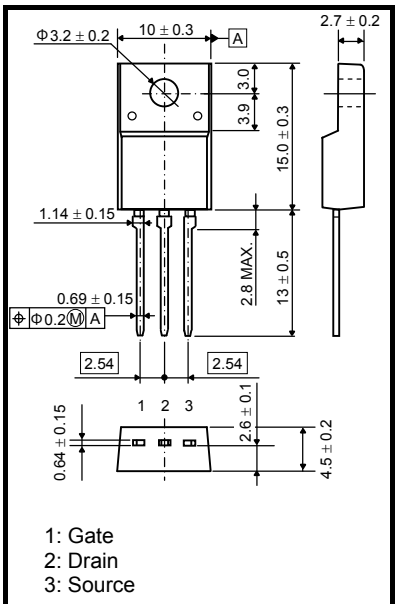
TK13A65U

Switching Regulator Applications

- Low drain-source ON resistance: $R_{DS\ (ON)}$ = 0.32 Ω (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 8.0 S (typ.)
- Low leakage current: I_{DSS} = 100 μA (max) (V_{DS} = 650 V)
- Enhancement-mode: V_{th} = 3.0 to 5.0 V (V_{DS} = 10 V, I_D = 1 mA)

Unit: mm



JEDEC	—
JEITA	SC-67
TOSHIBA	2-10U1B

Weight : 1.7 g (typ.)

Absolute Maximum Ratings (Ta = 25°C)

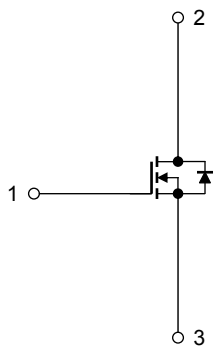
Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	650	V
Gate-source voltage		V_{GSS}	±30	V
Drain current	DC (Note 1)	I_D	13	A
	Pulse (t = 1 ms) (Note 1)	I_{DP}	26	
Drain power dissipation (Tc = 25°C)		P_D	40	W
Single pulse avalanche energy (Note 2)		E_{AS}	86	mJ
Avalanche current		I_{AR}	13	A
Repetitive avalanche energy (Note 3)		E_{AR}	4.0	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

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	$R_{th\ (ch-c)}$	3.125	°C/W
Thermal resistance, channel to ambient	$R_{th\ (ch-a)}$	62.5	°C/W

Internal Connection



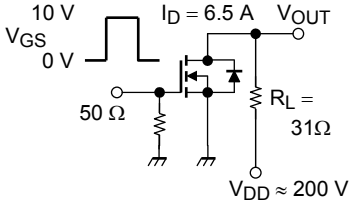
Note 1: Please use devices on conditions that the channel temperature is below 150°C.

Note 2: V_{DD} = 90 V, T_{ch} = 25 °C (initial), L = 0.9 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. Please handle with caution.

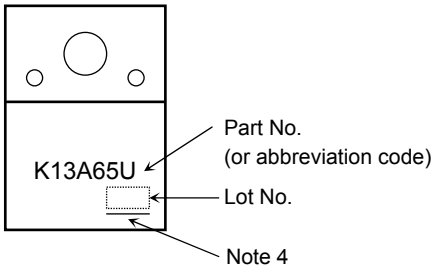
Electrical Characteristics (Ta = 25°C)

