

# F5041

FUJI Intelligent Power MOSFET

## Intelligent Power MOSFET

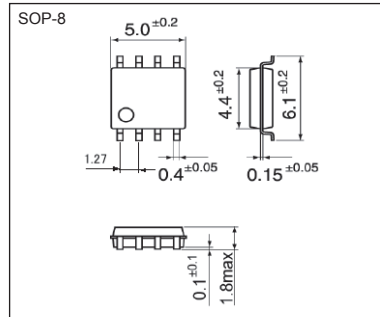
### ■ Features

- Two N-ch power MOSFET circuits
- Over temperature protection
- Short circuit protection
- Low on-resistance
- High speed switching

### ■ Applications

- Solenoid driver
- Lamp driver
- Replacements for fuse and relay

### ■ Outline drawings [mm]



### ■ Connection

- ① SOURCE 1
- ② GATE 1
- ③ SOURCE 2
- ④ GATE 2
- ⑤ ⑥ DRAIN 2
- ⑦ ⑧ DRAIN 1

### ■ Maximum ratings and characteristics

#### ● Absolute maximum ratings (at Tc=25°C, unless otherwise specified)

Description	Symbol	Characteristics	Unit	Remarks
Drain-source voltage	V <sub>DS</sub>	40	V	DC
Gate-source voltage	V <sub>GS</sub>	7	V	DC
Gate-source minus voltage	-V <sub>GSS</sub>	1.5	V	R <sub>G</sub> =100Ω
Continuous drain current	I <sub>D</sub>	1	A	-
Maximum power dissipation	P <sub>D</sub>	1.5	W	*
Operating junction temperature	T <sub>J</sub>	150	°C	-
Storage temperature range	T <sub>stg</sub>	-55 ~ 150	°C	-
Single pulse inductive load switch-off energy dissipation	E <sub>clt</sub>	25	mJ	T <sub>J</sub> =150°C, I <sub>D</sub> =0.5A Single pulse, dv/dt≤10V/μs

Note \* : Surface mounted on 1000mm<sup>2</sup>PCB (FR-4), 2ch on simultaneously

#### ● Electrical characteristics (at Tc=25°C unless otherwise specified)

Description	Symbol	Conditions	min.	typ.	max.	Unit
Drain-source clamp voltage	V <sub>DSS</sub>	I <sub>D</sub> =1mA, V <sub>GS</sub> =0V	40	-	60	V
Gate threshold voltage	V <sub>GS(th)</sub>	I <sub>D</sub> =10mA, V <sub>DS</sub> =13V	1.53	-	2.8	V
Operation gate voltage (protection circuit operates)	V <sub>GS(op)</sub>	-	2.8	-	7.0	V
Zero gate voltage drain current	I <sub>DSS(-VGS)</sub>	V <sub>DS</sub> =16V, V <sub>GS</sub> =0~1.5V V <sub>DS</sub> =30V, V <sub>GS</sub> =0~1.5V	-	-	15 35	μA
Zero gate minus voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> =16V, V <sub>GS</sub> =-1.5V, R <sub>G</sub> =100Ω V <sub>DS</sub> =30V, V <sub>GS</sub> =-1.5V, R <sub>G</sub> =100Ω	-	-	12 30	μA
Gate-source leakage current	I <sub>GS(m)</sub> I <sub>GS(um)</sub>	V <sub>GS</sub> =5V** V <sub>GS</sub> =5V, T <sub>J</sub> >150°C***	-	-	250 300	μA
Drain-source on-state resistance	R <sub>DS(on)</sub>	I <sub>D</sub> =0.5A, V <sub>GS</sub> =5V	-	-	600	mΩ
Turn-on time	t <sub>on</sub>	V <sub>DS</sub> =13V, I <sub>D</sub> =0.5A, V <sub>GS</sub> =5V	-	-	50	μs
Turn-off time	t <sub>off</sub>	V <sub>DS</sub> =13V, I <sub>D</sub> =0.5A, V <sub>GS</sub> =5V	-	-	50	μs
Over-temperature protection	T <sub>trip</sub>	V <sub>GS</sub> =5V	150	-	-	°C
Short circuit protection	I <sub>oc</sub>	V <sub>GS</sub> =5V	1.5	-	-	A

