

N-channel Load Switch IC

NO. EA-268-111028

OUTLINE

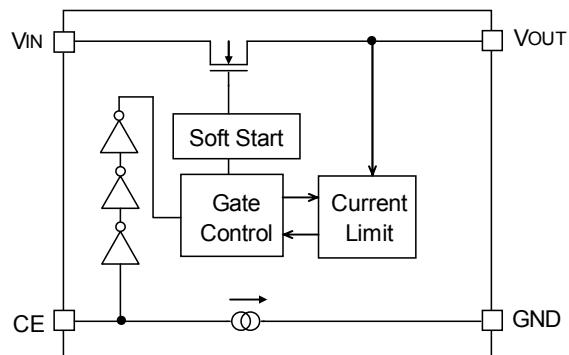
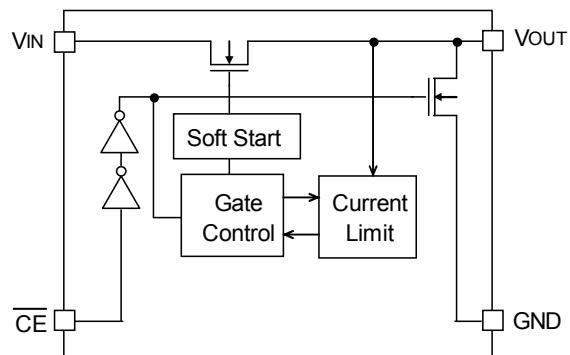
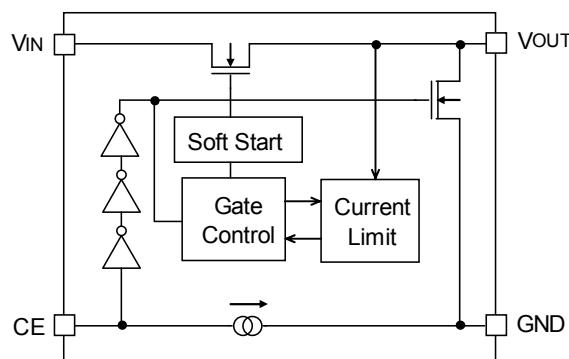
The R5540 series are N-channel Load Switch ICs with the low supply current, Typ. 9µA. By using an Nch transistor as a driver transistor, the features of low on resistance and the reverse current protection at off state are realized in these ICs. The gate voltage of the N-channel transistor is supplied from the internal step-up circuit. The R5540 is an ideal switch to supply the power from the secondary power source such as the output of a step-down DC/DC to the load circuit. Since the package for the R5540 is the ultra small-sized DFN(PLP)1010-4F, high density mounting on board is possible.

FEATURES

- Built-in an N-channel MOSFET
- Input Voltage Range 0.75V to 3.6V (Code 002)
..... 0.8V to 3.6V (Code 004)
- Supply Current at Operation ($I_{OUT}=0mA$) Typ. 9µA
- Supply Current at Standby Mode Typ. 0.7µA
- Switch On Resistance Typ. 120mΩ ($V_{IN}=1.2V$)
- Output Current Min. 200mA/ Min. 450mA
- Package DFN(PLP)1010-4F
- Built-in Over-current Sensing Circuit TYP. 350mA/ TYP. 700mA
- Built-in Soft-start function

APPLICATION

- For secondary power source for electrical appliances such as mobile communication equipments, cameras, VCRs and Camcorders.

BLOCK DIAGRAMS**R5540KxxxB****R5540KxxxC****R5540KxxxD**

SELECTION GUIDE

The output current value, the auto-discharge function and the polarity of CE pin from "L" active, "H" active are selectable at the user's request.

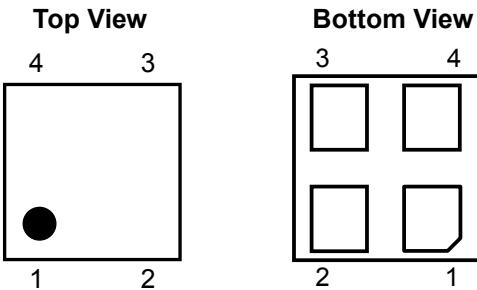
Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
R5540Kxxx*-TR	DFN(PLP)1010-4F	10,000pcs	Yes	Yes

xxx: The output current value can be designated by the following codes.
 002: Output Current (200mA)
 004: Output Current (450mA)

*: Auto-discharge function at off state and the polarity of CE pin are option as follows.
 B: "H" active, without auto-discharge function at off state
 C: "L" active, with auto-discharge function at off state
 D: "H" active, with auto-discharge function at off state

PIN CONFIGURATIONS

• DFN(PLP)1010-4F



PIN DESCRIPTION

● R5540K : DFN(PLP)1010-4F

Pin No	Symbol	Pin Description
1	GND	Ground Pin
2	\overline{CE} / CE	Chip Enable Pin ("L" Active / "H" Active)
3	V_{IN}	Input Pin
4	V_{OUT}	Output Pin

ABSOLUTE MAXIMUM RATINGS

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	-0.3 to 5.0	V
V_{CE}	Input Voltage (\overline{CE} / CE Pin)	-0.3 to 5.0	V
V_{OUT}	Output Voltage	-0.3 to 5.0	V
I_{OUT}	Output Current	Internally limited	mA
P_D	Power Dissipation (Standard Test Land Pattern)*	300	mW
Ta	Ambient Temperature	-40 to 85	°C
Tstg	Storage Temperature	-55 to 125	°C

*) For Power Dissipation, please refer to Power Dissipation to be described.

ABSOLUTE MAXIMUM RATINGS

Electronic and mechanical stress momentarily exceeded absolute maximum ratings may cause the permanent damages and may degrade the life time and safety for both device and system using the device in the field. The functional operation at or over these absolute maximum ratings is not assured.

