

5. Thermal Characteristics

Characteristics	Symbol	Max	Unit
Channel-to-case thermal resistance	$R_{th(ch-c)}$	0.49	°C/W
Channel-to-ambient thermal resistance	$R_{th(ch-a)}$	83.3	

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

Note 2: Limited by silicon chip capability. Package limit is 100 A.

Note 3: Device mounted with heatsink so that $R_{th(ch-a)}$ becomes 2.77°C/W.

Note 4: $V_{DD} = 80\text{ V}$, $T_{ch} = 25^\circ\text{C}$ (initial), $L = 48.3\text{ }\mu\text{H}$, $I_{AR} = 72\text{ A}$

Note: This transistor is sensitive to electrostatic discharge and should be handled with care.

6. Electrical Characteristics

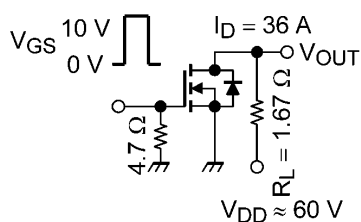
6.1. Static Characteristics ($T_a = 25^\circ\text{C}$ unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I_{GSS}	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$	—	—	± 0.1	μA
Drain cut-off current	I_{DSS}	$V_{DS} = 120\text{ V}$, $V_{GS} = 0\text{ V}$	—	—	10	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$I_D = 10\text{ mA}$, $V_{GS} = 0\text{ V}$	120	—	—	V
Drain-source breakdown voltage (Note 5)	$V_{(BR)DSX}$	$I_D = 10\text{ mA}$, $V_{GS} = -20\text{ V}$	90	—	—	
Gate threshold voltage	V_{th}	$V_{DS} = 10\text{ V}$, $I_D = 1.0\text{ mA}$	2.0	—	4.0	
Drain-source on-resistance	$R_{DS(ON)}$	$V_{GS} = 10\text{ V}$, $I_D = 36\text{ A}$	—	3.6	4.4	$\text{m}\Omega$

Note 5: If a reverse bias is applied between gate and source, this device enters $V_{(BR)DSX}$ mode. Note that the drain-source breakdown voltage is lowered in this mode.

6.2. Dynamic Characteristics ($T_a = 25^\circ\text{C}$ unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Input capacitance	C_{iss}	$V_{DS} = 60\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	—	8100	—	pF
Reverse transfer capacitance	C_{rss}		—	30	—	
Output capacitance	C_{oss}		—	1200	—	
Gate resistance	r_g	—	—	2.4	—	Ω
Switching time (rise time)	t_r	See Figure 6.2.1	—	33	—	ns
Switching time (turn-on time)	t_{on}		—	64	—	
Switching time (fall time)	t_f		—	37	—	
Switching time (turn-off time)	t_{off}		—	120	—	



Duty $\leq 1\%$, $t_w = 10\text{ }\mu\text{s}$
Fig. 6.2.1 Switching Time Test Circuit

6.3. Gate Charge Characteristics ($T_a = 25^\circ\text{C}$ unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Total gate charge (gate-source plus gate-drain)	Q_g	$V_{DD} \approx 96\text{ V}$, $V_{GS} = 10\text{ V}$, $I_D = 72\text{ A}$	—	130	—	nC
Gate-source charge 1	Q_{gs1}		—	44	—	
Gate-drain charge	Q_{gd}		—	34	—	
Gate switch charge	Q_{SW}		—	52	—	

6.4. Source-Drain Characteristics ($T_a = 25^\circ\text{C}$ unless otherwise specified)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Reverse drain current (DC) (Note 6)	I_{DR}	—	—	—	72	A
Reverse drain current (pulsed) (Note 6)	I_{DRP}	—	—	—	360	
Diode forward voltage	V_{DSF}	$I_{DR} = 72\text{ A}, V_{GS} = 0\text{ V}$	—	—	-1.2	V
Reverse recovery time (Note 7)	t_{rr}	$I_{DR} = 72\text{ A}, V_{GS} = 0\text{ V}$ $-di_{DR}/dt = 100\text{ A}/\mu\text{s}$	—	110	—	ns
Reverse recovery charge (Note 7)	Q_{rr}		—	290	—	nC

Note 6: Ensure that the channel temperature does not exceed 150°C .

Note 7: Ensure that V_{DS} peak does not exceed V_{DSS} .