Note \*\* : Under normal operation

Note \*\*\* : Under self protection (Short circuit ~ Short circuit protection ~ Over-temperature protection)

#### ● Electrical characteristics (at Tc=-40~105°C unless otherwise specified)

Description	Symbol	Conditions	min.	typ.	max.	Unit
Drain-source clamp voltage	V <sub>DSS</sub>	I <sub>D</sub> =1mA, V <sub>GS</sub> =0V	38	-	62	V
Gate threshold voltage	V <sub>GS(th)</sub>	I <sub>D</sub> =10mA, V <sub>DS</sub> =13V	1.5	-	3.0	V
Operation gate voltage (protection circuit operates)	V <sub>GS(op)</sub>	-	3.0	-	6.8	V
Zero gate voltage drain current	I <sub>DSS(-VGS)</sub>	V <sub>DS</sub> =16V, V <sub>GS</sub> =0~1.5V V <sub>DS</sub> =30V, V <sub>GS</sub> =0~1.5V	-	-	25 50	μA
Zero gate minus voltage drain current	I <sub>DSS</sub>	V <sub>DS</sub> =16V, V <sub>GS</sub> =-1.5V, R <sub>G</sub> =100Ω V <sub>DS</sub> =30V, V <sub>GS</sub> =-1.5V, R <sub>G</sub> =100Ω	-	-	20 50	μA
Gate-source leakage current	I <sub>GS(m)</sub> I <sub>GS(um)</sub>	V <sub>GS</sub> =5V** V <sub>GS</sub> =5V, T <sub>J</sub> >150°C***	-	-	300 350	μA
Drain-source on-state resistance	R <sub>DS(on)</sub>	I <sub>D</sub> =0.5A, V <sub>GS</sub> =5V	-	-	920	mΩ
Turn-on time	t <sub>on</sub>	V <sub>DS</sub> =13V, I <sub>D</sub> =0.5A, V <sub>GS</sub> =5V	-	-	70	μs
Turn-off time	t <sub>off</sub>	V <sub>DS</sub> =13V, I <sub>D</sub> =0.5A, V <sub>GS</sub> =5V	-	-	50	μs
Short circuit protection	I <sub>oc</sub>	V <sub>GS</sub> =5V	0.7	-	-	A

Note \*\* : Under normal operation

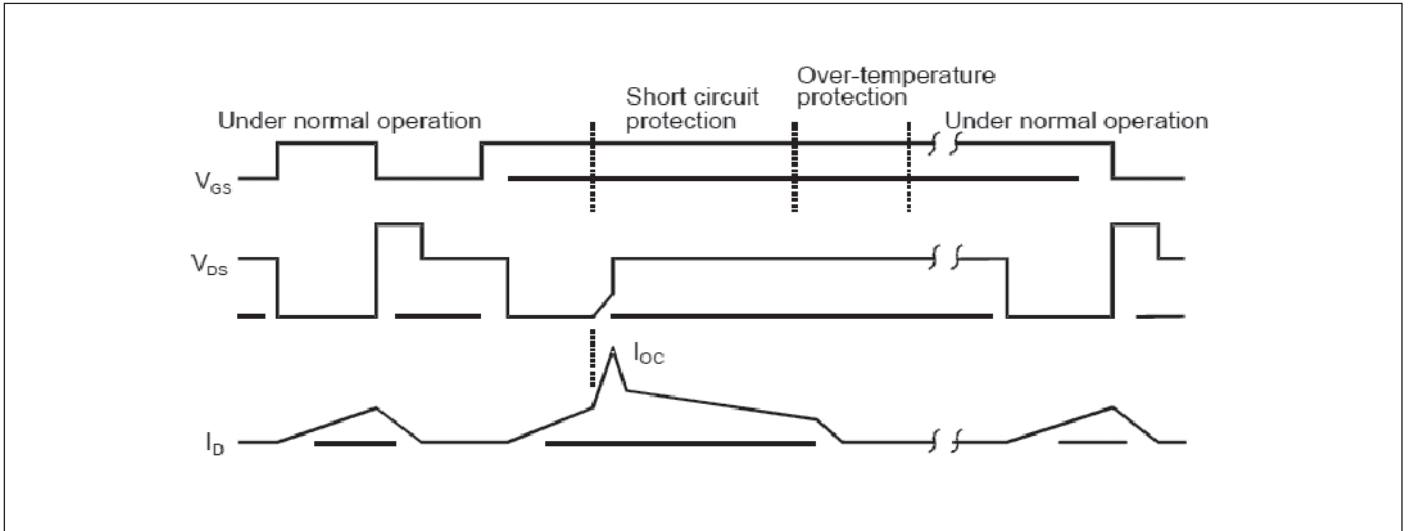
Note \*\*\* : Under self protection (Short circuit ~ Short circuit protection ~ Over-temperature protection)

