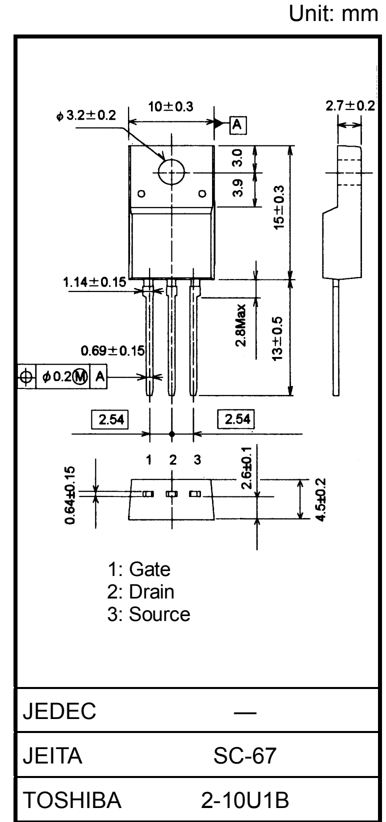
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (π-MOSVI)

2SK3561

Switching Regulator Applications

Unit: mm



Weight : 1.7 g (typ.)

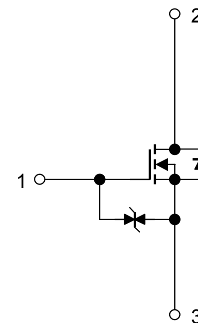
- Low drain-source ON resistance: $R_{DS\ (ON)}$ = 0.75 Ω (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 6.5S (typ.)
- Low leakage current: I_{DSS} = 100 μA (V_{DS} = 500 V)
- Enhancement mode: V_{th} = 2.0~4.0 V (V_{DS} = 10 V, I_D = 1 mA)

Maximum Ratings (Ta = 25°C)

Characteristics		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	8	A
	Pulse (t = 1 ms) (Note 1)	I_{DP}	32	
Drain power dissipation (Tc = 25°C)		P_D	40	W
Single pulse avalanche energy (Note 2)		E_{AS}	312	mJ
Avalanche current		I_{AR}	8	A
Repetitive avalanche energy (Note 3)		E_{AR}	4	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	-55~150	°C

Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th\ (ch-c)}$	3.125	°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.

Note 2: V_{DD} = 90 V, T_{ch} = 25°C(initial), L = 8.3 mH, I_{AR} = 8 A, R_G = 25 Ω

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

This transistor is an electrostatic-sensitive device. Please handle with caution.

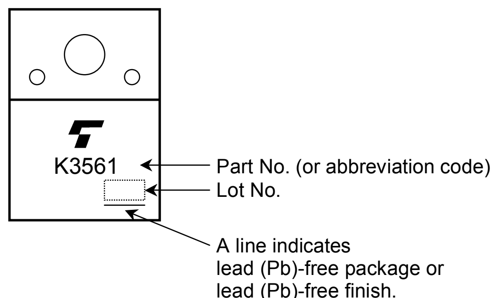
Electrical Characteristics (Ta = 25°C)

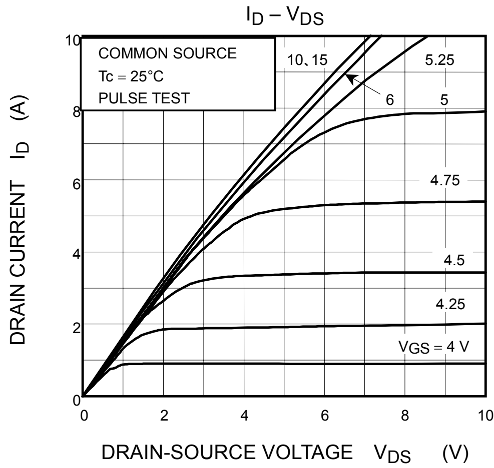
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±25 V, V_{DS} = 0 V	—	—	±10	µA
Gate-source breakdown voltage		$V_{(BR)\ GSS}$	I_G = ±10 µA, V_{DS} = 0 V	±30	—	—	V
Drain cut-off current		I_{DSS}	V_{DS} = 500 V, V_{GS} = 0 V	—	—	100	µA
Drain-source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	500	—	—	V
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 1 mA	2.0	—	4.0	V
Drain-source ON resistance		$R_{DS\ (ON)}$	V_{GS} = 10 V, I_D = 4 A	—	0.75	0.85	Ω
Forward transfer admittance		$\lvert Y_{fs} \rvert$	V_{DS} = 10 V, I_D = 4 A	3.0	6.5	—	S
Input capacitance		C_{iss}	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 MHz	—	1050	—	pF
Reverse transfer capacitance		C_{rss}		—	10	—	
Output capacitance		C_{oss}		—	110	—	
Switching time	Rise time	t_r	10 V, V_{GS}, 0 V, I_D = 4 A, V_{OUT}, 50 Ω, R_L = 50 Ω, V_{DD} ≃ 200 V	—	26	—	ns
	Turn-on time	t_{on}		—	45	—	
	Fall time	t_f		—	38	—	
	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 = 8 A	—	28	—	nC
Gate-source charge		Q_{gs}		—	16	—	
Gate-drain charge		Q_{gd}		—	12	—	