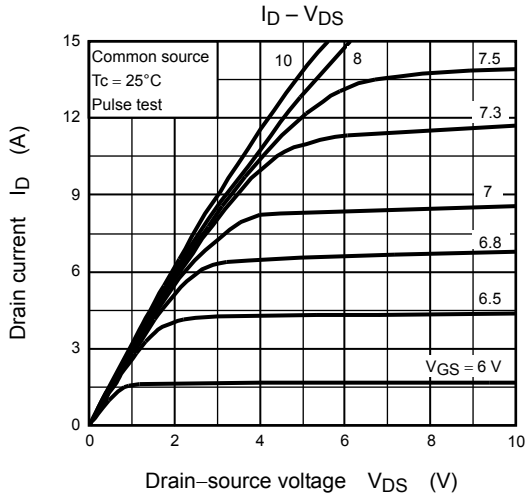
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±30 V, V_{DS} = 0 V	—	—	±1	μA
Drain cut-off current		I_{DSS}	V_{DS} = 650 V, V_{GS} = 0 V	—	—	100	μA
Drain-source breakdown voltage		$V_{(BR)DSS}$	I_D = 10 mA, V_{GS} = 0 V	650	—	—	V
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 1 mA	3.0	—	5.0	V
Drain-source ON resistance		$R_{DS(ON)}$	V_{GS} = 10 V, I_D = 6.5 A	—	0.32	0.38	Ω
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 6.5 A	2.0	8.0	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	950	—	pF
Reverse transfer capacitance		C_{rss}		—	47	—	
Output capacitance		C_{oss}		—	2300	—	
Switching time	Rise time	t_r	 Duty ≤ 1%, t_w = 10 μs	—	30	—	ns
	Turn-ON time	t_{on}		—	65	—	
	Fall time	t_f		—	8	—	
	Turn-OFF time	t_{off}		—	80	—	
Total gate charge		Q_g	V_{DD} ≈ 400 V, V_{GS} = 10 V, I_D = 13 A	—	17	—	nC
Gate-source charge		Q_{gs}		—	10	—	
Gate-drain charge		Q_{gd}		—	7	—	

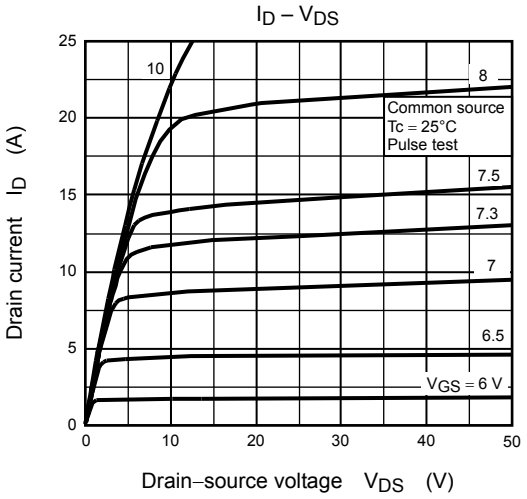
Source-Drain Ratings and Characteristics (Ta = 25°C)

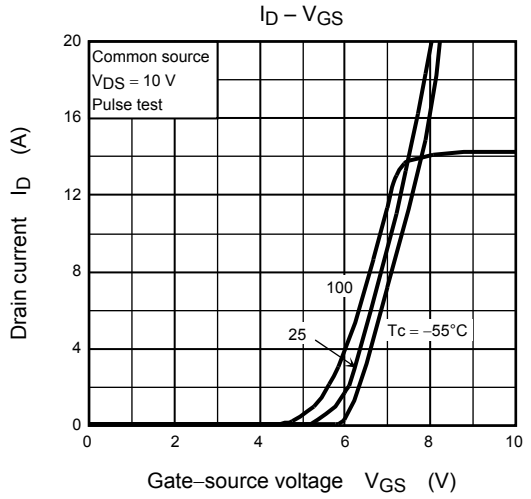
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	13	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	26	A
Forward voltage (diode)	V_{DSF}	I_{DR} = 13 A, V_{GS} = 0 V	—	—	−1.7	V
Reverse recovery time	t_{rr}	I_{DR} = 13 A, V_{GS} = 0 V, dI_{DR}/dt = 100 A/μs	—	430	—	ns
Reverse recovery charge	Q_{rr}		—	7.0	—	μC

