

Silicon P Channel MOS Type / Silicon Epitaxial Schottky Barrier Diode

SSM6G18NU

Power Management Switch Applications

- Combined a P-channel MOSFET and a schottky barrier diode in one package.
- Low $R_{DS(ON)}$ and Low V_F
 - $R_{DS(ON)} = 261\text{ m}\Omega$ (max) (@ $V_{GS} = -1.5\text{V}$)
 - $R_{DS(ON)} = 185\text{ m}\Omega$ (max) (@ $V_{GS} = -1.8\text{V}$)
 - $R_{DS(ON)} = 143\text{ m}\Omega$ (max) (@ $V_{GS} = -2.5\text{V}$)
 - $R_{DS(ON)} = 112\text{ m}\Omega$ (max) (@ $V_{GS} = -4.5\text{V}$)

Unit: mm

Absolute Maximum Ratings

MOSFET ($T_a = 25^\circ\text{C}$)

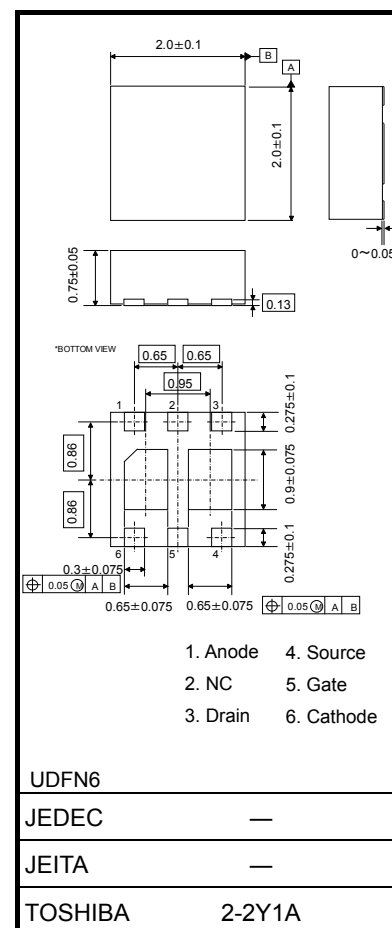
Characteristics	Symbol	Rating	Unit
Drain-Source voltage	V_{DS}	-20	V
Gate-Source voltage	V_{GS}	± 8	V
Drain current	DC	I_D (Note 1)	A
	Pulse	I_{DP} (Note 1)	
Power dissipation	P_D (Note 2)	1	W
	$t < 10\text{s}$	2	
Channel temperature	T_{ch}	150	$^\circ\text{C}$

Schottky Barrier Diode($T_a = 25^\circ\text{C}$)

Characteristics	Symbol	Rating	Unit
Reverse voltage	V_R	30	V
Average forward current	I_O	1.0	A
Peak one cycle surge forward current(10ms)	I_{FSM}	5.0	A
Junction temperature	T_j	150	$^\circ\text{C}$

MOSFET and Diode ($T_a = 25^\circ\text{C}$)

Characteristics	Symbol	Rating	Unit
Storage temperature range	T_{stg}	-55 to 150	$^\circ\text{C}$



Weight: 8.5 mg (typ.)

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).

Note 1: The junction temperature should not exceed 150°C during use.

Note 2: Mounted on FR4 board.

(25.4 mm × 25.4 mm × 1.6 mm, Cu Pad: 645mm²)

MOSFET

Electrical Characteristics (Ta = 25°C)