RECOMMENDED OPERATING CONDITIONS (ELECTRICAL CHARACTERISTICS)

All of electronic equipment should be designed that the mounted semiconductor devices operate within the recommended operating conditions. The semiconductor devices cannot operate normally over the recommended operating conditions, even if when they are used over such conditions by momentary electronic noise or surge. And the semiconductor devices may receive serious damage when they continue to operate over the recommended operating conditions.

ELECTRICAL CHARACTERISTICS

V_{IN} = 0.75 to 3.60V(Code 002) , 0.80 to 3.60V(Code 004), $C_{IN} = 1\mu F$, $C_{OUT} = \text{None}$, unless otherwise noted.

The specification in surrounded by is guaranteed by design at all temperature range, $-40^\circ C \leq Ta \leq 85^\circ C$.

R5540Kxxxx (Ta=25°C)

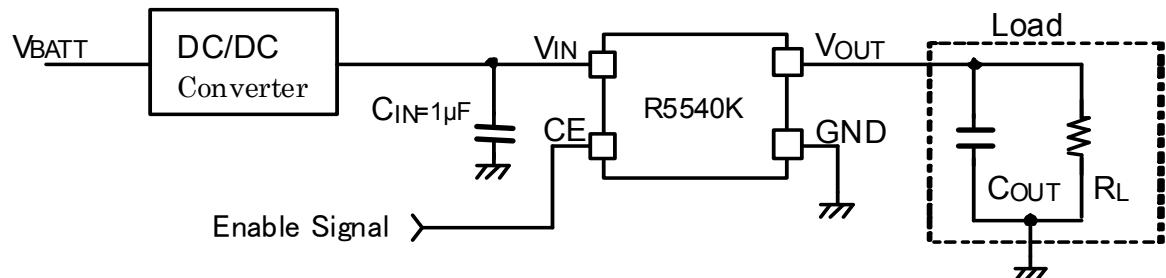
Symbol	Item	Conditions		Min.	Typ.	Max.	Unit	
V_{IN}	Input Voltage	Code 002		0.75		3.60	V	
		Code 004		0.80		3.60		
R_{ON}	Switch ON Resistance	Code 002	$V_{IN}=1.2V$, $I_{OUT}=200mA$		120	180	$m\Omega$	
		Code 004	$V_{IN}=1.2V$, $I_{OUT}=450mA$					
I_{OUT}	Output Current	Code 002		200			mA	
I_{OUT}	Output Current	Code 004		450				
I_{SS}	Supply Current	$I_{OUT}=0mA$ *Note1			9	40	μA	
Istandby	Standby Current	$V_{OUT}=GND$ $V_{IN}=1.8V$ *Note2	Ta=25°C		0.7		μA	
			Ta=85°C		5			
I_{LIM}	Current Limit	Code 002	$V_{IN}=1.2V$	200	350	500	mA	
I_{LIM}	Current Limit	Code 004		450	700	1000		
I_{SC}	Short Current Limit	$V_{IN}=1.2V$, $V_{OUT}=0V$			50	100	mA	
I_{CE}	\overline{CE} Input Current	C version			0.4		μA	
I_{CEPD}	CE Pull-down Current	B, D version			0.7		μA	
V_{CEH}	CE Input Voltage "H"	$V_{IN}=2.5V$ to 3.6V		1.0			V	
		$V_{IN}=1.0V$ to 2.5V		0.9				
		$V_{IN}=0.75V$ to 1.0V		$V_{IN} \times 0.9$				
V_{CEL}	CE Input Voltage "L"	$V_{IN}=0.75V$ to 3.6V				0.4	V	
R_{LOW}	Auto-discharge Nch Tr. ON Resistance (Version. C, D)	$V_{IN}=1.2V$ *Note2			100		Ω	
t_r	Output Rise Time	$V_{IN}=1.2V$, $V_{OUT}=10\% \sim 90\%$ $C_{OUT}=0.1\mu F$			73		μs	
t_{sc}	Short Current Response Time	$V_{OUT}=0V$			30		μs	

All test categories were tested on the units under the pulse load condition ($T_j \approx Ta = 25^\circ C$) except Short Current Response Time.

*Note1 $\overline{CE} = L$ for "L" active, $CE=H$ for "H" active

*Note2 $\overline{CE} = H$ for "L" active, $CE=L$ for "H" active

TYPICAL APPLICATION

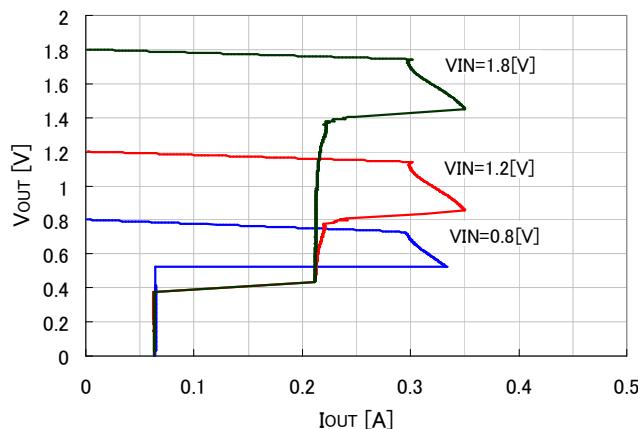


Basically, the R5540K series do not require a bypass capacitor between V_{IN} and GND, however, considering the spike noise caused by the high side inductor at current limit, use 0.1uF or more capacitor as a bypass capacitor. More capacitance is also acceptable depending on the application.

