

F5044H

FUJI High-side IPS

High-side Intelligent Power Switch

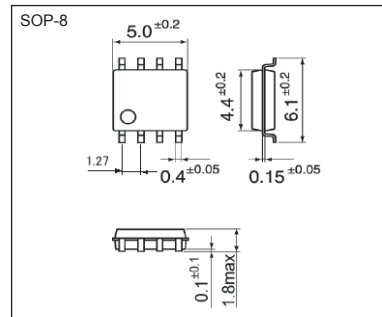
Features

- Over current detection
- Over temperature shutdown
- Over voltage shutdown
- Open load detection
- Low on-resistance
- High speed switching

Applications

- Solenoid driver
- Replacements for fuse and relay

Outline drawings [mm]



Connection

TERMINAL No.	FUNCTION	SYMBOL
①	OUTPUT	OUT
②	GROUND	GND
③	STATUS	ST
④	INPUT	IN
⑤ ⑥ ⑦ ⑧	SUPPLY VOLTAGE	V _{cc}

Maximum ratings and characteristics

Absolute maximum ratings (at T_c=25°C)

Description	Symbol	Characteristics	Unit	Remarks
Supply voltage	V _{cc}	50	V	Pulse 0.25 sec
		33	V	DC
Continuous drain current	I _D	2.5	A	*
Input voltage	V _{IN}	-0.3~V _{cc} +0.3	V	DC
Status current	I _{ST}	5	mA	-
Maximum power dissipation	P _D	1.5	W	*
Operating junction temperature	T _j	150	°C	-
Storage temperature range	T _{stg}	-55~150	°C	-
Single pulse inductive load switch-off energy dissipation	E _{CL}	100	mJ	T _j =150°C, L=50mH, Single pulse, dv/dt≤10V/us

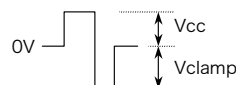
* Surface mounted on 1000mm² PCB(FR-4)

Electrical characteristics (at T_c=25°C, unless otherwise specified.)

Description	Symbol	Conditions	min.	typ.	max.	Unit
Operating voltage	V _{cc}	TC=-40~150°C	6	-	28	V
Standby current	I _{cc}	V _{cc} =13V, R _L =10Ω, V _{IN} =0V	-	-	3	mA
Input voltage	V _{IN}	V _{cc} =13V	3.5	-	-	V
	V _{IN(L)}	V _{cc} =13V	-	-	1.5	V
Input current	I _{IN(H)}	V _{cc} =13V, V _{IN} =5V	-	-	12.0	μA
On-state resistance	R _{DS(on)}	V _{cc} =13V, I _L =1.25A	-	-	0.12	Ω
Output leakage current	I _{OL}	V _{cc} =13V	-	-	0.5	mA
Over current detection	I _{OC} **	V _{cc} =13V	3	-	6	A
Peak-current under Over-current detection	PeakI	V _{cc} =13V	-	10	-	A
Over-temperature shutdown	T _{trip}	V _{cc} =13V	150	-	200	°C
Over-voltage shutdown	V _{OV}	-	28	-	33	V
Turn-on time	T _{on}	V _{cc} =13V, R _L =10Ω	-	-	120	μs
Turn-off time	T _{off}	V _{cc} =13V, R _L =10Ω	-	-	40	μs
Status voltage	V _{ST(L)}	V _{cc} =13V, R _L =10Ω, V _{IN} =0V, I _{ST} =1mA	-	-	0.4	V
Status leakage current	I _{STleak}	V _{cc} =13V, R _L =10Ω, V _{IN} =5V, V _{ST} =5V	-	-	10	μA
Output-clamp voltage	V _{clamp} ***	V _{cc} =13V, I _L =1.25A, V _{IN} =0V, L=10mH	-(50-V _{cc})	-	-(60-V _{cc})	V
Diode forward on-voltage	V _{SD}	V _{IN} =0V, I _{SD} =-6A	-	-	1.5	V
Open-load detection	R _{LOPEN}	V _{cc} =13V, V _{IN} =0V	6	-	36	kΩ

** At over-current detection, the device moved switching mode.

*** <Output-clamp voltage: V_{clamp}> 50V≤V_{CC}+V_{clamp}≤60V ←



● Electrical characteristics (at Tc=-40~110°C, unless otherwise specified)