Characteristic	Symbol	Test Conditions	Min	Typ.	Max	Unit
Drain-Source breakdown voltage	V (BR) DSS	I _D = -1 mA, V _{GS} = 0 V	-20	—	—	V
	V (BR) DSX	I _D = -1 mA, V _{GS} = 5 V (Note 4)	-15	—	—	
Drain cut-off current	I _{DSS}	V _{DS} = -20 V, V _{GS} = 0 V	—	—	-1	μA
Gate leakage current	I _{GSS}	V _{GS} = ± 8 V, V _{DS} = 0 V	—	—	±1	μA
Gate threshold voltage	V _{th}	V _{DS} = -3 V, I _D = -1 mA	-0.3	—	-1.0	V
Forward transfer admittance	Y _{fs}	V _{DS} = -3 V, I _D = -1.0 A (Note 3)	2.7	5.4	—	S
Drain-source ON-resistance	R _{DS (ON)}	I _D = -1.0 A, V _{GS} = -4.5 V (Note 3)	—	89	112	mΩ
		I _D = -0.6 A, V _{GS} = -2.5 V (Note 3)	—	107	143	
		I _D = -0.4 A, V _{GS} = -1.8 V (Note 3)	—	128	185	
		I _D = -0.2 A, V _{GS} = -1.5 V (Note 3)	—	148	261	
Input capacitance	C _{iss}	V _{DS} = -10 V, V _{GS} = 0 V, f = 1 MHz	—	270	—	pF
Output capacitance	C _{oss}		—	40	—	
Reverse transfer capacitance	C _{rss}		—	32	—	
Total Gate Charge	Q _g	V _{DD} = -10 V, I _D = -2.0 A V _{GS} = -4.5 V	—	4.6	—	nC
Gate-Source Charge	Q _{gs1}		—	0.4	—	
Gate-Drain Charge	Q _{gd}		—	0.9	—	
Switching time	Turn-on time	V _{DD} = -10 V, I _D = -1.0 A V _{GS} = 0 to -2.5 V, R _G = 4.7 Ω	—	17	—	ns
	Turn-off time		—	43	—	
Drain-Source forward voltage	V _{DSF}	I _D = 2.0 A, V _{GS} = 0 V (Note 3)	—	0.86	1.2	V

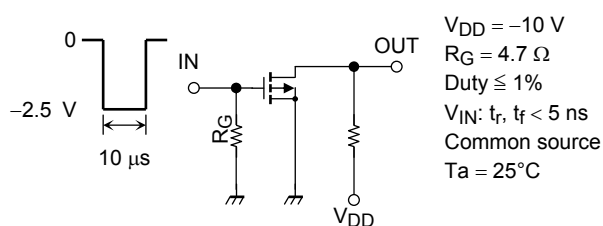
Note 3: Pulse test

Note 4: If a forward bias is applied between gate and source, this device enters V(BR)DSX mode.

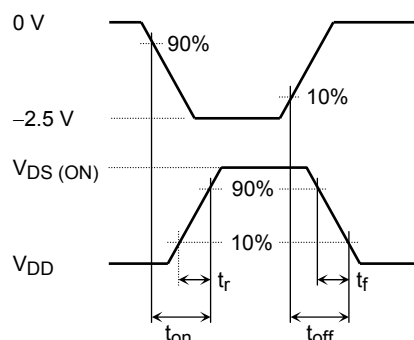
Note that the drain-source breakdown voltage is lowered in this mode

Switching Time Test Circuit

(a) Test circuit



(b) V_{IN}



(c) V_{OUT}

Precaution

V_{th} can be expressed as voltage between gate and source when low operating current value is I_D = -1mA 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.

Schottky Barrier Diode

Electrical Characteristics (Ta = 25°C)

Characteristics	Symbol	Test Conditions	Min	Typ.	Max	Unit
Forward voltage	V _F (1)	I _F = 100 mA	—	0.31	—	V
	V _F (2)	I _F = 200 mA	—	0.36	—	
	V _F (3)	I _F = 500 mA	—	0.38	0.45	
	V _F (4)	I _F = 1000 mA	—	0.48	0.58	
Reverse current	I _R	V _R = 30 V	—	5	50	μA
Total capacitance	C _T	V _R = 0 V, f = 1 MHz	—	120	—	pF

Precaution

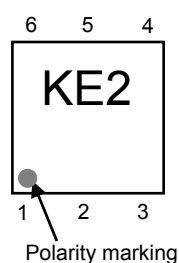
The Schottky barrier diode in this device has large reverse current leakage compared to typical switching diodes. Thus, excessive operating temperature or voltage may cause thermal runaway. To avoid this problem, be sure to take both forward and reverse loss into consideration.

Handling Precaution

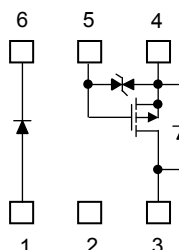
When handling individual devices that are not yet mounted on a circuit board, make sure that the environment is protected against electrostatic discharge. Operators should wear antistatic clothing, and containers and other objects that come into direct contact with devices should be made of antistatic materials.

