150 mA Voltage Regulator (Wide Input Voltage Range) for Automotive Applications

NO. EC-152-160930

OUTLINE

The R1514x is a CMOS-based positive voltage regulator (VR) IC featuring 150 mA output current. It is specifically designed for automotive applications. The R1514xxxxB has features of high input voltage and ultra-low supply current. A peak current limit circuit, a short current limit circuit, and a thermal shutdown circuit are built in the R1514x.

The operating temperature is −40°C to 105°C and the maximum input voltage is 36 V, the R1514x is very suitable for power source of car accessories.

The regulator output voltage is fixed in the R1514xxxxB and can be selected with a step of 0.1 V in the range of 2.0 V to 12.0 V. The Output voltage accuracy is ±2%.

The packages for this IC are the SOT-89-5 for space saving and the HSOP-6J for higher power applications.

FEATURES

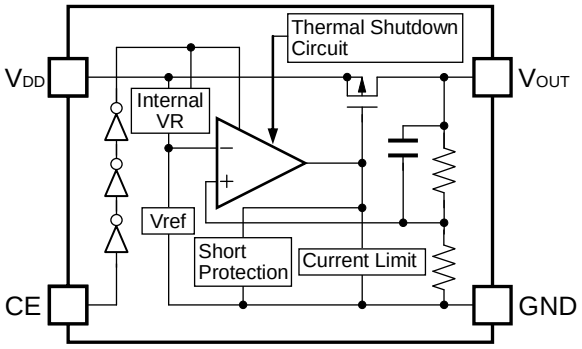
- Input Voltage Range (Maximum Rating) .....4 V to 36 V (50 V)
- Operating Temperature .....−40°C to 105°C
- Supply Current (I_{SS}) ..... Typ. 9 µA
- Standby Current (Istandby) ..... Typ. 0.1 µA
- Temperature-Drift Coefficient of Output Voltage .. Typ. ±100 ppm/°C
- Output Current (I_{OUT}) ..... Min. 150 mA (V_{IN} = V_{OUT} + 3.0 V; R1514x050B)
- Line Regulation..... Typ. 0.05%/V
- Output Voltage Accuracy ..... ±2%
- Output Voltage Range (V_{OUT}) ..... 2.0 V to 12.0 V (0.1 V step)
- Packages..... SOT-89-5, HSOP-6J
- Built-in Short Current Limit Circuit.....Typ. 50 mA
- Built-in Peak Current Limit Circuit
- Built-in Thermal Shutdown Circuit

APPLICATIONS

- Power source for car accessories including car audio equipment, car navigation system, and ETC system.
- Power source for control units including EV inverter and charge control.

BLOCK DIAGRAM

R1514xxxxB



SELECTION GUIDE

The output voltage, package for the ICs can be selected at the user's request.

Product Name	Package	Quantity per Reel	Pb Free	Halogen Free
R1514HxxxB-T1-#E	SOT-89-5	1,000 pcs	Yes	Yes
R1514SxxxB-E2-#E	HSOP-6J	1,000 pcs	Yes	Yes

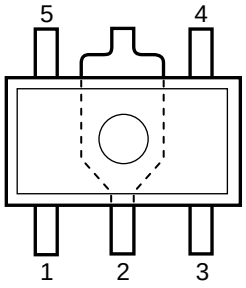
xxx: The output voltage (V_{OUT}) can be designated in the range of 2.0 V (020) to 12.0 V (120) in 0.1 V step.

#: Specify Automotive Class Code

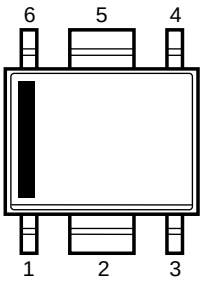
	Operating Temperature Range	Guaranteed Specs Temperature Range	Screening
A	−40°C to 105°C	25°C	High temperature
J	−40°C to 105°C	−40°C to 105°C	High and low temperature

PIN DESCRIPTIONS

SOT-89-5



HSOP-6J



SOT-89-5

Pin No.	Symbol	Description
1	V_{OUT}	Output Pin
2	GND*1	Ground Pin
3	CE	Chip Enable Pin, Active-high.
4	GND*1	Ground Pin
5	V_{DD}	Input Pin

*1 The GND pin must be wired together when it is mounted on board.

HSOP-6J

Pin No.	Symbol	Description
1	V_{OUT}	Output Pin
2	GND*2	Ground Pin
3	CE	Chip Enable Pin, Active-high.
4	GND*2	Ground Pin
5	GND*2	Ground Pin
6	V_{DD}	Input Pin

*2 The GND pin must be wired together when it is mounted on board.

ABSOLUTE MAXIMUM RATINGS

Symbol	Item		Rating	Unit
V_{IN}	Input Voltage		−0.3 to 50	V
V_{IN}	Peak Input Voltage*3		60	V
V_{CE}	Input Voltage (CE Pin)		−0.3 to V_{IN} + 0.3 ≤ 50	V
V_{OUT}	Output Voltage		−0.3 to V_{IN} + 0.3 ≤ 50	V
I_{OUT}	Output Current		250	mA
P_D	Power Dissipation (SOT-89-5)*4	Standard Land Pattern	1120	mW
		High Wattage Land Pattern	1620	
	Power Dissipation (HSOP-6J) *4	Standard Land Pattern	2100	
		Ultra High Wattage Land Pattern	3400	
Tj	Junction Temperature		−40 to 150	°C
Tstg	Storage Temperature Range		−55 to 150	°C

*3 Duration time = 200 ms
*4 Refer to *POWER DISSIPATION* for detailed information.