Description	Symbol	Conditions	min.	typ.	max.	Unit
Operating voltage	V _{cc}	—	6.4	—	27	V
Standby current	I _{cc}	V _{cc} =13V, R _L =10Ω, V _{IN} =0V	—	—	3.6	mA
Input voltage	V _{IN} (H)	V _{cc} =13V	3.52	—	—	V
	V _{IN} (L)	V _{cc} =13V	—	—	1.44	V
Input current	I _{IN} (H)	V _{cc} =13V, V _{IN} =5V	—	—	14.4	μA
On-state resistance	R _{DS(on)}	V _{cc} =13V, I _L =1.25A	—	—	0.192	Ω
Output leakage current	I _{OL}	V _{cc} =13V	—	—	0.6	mA
Over current detection	I _{OC} **	V _{cc} =13V	2.2	—	7.4	A
Over voltage detection	V _{OV}	—	27.0	—	34.5	V
Turn-on time	T _{on}	V _{cc} =13V, R _L =10Ω	—	—	145	μs
Turn-off time	T _{off}	V _{cc} =13V, R _L =10Ω	—	—	45	μs
Status voltage	V _{ST} (L)	V _{cc} =13V, R _L =10Ω, V _{IN} =0V, I _{ST} =1mA	—	—	0.5	V
Status leakage current	I _{STleak}	V _{cc} =13V, R _L =10Ω, V _{IN} =5V, V _{ST} =5V	—	—	14	μA
Output-clamp voltage	V _{clamp} ***	V _{cc} =13V, I _L =1.0A, V _{IN} =0V, L=10mH	-(48.2-V _{cc})	—	-(61.8-V _{cc})	V
Diode forward on-voltage	V _{SD}	V _{IN} =0V, I _{SD} =-6A	—	—	1.8	V
Open-load detection	R _{LOPEN}	V _{cc} =13V, V _{IN} =0V	4.9	—	45	kΩ

** At over-current detection, the device moved switching mode.

*** <Output-clamp voltage:V_{clamp}> 50V ≤ V_{cc}+V_{clamp} ≤ 60V(Tc=25°C)

● Thermal characteristics

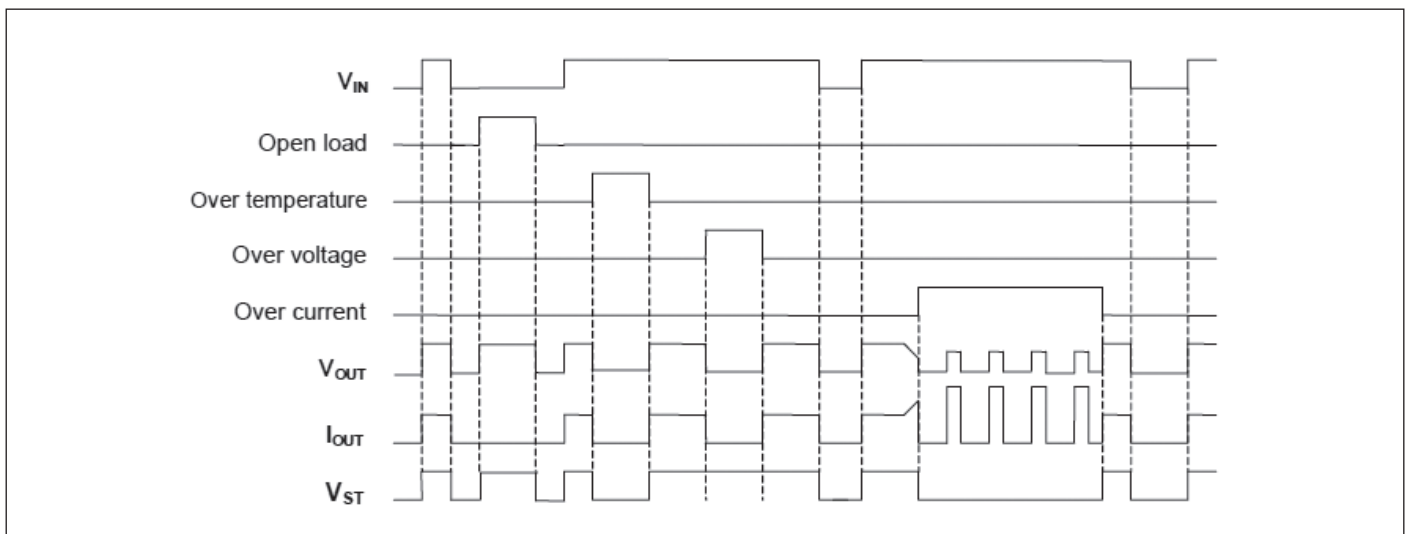
Description	Symbol	Test conditions	min.	typ.	max.	Unit
Thermal resistance	R _{th(j-a)}	Junction - ambient****	—	—	83.0	°C/W