Thermal resistance R_{th (ch-a)} and 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

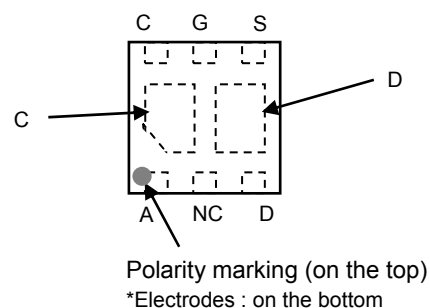
Marking(Top View)



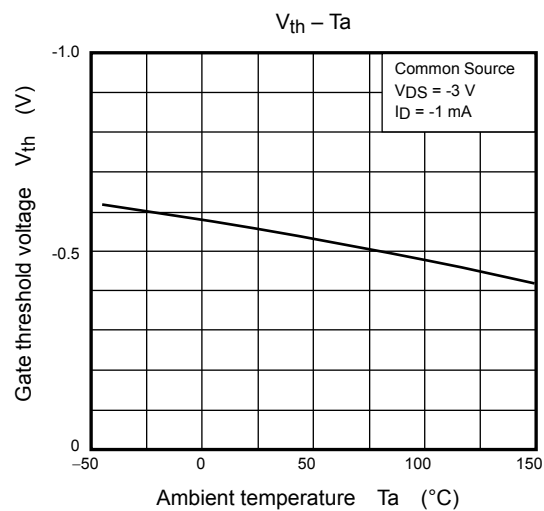
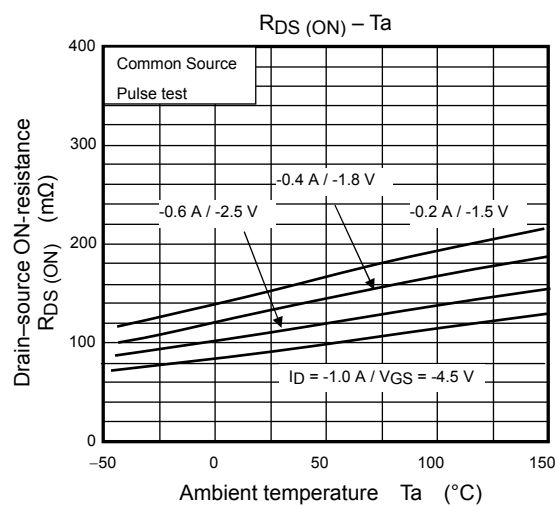
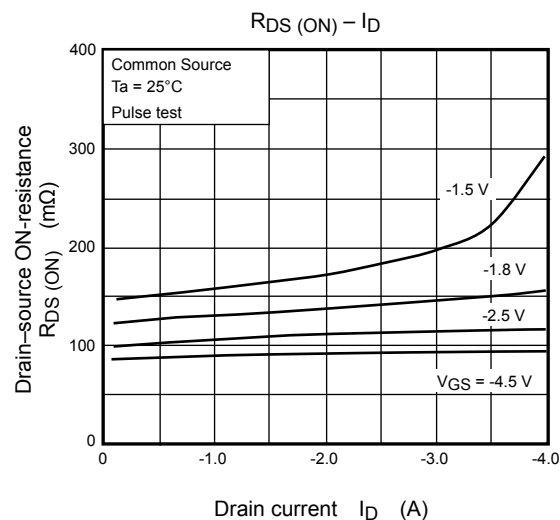
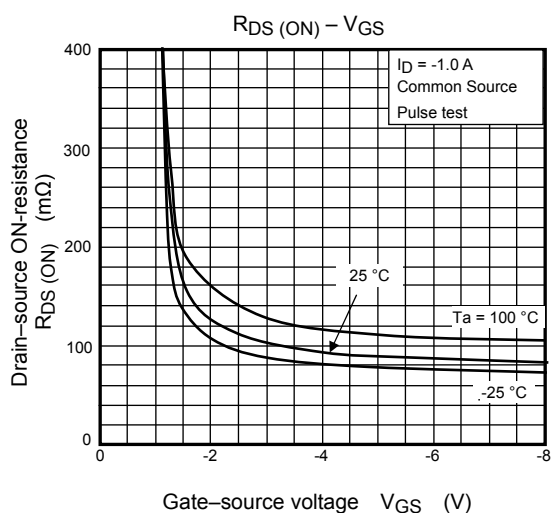
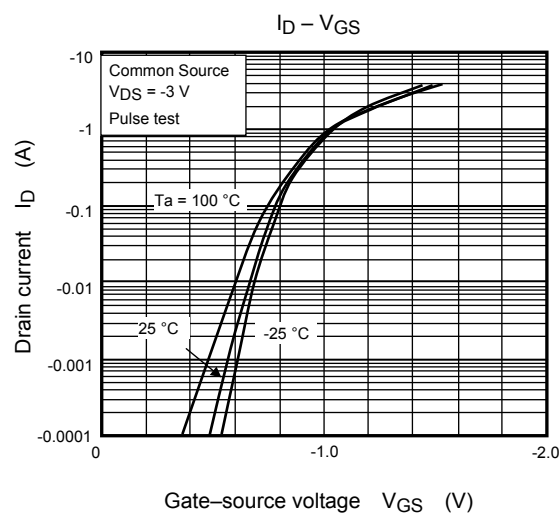
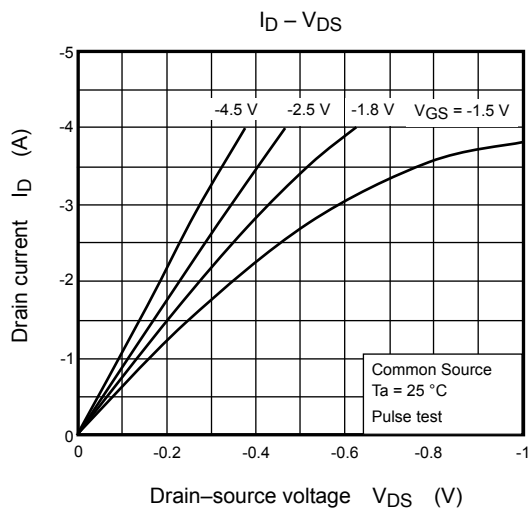
Equivalent Circuit(Top View)