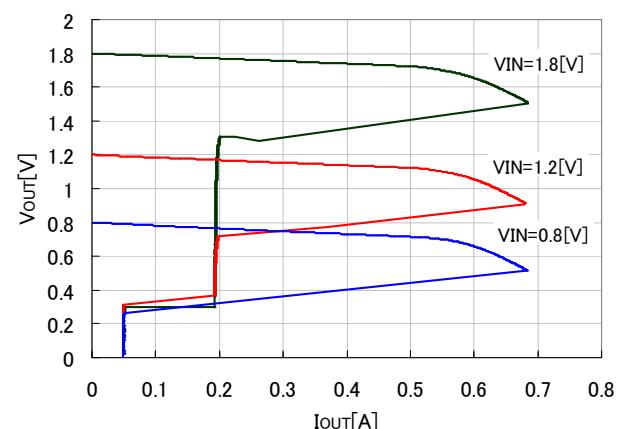
TYPICAL CHARACTERISTIC

- 1) Output Voltage vs. Output Current $C_{IN}=1\mu F$, $C_{OUT}=1\mu F$

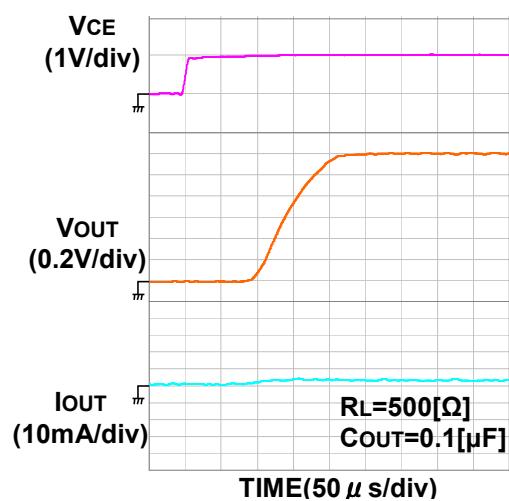
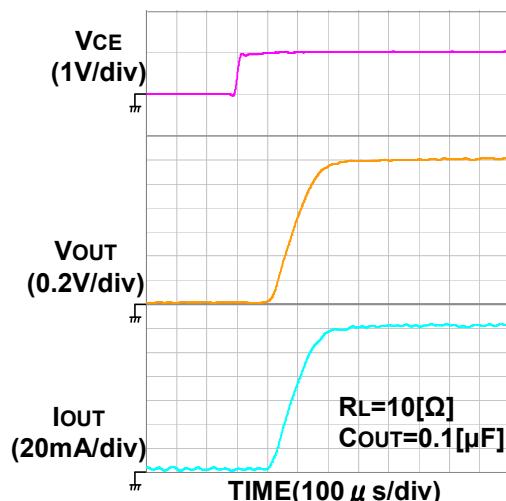
R5540K002x

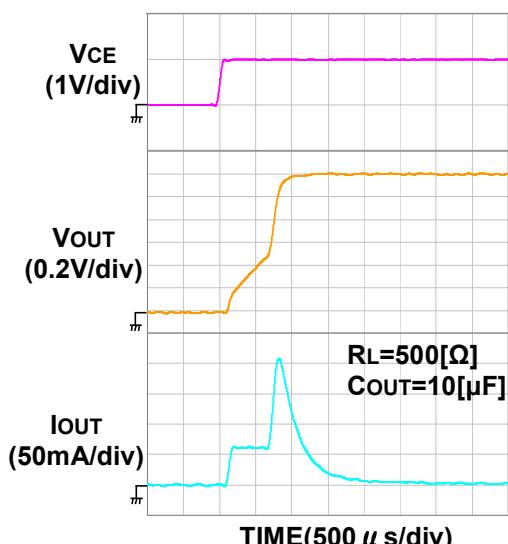
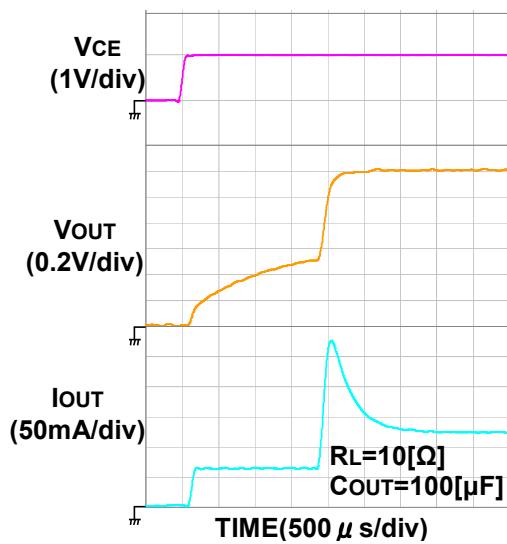
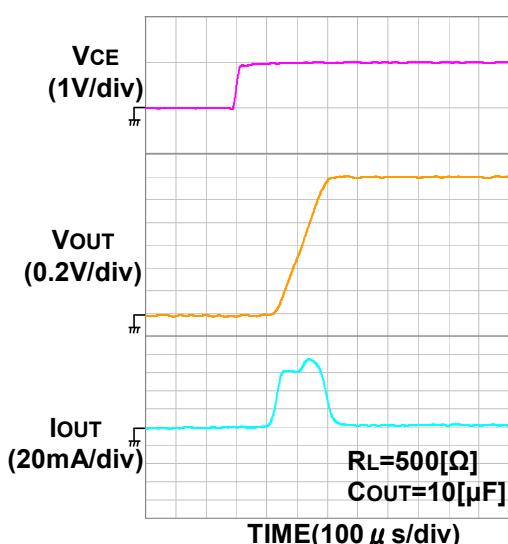
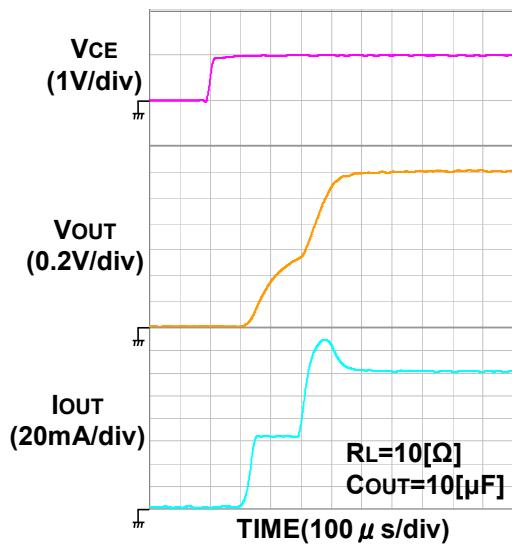
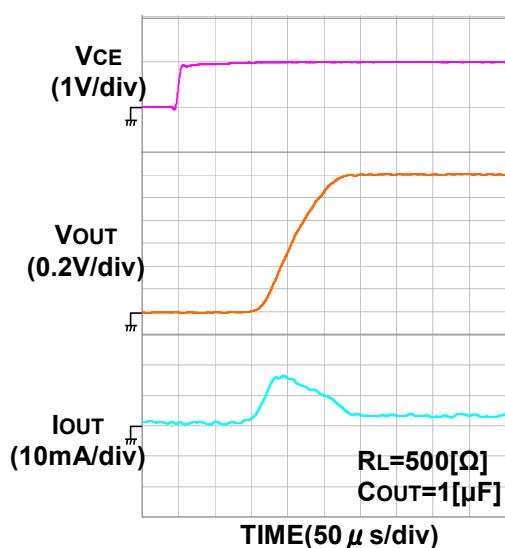
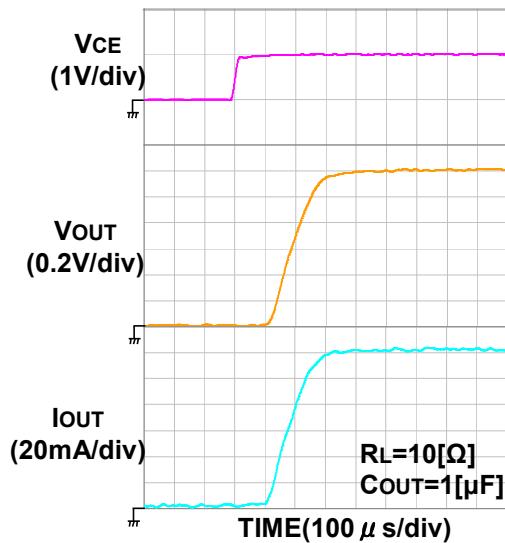