### ● Thermal resistance

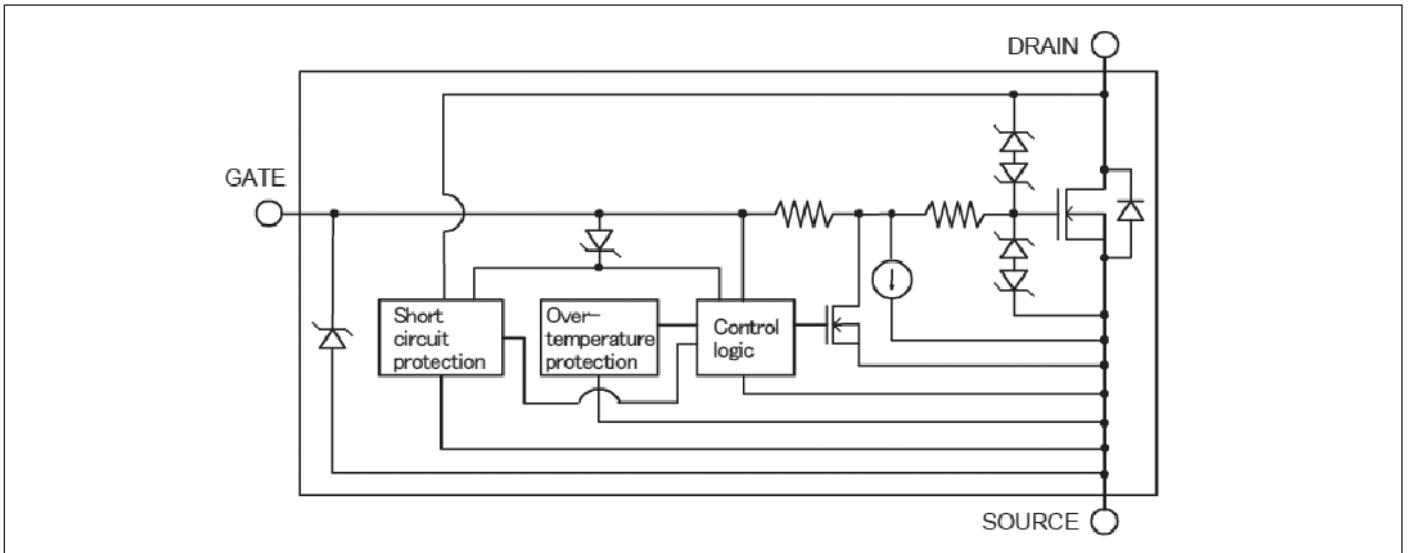
Description	Symbol	Test conditions	min.	typ.	max.	Unit
Thermal resistance	R <sup>th</sup> (j-a)	Junction-ambient*	-	-	83	°C/W