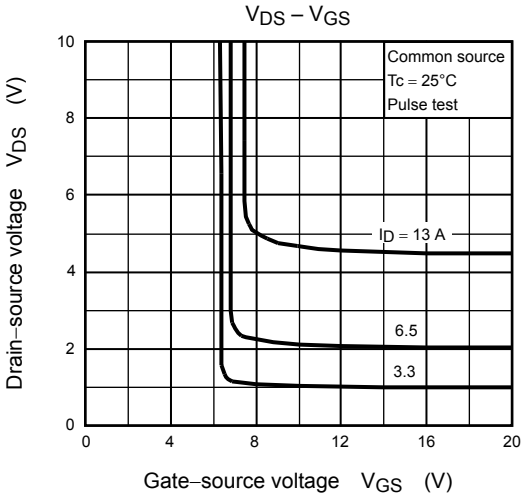
Marking

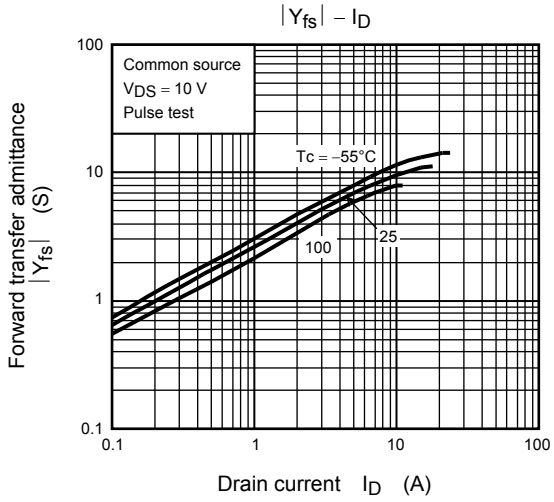


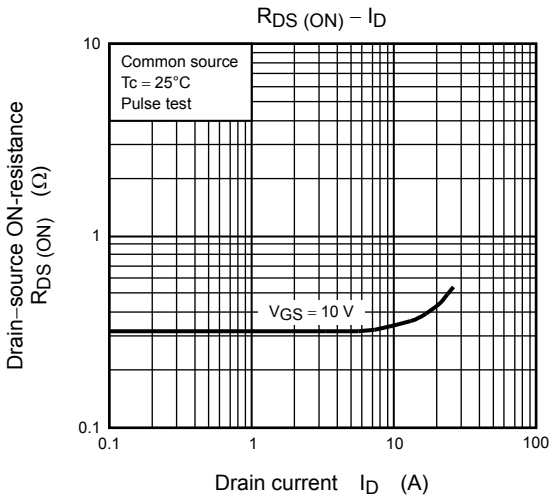

ID – VDS
Common source
Tc = 25°C
Pulse test
10
8
7.5
7.3
7
6.8
6.5
VGS = 6 V
Drain current ID (A)
Drain–source voltage VDS (V)
0
3
6
9
12
15
0
2
4
6
8
10


ID – VDS
10
8
Common source
Tc = 25°C
Pulse test
7.5
7.3
7
6.5
VGS = 6 V
Drain current ID (A)
Drain–source voltage VDS (V)
0
5
10
15
20
25
0
10
20
30
40
50


ID – VGS
Common source
VDS = 10 V
Pulse test
100
25
Tc = –55°C
Drain current ID (A)
Gate–source voltage VGS (V)
0
4
8
12
16
20
0
2
4
6
8
10


VDS – VGS
Common source
Tc = 25°C
Pulse test
ID = 13 A
6.5
3.3
Drain–source voltage VDS (V)
Gate–source voltage VGS (V)
0
2
4
6
8
10
0
4
8
12
16
20


|Yfs| – ID
Common source
VDS = 10 V
Pulse test
Tc = –55°C
100
25
Forward transfer admittance |Yfs| (S)
Drain current ID (A)
0.1
1
10
100
0.1
1
10
100


RDS (ON) – ID
Common source
Tc = 25°C
Pulse test
VGS = 10 V
Drain–source ON-resistance RDS (ON) (Ω)
Drain current ID (A)
0.1
1
10
0.1
1
10
100