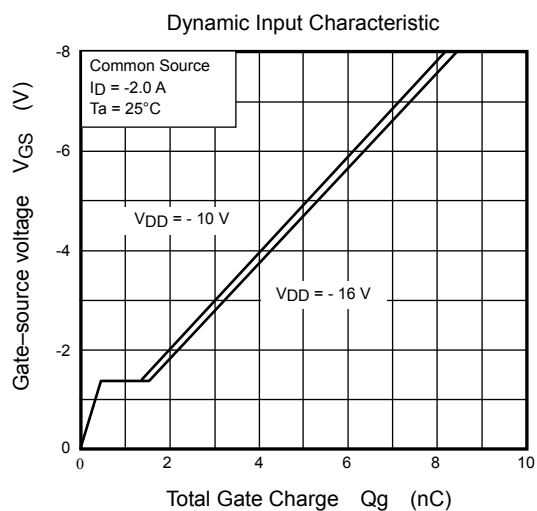
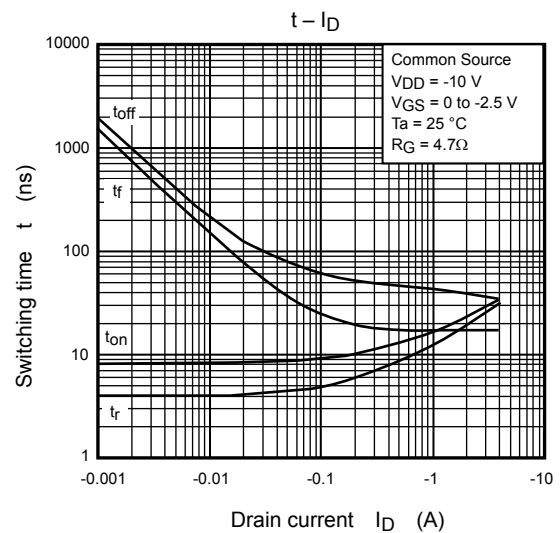
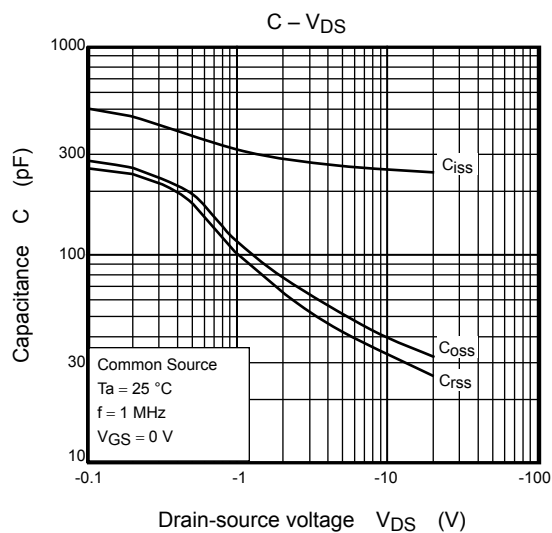
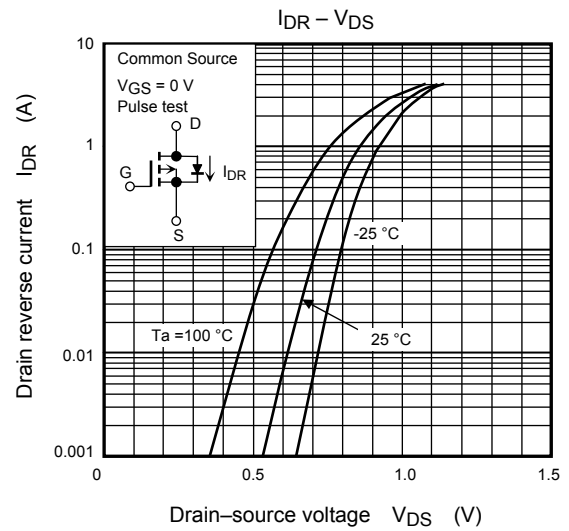
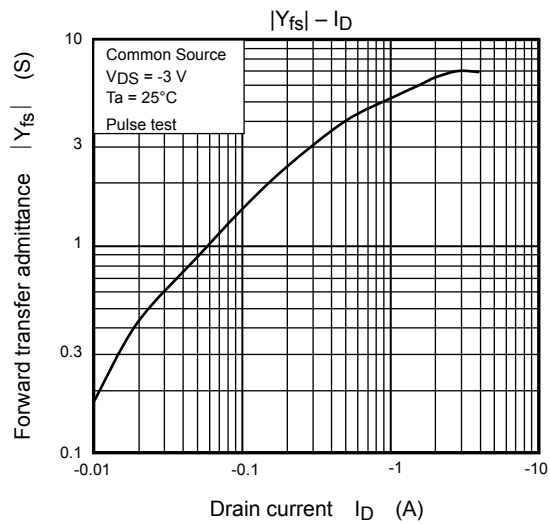