Note \* : Surface mounted on 1000mm<sup>2</sup>PCB (FR-4), 2ch on simultaneously

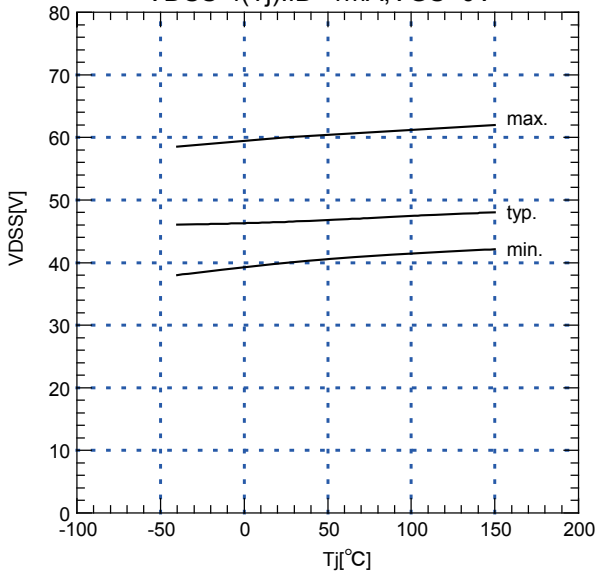
■ Timing chart



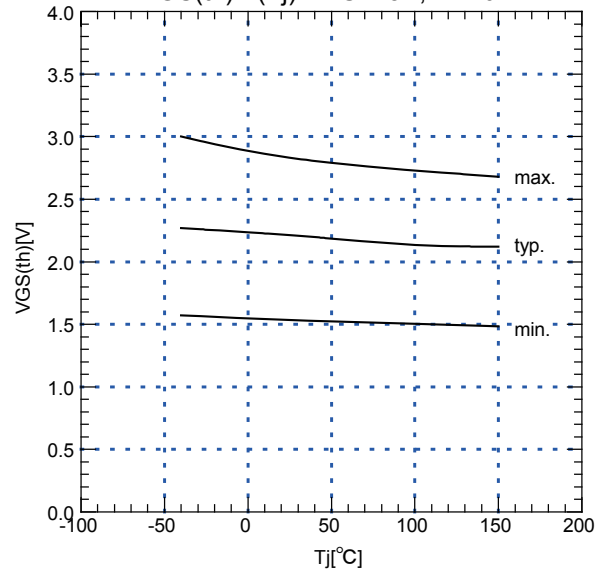
■ Circuit block diagram



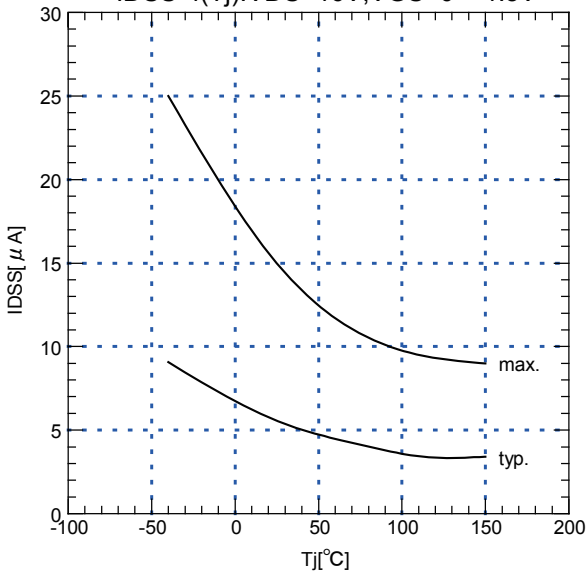
Drain-source breakdown voltage  
 $V_{DSS}=f(T_j): I_D=1\text{mA}, V_{GS}=0\text{V}$



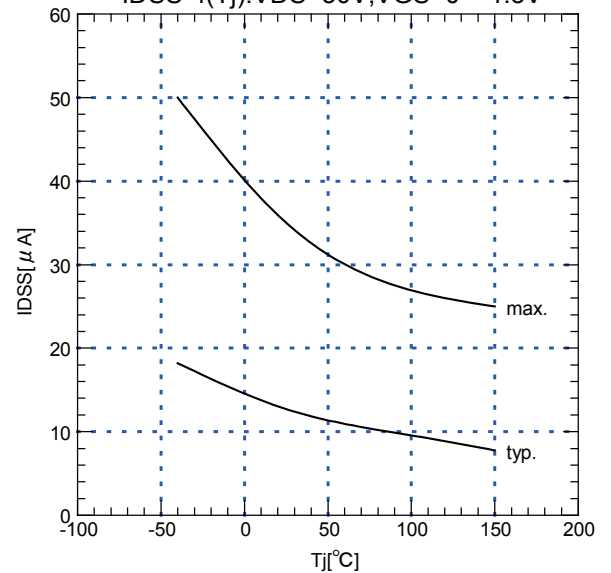
Gate threshold voltage  
 $V_{GS(th)}=f(T_j): V_{DS}=13\text{V}, I_D=10\text{mA}$