R5540K004x

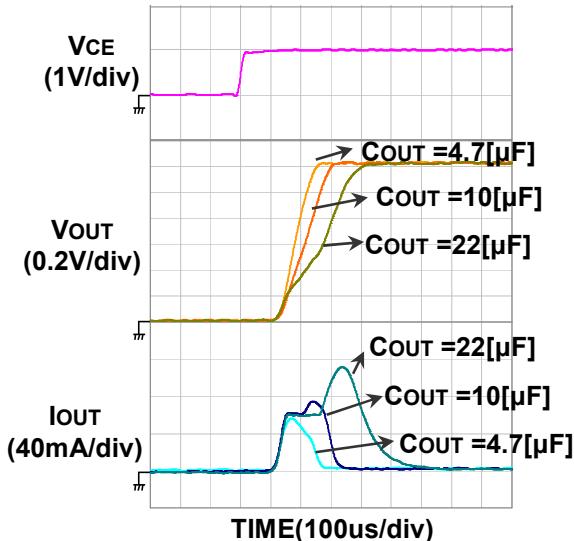


- 2) Turn on waveform (002x, $V_{IN}=1.2V$, $C_{IN}=1\mu F$, $T_a=25^\circ C$)

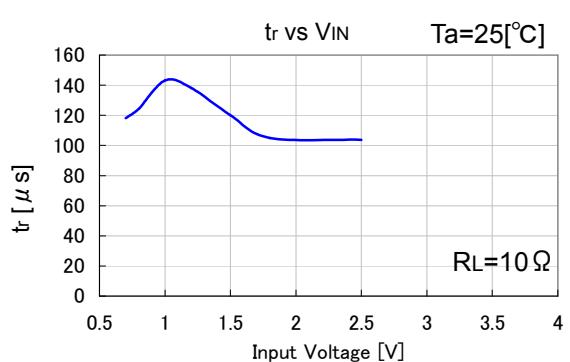




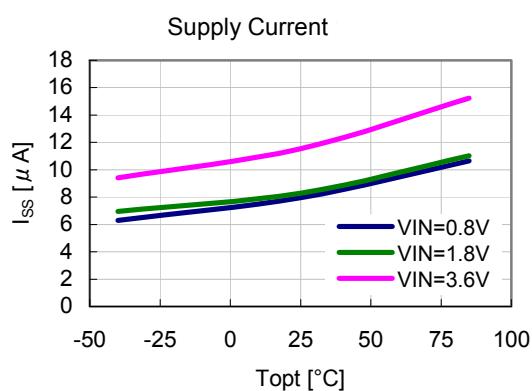
3) Inrush current vs. output capacitor (002x)



