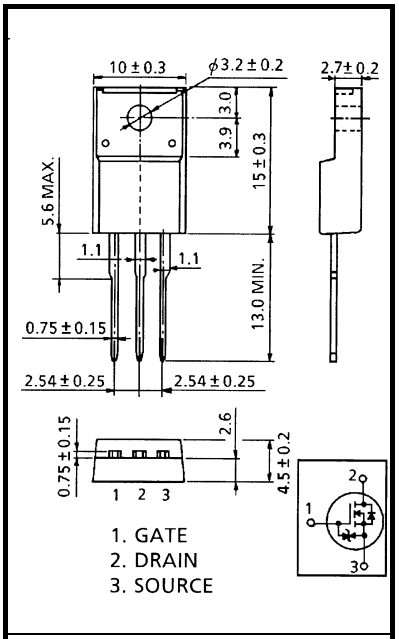
TOSHIBA Field Effect Transistor Silicon N-Channel MOS Type (U−MOSIII)

2SK3846

Switching Regulator, DC/DC Converter and Motor Drive Applications

- Low drain−source ON resistance : $R_{DS\ (ON)}$ = 12 mΩ (typ.)
- High forward transfer admittance : $|Y_{fs}|$ = 33 S (typ.)
- Low leakage current : I_{DSS} = 100 μA (max) (V_{DS} = 40 V)
- Enhancement mode : V_{th} = 1.5~2.5 V (V_{DS} = 10 V, I_D = 1 mA)

Unit: mm



JEDEC	—
JEITA	SC-67
TOSHIBA	2-10R1B

Weight: 1.9 g (typ.)

Maximum Ratings (Ta = 25°C)

Characteristic		Symbol	Rating	Unit
Drain–source voltage		V_{DSS}	40	V
Drain–gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	40	V
Gate–source voltage		V_{GSS}	±20	V
Drain current	DC (Note 1)	I_D	26	A
	Pulse (Note 1)	I_{DP}	78	A
Drain power dissipation (Tc = 25°C)		P_D	25	W
Single-pulse avalanche energy (Note 2)		E_{AS}	63	mJ
Avalanche current		I_{AR}	26	A
Repetitive avalanche energy (Note 3)		E_{AR}	2.5	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	$R_{th\ (ch–c)}$	5.0	°C/W
Thermal resistance, channel to ambient	$R_{th\ (ch–a)}$	62.5	°C/W

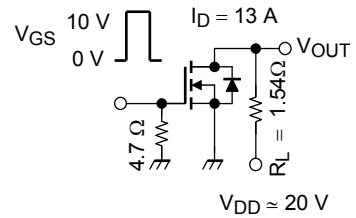
Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: V_{DD} = 25 V, T_{ch} = 25°C (initial), L = 97 μH, I_{AR} = 26 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.

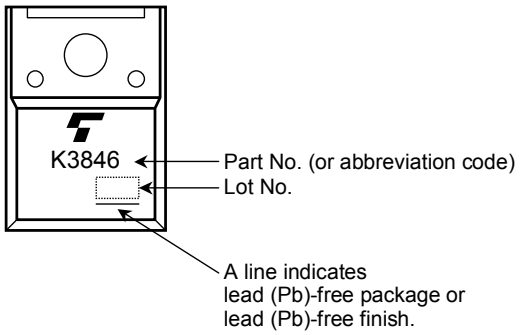
Electrical Characteristics (Ta = 25°C)

