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

2SK3538

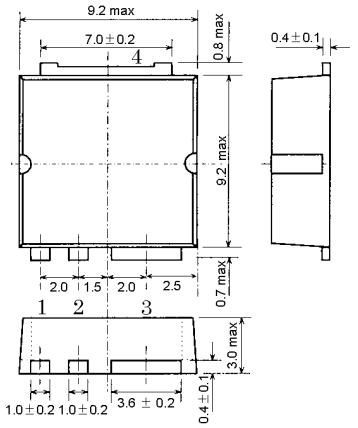
Switching Regulator, DC-DC Converter Applications

- Low drain-source ON resistance: $R_{DS\ (ON)}$ = 75 mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 7.0 S (typ.)
- Low leakage current: I_{DSS} = 100 μA (V_{DS} = 500 V)
- Enhancement-mode: V_{th} = 2.0 to 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 (Note 1)	I_{DP}	32	
Drain power dissipation (Tc = 25°C)		P_D	65	W
Single pulse avalanche energy (Note 2)		E_{AS}	312	mJ
Avalanche current		I_{AR}	8	A
Repetitive avalanche energy (Note 3)		E_{AR}	6.5	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

Unit: mm



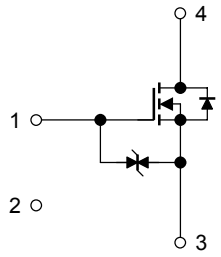
1. GATE : G
2. N.C.
3. SOURCE : S
4. DRAIN : D

JEDEC	—
JEITA	SC-97
TOSHIBA	2-9F1B

Weight: 0.74 g (typ.)

Thermal Characteristics

Characteristics	Symbol	Max	Unit
Thermal resistance, channel to case	$R_{th\ (ch-c)}$	1.92	°C/W



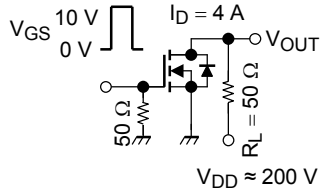
Note 1: Please use devices on condition that the channel temperature is below 150°C.

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.

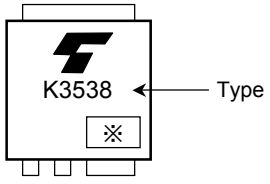
Electrical Characteristics (Ta = 25°C)

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_S = 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		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 4 A	3.5	7.0	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	1300	—	pF
Reverse transfer capacitance		C_{rss}		—	130	—	
Output capacitance		C_{oss}		—	400	—	
Switching time	Rise time	t_r	 Duty ≤ 1%, t_w = 10 μs	—	26	—	pF
	Turn-on time	t_{on}		—	45	—	
	Fall time	t_f		—	40	—	
	Turn-off time	t_{off}		—	140	—	
Total gate charge (gate-source plus gate-drain)		Q_g	V_{DD} ≈ 400 V, V_{GS} = 10 V, I_D = 8 A	—	30	—	nC
Gate-source charge		Q_{gs}		—	17	—	
Gate-drain (“miller”) charge		Q_{gd}		—	13	—	

Source-Drain Diode 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, dI_{DR}/dt = 100 A/μs	—	1200	—	ns
Reverse recovery charge	Q_{rr}		—	10	—	μC

Marking

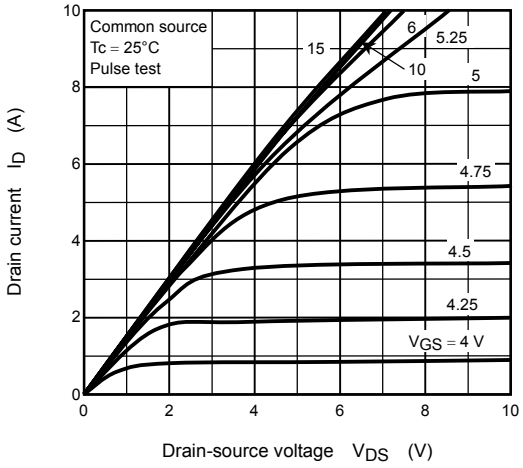


※ Lot Number

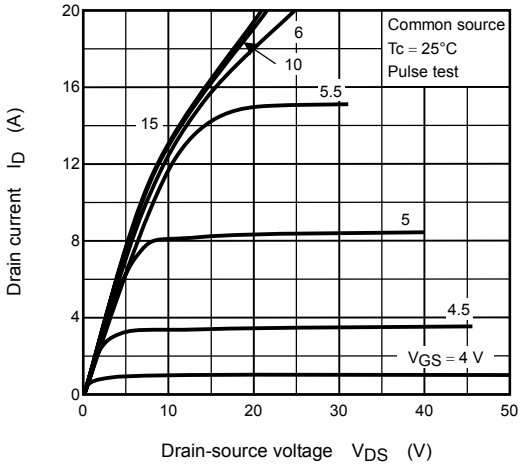
Month (starting from alphabet A)

