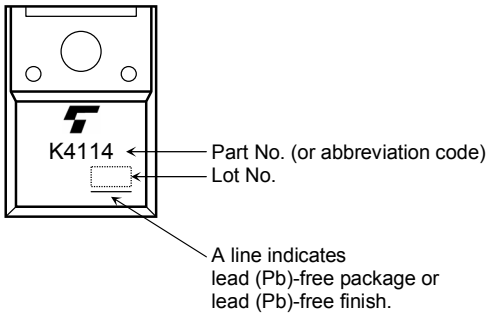
Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±30 V, V_{DS} = 0 V	—	—	±10	μA
Gate-source breakdown voltage		$V_{(BR)\ GSS}$	I_G = ±10 μA, V_{DS} = 0 V	±30	—	—	V
Drain cutoff current		I_{DSS}	V_{DS} = 720 V, V_{GS} = 0 V	—	—	100	μA
Drain-source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	900	—	—	V
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 1 mA	4.0	—	5.0	V
Drain-source ON resistance		$R_{DS\ (ON)}$	V_{GS} = 10 V, I_D = 3 A	—	2.2	2.5	Ω
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 20 V, I_D = 3 A	1.5	3.5	—	S
Input capacitance		C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 MHz	—	1150	—	pF
Reverse transfer capacitance		C_{rss}		—	20	—	
Output capacitance		C_{oss}		—	110	—	
Switching time	Rise time	t_r		—	100	—	ns
	Turn-on time	t_{on}		—	140	—	
	Fall time	t_f		—	40	—	
	Turn-off time	t_{off}	Duty ≦ 1%, t_w = 10 μs	—	130	—	
Total gate charge		Q_g	V_{DD} ≃ 400 V, V_{GS} = 10 V, I_D = 5 A	—	25	—	nC
Gate-source charge		Q_{gs}		—	11	—	
Gate-drain charge		Q_{gd}		—	14	—	

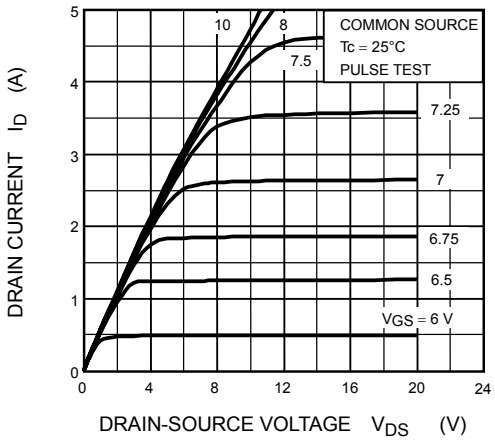
Source-Drain Ratings and Characteristics (Ta = 25°C)

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}	—	—	—	15	A
Forward voltage (diode)		V_{DSF}	I_{DR} = 5 A, V_{GS} = 0 V	—	—	−1.7	V
Reverse recovery time		t_{rr}	I_{DR} = 5 A, V_{GS} = 0 V, dI_{DR}/dt = 100 A/μs	—	900	—	ns
Reverse recovery charge		Q_{rr}		—	5.4	—	μC