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

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	4 to 36	V
Ta	Operating Temperature Range	−40 to 105	°C

RECOMMENDED OPERATING CONDITIONS

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

The specifications surrounded by ☐ are guaranteed by design engineering at -40°C ≤ Ta ≤ 105 °C.

R1514xxxxB (-AE) (Ta = 25°C)

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
I_{SS}	Supply Current	V_{IN} = V_{OUT} + 3.0 V, I_{OUT} = 0 mA			9	20	µA
Istandby	Standby Current	V_{IN} = 36 V, V_{CE} = 0 V			0.1	1.0	µA
V_{OUT}	Output Voltage	V_{IN} = V_{OUT} + 3.0 V, I_{OUT} = 1 mA	Ta = 25°C	x0.98		x1.02	V
			−40°C ≤ Ta ≤ 105°C	x 0.97		x 1.03	V
I_{OUT}	Output Current	V_{IN} = V_{OUT} + 3.0 V		Refer to the *Product-specific Electrical Characteristics*			
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	V_{IN} = V_{OUT} + 3.0 V, 1 mA ≤ I_{OUT} ≤ 40 mA					
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	V_{OUT} + 1.5 V ≤ V_{IN} ≤ 36 V, I_{OUT} = 1 mA			0.05	0.20	%/V
V_{DIF}	Dropout Voltage	I_{OUT} = 20 mA		Refer to the *Product-specific Electrical Characteristics*			
I_{SC}	Short Current Limit	V_{OUT} = 0 V			50		mA
V_{CEH}	CE Input Voltage "H"			1.5		V_{IN}	V
V_{CEL}	CE Input Voltage "L"			0.0		0.3	V
T_{TSD}	Thermal Shutdown Temperature	Junction Temperature		150	160		°C
T_{TSR}	Thermal Shutdown Released Temperature	Junction Temperature		110	130		°C

All test items listed under Electrical Characteristics are done under the pulse load condition (Tj ≈ Ta = 25°C).

The specifications surrounded by ☐ are guaranteed by design engineering at -40°C ≤ Ta ≤ 105 °C.

Product-specific Electrical Characteristics

R1514xxxxB (-AE) (Ta = 25°C)

Product Name	V_{OUT} [V]						I_{OUT} [mA]		$\Delta V_{OUT}/\Delta I_{OUT}$ [mV]		V_{DIF} [V]		
	Ta = 25°C			−40°C ≤ Ta ≤ 105°C			Ta = 25°C	−40°C ≤ Ta ≤ 105°C			TYP.	Ta = 25°C	−40°C ≤ Ta ≤ 105°C
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	MIN.	MIN.	TYP.	MAX.		MAX.	MAX.
R1514x020B	1.960	2.000	2.040	1.940	2.000	2.060	100	90	10	25	–	2.00	2.0
R1514x021B	2.058	2.100	2.142	2.037	2.100	2.163						1.90	1.9
R1514x022B	2.156	2.200	2.244	2.134	2.200	2.266						1.80	1.8
R1514x023B	2.254	2.300	2.346	2.231	2.300	2.369						1.70	1.7
R1514x024B	2.352	2.400	2.448	2.328	2.400	2.472						1.60	1.6
R1514x025B	2.450	2.500	2.550	2.425	2.500	2.575						1.50	1.5
R1514x026B	2.548	2.600	2.652	2.522	2.600	2.678						1.40	1.4
R1514x027B	2.646	2.700	2.754	2.619	2.700	2.781						1.30	1.3
R1514x028B	2.744	2.800	2.856	2.716	2.800	2.884						1.20	1.2
R1514x029B	2.842	2.900	2.958	2.813	2.900	2.987						1.10	1.1
R1514x030B	2.940	3.000	3.060	2.910	3.000	3.090	120	120				1.00	1.0
R1514x031B	3.038	3.100	3.162	3.007	3.100	3.193						0.90	0.9
R1514x032B	3.136	3.200	3.264	3.104	3.200	3.296						0.80	0.8
R1514x033B	3.234	3.300	3.366	3.201	3.300	3.399						0.70	0.7
R1514x034B	3.332	3.400	3.468	3.298	3.400	3.502						0.60	0.7
R1514x035B	3.430	3.500	3.570	3.395	3.500	3.605						0.50	0.6
R1514x036B	3.528	3.600	3.672	3.492	3.600	3.708						0.40	0.6
R1514x037B	3.626	3.700	3.774	3.589	3.700	3.811					0.35	0.60	0.60
R1514x038B	3.724	3.800	3.876	3.686	3.800	3.914							
R1514x039B	3.822	3.900	3.978	3.783	3.900	4.017							
R1514x040B	3.920	4.000	4.080	3.880	4.000	4.120					0.25	0.40	0.50
R1514x041B	4.018	4.100	4.182	3.977	4.100	4.223							
R1514x042B	4.116	4.200	4.284	4.074	4.200	4.326							
R1514x043B	4.214	4.300	4.386	4.171	4.300	4.429							
R1514x044B	4.312	4.400	4.488	4.268	4.400	4.532							
R1514x045B	4.410	4.500	4.590	4.365	4.500	4.635							
R1514x046B	4.508	4.600	4.692	4.462	4.600	4.738							
R1514x047B	4.606	4.700	4.794	4.559	4.700	4.841							
R1514x048B	4.704	4.800	4.896	4.656	4.800	4.944							
R1514x049B	4.802	4.900	4.998	4.753	4.900	5.047							