Year (last number of the christian era)

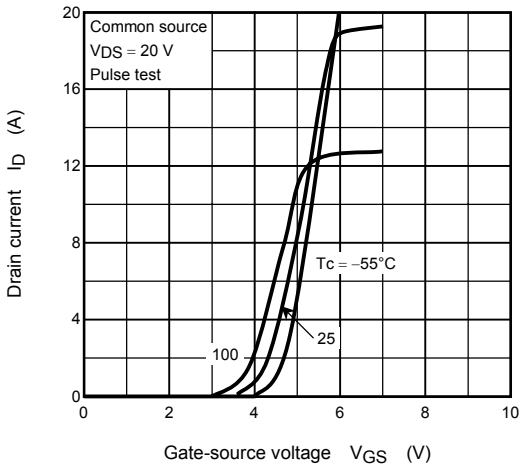
$I_D - V_{DS}$



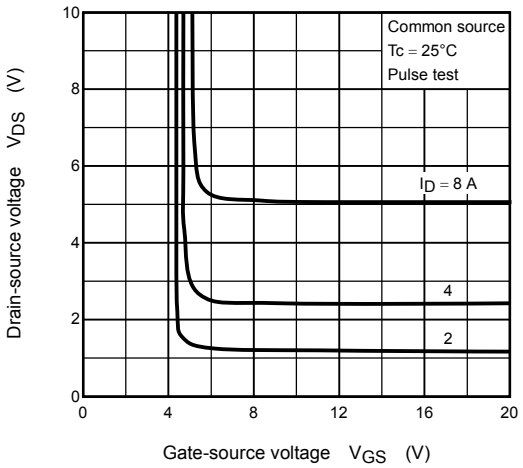
$I_D - V_{DS}$



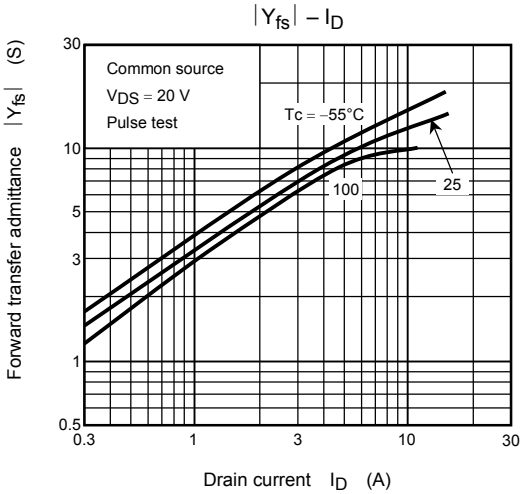
$I_D - V_{GS}$



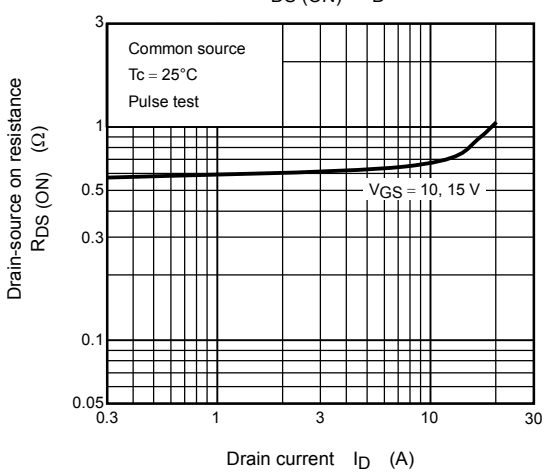
$V_{DS} - V_{GS}$



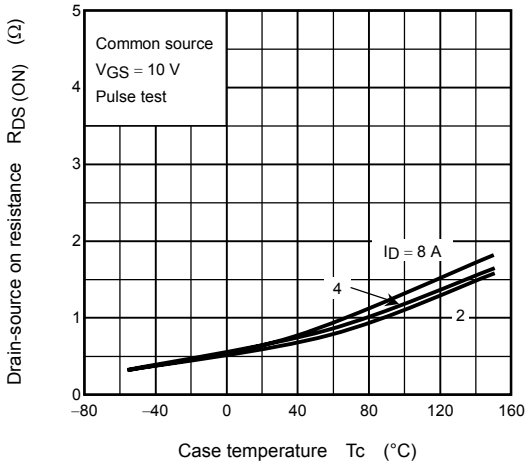
$|Y_{fs}| - I_D$



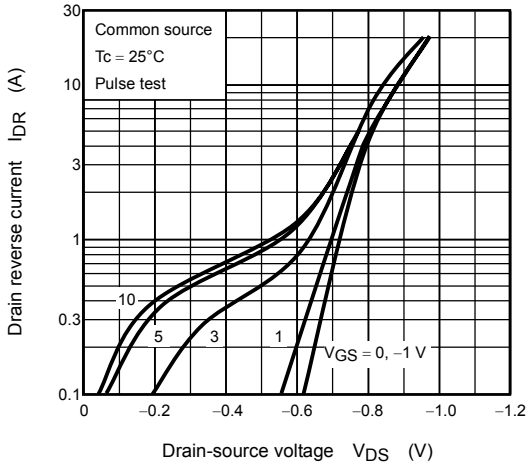