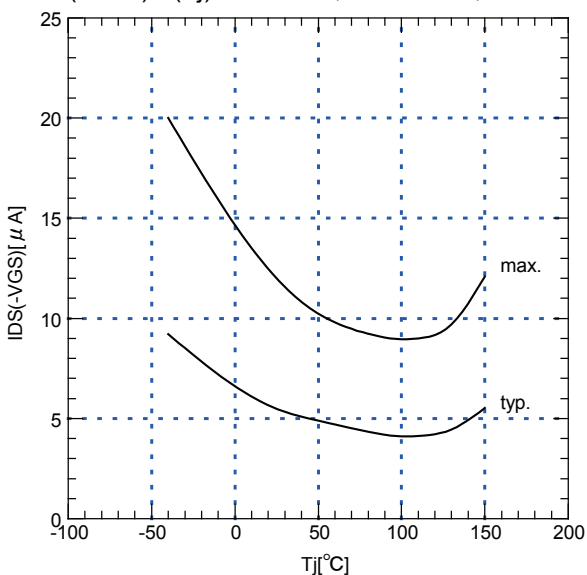
Zero gate voltage drain current  
 $I_{DSS}=f(T_j): V_{DS}=16\text{V}, V_{GS}=0 \sim 1.5\text{V}$



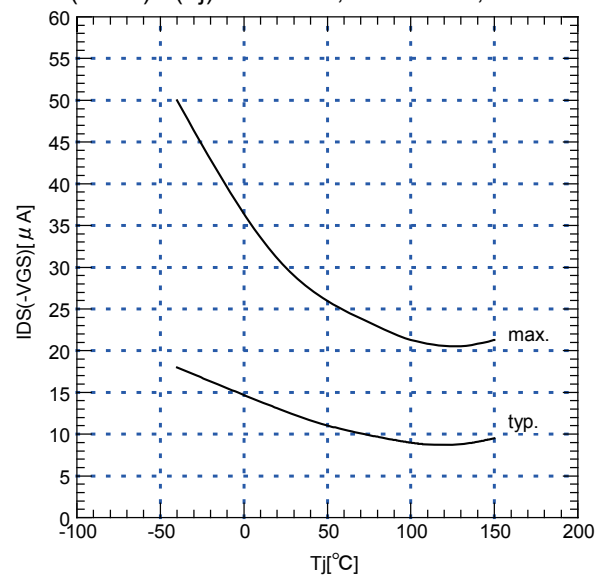
Zero gate voltage drain current  
 $I_{DSS}=f(T_j): V_{DS}=30\text{V}, V_{GS}=0 \sim 1.5\text{V}$