Characteristic		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V	—	—	±10	μA
Drain cutoff current		I_{DSS}	V_{DS} = 40 V, V_{GS} = 0 V	—	—	100	μA
Drain–source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	40	—	—	V
		$V_{(BR)\ DSX}$	I_D = 10 mA, V_{GS} = −20 V	15	—	—	
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 1 mA	1.5	—	2.5	V
Drain–source ON resistance		$R_{DS\ (ON)}$	V_{GS} = 4.5 V, I_D = 13 A	—	19	26	mΩ
			V_{GS} = 10 V, I_D = 13 A	—	12	16	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 13 A	16	33	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	1980	—	pF
Reverse transfer capacitance		C_{rss}		—	210	—	
Output capacitance		C_{oss}		—	300	—	
Switching time	Rise time	t_r		—	7	—	ns
	Turn–on time	t_{on}		—	22	—	
	Fall time	t_f		—	10	—	
	Turn–off time	t_{off}	Duty ≦ 1%, t_w = 10 μs	—	60	—	
Total gate charge (gate–source plus gate–drain)		Q_g	V_{DD} ≈ 32 V, V_{GS} = 10 V, I_D = 26 A	—	40	—	nC
Gate–source charge		Q_{gs}		—	28	—	
Gate–drain (“Miller”) Charge		Q_{gd}		—	12	—	

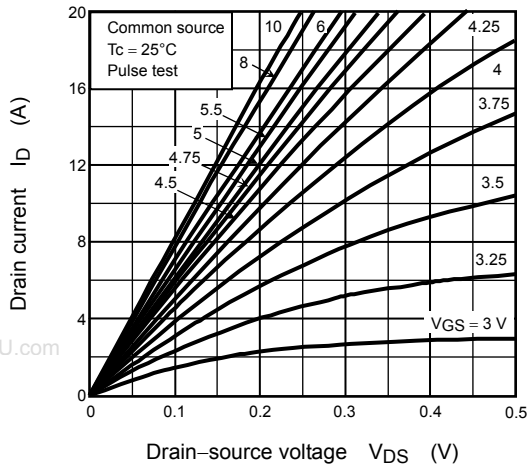
Source–Drain Ratings and Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Continuous drain reverse current (Note 1)	I_{DR}	—	—	—	26	A
Pulse drain reverse current (Note 1)	I_{DRP}	—	—	—	78	A
Forward voltage (diode)	V_{DSF}	I_{DR} = 26 A, V_{GS} = 0 V	—	—	−1.5	V
Reverse recovery time	t_{rr}	I_{DR} = 26 A, V_{GS} = 0 V	—	40	—	ns
Reverse recovery charge	Q_{rr}	dI_{DR} / dt = 50 A / μs	—	24	—	nC