**** Surface mounted on 1000mm² PCB (FR-4)

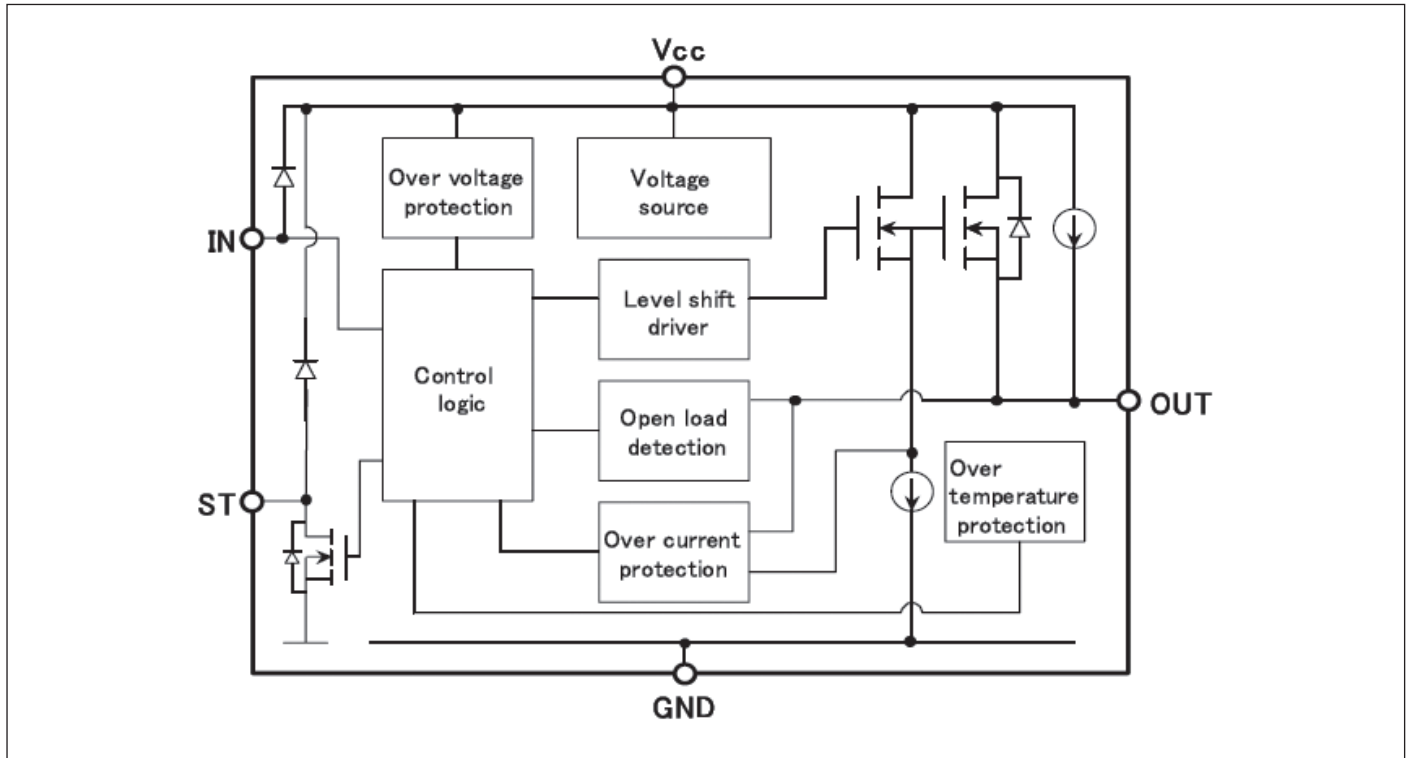
● Truth table

	Input voltage	Status voltage	Output voltage	Remarks
Normal operation	L	L	L	—
	H	H	H	
	Open	L	L	
Open-load	L	H	H	Auto-restart
Over-current	L	L	L	Switching mode Auto-restart
	H	L	L	
Over-temperature	L	L	L	Auto-restart
	H	L	L	
Over-voltage	L	L	L	Auto-restart
	H	H	L	