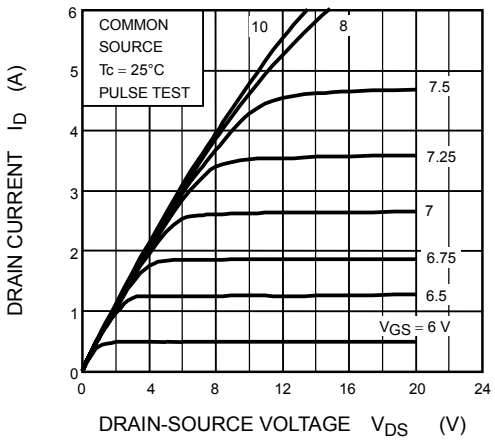
Marking



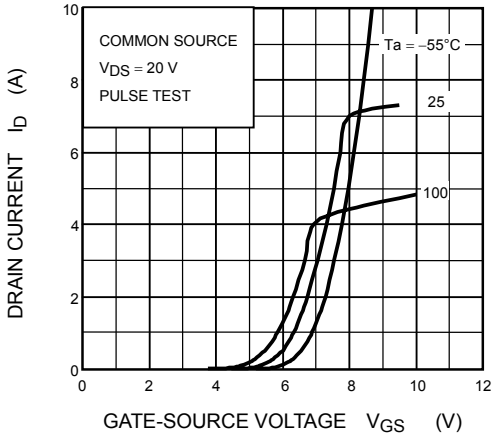
$I_D - V_{DS}$



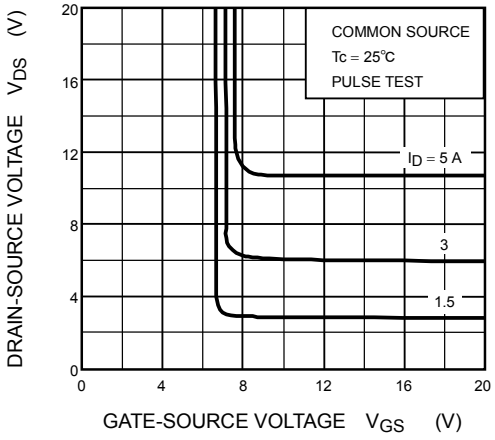
$I_D - V_{DS}$



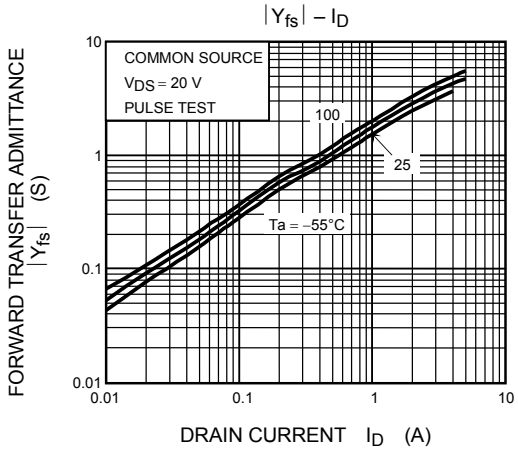
$I_D - V_{GS}$



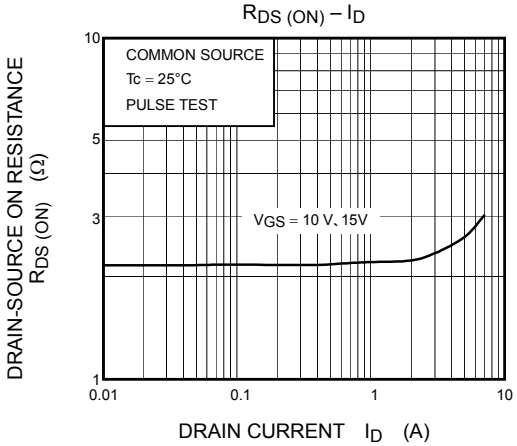
$V_{DS} - V_{GS}$



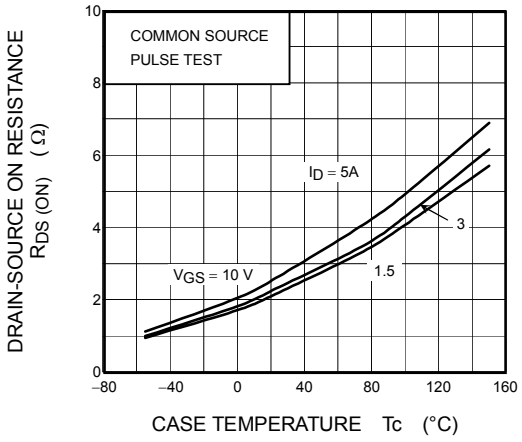
$|Y_{fs}| - I_D$



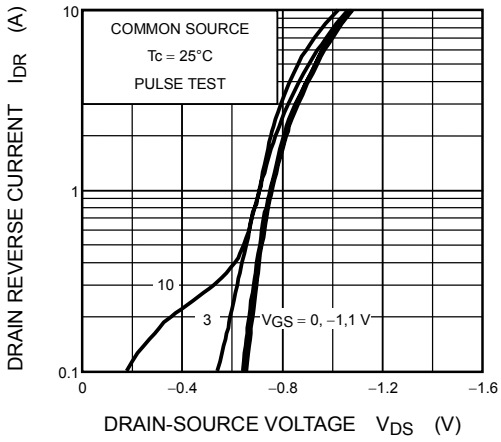
$R_{DS\ (ON)} - I_D$



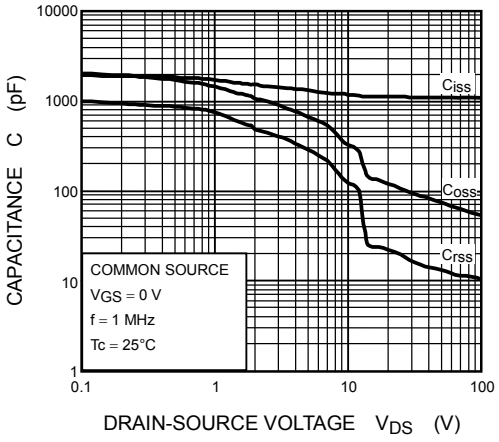
$R_{DS\ (ON)}$ – Tc



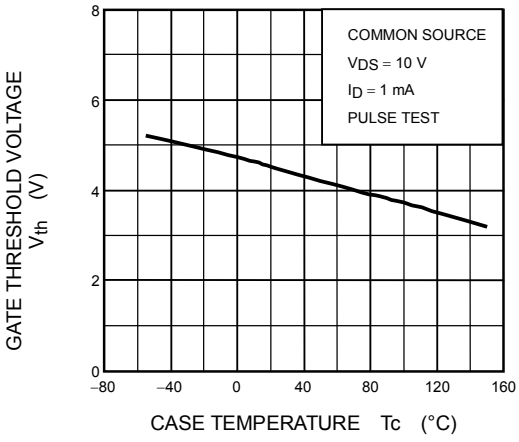
I_{DR} – V_{DS}