7. Marking

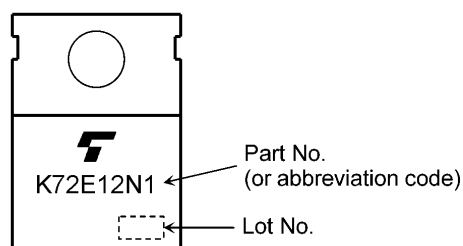


Fig. 7.1 Marking

8. Characteristics Curves (Note)

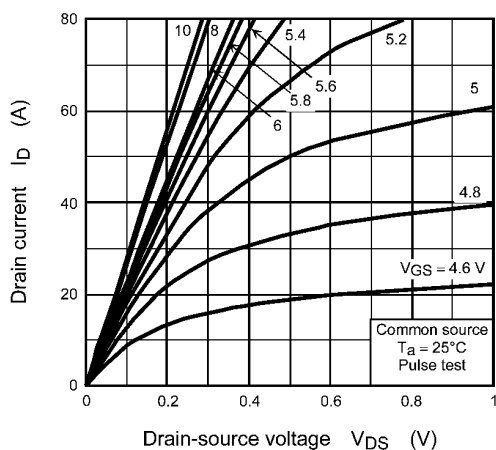


Fig. 8.1 $I_D - V_{DS}$

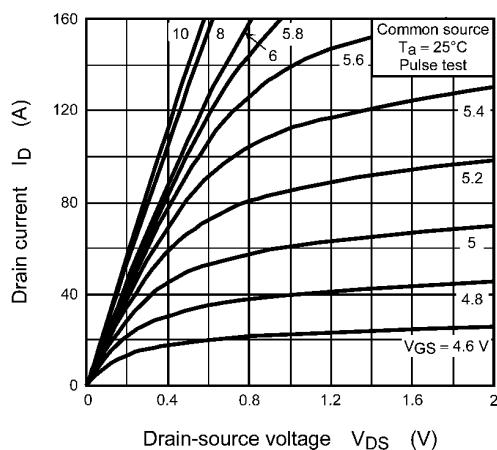


Fig. 8.2 $I_D - V_{DS}$

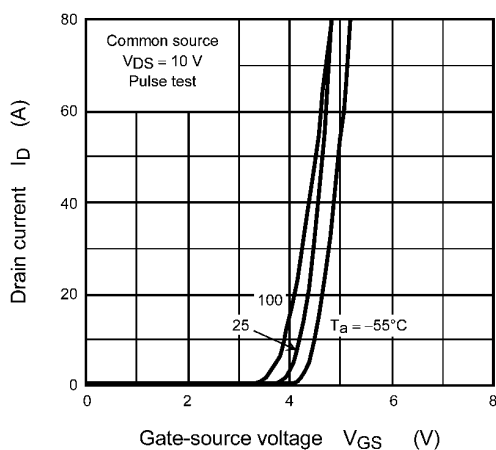


Fig. 8.3 $I_D - V_{GS}$

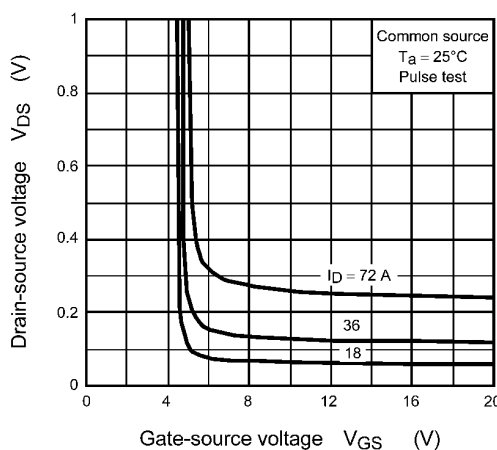


Fig. 8.4 $V_{DS} - V_{GS}$

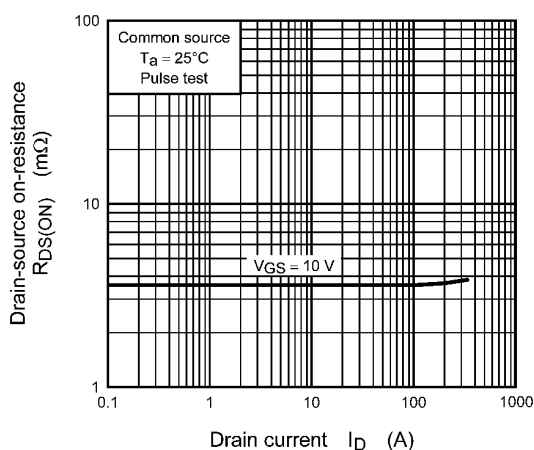


