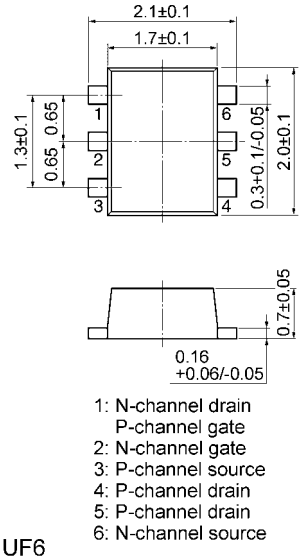
TOSHIBA Multi-Chip Device
Silicon P-Channel MOS Type (U-MOS II) + N-Channel MOS Type (Planer)

SSM6E01TU

Load Switch Applications

- P-channel MOSFET and N-channel MOSFET incorporated into one package.
- Low power dissipation due to P-channel MOSFET that features low $R_{DS\ (ON)}$ and low-voltage operation

Unit: mm



UF6

JEDEC	—
JEITA	—
TOSHIBA	—

Weight: 7.0 mg (typ.)

Q1 Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	−12	V
Gate-Source voltage		V_{GSS}	±12	V
Drain current	DC	I_D	−1.0	A
	Pulse	I_{DP} (Note 2)	−2.0	

Q2 Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-Source voltage		V_{DS}	20	V
Gate-Source voltage		V_{GSS}	10	V
Drain current	DC	I_D	0.05	A
	Pulse	I_{DP} (Note 2)	0.2	

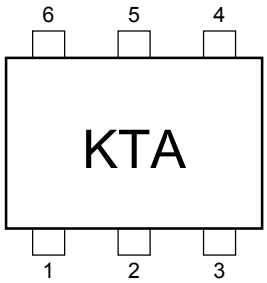
Maximum Ratings (Q1, Q2 common) (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Drain power dissipation	P_D (Note 1)	0.5	W
Channel temperature	T_{ch}	150	°C
Storage temperature range	T_{stg}	−55~150	°C

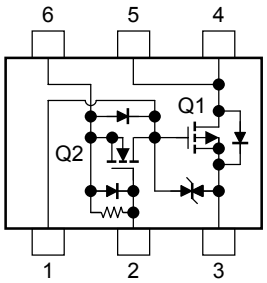
Note 1: Mounted on an FR4 board (25.4 mm × 25.4 mm × 1.6 t, Cu pad: 645 mm^2)

Note 2: Pulse width limited by maximum channel temperature.

Marking



Equivalent Circuit (top view)



Handling Precaution

This product has a MOS structure and is sensitive to electrostatic discharge. When handling individual devices (that have not yet been mounted on a PCB), ensure that the environment is protected against static electricity. Operators should wear anti-static clothing, containers and other objects which may come into direct contact with devices should be made of anti-static materials.

Thermal resistance $R_{th\ (j\text{-}a)}$ and drain power dissipation P_D vary depending on board material, board area, board thickness and pad area. When using this device, please take heat dissipation into consideration.

Q1 Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Forward voltage (diode)	V_{DSF}	I_{DR} = 1.0 A, V_{GS} = 0 V	—	—	1.2	V
Gate leakage current	I_{GSS}	V_{GS} = ±10 V, V_{DS} = 0	—	—	±1	μA
Drain-Source breakdown voltage	$V_{(BR)\ DSS}$	I_D = −1 mA, V_{GS} = 0	−12	—	—	V
Drain cut-off current	I_{DSS}	V_{DS} = −12 V, V_{GS} = 0	—	—	−1	μA
Gate threshold voltage	V_{th}	V_{DS} = −3 V, I_D = −0.1 mA	−0.4	—	−1.1	V
Forward transfer admittance	$\|Y_{fs}\|$	V_{DS} = −3 V, I_D = −0.5 A (Note 3)	1.3	2.5	—	S
Drain-Source ON resistance	$R_{DS\ (ON)}$	I_D = −0.5 A, V_{GS} = −4 V (Note 3)	—	125	160	mΩ
		I_D = −0.5 A, V_{GS} = −2.5 V (Note 3)	—	180	240	
Input capacitance	C_{iss}	V_{DS} = −10 V, V_{GS} = 0, f = 1 MHz	—	310	—	pF