R1514xxxxB (-AE) (Ta=25°C)

Product Name	V_{OUT} [V]						I_{OUT} [mA]		$\Delta V_{OUT}/\Delta I_{OUT}$ [mV]		V_{DIF} [V]		
	Ta = 25°C			−40°C ≤ Ta ≤ 105°C			Ta = 25°C	−40°C ≤ Ta ≤ 105°C			TYP.	Ta = 25°C	−40°C ≤ Ta ≤ 105°C
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	MIN.	MIN.	TYP.	MAX.		MAX.	MAX.
R1514x050B	4.900	5.000	5.100	4.850	5.000	5.150							
R1514x051B	4.998	5.100	5.202	4.947	5.100	5.253							
R1514x052B	5.096	5.200	5.304	5.044	5.200	5.356							
R1514x053B	5.194	5.300	5.406	5.141	5.300	5.459							
R1514x054B	5.292	5.400	5.508	5.238	5.400	5.562							
R1514x055B	5.390	5.500	5.610	5.335	5.500	5.665							
R1514x056B	5.488	5.600	5.712	5.432	5.600	5.768							
R1514x057B	5.586	5.700	5.814	5.529	5.700	5.871							
R1514x058B	5.684	5.800	5.916	5.626	5.800	5.974							
R1514x059B	5.782	5.900	6.018	5.723	5.900	6.077							
R1514x060B	5.880	6.000	6.120	5.820	6.000	6.180							
R1514x061B	5.978	6.100	6.222	5.917	6.100	6.283							
R1514x062B	6.076	6.200	6.324	6.014	6.200	6.386							
R1514x063B	6.174	6.300	6.426	6.111	6.300	6.489							
R1514x064B	6.272	6.400	6.528	6.208	6.400	6.592							
R1514x065B	6.370	6.500	6.630	6.305	6.500	6.695							
R1514x066B	6.468	6.600	6.732	6.402	6.600	6.798							
R1514x067B	6.566	6.700	6.834	6.499	6.700	6.901							
R1514x068B	6.664	6.800	6.936	6.596	6.800	7.004							
R1514x069B	6.762	6.900	7.038	6.693	6.900	7.107							
R1514x070B	6.860	7.000	7.140	6.790	7.000	7.210	150	150	20	35	0.20	0.35	0.40
R1514x071B	6.958	7.100	7.242	6.887	7.100	7.313							
R1514x072B	7.056	7.200	7.344	6.984	7.200	7.416							
R1514x073B	7.154	7.300	7.446	7.081	7.300	7.519							
R1514x074B	7.252	7.400	7.548	7.178	7.400	7.622							
R1514x075B	7.350	7.500	7.650	7.275	7.500	7.725							
R1514x076B	7.448	7.600	7.752	7.372	7.600	7.828							
R1514x077B	7.546	7.700	7.854	7.469	7.700	7.931							
R1514x078B	7.644	7.800	7.956	7.566	7.800	8.034							
R1514x079B	7.742	7.900	8.058	7.663	7.900	8.137							
R1514x080B	7.840	8.000	8.160	7.760	8.000	8.240							
R1514x081B	7.938	8.100	8.262	7.857	8.100	8.343							
R1514x082B	8.036	8.200	8.364	7.954	8.200	8.446							
R1514x083B	8.134	8.300	8.466	8.051	8.300	8.549							
R1514x084B	8.232	8.400	8.568	8.148	8.400	8.652							
R1514x085B	8.330	8.500	8.670	8.245	8.500	8.755							
R1514x086B	8.428	8.600	8.772	8.342	8.600	8.858							
R1514x087B	8.526	8.700	8.874	8.439	8.700	8.961							
R1514x088B	8.624	8.800	8.976	8.536	8.800	9.064							
R1514x089B	8.722	8.900	9.078	8.633	8.900	9.167							

R1514xxxxB (-AE) (Ta = 25°C)