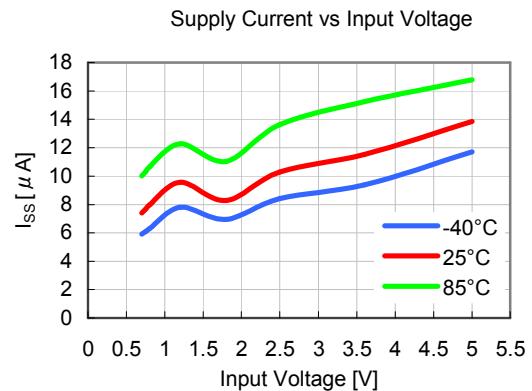
4) Input voltage vs. Turn-on speed



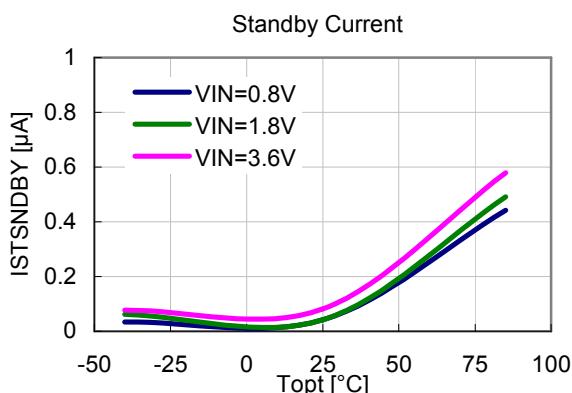
5) Supply current vs. Temperature



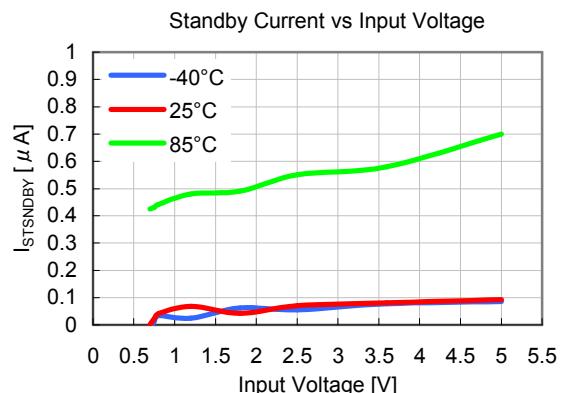
6) Standby current vs. Input voltage

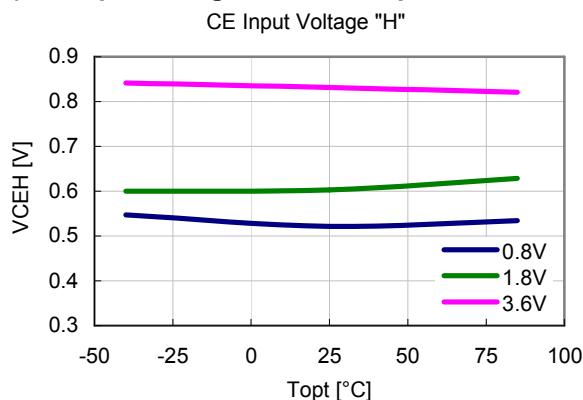
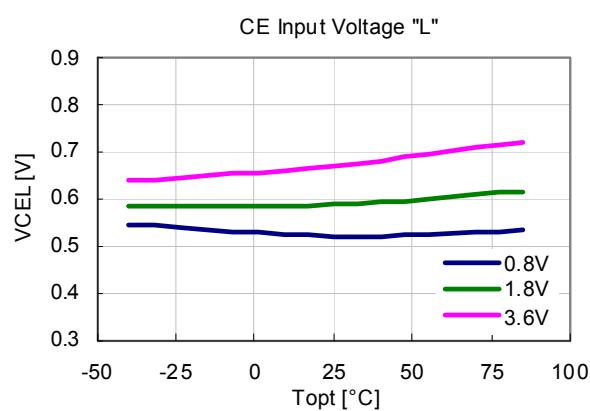
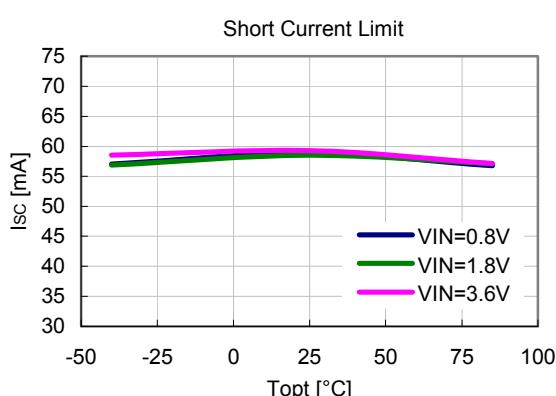
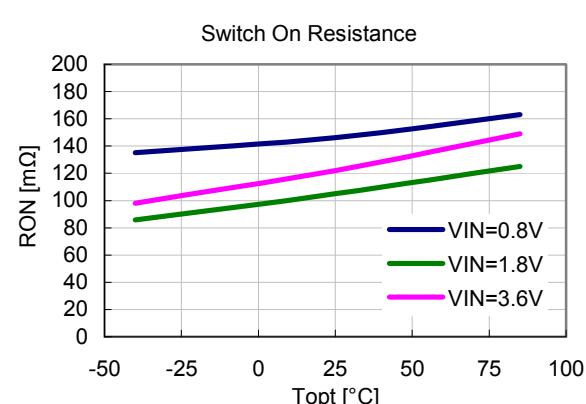
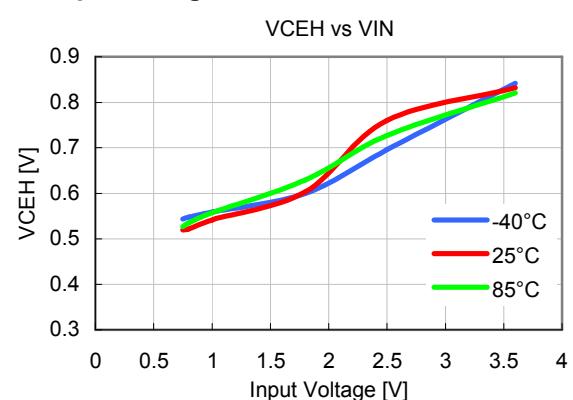
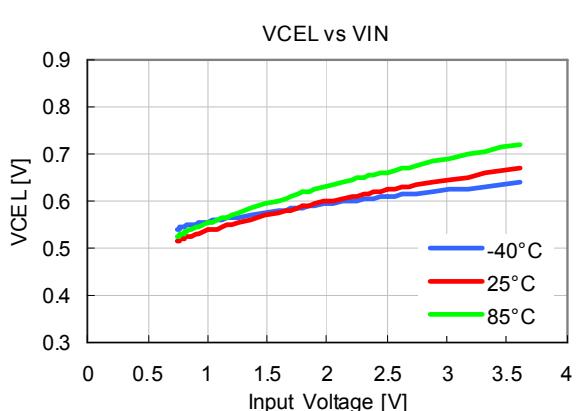
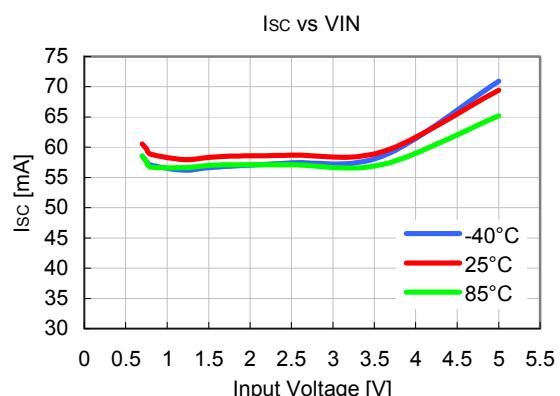
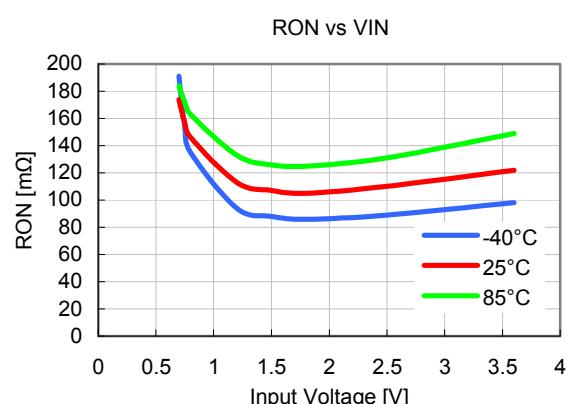