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

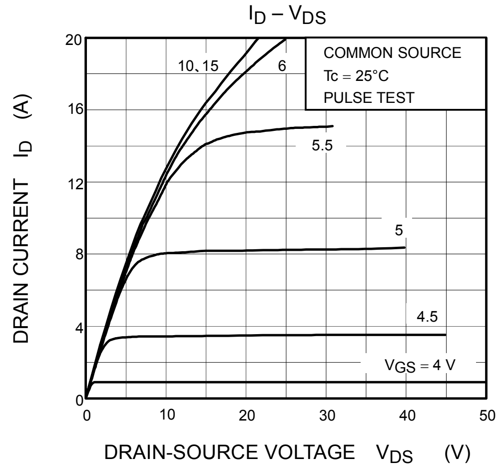
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	8	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	32	A
Forward voltage (diode)	V_{DSF}	I_{DR} = 8 A, V_{GS} = 0 V	—	—	−1.7	V
Reverse recovery time	t_{rr}	I_{DR} = 8 A, V_{GS} = 0 V,	—	1200	—	ns
Reverse recovery charge	Q_{rr}	dI_{DR}/dt = 100 A/µs	—	10	—	µC

Marking

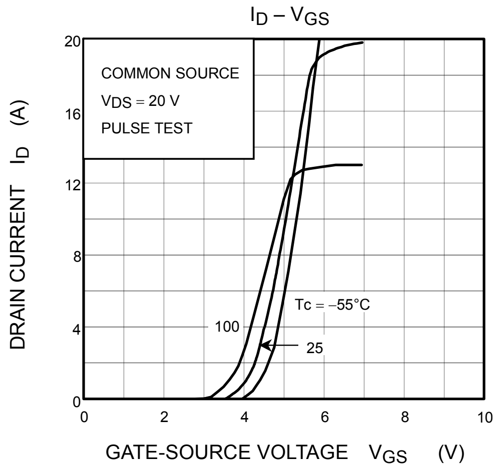




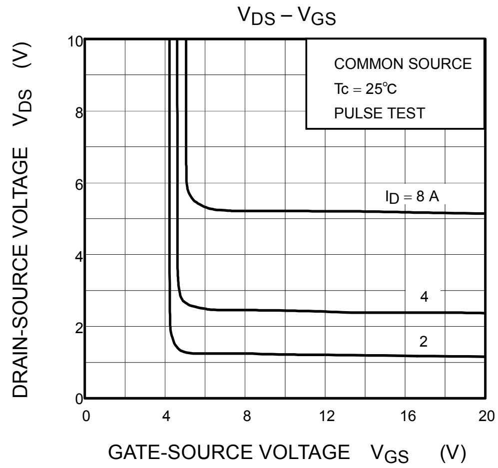
$I_D – V_{DS}$
COMMON SOURCE
Tc = 25°C
PULSE TEST
10、15
5.25
6
5
4.75
4.5
4.25
V_{GS} = 4 V
DRAIN CURRENT I_D (A)
DRAIN-SOURCE VOLTAGE V_{DS} (V)