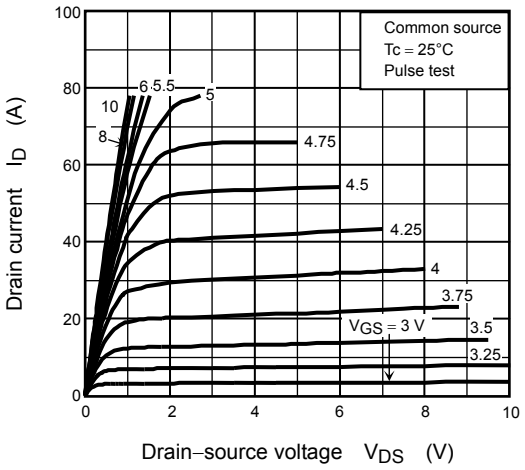
Marking



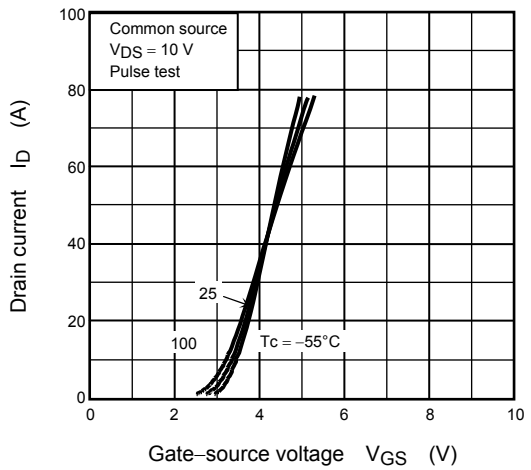
$I_D - V_{DS}$



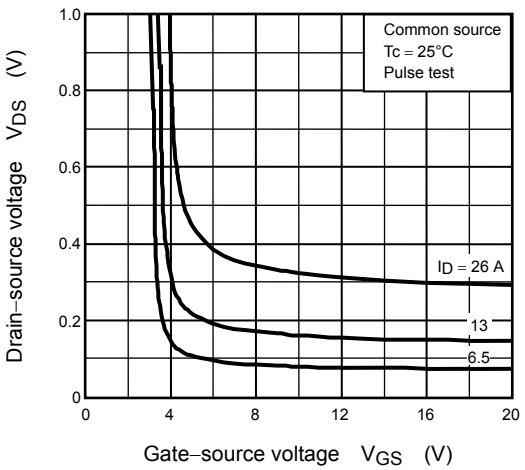
$I_D - V_{DS}$



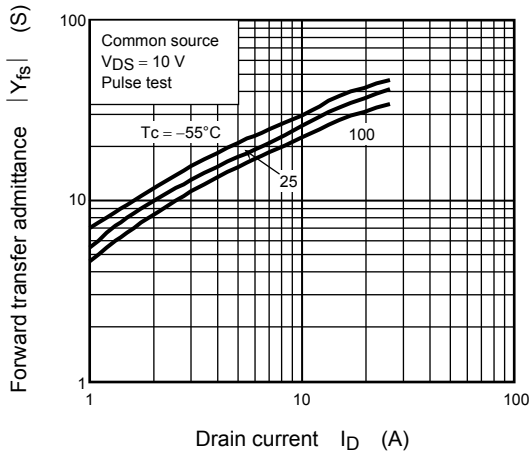
$I_D - V_{GS}$



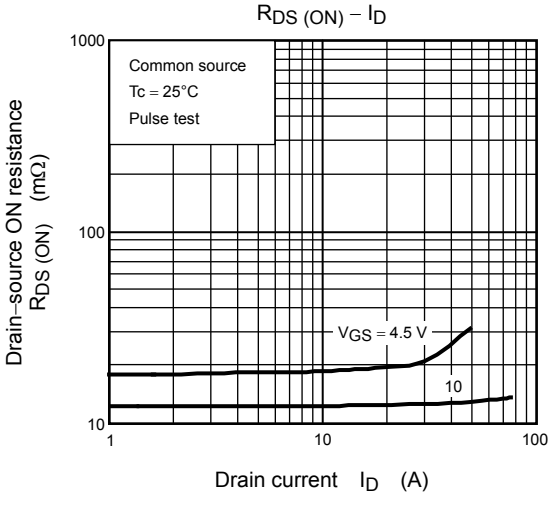
$V_{DS} - V_{GS}$



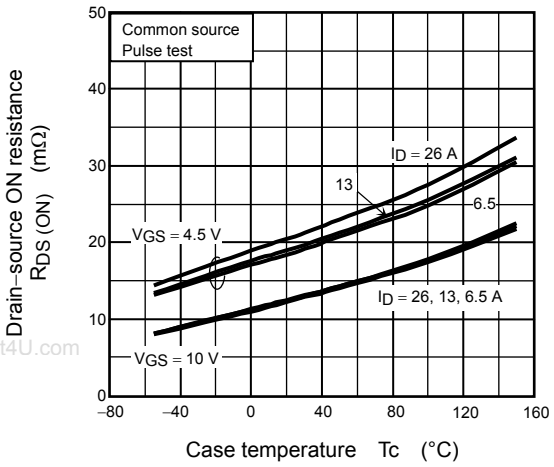
$|Y_{fs}| - I_D$



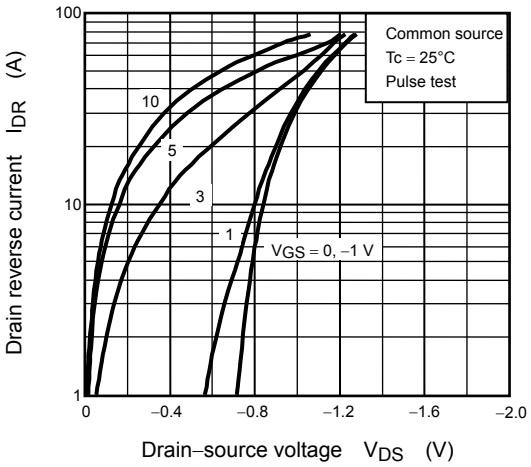