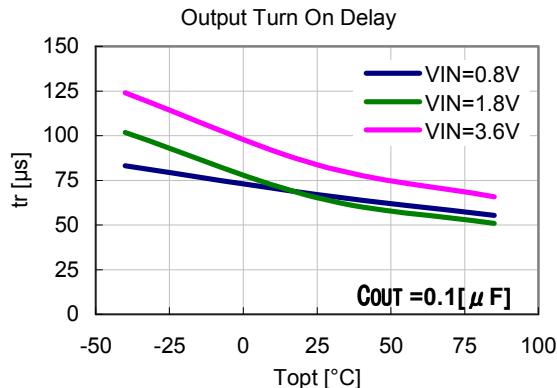
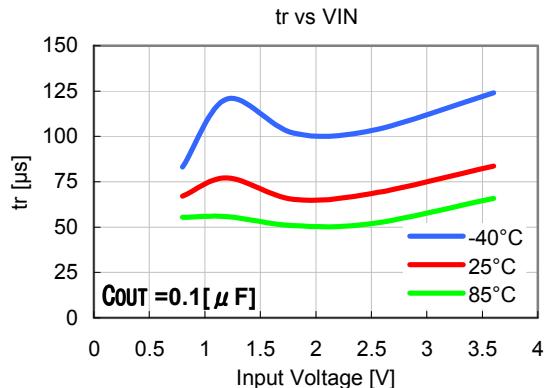
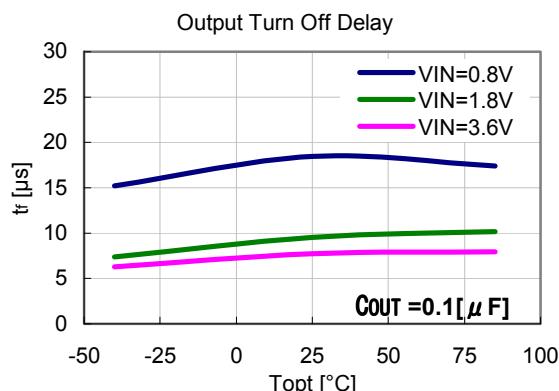
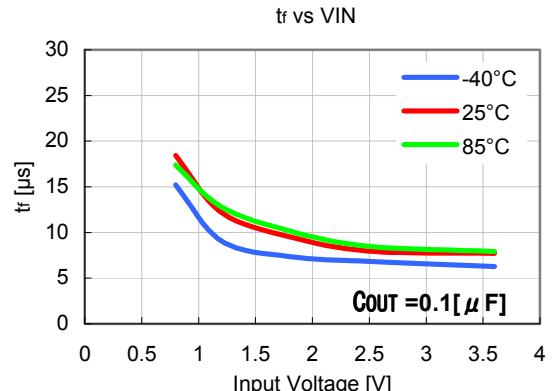
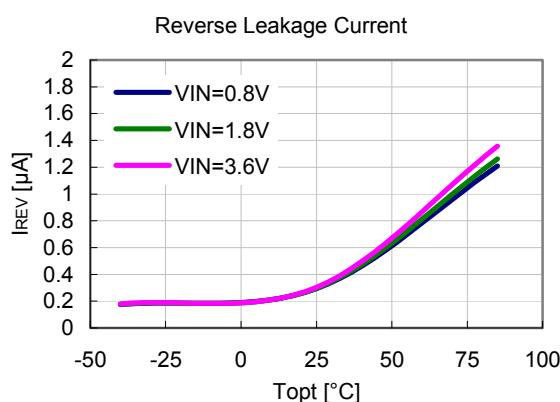
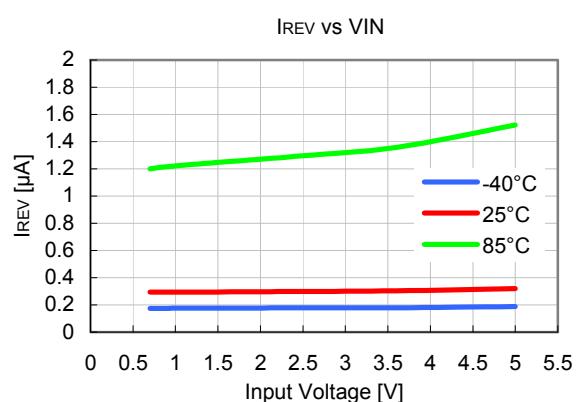
7) Standby Current vs. Temperature