Note 3: Pulse test

Q2 Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current	I_{GSS}	V_{GS} = 10 V, V_{DS} = 0	—	—	15	μA
Drain-Source breakdown voltage	$V_{(BR)\ DSS}$	I_D = 0.1 mA, V_{GS} = 0	20	—	—	V
Drain cut-off current	I_{DSS}	V_{DS} = 20 V, V_{GS} = 0	—	—	1	μA
Gate threshold voltage	V_{th}	V_{DS} = 3 V, I_D = 0.1 mA	0.7	—	1.3	V
Forward transfer admittance	$\|Y_{fs}\|$	V_{DS} = 3 V, I_D = 10 mA (Note 3)	25	50	—	mS
Drain-Source ON resistance	$R_{DS\ (ON)}$	I_D = 10 mA, V_{GS} = 2.5 V (Note 3)	—	4	10	Ω
Input capacitance	C_{iss}	V_{DS} = 3 V, V_{GS} = 0, f = 1 MHz	—	11	—	pF
Gate-Source resistance	R_{GS}	V_{GS} = 0~10 V	0.7	1.0	1.3	MΩ

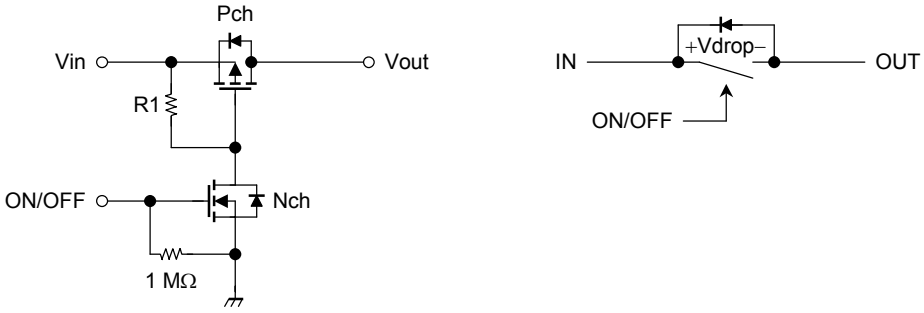
Note 3: Pulse test

Precaution

V_{th} can be expressed as voltage between gate and source when low operating current value is I_D = ±100 μA for this product. For normal switching operation, $V_{GS\ (on)}$ requires higher voltage than V_{th} and $V_{GS\ (off)}$ requires lower voltage than V_{th}. (Relationship can be established as follows: $V_{GS\ (off)} < V_{th} < V_{GS\ (on)}$)

Please take this into consideration for using the device. 2.5 V or higher is recommended for V_{GS} voltage to turn on the N-channel MOSFET of this product.

Load Switch Application



Load Switch Ratings (Ta = 25°C)

Characteristics	Symbol	Rating	Unit
Input voltage	V_{in}	2.5~12	V
ON/OFF voltage	$V_{on/off}$	2.5~10	V
Load current (DC)	I_L	1	A
Load current (pulse)	I_{LP} (Note 4)	2	A
Channel temperature	T_{ch}	150	°C

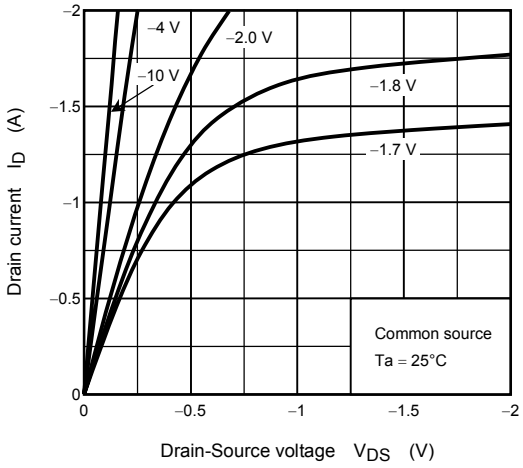
Note 4: Pulse width limited by maximum channel temperature.