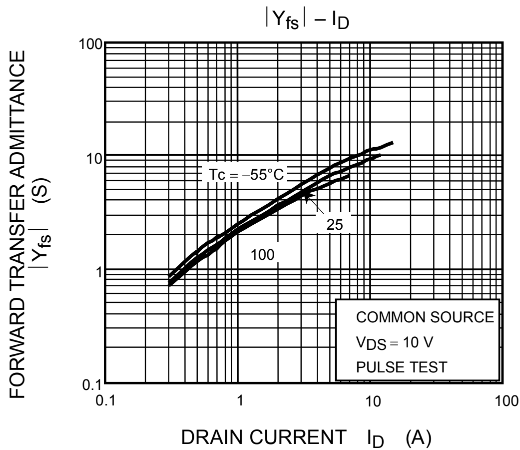
$I_D – V_{DS}$
COMMON SOURCE
Tc = 25°C
PULSE TEST
10、15
6
5.5
5
4.5
V_{GS} = 4 V
DRAIN CURRENT I_D (A)
DRAIN-SOURCE VOLTAGE V_{DS} (V)



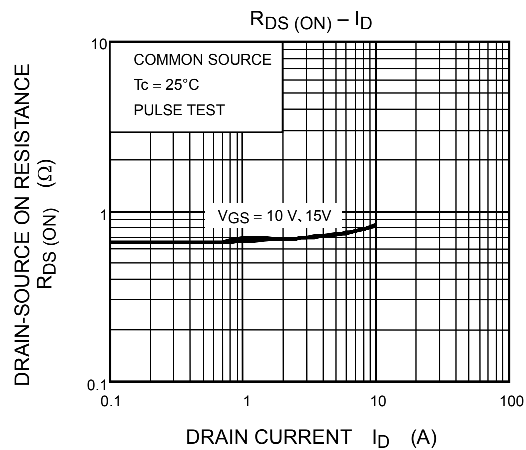
$I_D – V_{GS}$
COMMON SOURCE
V_{DS} = 20 V
PULSE TEST
Tc = –55°C
100
25
DRAIN CURRENT I_D (A)
GATE-SOURCE VOLTAGE V_{GS} (V)



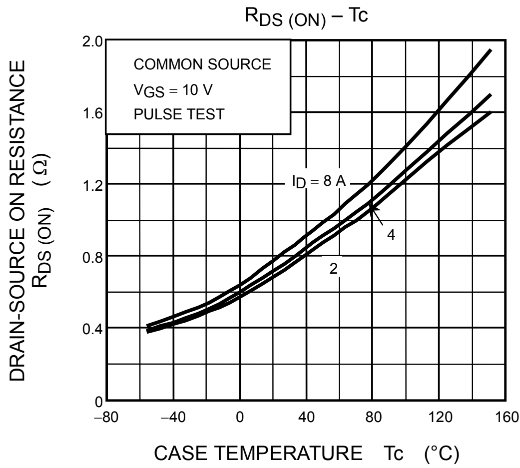
$V_{DS} – V_{GS}$
COMMON SOURCE
Tc = 25°C
PULSE TEST
I_D = 8 A
4
2
DRAIN-SOURCE VOLTAGE V_{DS} (V)
GATE-SOURCE VOLTAGE V_{GS} (V)

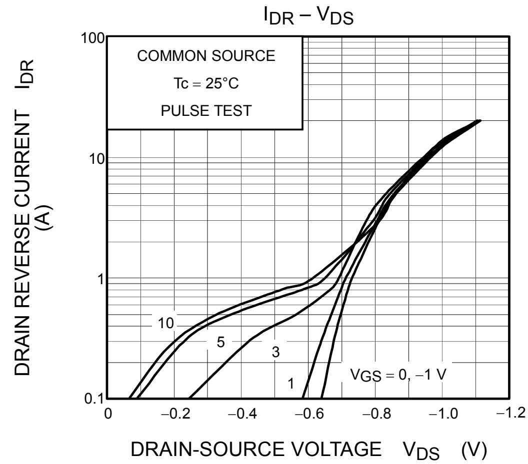


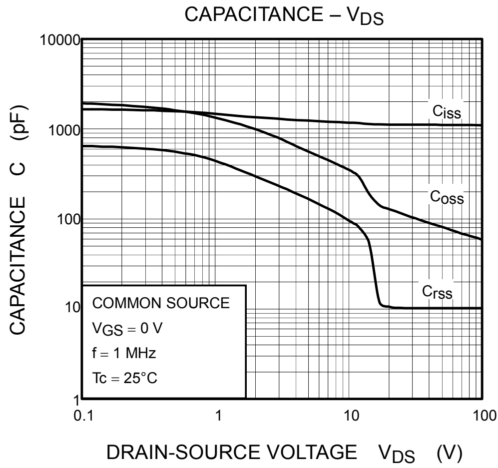
$|Y_{fs}| – I_D$
Tc = –55°C
25
100
COMMON SOURCE
V_{DS} = 10 V
PULSE TEST
FORWARD TRANSFER ADMITTANCE $|Y_{fs}|$ (S)
DRAIN CURRENT I_D (A)