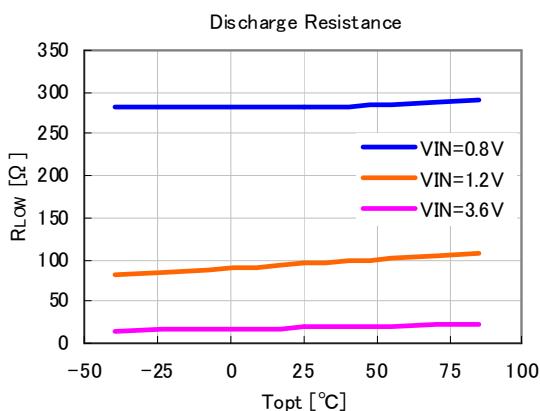
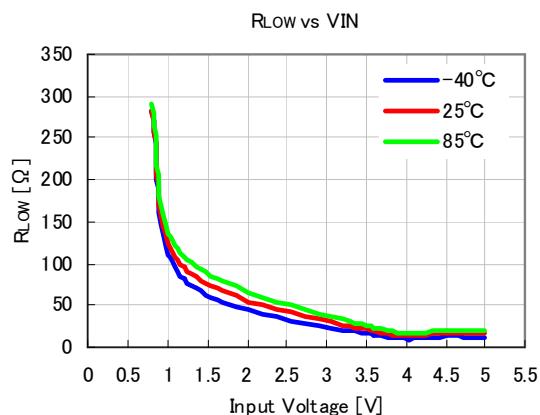
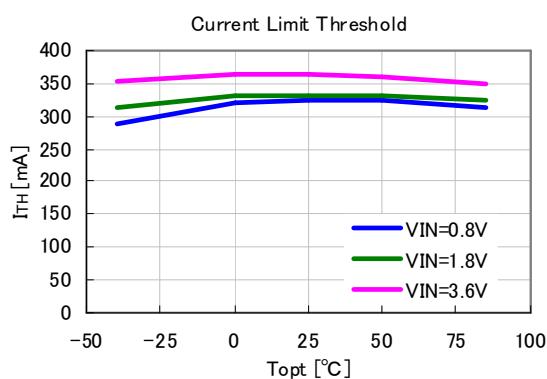
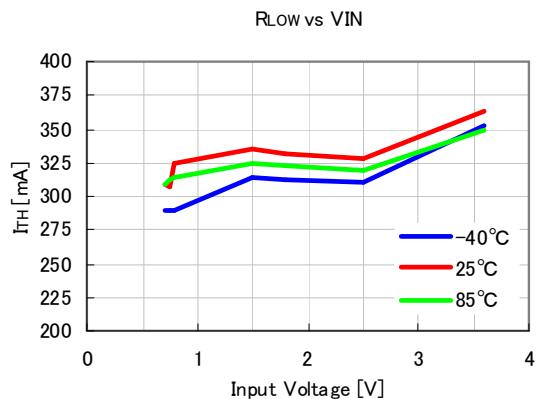
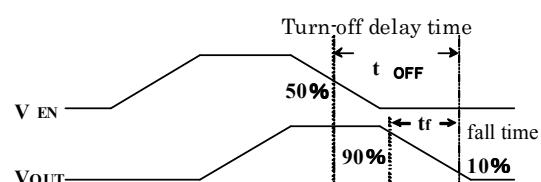
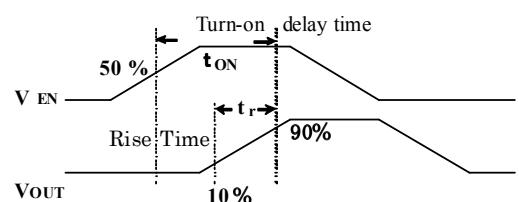