Load Switch Electrical Characteristics (Ta = 25°C)

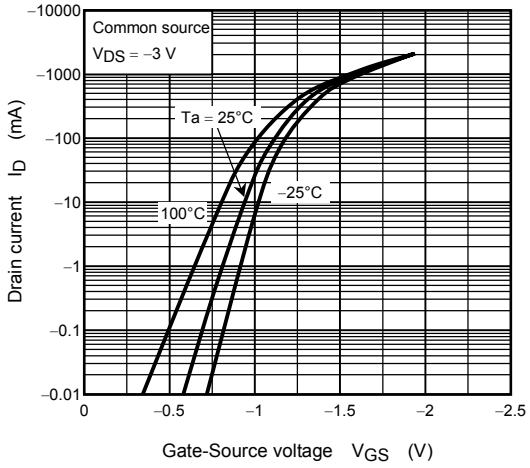
Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Leakage current	I_{FL}	V_{in} = 8 V, $V_{ON/OFF}$ = 0	—	—	1	μA
P-channel drop voltage	$V_{DROP\ (1)}$	V_{in} = 3.0 V, $V_{ON/OFF}$ = 2.5 V, I_L = 0.5 A	—	0.09	0.12	V
	$V_{DROP\ (2)}$	V_{in} = 5.0 V, $V_{ON/OFF}$ = 2.5 V, I_L = 1.0 A	—	0.13	0.16	
N-channel drive voltage	$V_{on/off}$	V_{DS} = 3 V, I_D = 0.1 mA	0.7	—	1.3	V

Q1 (Pch MOSFET)