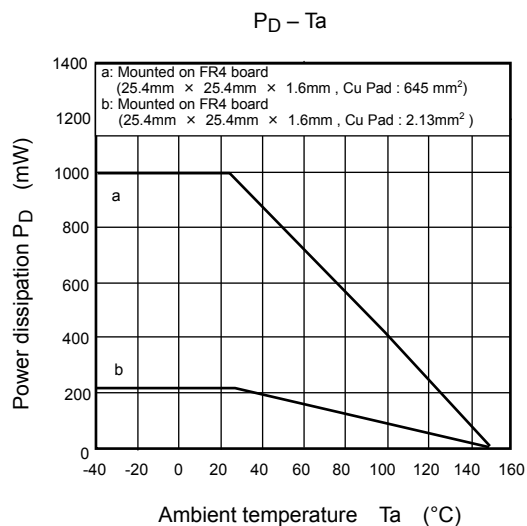
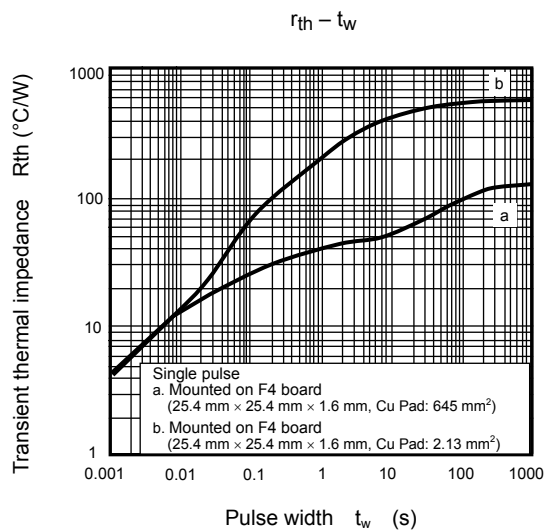
Pin Condition(Top View)