$R_{DS\ (ON)} - I_D$



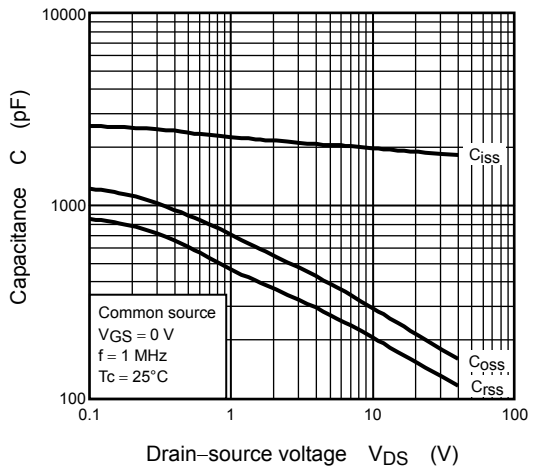
$R_{DS\ (ON)}$ – Tc



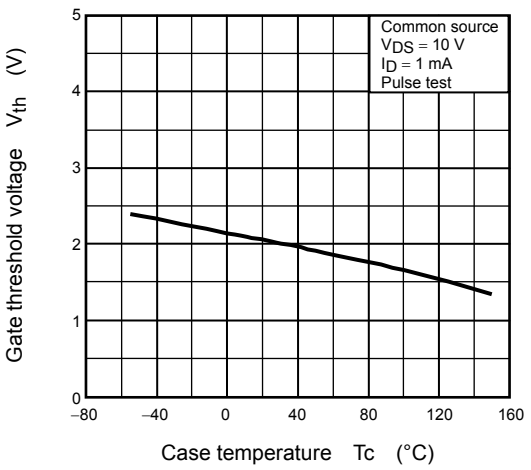
I_{DR} – V_{DS}



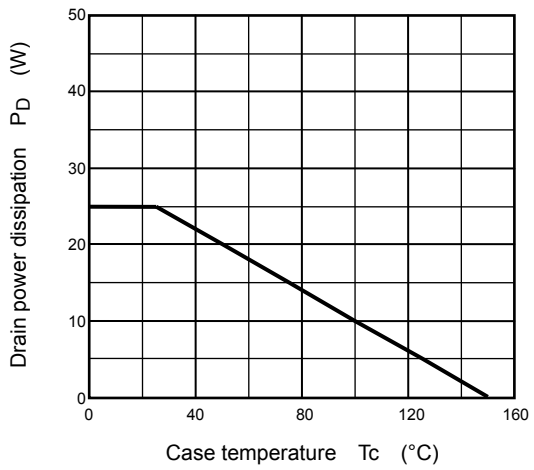
C – V_{DS}



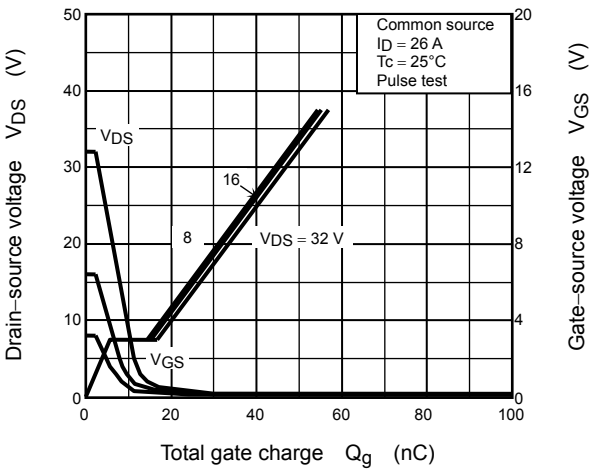
V_{th} – Tc



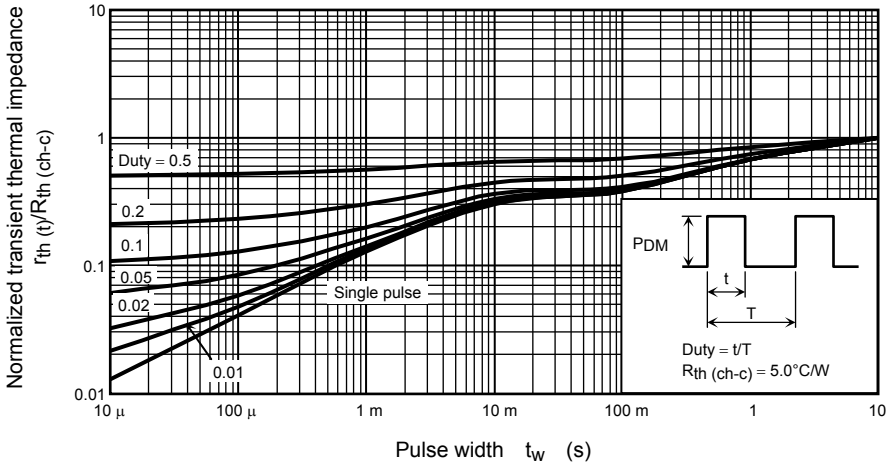
P_D – Tc



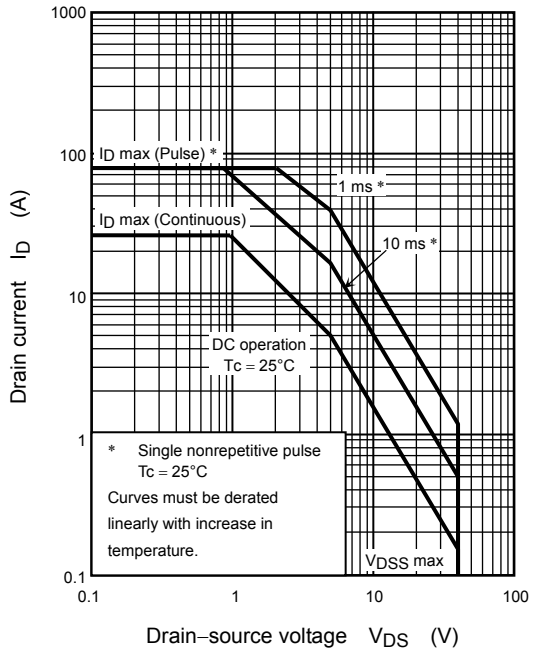
Dynamic input/output characteristics