$R_{DS\ (ON)} - I_D$



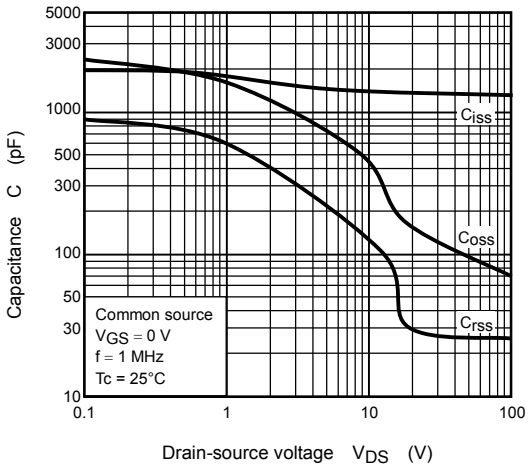
$R_{DS\ (ON)}$ – Tc



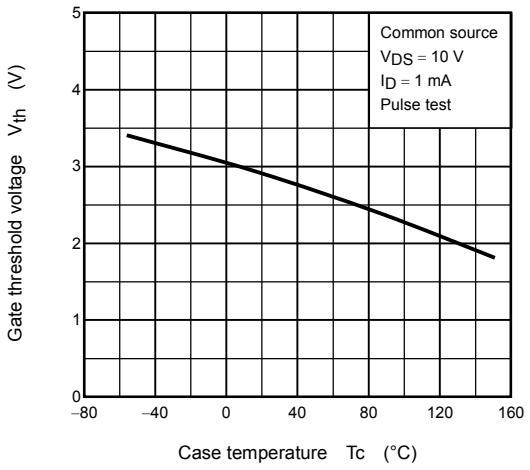
I_{DR} – V_{DS}



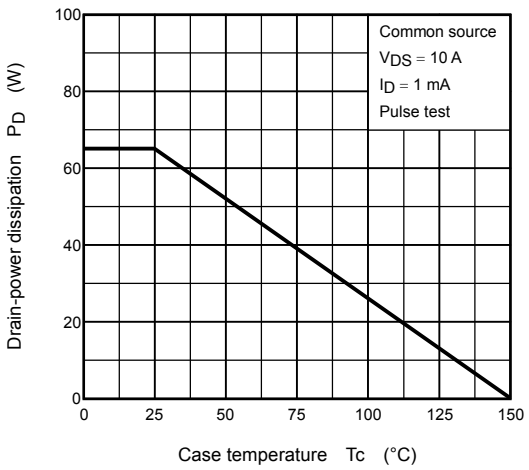
Capacitance – V_{DS}



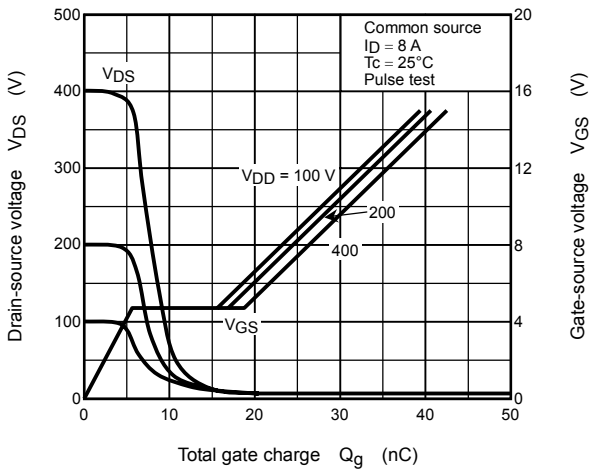
V_{th} – Tc



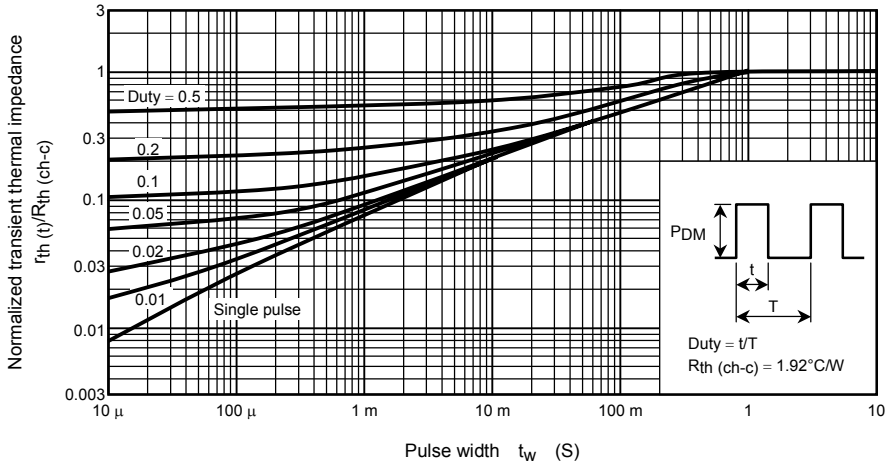
P_D – Tc



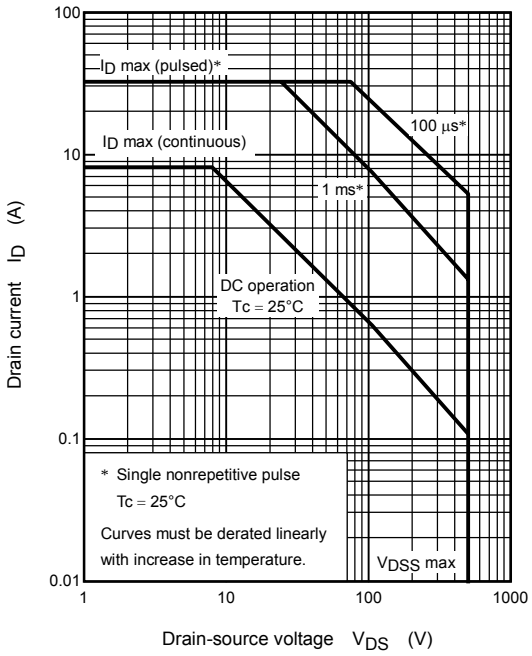
Dynamic input/output characteristics



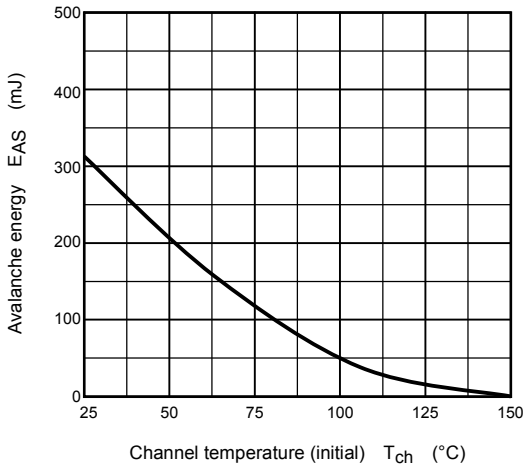
$r_{th} - t_w$

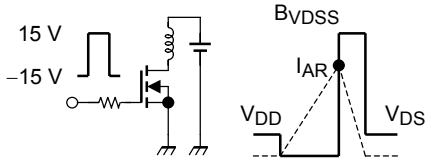


Safe operating area



$E_{AS} - T_{ch}$





Test circuit Waveform

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

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

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