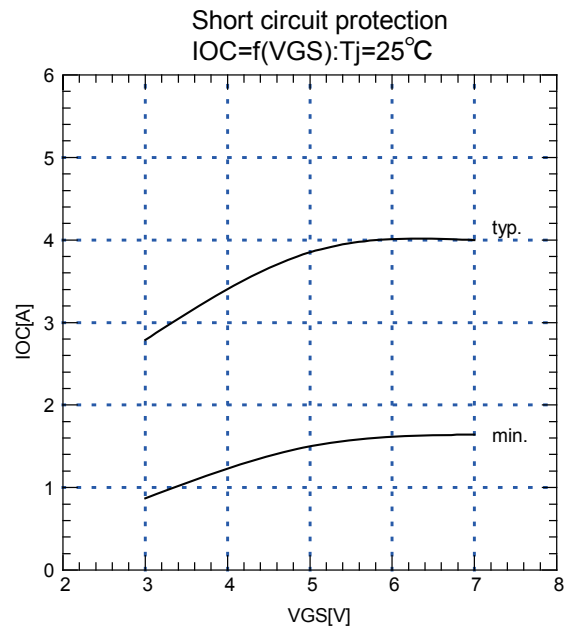
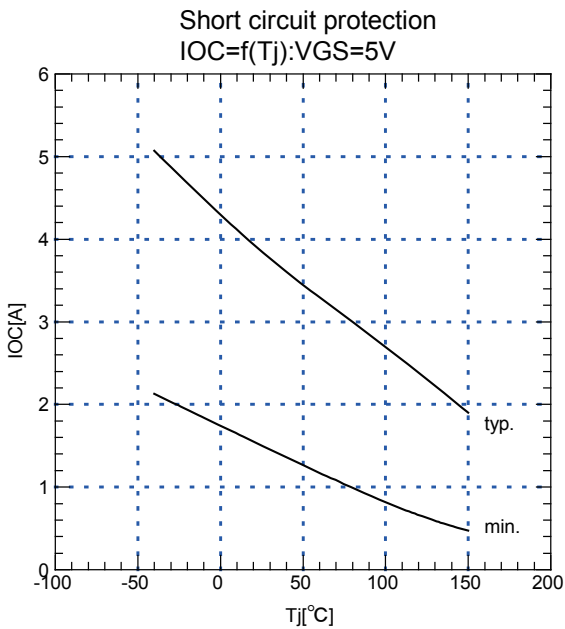
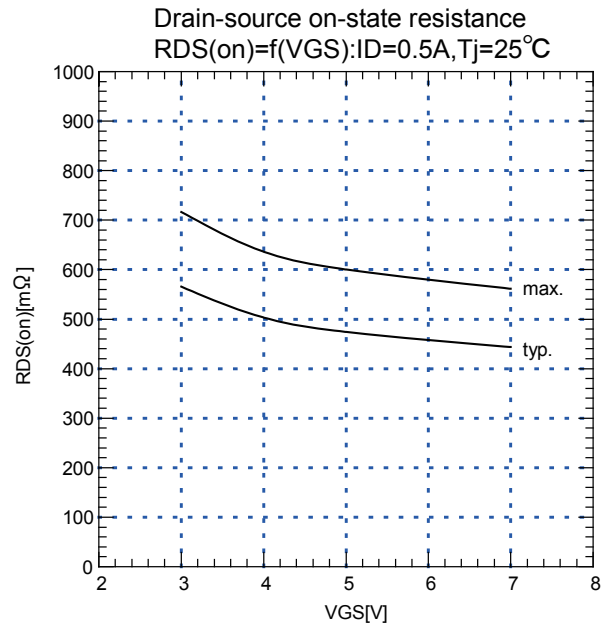
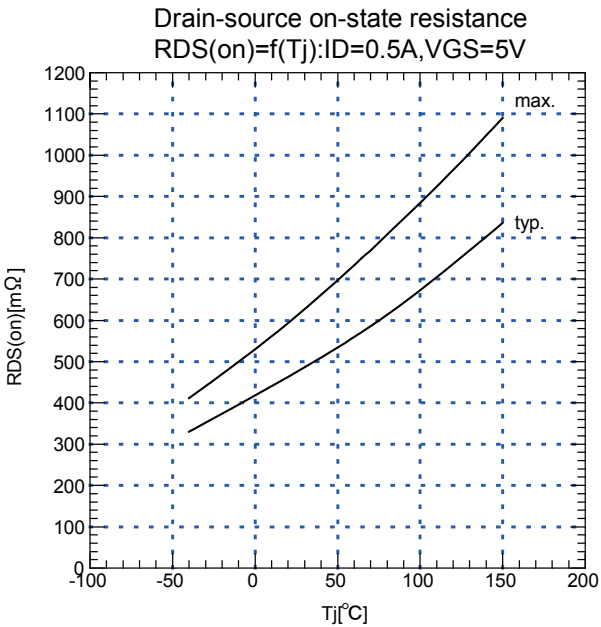
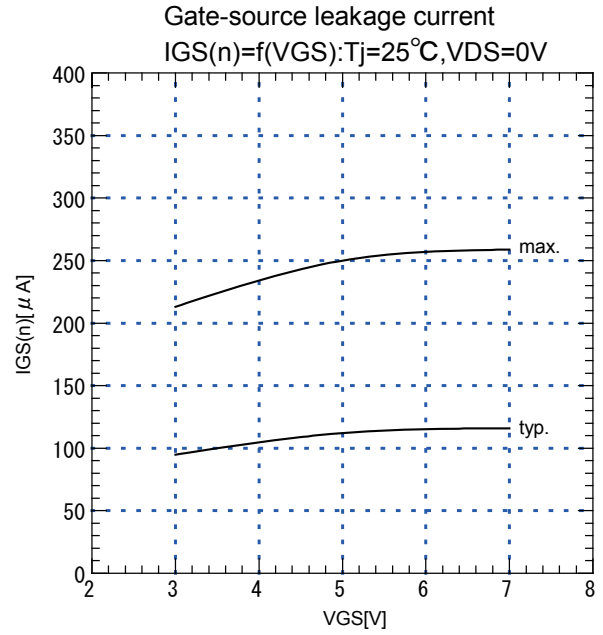
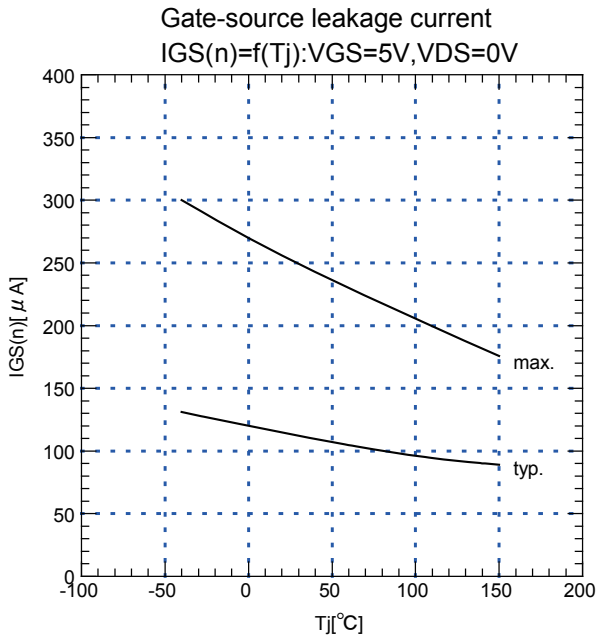