Product Name	V_{OUT} [V]						I_{OUT} [mA]		$\Delta V_{OUT}/\Delta I_{OUT}$ [mV]		V_{DIF} [V]		
	Ta = 25°C			−40°C ≤ Ta ≤ 105°C			Ta = 25°C	−40°C ≤ Ta ≤ 105°C			TYP.	Ta = 25°C	−40°C ≤ Ta ≤ 105°C
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	MIN.	MIN.	TYP.	MAX.		MAX.	MAX.
R1514x090B	8.820	9.000	9.180	8.730	9.000	9.270							
R1514x091B	8.918	9.100	9.282	8.827	9.100	9.373							
R1514x092B	9.016	9.200	9.384	8.924	9.200	9.476							
R1514x093B	9.114	9.300	9.486	9.021	9.300	9.579							
R1514x094B	9.212	9.400	9.588	9.118	9.400	9.682							
R1514x095B	9.310	9.500	9.690	9.215	9.500	9.785							
R1514x096B	9.408	9.600	9.792	9.312	9.600	9.888							
R1514x097B	9.506	9.700	9.894	9.409	9.700	9.991							
R1514x098B	9.604	9.800	9.996	9.506	9.800	10.094							
R1514x099B	9.702	9.900	10.098	9.603	9.900	10.197							
R1514x100B	9.800	10.000	10.200	9.700	10.000	10.300							
R1514x101B	9.898	10.100	10.302	9.797	10.100	10.403							
R1514x102B	9.996	10.200	10.404	9.894	10.200	10.506							
R1514x103B	10.094	10.300	10.506	9.991	10.300	10.609							
R1514x104B	10.192	10.400	10.608	10.088	10.400	10.712							
R1514x105B	10.290	10.500	10.710	10.185	10.500	10.815	150	150	20	35	0.20	0.35	0.40
R1514x106B	10.388	10.600	10.812	10.282	10.600	10.918							
R1514x107B	10.486	10.700	10.914	10.379	10.700	11.021							
R1514x108B	10.584	10.800	11.016	10.476	10.800	11.124							
R1514x109B	10.682	10.900	11.118	10.573	10.900	11.227							
R1514x110B	10.780	11.000	11.220	10.670	11.000	11.330							
R1514x111B	10.878	11.100	11.322	10.767	11.100	11.433							
R1514x112B	10.976	11.200	11.424	10.864	11.200	11.536							
R1514x113B	11.074	11.300	11.526	10.961	11.300	11.639							
R1514x114B	11.172	11.400	11.628	11.058	11.400	11.742							
R1514x115B	11.270	11.500	11.730	11.155	11.500	11.845							
R1514x116B	11.368	11.600	11.832	11.252	11.600	11.948							
R1514x117B	11.466	11.700	11.934	11.349	11.700	12.051							
R1514x118B	11.564	11.800	12.036	11.446	11.800	12.154							
R1514x119B	11.662	11.900	12.138	11.543	11.900	12.257							
R1514x120B	11.760	12.000	12.240	11.640	12.000	12.360							

R1514xxxxB (-JE) (−40°C ≤ Ta ≤ 105°C)

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
I_{SS}	Supply Current	V_{IN} = V_{OUT} + 3.0 V, I_{OUT} = 0 mA			9	20	µA
Istandby	Standby Current	V_{IN} = 36 V, V_{CE} = 0 V			0.1	1.0	µA
V_{OUT}	Output Voltage	V_{IN} = V_{OUT} + 3.0 V, I_{OUT} = 1 mA	Ta = 25°C	x 0.98		x 1.02	V
			−40°C ≤ Ta ≤ 105°C	x 0.97		x 1.03	V
I_{OUT}	Output Current	V_{IN} = V_{OUT} + 3.0 V		Refer to the *Product-specific Electrical Characteristics*			
$\Delta V_{OUT}/\Delta I_{OUT}$	Load Regulation	V_{IN} = V_{OUT} + 3.0 V, 1 mA ≤ I_{OUT} ≤ 40 mA					
$\Delta V_{OUT}/\Delta V_{IN}$	Line Regulation	V_{OUT} + 1.5 V ≤ V_{IN} ≤ 36 V, I_{OUT} = 1 mA			0.05	0.20	%/V
V_{DIF}	Dropout Voltage	I_{OUT} = 20 mA		Refer to the *Product-specific Electrical Characteristics*			
I_{SC}	Short Current Limit	V_{OUT} = 0 V			50		mA
V_{CEH}	CE Input Voltage "H"			1.5		V_{IN}	V
V_{CEL}	CE Input Voltage "L"			0.0		0.3	V
T_{TSD}	Thermal Shutdown Temperature	Junction Temperature		150	160		°C
T_{TSR}	Thermal Shutdown Released Temperature	Junction Temperature		110	130		°C

Product-specific Electrical Characteristics

R1514xxxxB (-JE) (−40°C ≤ Ta ≤ 105°C)