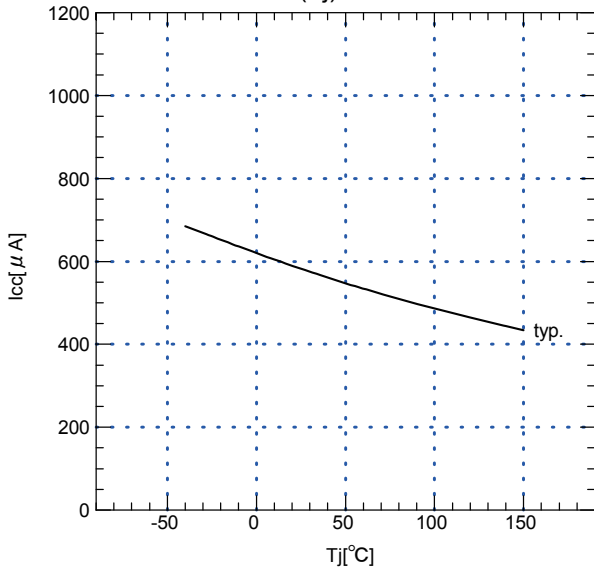
■ Timing chart



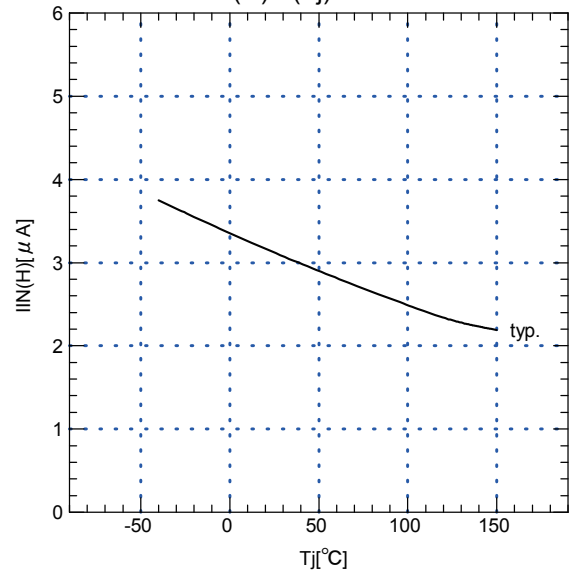
■ Circuit block diagram



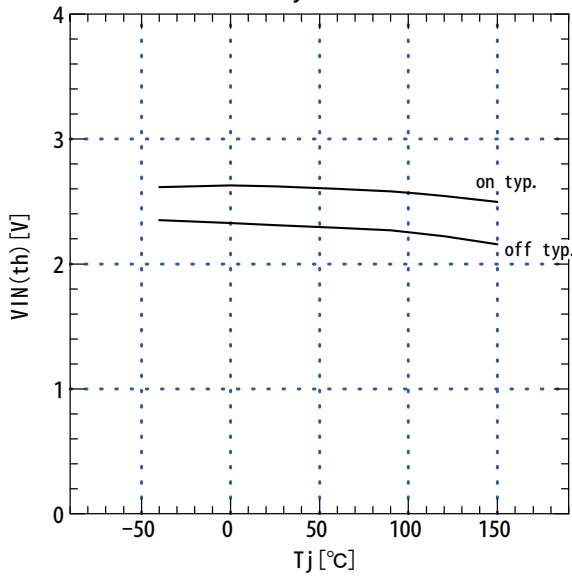
Standby current
 $I_{cc}=f(T_j):V_{cc}=13V$



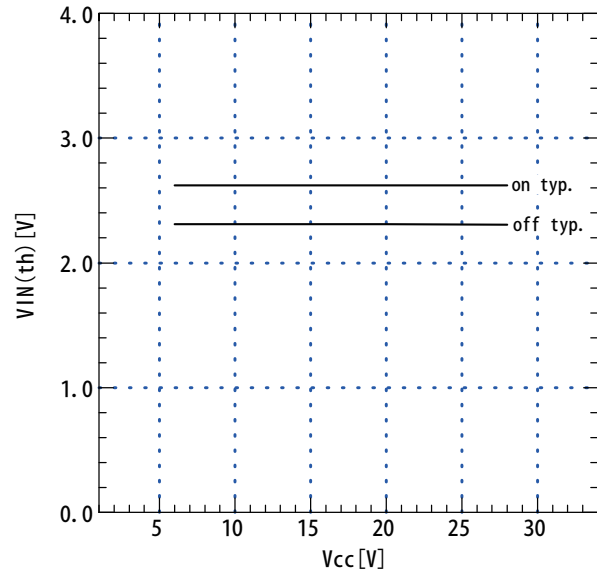
Input current
 $I_{IN(H)}=f(T_j):V_{cc}=13V$



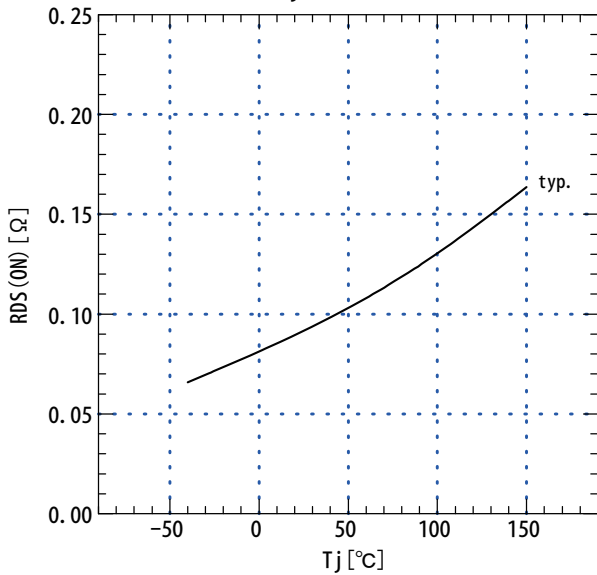
Input threshold voltage
 $V_{IN(th)}=f(T_j):V_{cc}=13V$