Fig. 8.5 $R_{DS(ON)} - I_D$

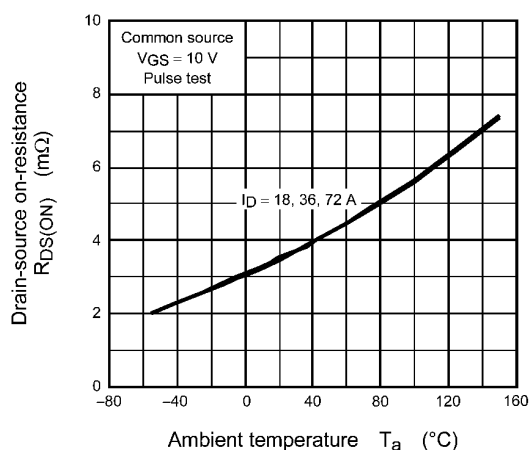


Fig. 8.6 $R_{DS(ON)} - T_a$

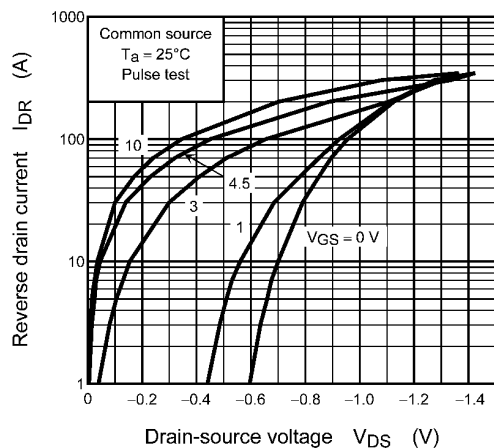


Fig. 8.7 $I_{DR} - V_{DS}$

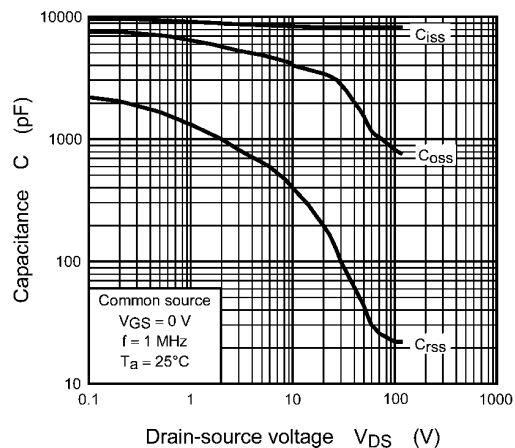


Fig. 8.8 Capacitance - V_{DS}

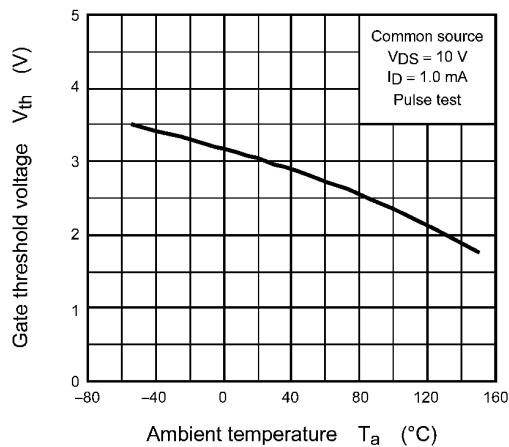


Fig. 8.9 $V_{th} - T_a$

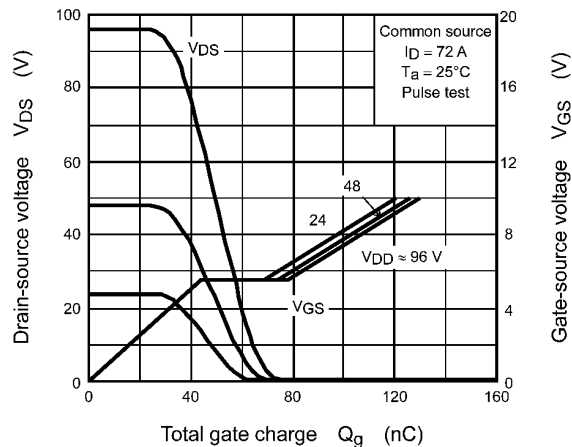
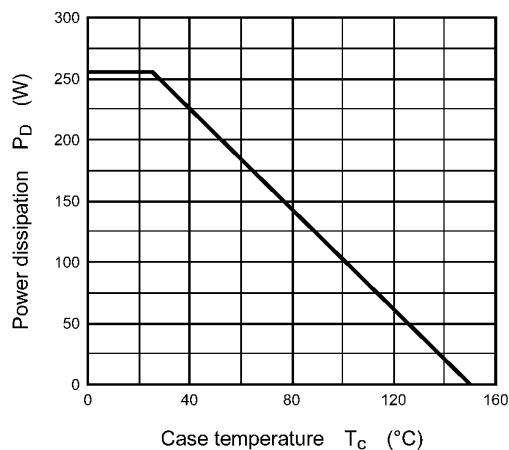