Product Name	V_{OUT} [V]						I_{OUT} [mA]		$\Delta V_{OUT}/\Delta I_{OUT}$ [mV]		V_{DIF} [V]		
	Ta = 25°C			−40°C ≤ Ta ≤ 105°C			Ta = 25°C	−40°C ≤ Ta ≤ 105°C			TYP.	Ta = 25°C	−40°C ≤ Ta ≤ 105°C
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	MIN.	MIN.	TYP.	MAX.		MAX.	MAX.
R1514x020B	1.960	2.000	2.040	1.940	2.000	2.060	100	90	10	25	−	2.00	2.0
R1514x021B	2.058	2.100	2.142	2.037	2.100	2.163						1.90	1.9
R1514x022B	2.156	2.200	2.244	2.134	2.200	2.266						1.80	1.8
R1514x023B	2.254	2.300	2.346	2.231	2.300	2.369						1.70	1.7
R1514x024B	2.352	2.400	2.448	2.328	2.400	2.472						1.60	1.6
R1514x025B	2.450	2.500	2.550	2.425	2.500	2.575						1.50	1.5
R1514x026B	2.548	2.600	2.652	2.522	2.600	2.678						1.40	1.4
R1514x027B	2.646	2.700	2.754	2.619	2.700	2.781						1.30	1.3
R1514x028B	2.744	2.800	2.856	2.716	2.800	2.884						1.20	1.2
R1514x029B	2.842	2.900	2.958	2.813	2.900	2.987						1.10	1.1
R1514x030B	2.940	3.000	3.060	2.910	3.000	3.090	120	120				1.00	1.0
R1514x031B	3.038	3.100	3.162	3.007	3.100	3.193						0.90	0.9
R1514x032B	3.136	3.200	3.264	3.104	3.200	3.296						0.80	0.8
R1514x033B	3.234	3.300	3.366	3.201	3.300	3.399						0.70	0.7
R1514x034B	3.332	3.400	3.468	3.298	3.400	3.502						0.60	0.7
R1514x035B	3.430	3.500	3.570	3.395	3.500	3.605						0.50	0.6
R1514x036B	3.528	3.600	3.672	3.492	3.600	3.708						0.40	0.6
R1514x037B	3.626	3.700	3.774	3.589	3.700	3.811					0.35	0.60	0.60
R1514x038B	3.724	3.800	3.876	3.686	3.800	3.914							
R1514x039B	3.822	3.900	3.978	3.783	3.900	4.017							
R1514x040B	3.920	4.000	4.080	3.880	4.000	4.120					0.25	0.40	0.50
R1514x041B	4.018	4.100	4.182	3.977	4.100	4.223							
R1514x042B	4.116	4.200	4.284	4.074	4.200	4.326							
R1514x043B	4.214	4.300	4.386	4.171	4.300	4.429							
R1514x044B	4.312	4.400	4.488	4.268	4.400	4.532							
R1514x045B	4.410	4.500	4.590	4.365	4.500	4.635							
R1514x046B	4.508	4.600	4.692	4.462	4.600	4.738							
R1514x047B	4.606	4.700	4.794	4.559	4.700	4.841							
R1514x048B	4.704	4.800	4.896	4.656	4.800	4.944							
R1514x049B	4.802	4.900	4.998	4.753	4.900	5.047							

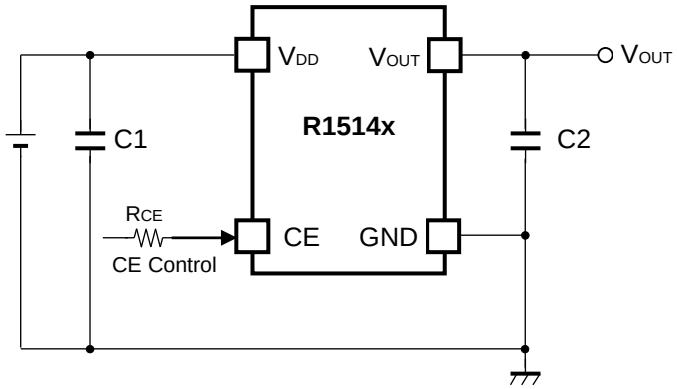
R1514xxxxB (-JE) (−40°C ≤ Ta ≤ 105°C)