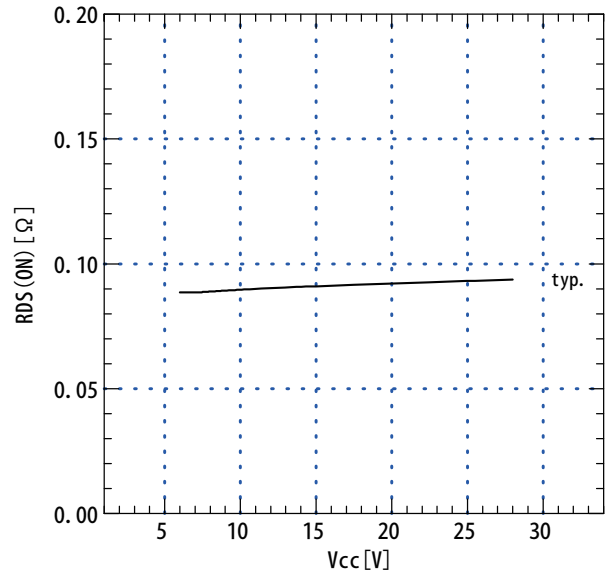
Input threshold voltage
 $V_{IN(th)}=f(V_{cc})$

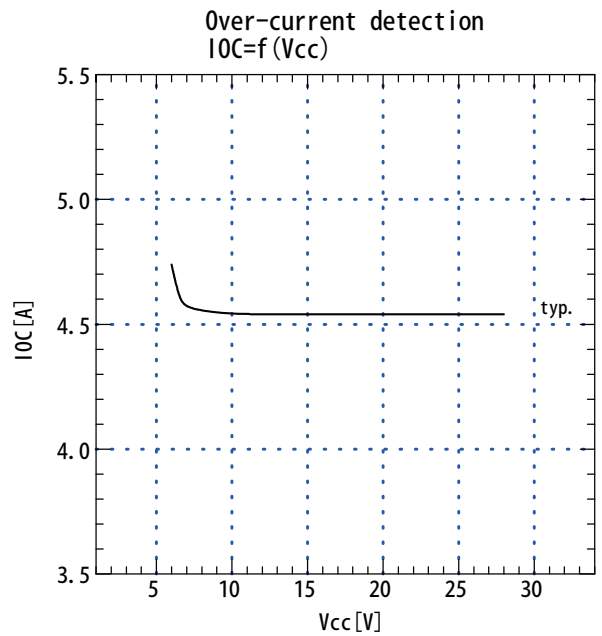
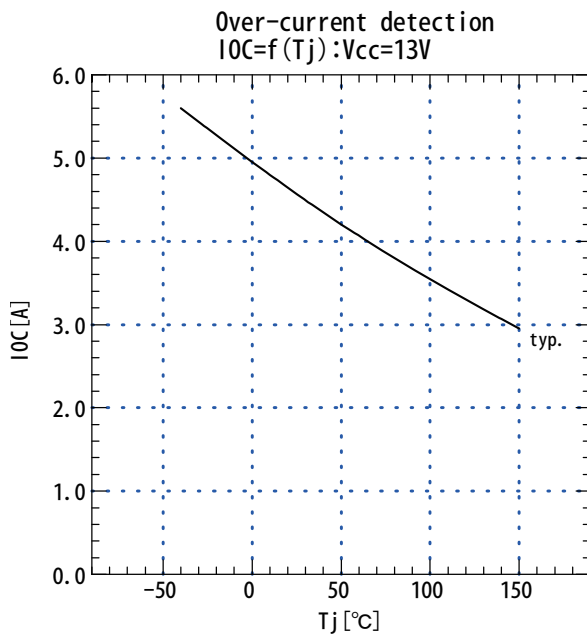