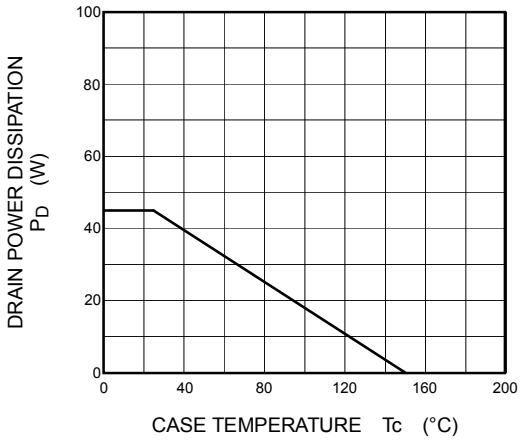
CAPACITANCE – V_{DS}



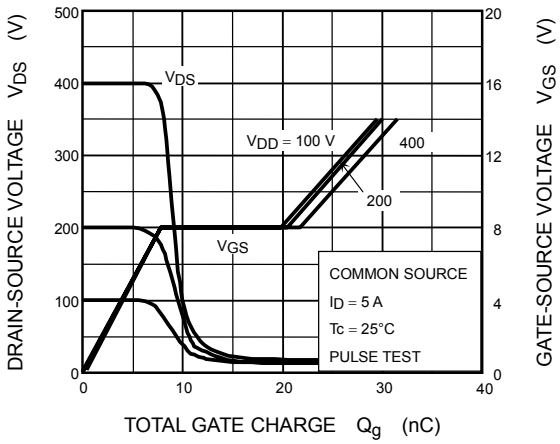
V_{th} – Tc



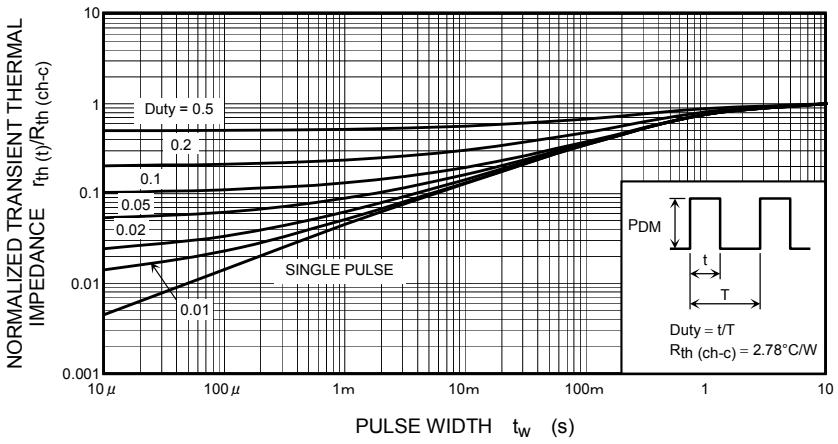
P_D – Tc



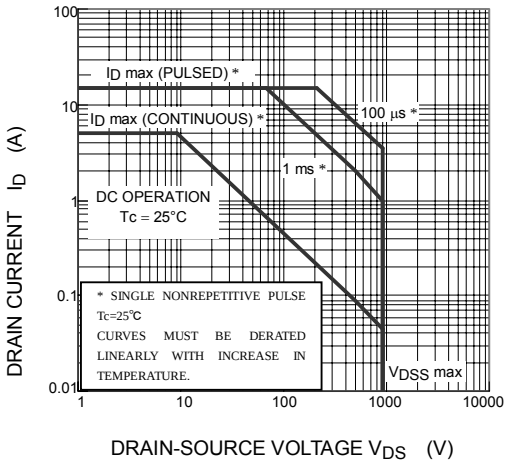
DYNAMIC INPUT / OUTPUT CHARACTERISTICS



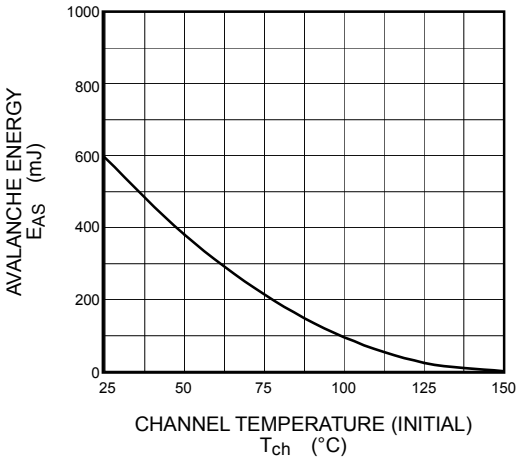
$r_{th} - t_w$

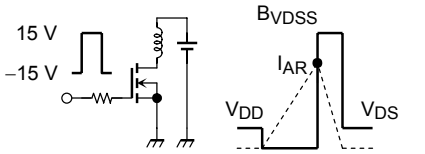


SAFE OPERATING AREA



$E_{AS} - T_{ch}$





TEST CIRCUIT WAVEFORM

$R_G = 25\ \Omega$
$V_{DD} = 90$ V, L = 43.6mH

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

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