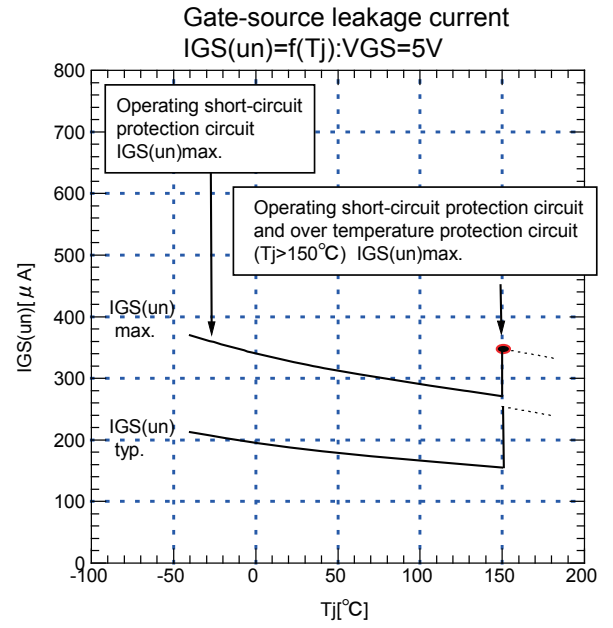
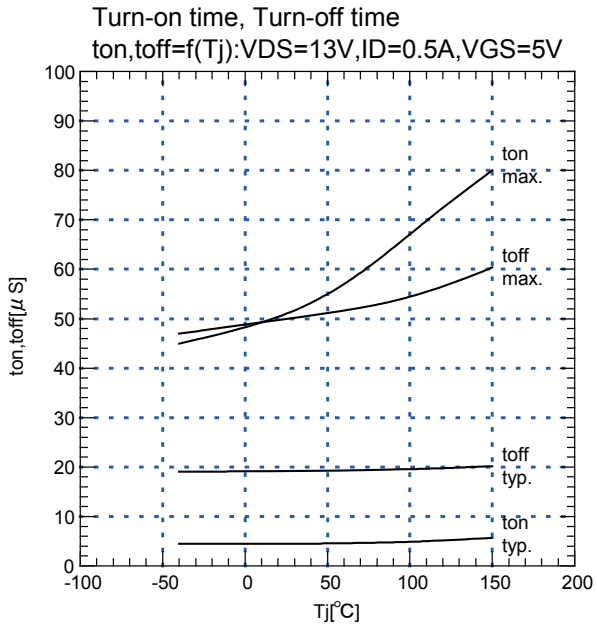
Zero gate minus voltage drain current  
 $I_{DS(-V_{GS})}=f(T_j): V_{DS}=16\text{V}, V_{GS}=-1.5\text{V}, R_G=100\Omega$



Zero gate minus voltage drain current  
 $I_{DS(-V_{GS})}=f(T_j): V_{DS}=30\text{V}, V_{GS}=-1.5\text{V}, R_G=100\Omega$







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