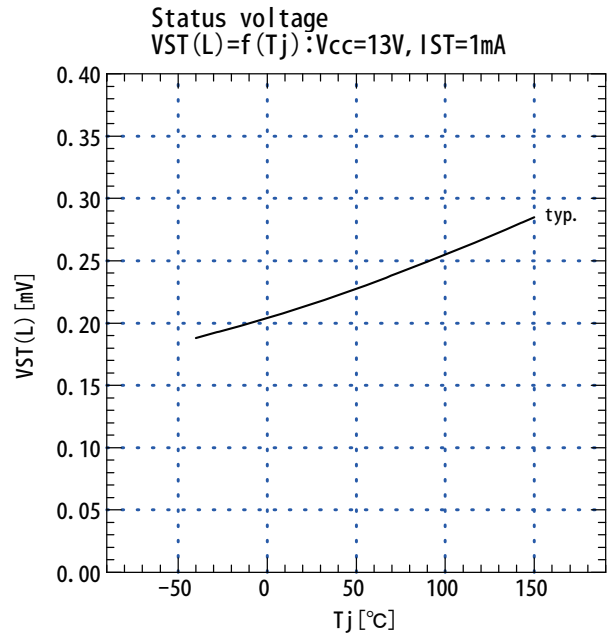
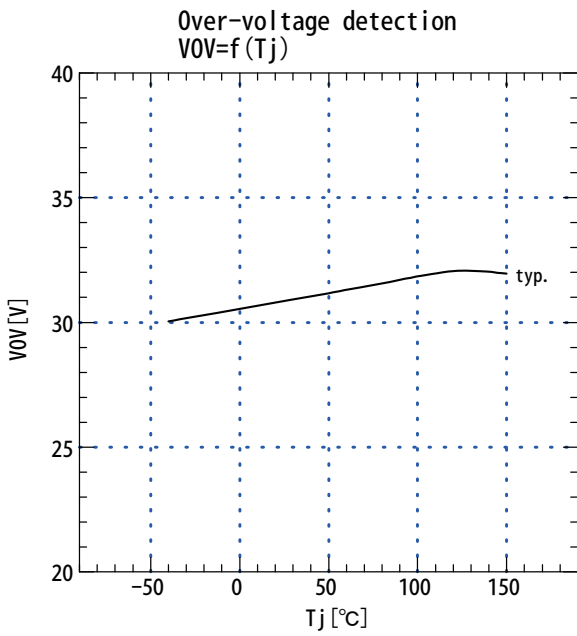
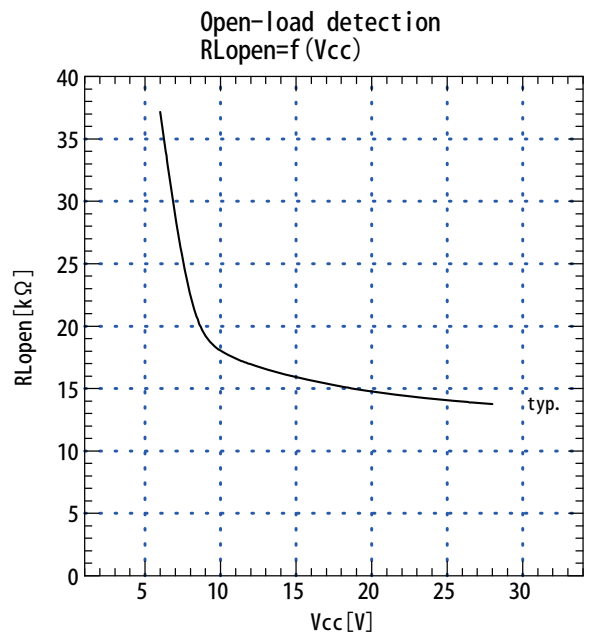
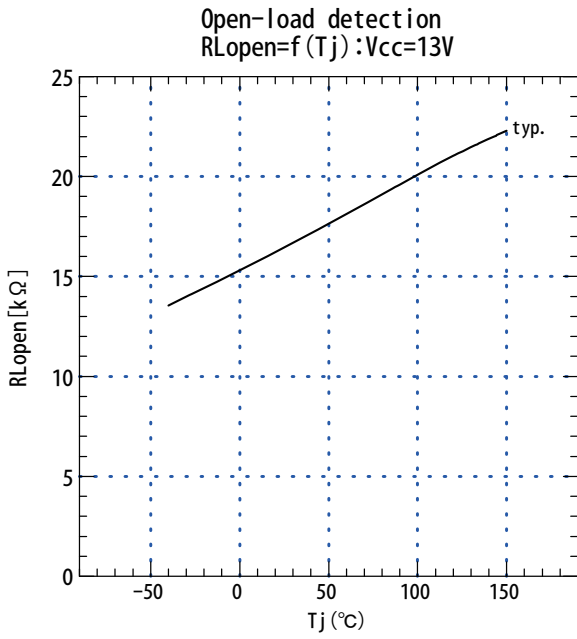