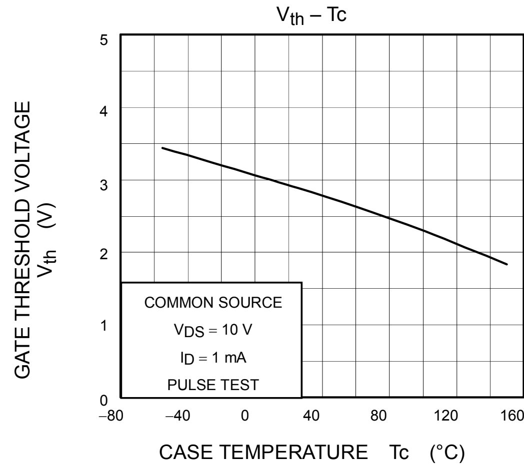


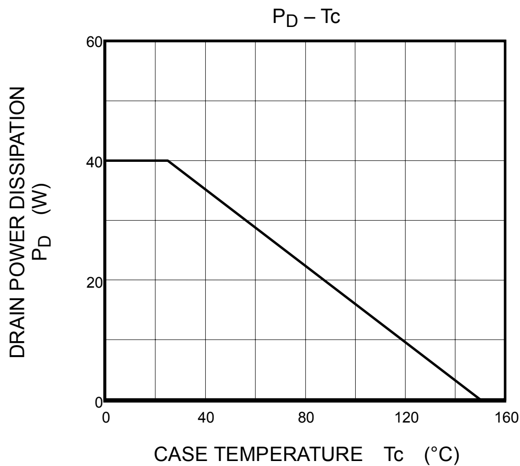
$R_{DS (ON)} – I_D$
COMMON SOURCE
Tc = 25°C
PULSE TEST
V_{GS} = 10 V、15V
DRAIN-SOURCE ON RESISTANCE $R_{DS (ON)}$ (Ω)
DRAIN CURRENT I_D (A)

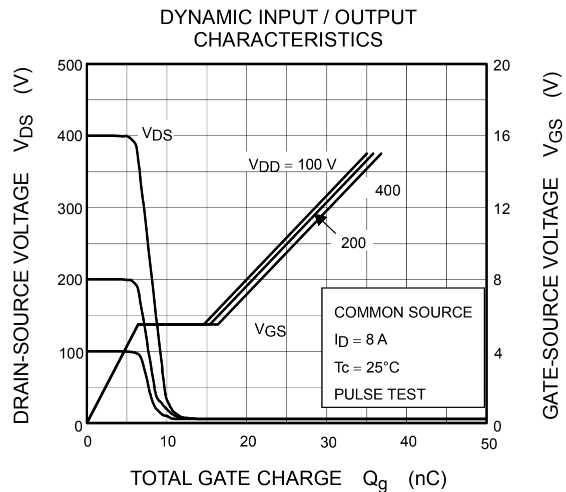

RDS (ON) – Tc
COMMON SOURCE
VGS = 10 V
PULSE TEST
ID = 8 A
4
2
DRAIN-SOURCE ON RESISTANCE RDS (ON) (Ω)
CASE TEMPERATURE Tc (°C)