Fig. 8.10 Dynamic Input/Output Characteristics



**Fig. 8.11 $P_D - T_c$
 (Guaranteed Maximum)**

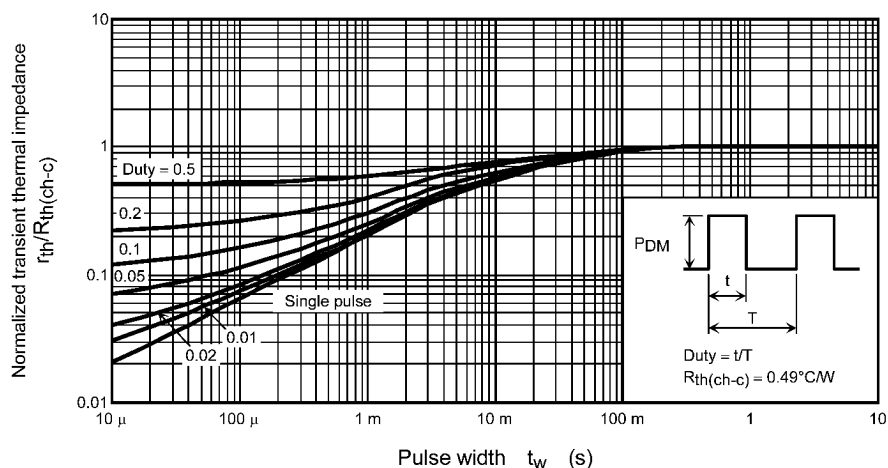


Fig. 8.12 $r_{th}/R_{th(ch-c)} - t_w$
(Guaranteed Maximum)

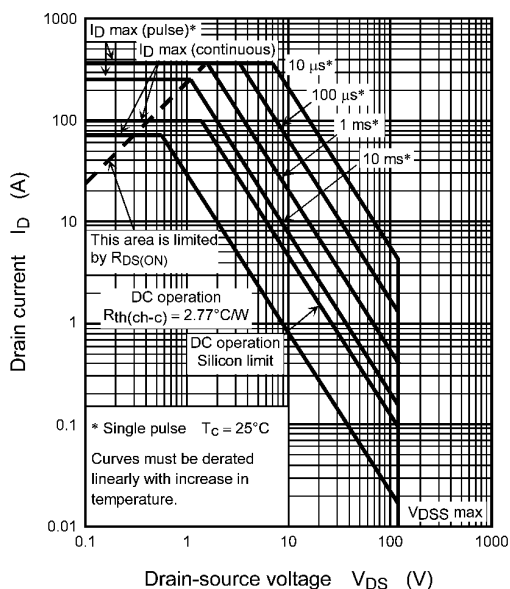


Fig. 8.13 Safe Operating Area
(Guaranteed Maximum)

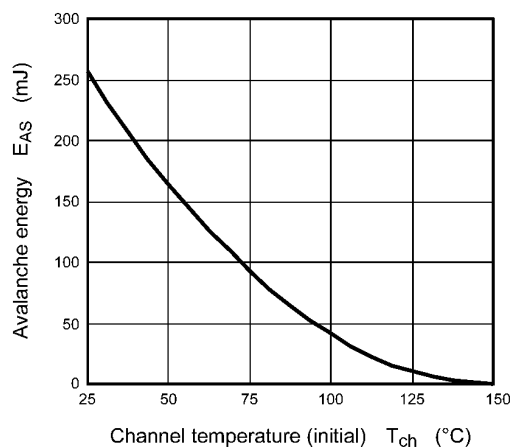


Fig. 8.14 $E_{AS} - T_{ch}$
(Guaranteed Maximum)