On-state resistance
 $R_{DS(ON)}=f(T_j):V_{cc}=13V, I_D=1.25A$

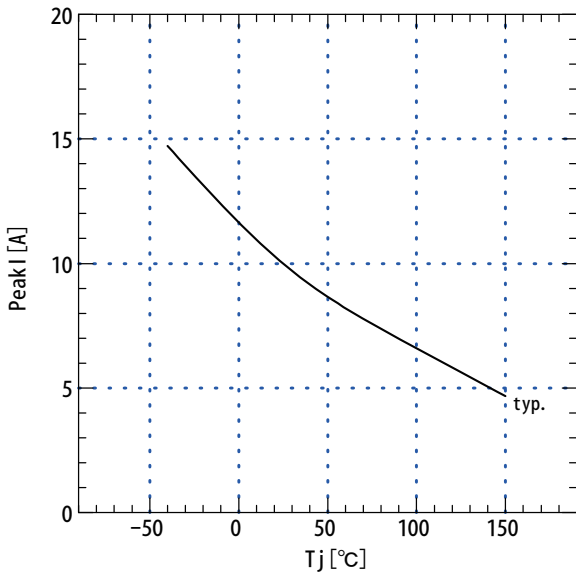


On-state resistance
 $R_{DS(ON)}=f(V_{cc}):I_{out}=1.25A$

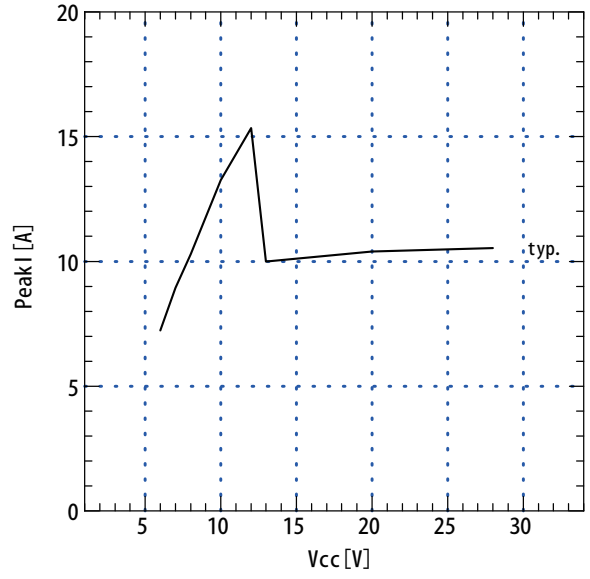




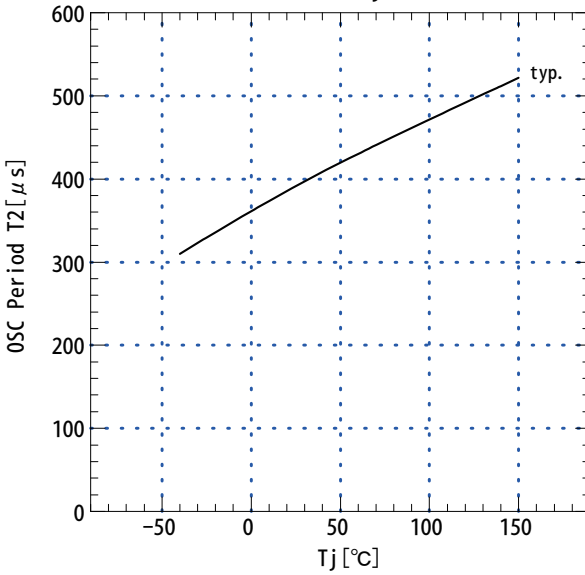
Peak-current under Over-current detection
 $PeakI=f(Tj):Vcc=13V$



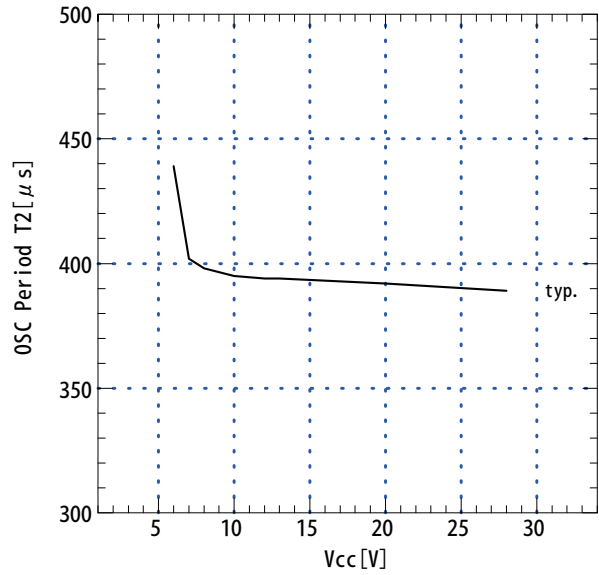
Peak-current under Over-current detection
 $PeakI=f(Vcc)$



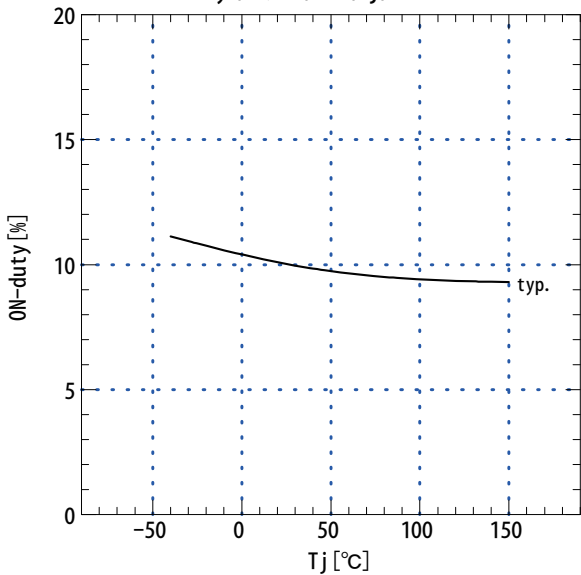
OSC Period T2
 $OSC\ Period\ T2=f(Tj):Vcc=13V$