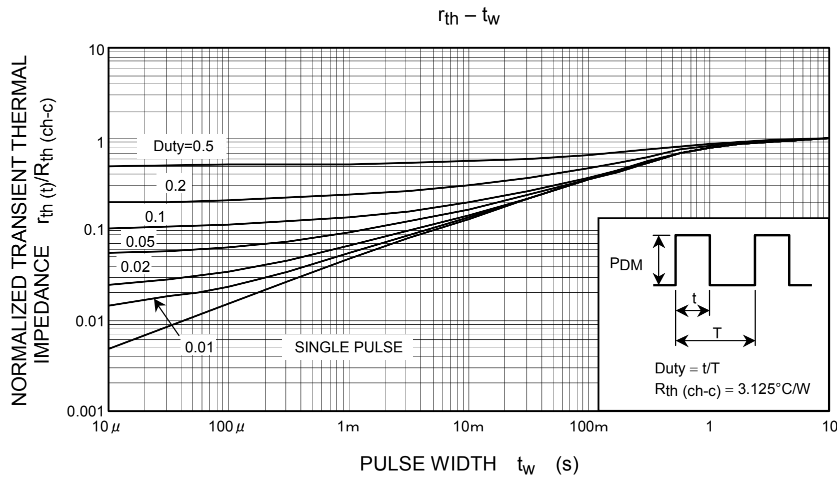

IDR – VDS
COMMON SOURCE
Tc = 25°C
PULSE TEST
10
5
3
1
VGS = 0, −1 V
DRAIN REVERSE CURRENT IDR (A)
DRAIN-SOURCE VOLTAGE VDS (V)

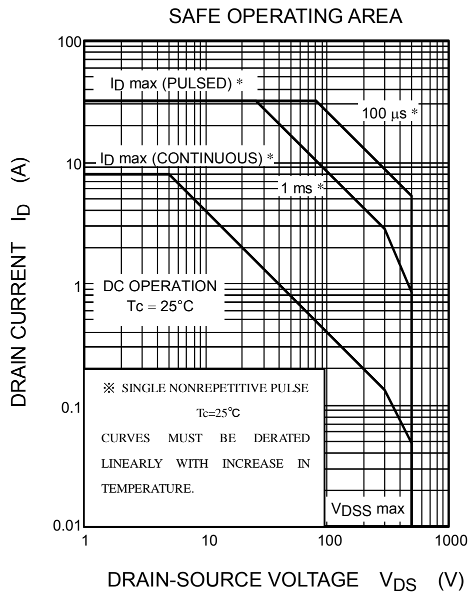

CAPACITANCE – VDS
Ciss
Coss
Crss
COMMON SOURCE
VGS = 0 V
f = 1 MHz
Tc = 25°C
CAPACITANCE C (pF)
DRAIN-SOURCE VOLTAGE VDS (V)

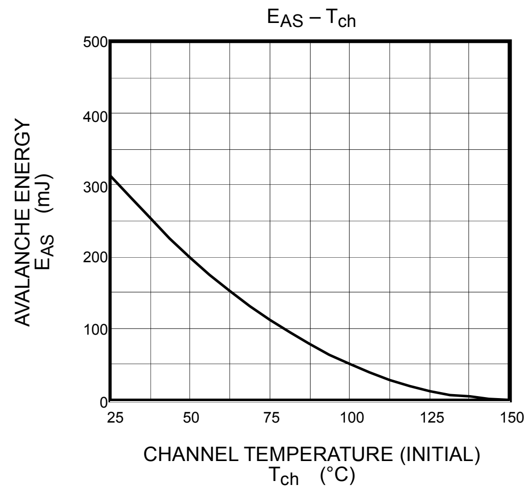

Vth – Tc
COMMON SOURCE
VDS = 10 V
ID = 1 mA
PULSE TEST
GATE THRESHOLD VOLTAGE Vth (V)
CASE TEMPERATURE Tc (°C)

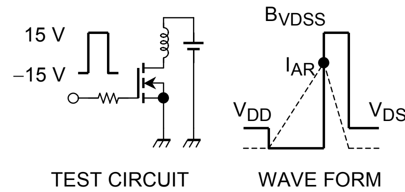

PD – Tc
DRAIN POWER DISSIPATION PD (W)
CASE TEMPERATURE Tc (°C)


DYNAMIC INPUT / OUTPUT CHARACTERISTICS
VDS
VDD = 100 V
400
200
VGS
COMMON SOURCE
ID = 8 A
Tc = 25°C
PULSE TEST
DRAIN-SOURCE VOLTAGE VDS (V)
GATE-SOURCE VOLTAGE VGS (V)
TOTAL GATE CHARGE Qg (nC)









$R_G = 25\ \Omega$
$V_{DD} = 90$ V, L = 8.3mH

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