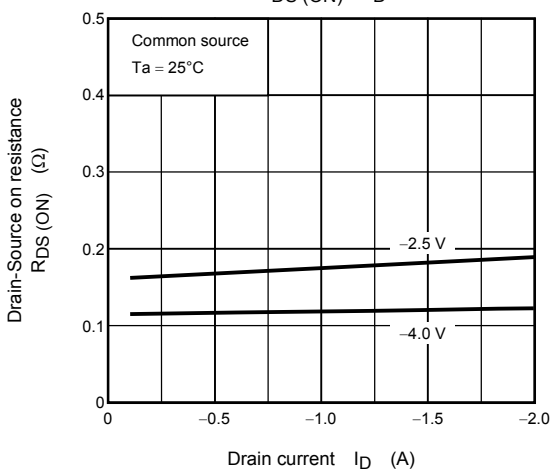
$I_D - V_{DS}$



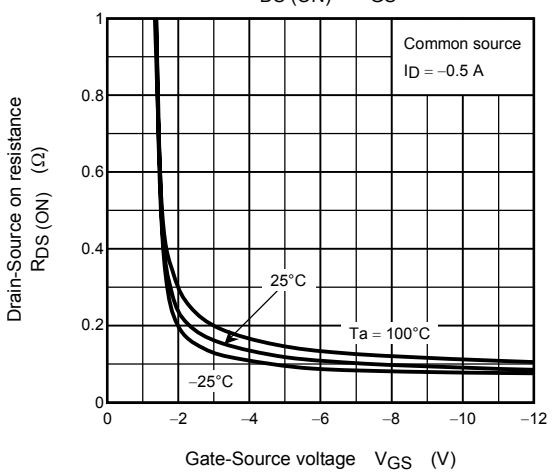
$I_D - V_{GS}$



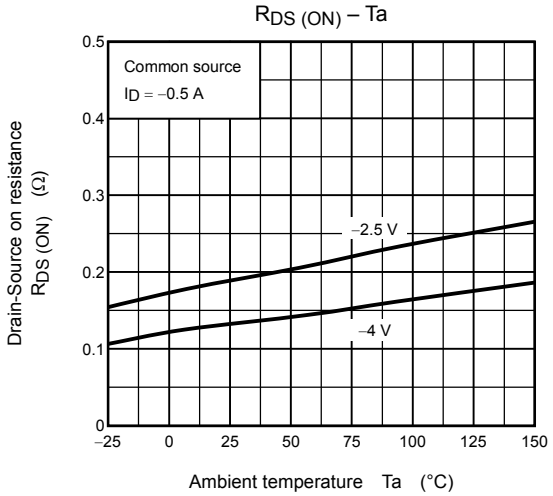
$R_{DS\ (ON)} - I_D$



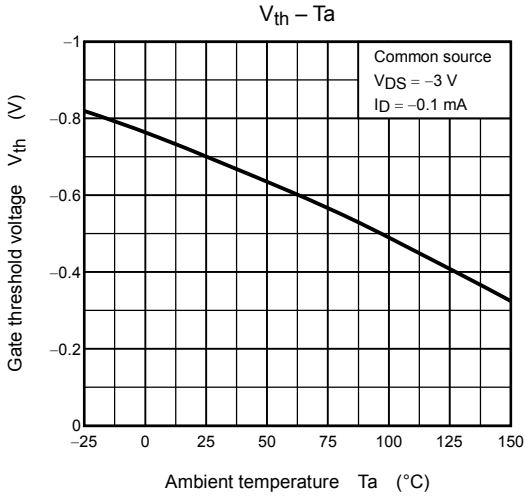
$R_{DS\ (ON)} - V_{GS}$



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

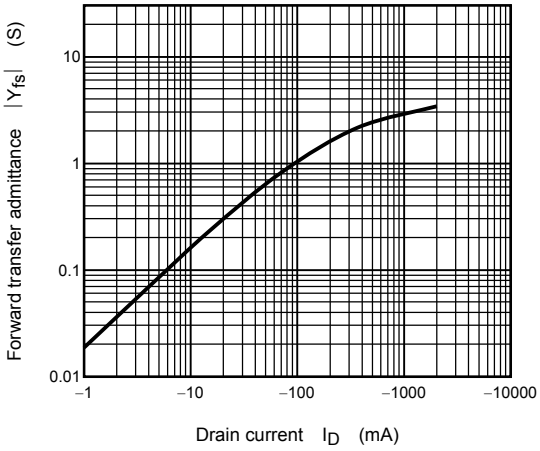


$V_{th} - Ta$

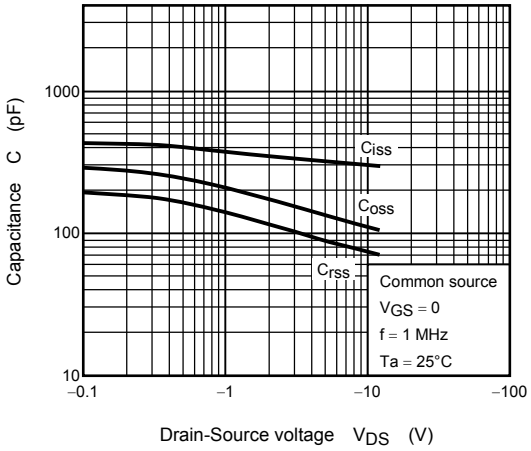


Q1 (Pch MOSFET)