Product Name	V_{OUT} [V]						I_{OUT} [mA]		$\Delta V_{OUT}/\Delta I_{OUT}$ [mV]		V_{DIF} [V]		
	Ta = 25°C			−40°C ≤ Ta ≤ 105°C			Ta = 25°C	−40°C ≤ Ta ≤ 105°C			TYP.	Ta = 25°C	−40°C ≤ Ta ≤ 105°C
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	MIN.	MIN.	TYP.	MAX.		MAX.	MAX.
R1514x050B	4.900	5.000	5.100	4.850	5.000	5.150							
R1514x051B	4.998	5.100	5.202	4.947	5.100	5.253							
R1514x052B	5.096	5.200	5.304	5.044	5.200	5.356							
R1514x053B	5.194	5.300	5.406	5.141	5.300	5.459							
R1514x054B	5.292	5.400	5.508	5.238	5.400	5.562							
R1514x055B	5.390	5.500	5.610	5.335	5.500	5.665							
R1514x056B	5.488	5.600	5.712	5.432	5.600	5.768							
R1514x057B	5.586	5.700	5.814	5.529	5.700	5.871							
R1514x058B	5.684	5.800	5.916	5.626	5.800	5.974							
R1514x059B	5.782	5.900	6.018	5.723	5.900	6.077							
R1514x060B	5.880	6.000	6.120	5.820	6.000	6.180							
R1514x061B	5.978	6.100	6.222	5.917	6.100	6.283							
R1514x062B	6.076	6.200	6.324	6.014	6.200	6.386							
R1514x063B	6.174	6.300	6.426	6.111	6.300	6.489							
R1514x064B	6.272	6.400	6.528	6.208	6.400	6.592							
R1514x065B	6.370	6.500	6.630	6.305	6.500	6.695							
R1514x066B	6.468	6.600	6.732	6.402	6.600	6.798							
R1514x067B	6.566	6.700	6.834	6.499	6.700	6.901							
R1514x068B	6.664	6.800	6.936	6.596	6.800	7.004							
R1514x069B	6.762	6.900	7.038	6.693	6.900	7.107							
R1514x070B	6.860	7.000	7.140	6.790	7.000	7.210							
R1514x071B	6.958	7.100	7.242	6.887	7.100	7.313							
R1514x072B	7.056	7.200	7.344	6.984	7.200	7.416							
R1514x073B	7.154	7.300	7.446	7.081	7.300	7.519							
R1514x074B	7.252	7.400	7.548	7.178	7.400	7.622							
R1514x075B	7.350	7.500	7.650	7.275	7.500	7.725							
R1514x076B	7.448	7.600	7.752	7.372	7.600	7.828							
R1514x077B	7.546	7.700	7.854	7.469	7.700	7.931							
R1514x078B	7.644	7.800	7.956	7.566	7.800	8.034							
R1514x079B	7.742	7.900	8.058	7.663	7.900	8.137							
R1514x080B	7.840	8.000	8.160	7.760	8.000	8.240							
R1514x081B	7.938	8.100	8.262	7.857	8.100	8.343							
R1514x082B	8.036	8.200	8.364	7.954	8.200	8.446							
R1514x083B	8.134	8.300	8.466	8.051	8.300	8.549							
R1514x084B	8.232	8.400	8.568	8.148	8.400	8.652							
R1514x085B	8.330	8.500	8.670	8.245	8.500	8.755							
R1514x086B	8.428	8.600	8.772	8.342	8.600	8.858							
R1514x087B	8.526	8.700	8.874	8.439	8.700	8.961							
R1514x088B	8.624	8.800	8.976	8.536	8.800	9.064							
R1514x089B	8.722	8.900	9.078	8.633	8.900	9.167							
							150	150	20	35	0.20	0.35	0.40

R1514xxxxB (-JE) (−40°C ≤ Ta ≤ 105°C)

Product Name	V_{OUT} [V]						I_{OUT} [mA]		$\Delta V_{OUT}/\Delta I_{OUT}$ [mV]		V_{DIF} [V]		
	Ta = 25°C			−40°C ≤ Ta ≤ 105°C			Ta = 25°C	−40°C ≤ Ta ≤ 105°C			TYP.	Ta = 25°C	−40°C ≤ Ta ≤ 105°C
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	MIN.	MIN.	TYP.	MAX.		MAX.	MAX.
R1514x090B	8.820	9.000	9.180	8.730	9.000	9.270							
R1514x091B	8.918	9.100	9.282	8.827	9.100	9.373							
R1514x092B	9.016	9.200	9.384	8.924	9.200	9.476							
R1514x093B	9.114	9.300	9.486	9.021	9.300	9.579							
R1514x094B	9.212	9.400	9.588	9.118	9.400	9.682							
R1514x095B	9.310	9.500	9.690	9.215	9.500	9.785							
R1514x096B	9.408	9.600	9.792	9.312	9.600	9.888							
R1514x097B	9.506	9.700	9.894	9.409	9.700	9.991							
R1514x098B	9.604	9.800	9.996	9.506	9.800	10.094							
R1514x099B	9.702	9.900	10.098	9.603	9.900	10.197							
R1514x100B	9.800	10.000	10.200	9.700	10.000	10.300							
R1514x101B	9.898	10.100	10.302	9.797	10.100	10.403							
R1514x102B	9.996	10.200	10.404	9.894	10.200	10.506							
R1514x103B	10.094	10.300	10.506	9.991	10.300	10.609							
R1514x104B	10.192	10.400	10.608	10.088	10.400	10.712							
R1514x105B	10.290	10.500	10.710	10.185	10.500	10.815	150	150	20	35	0.20	0.35	0.40
R1514x106B	10.388	10.600	10.812	10.282	10.600	10.918							
R1514x107B	10.486	10.700	10.914	10.379	10.700	11.021							
R1514x108B	10.584	10.800	11.016	10.476	10.800	11.124							
R1514x109B	10.682	10.900	11.118	10.573	10.900	11.227							
R1514x110B	10.780	11.000	11.220	10.670	11.000	11.330							
R1514x111B	10.878	11.100	11.322	10.767	11.100	11.433							
R1514x112B	10.976	11.200	11.424	10.864	11.200	11.536							
R1514x113B	11.074	11.300	11.526	10.961	11.300	11.639							
R1514x114B	11.172	11.400	11.628	11.058	11.400	11.742							
R1514x115B	11.270	11.500	11.730	11.155	11.500	11.845							
R1514x116B	11.368	11.600	11.832	11.252	11.600	11.948							
R1514x117B	11.466	11.700	11.934	11.349	11.700	12.051							
R1514x118B	11.564	11.800	12.036	11.446	11.800	12.154							
R1514x119B	11.662	11.900	12.138	11.543	11.900	12.257							
R1514x120B	11.760	12.000	12.240	11.640	12.000	12.360							

TYPICAL APPLICATION



External Parts Example:

C1 (C_{IN})	0.1 µF (Ceramic)
C2 (C_{OUT})	0.1 µF (Ceramic)

TECHNICAL NOTES

PCB Layout

Ensure the V_{DD} and GND lines are sufficiently robust. If their impedance is too high, noise pickup or unstable operation may result. Connect a capacitor with a suitable value between the V_{DD} and GND, and as close as possible to the pins.