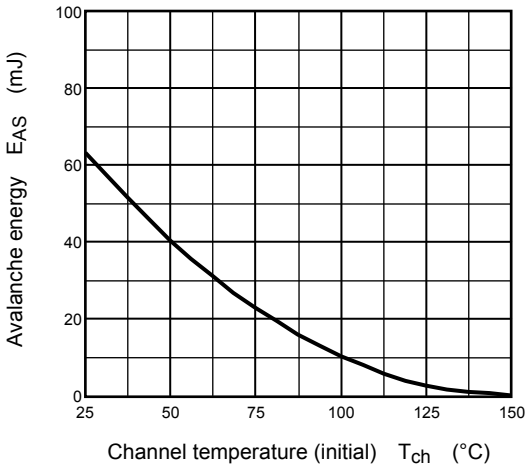
$r_{th} - t_w$

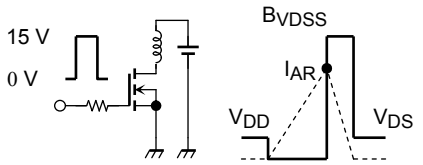


Safe operating area



$E_{AS} - T_{ch}$





Test circuit Wave form

$R_G = 25\ \Omega$
$V_{DD} = 25$ V, L = 48 μH

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

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20070701-EN

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