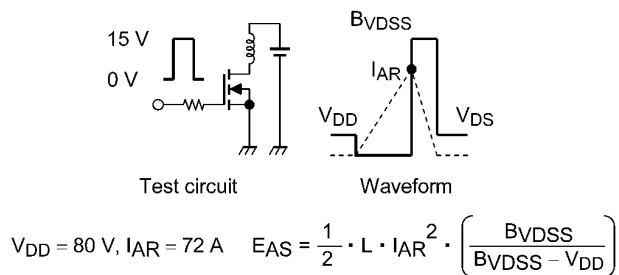
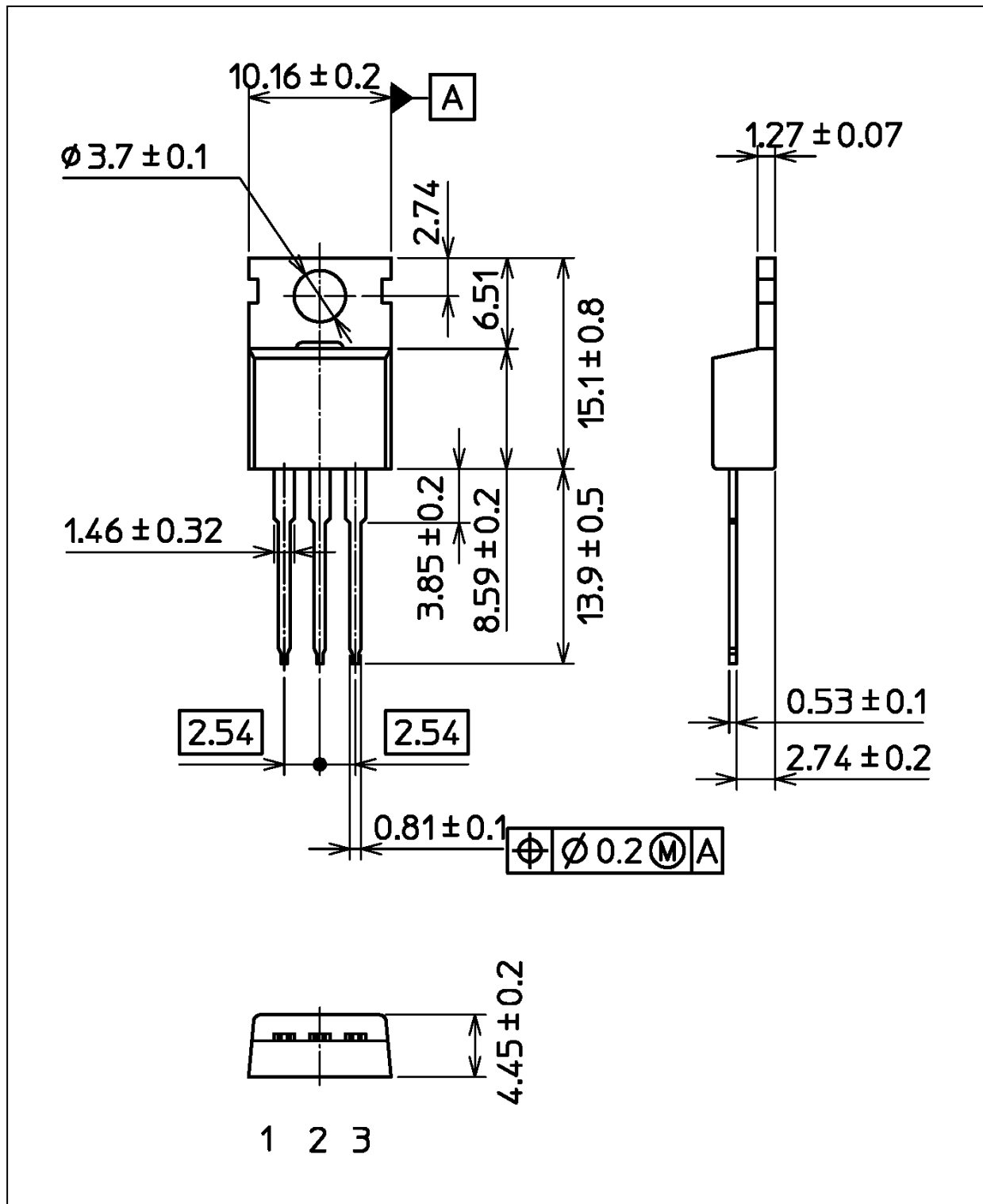


Fig. 8.15 Test Circuit/Waveform

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

Package Dimensions

Unit: mm



Weight: 1.93 g (typ.)

Package Name(s)
TOSHIBA: 2-10X1A
Nickname: TO-220

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