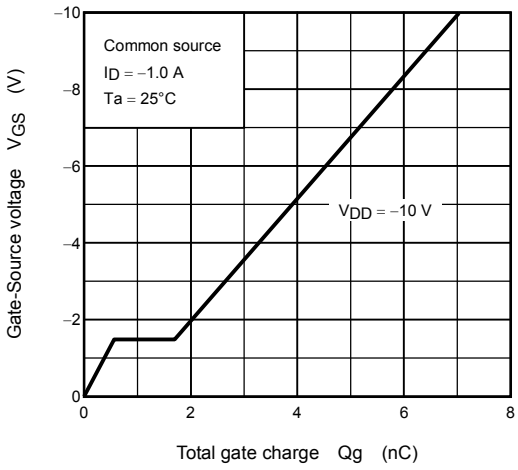
$|Y_{fs}| - I_D$



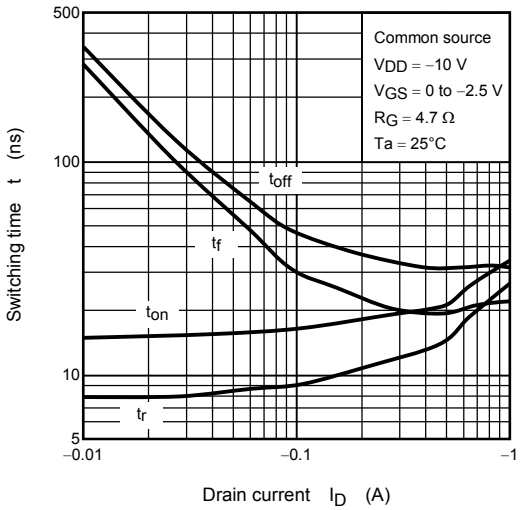
$C - V_{DS}$



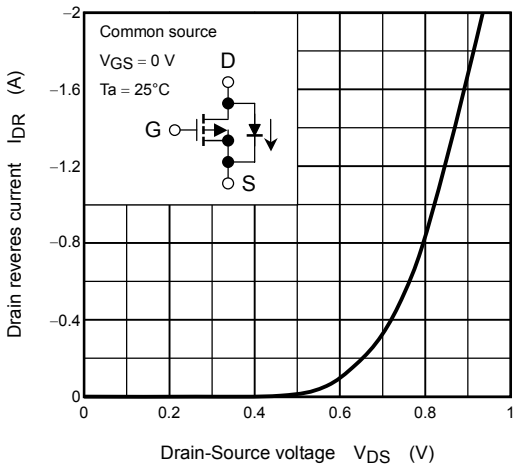
Dynamic input characteristics



$t - I_D$

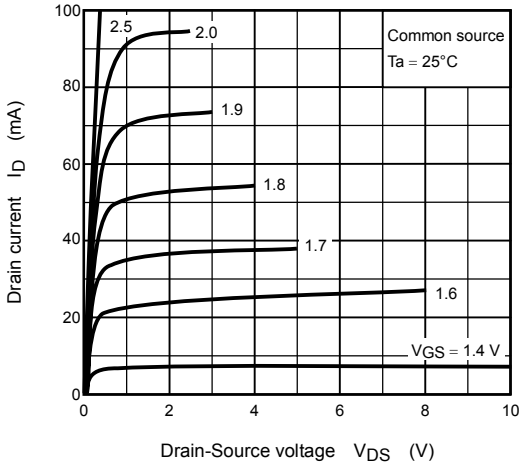


$I_{DR} - V_{DS}$

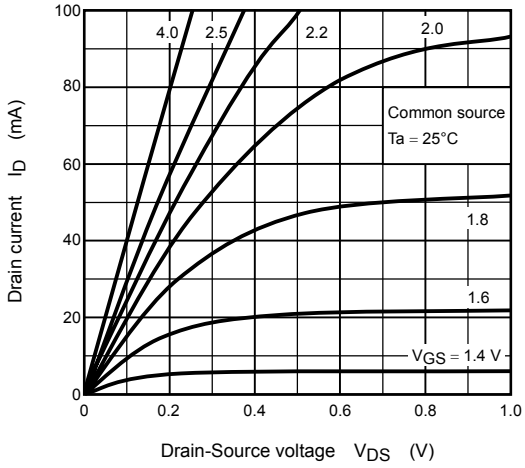


Q2 (Nch MOSFET)

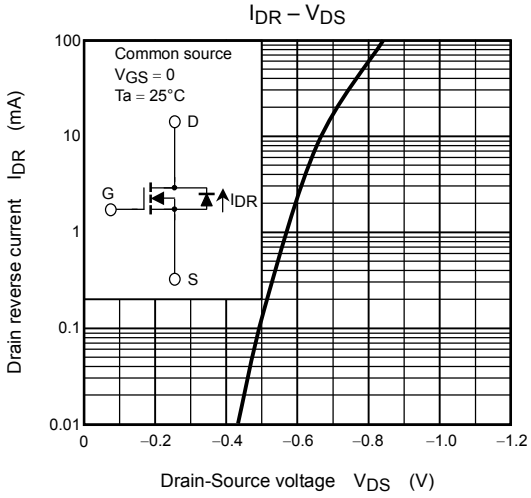
$I_D - V_{DS}$



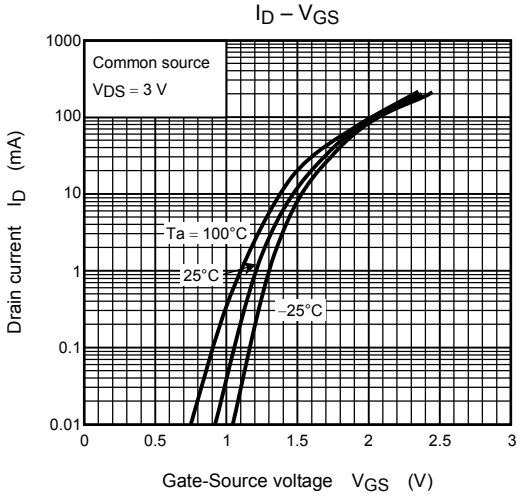
$I_D - V_{DS}$ (low-voltage area)