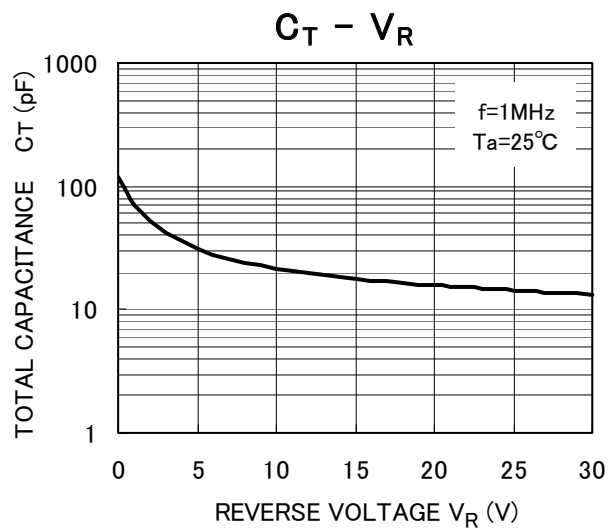
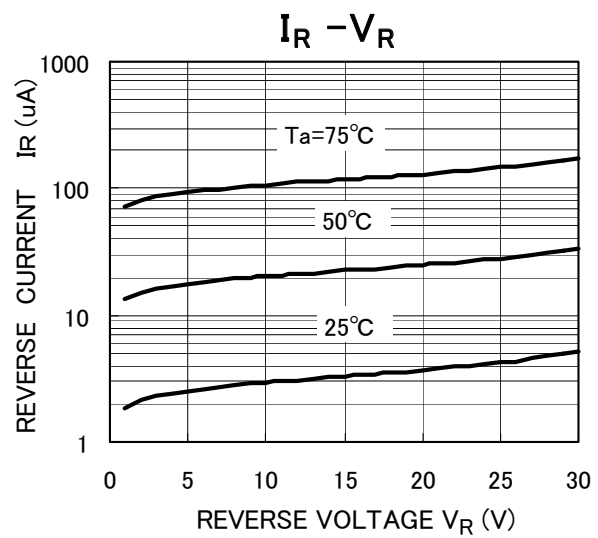
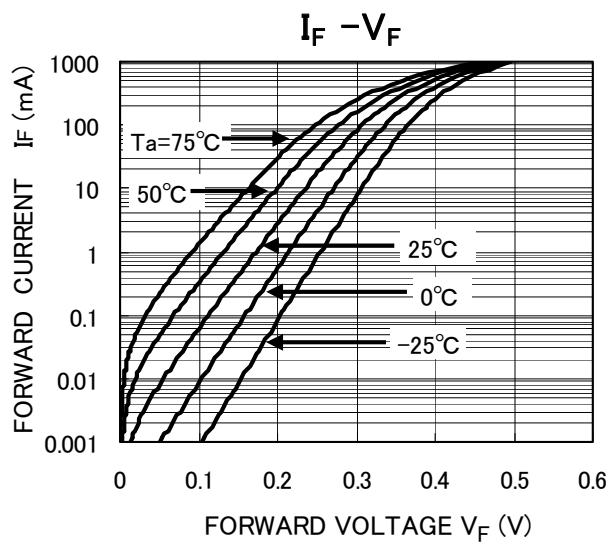
•MOSFET







Schottky Barrier Diode



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