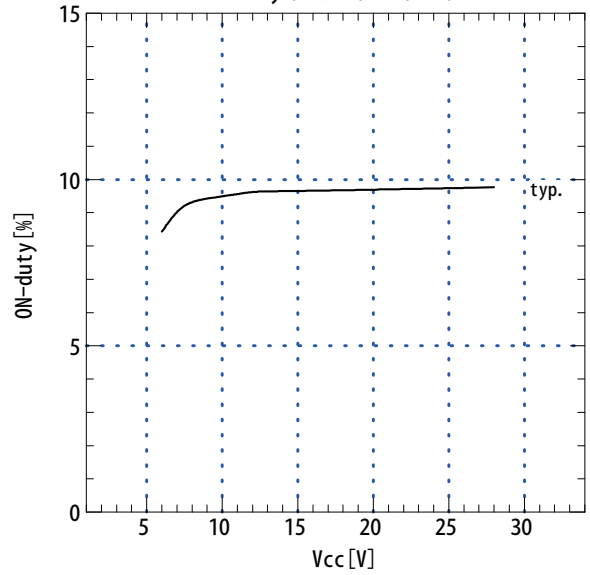
OSC Period T2
 $OSC\ Period\ T2=f(Vcc)$



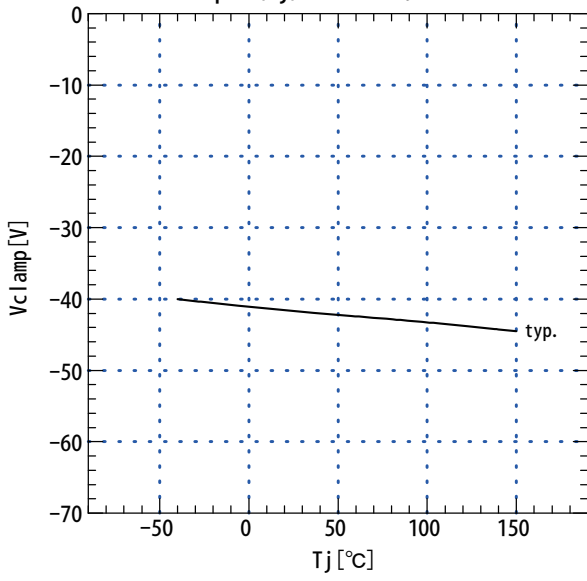
ON-duty
 $ON-duty(T1/T2)=f(Tj):Vcc=13V$



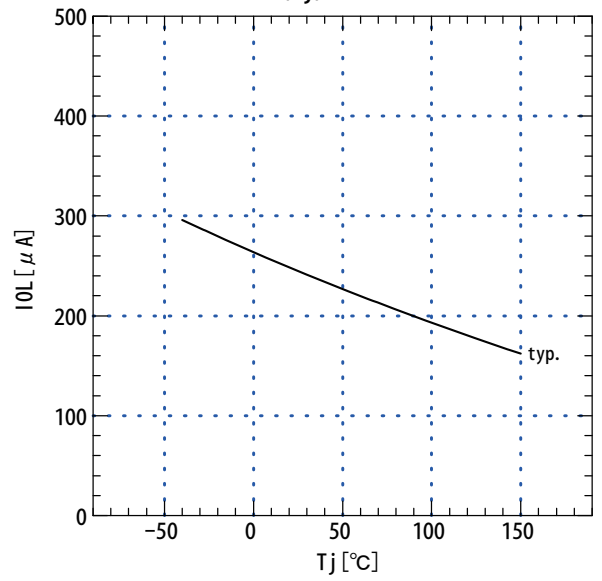
ON-duty
 $ON-duty(T1/T2)=f(Vcc)$



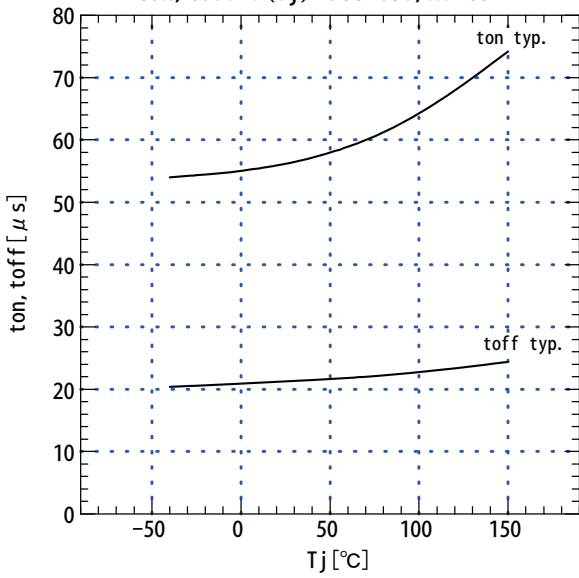
Vclamp detection
Vclamp=f(Tj):Vcc=13V, L=10mH



Output leakage current
IOL=f(Tj):Vcc=13V



Turn-on time, Turn-off time
ton, toff=f(Tj):Vcc=13V, RI=10Ω



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