Phase Compensation

Phase Compensation of the R1514x has been made internally for stable operation even though the load current would vary. Therefore, without the capacitors, C1 and C2, the output voltage is regulated, however, for more stable operation, use capacitors as C1 and C2. Especially, if the input line is long and impedance is high, C1 is necessary. Moreover, if you use rather large C2, transient response will be improved. Recommended value is in the range from 0.1 µF to 10 µF. Wiring should be made as short as possible.

Connect the capacitor, C1 between V_{DD} pin and GND and C2 between V_{OUT} and GND as close as possible.

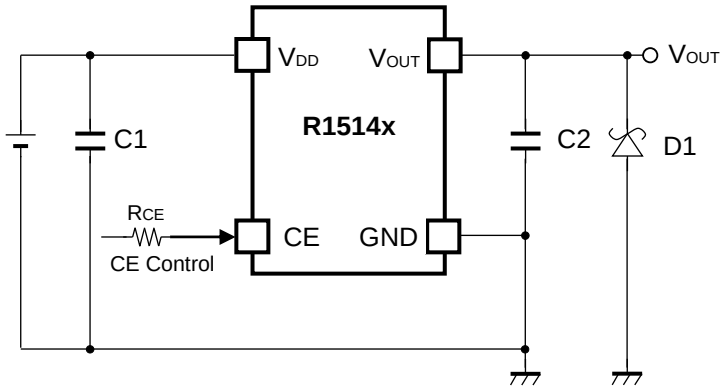
Thermal Shutdown

Thermal shutdown function is included in the R1514x, if the junction temperature is more than or equal to 160°C (Typ.), the operation of regulator would stop. After that, when the junction temperature is less than or equal to 130°C (Typ.), the operation of regulator would restart. Unless the cause of rising temperature would remove, the regulator repeats on and off, and output waveform would be like consecutive pulses.

Chip Enable Circuit

Do not make voltage level of chip enable pin keep floating level, or in between V_{CEH} and V_{CEL}. Otherwise, the output voltage would be unstable or indefinite, or unexpected current would flow internally.

TYPICAL APPLICATION FOR IC CHIP BREAKDOWN PREVENTION



When a sudden surge of electrical current travels along the V_{OUT} pin and GND due to a short-circuit, electrical resonance of a circuit involving an output capacitor (C2) and a short circuit inductor generates a negative voltage and may damage the device or the load devices. Connecting a schottky diode (D1) between the V_{OUT} pin and GND has the effect of preventing damage to them.

PACKAGE INFORMATION

POWER DISSIPATION (SOT89-5)

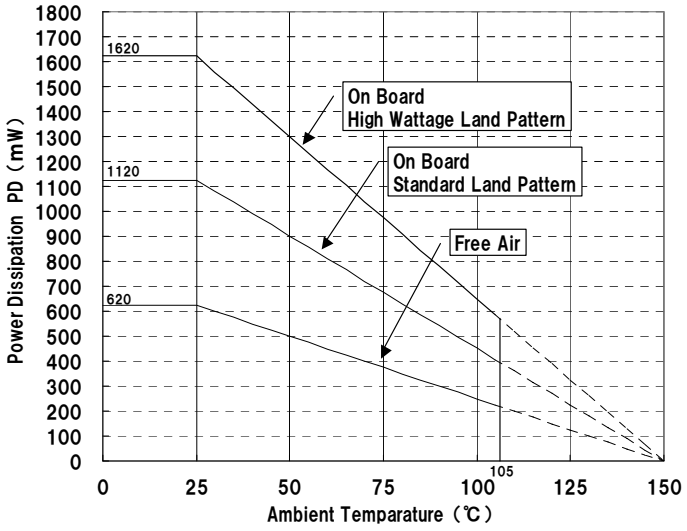
Power Dissipation (P_D) depends on conditions of mounting on board. This specification is based on the measurement at the condition below:

Measurement Conditions

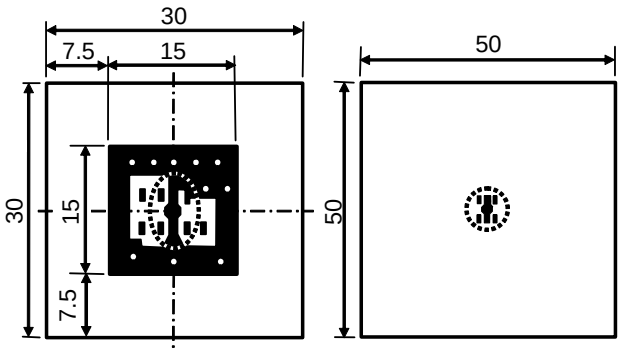
	High Wattage Land Pattern	Standard Land Pattern
Environment	Mounting on Board (Wind velocity = 0 m/s)	Mounting on Board (Wind velocity = 0 m/s)
Board Material	Glass cloth epoxy plastic (Double sided)	Glass cloth epoxy plastic (Double sided)
Board Dimensions	30 mm × 30 mm × 1.6 mm	50 mm × 50 mm × 1.6 mm
Copper Ratio	Top side : Approx. 20% , Back side : Approx. 100%	Top side : Approx. 10% , Back side : Approx. 100%
Through-hole	ϕ0.85 mm × 10 pcs	-