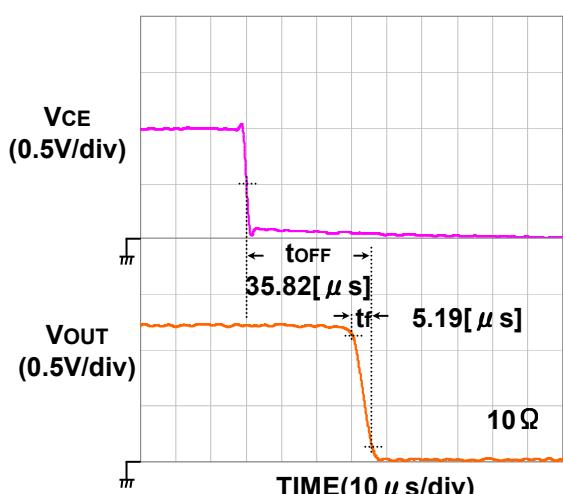
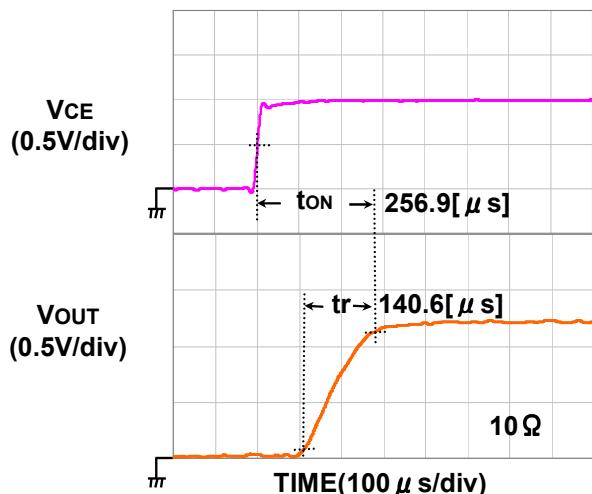
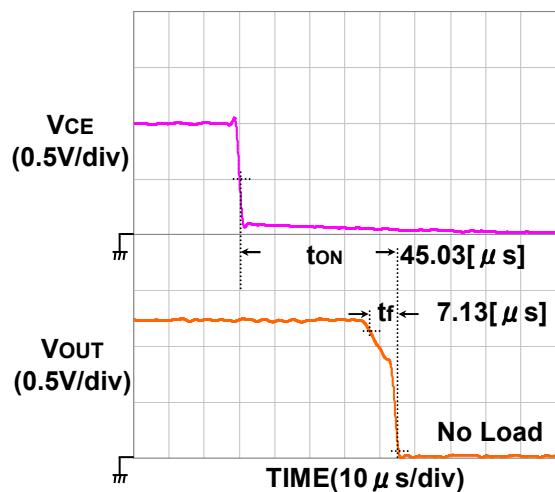
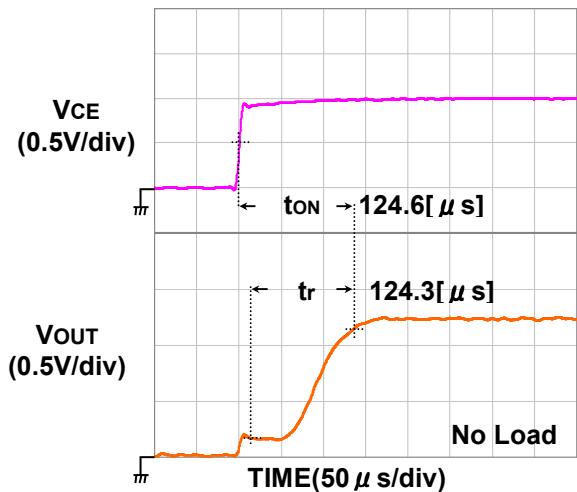
8) Standby current vs. Input voltage



9) CE Input voltage "H" vs. Temperature**11) CE Input voltage "L" vs. Temperature****13) Short current limit vs. Temperature****15) Switch on resistance vs. Temperature****10) CE Input voltage "H" vs. VDD****12) CE Input voltage "L" vs. VDD****14) Short current limit vs. Input voltage****16) Switch on resistance vs. Input voltage**

17) Output Rise time vs. Temperature**18) Output Rise time vs. Input voltage****19) Output Fall time vs. Temperature****20) Output Fall time vs. Input voltage****21) Reverse leakage current vs. Temperature****22) Reverse leakage current vs. Input voltage**

23) Discharge resistance vs. Temperature**24) Discharge resistance vs. Input voltage****25) Current limit vs. Temperature (002x)****26) Current limit vs. Input voltage (002x)****TIMING CHART**

Turn-on/ turn-off waveform ($V_{IN} = 1.2[V]$)

POWER DISSIPATION (DFN(PLP)1010-4F)

Power Dissipation (P_D) depends on conditions of mounting on board. This specification is based on the measurement at the condition below:

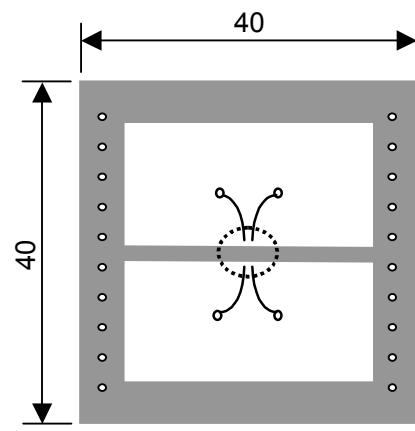
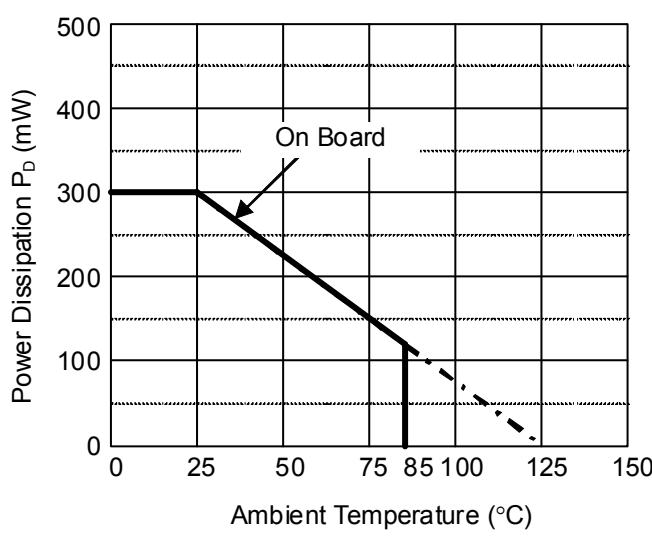
Measurement Conditions

	Standard Land Pattern
Environment	Mounting on Board (Wind velocity=0m/s)
Board Material	Glass cloth epoxy plastic (Double sided)
Board Dimensions	40mm×40mm×1.6mm
Copper Ratio	Top side: Approx. 50%, Back side: Approx. 50%
Through-holes	φ 0.54mm×24pcs

Measurement Result

($T_a=25^{\circ}\text{C}$, $T_{j\max}=125^{\circ}\text{C}$)

	Standard Land Pattern
Power Dissipation	300mW
Thermal Resistance	$\theta_{ja}=(125-25^{\circ}\text{C})/0.3\text{W}=330\text{ }^{\circ}\text{C/W}$ $\theta_{jc}=48\text{ }^{\circ}\text{C/W}$



Measurement Board Pattern

○ IC Mount Area (Unit : mm)



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- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помошь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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