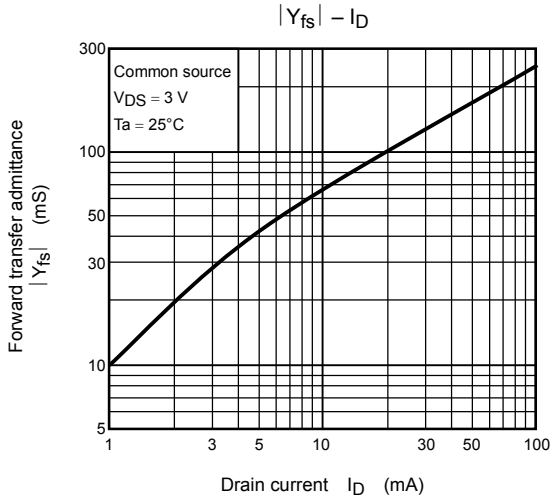
$I_{DR} - V_{DS}$



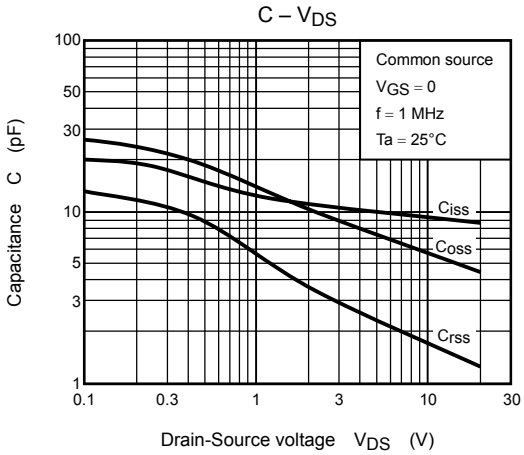
$I_D - V_{GS}$



$|Y_{fs}| - I_D$

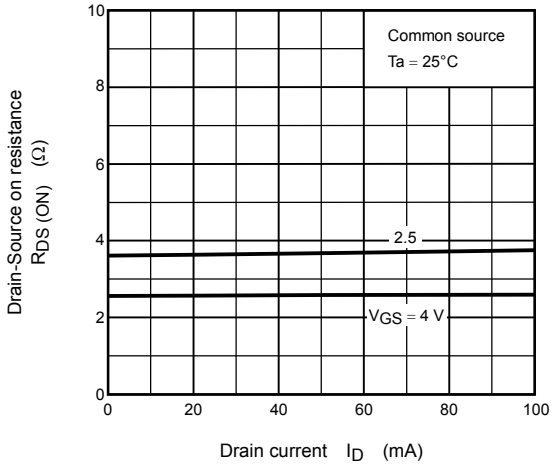


$C - V_{DS}$

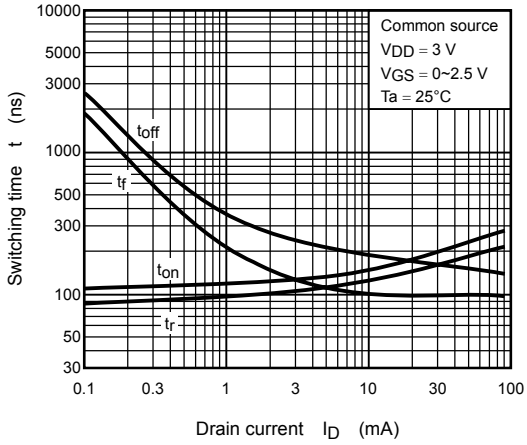


Q2 (Nch MOSFET)

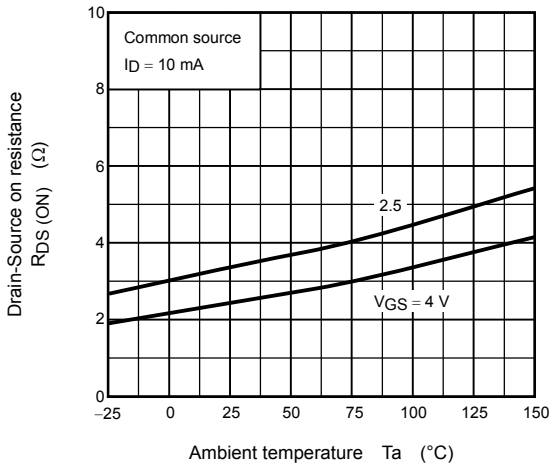
$R_{DS\ (ON)} - I_D$



$t - I_D$



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



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