Measurement Result (Ta = 25°C, Tjmax = 150°C)

	High Wattage Land Pattern	Standard Land Pattern	Free Air
Power Dissipation	1620 mW	1120 mW	620 mW
Thermal Resistance	77°C/W	111°C/W	200°C/W



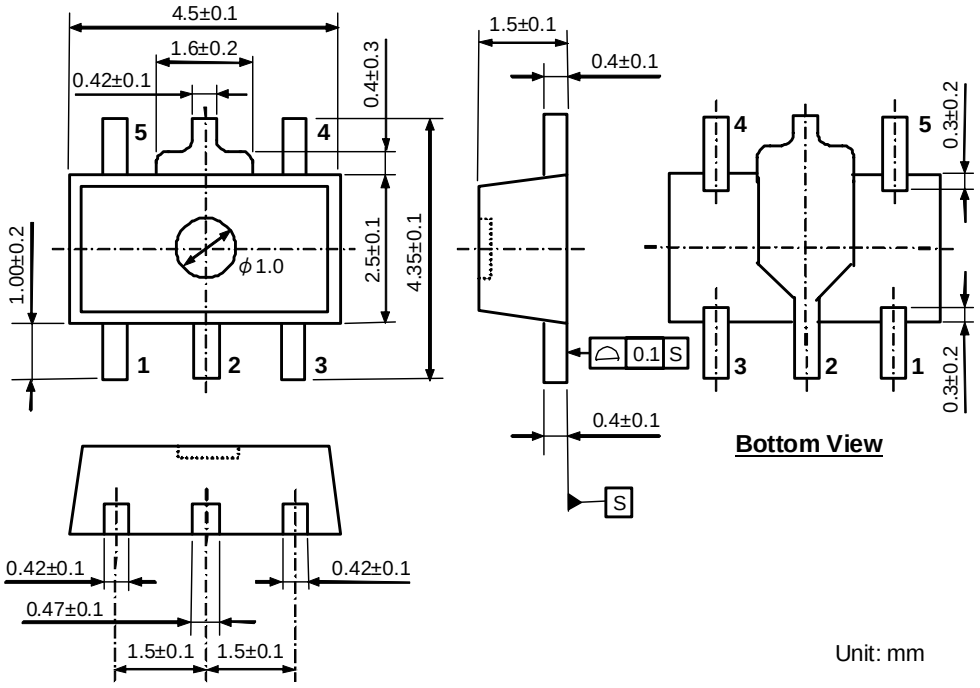
Power Dissipation



Measurement Board Pattern

IC Mount Area (Unit: mm)

PACKAGE DIMENSIONS (SOT89-5)

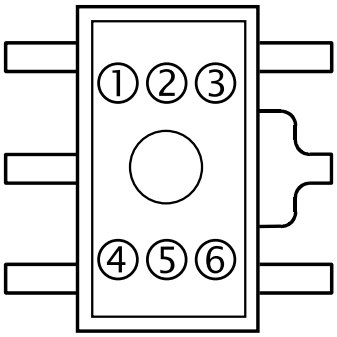


Unit: mm

MARK SPECIFICATION (SOT-89-5)

①②③④: Product Code … **Refer to *R1514H MARK SPECIFICATION TABLE (SOT-89-5)***

⑤⑥: Lot Number … Alphanumeric Serial Number



R1514H MARK SPECIFICATION TABLE (SOT-89-5)

Product Name	①②③④	V_{OUT}
R1514H020B	M 0 2 0	2.0 V
R1514H021B	M 0 2 1	2.1 V
R1514H022B	M 0 2 2	2.2 V
R1514H023B	M 0 2 3	2.3 V
R1514H024B	M 0 2 4	2.4 V
R1514H025B	M 0 2 5	2.5 V
R1514H026B	M 0 2 6	2.6 V
R1514H027B	M 0 2 7	2.7 V
R1514H028B	M 0 2 8	2.8 V
R1514H029B	M 0 2 9	2.9 V
R1514H030B	M 0 3 0	3.0 V
R1514H031B	M 0 3 1	3.1 V
R1514H032B	M 0 3 2	3.2 V
R1514H033B	M 0 3 3	3.3 V
R1514H034B	M 0 3 4	3.4 V
R1514H035B	M 0 3 5	3.5 V
R1514H036B	M 0 3 6	3.6 V
R1514H037B	M 0 3 7	3.7 V
R1514H038B	M 0 3 8	3.8 V
R1514H039B	M 0 3 9	3.9 V
R1514H040B	M 0 4 0	4.0 V
R1514H041B	M 0 4 1	4.1 V
R1514H042B	M 0 4 2	4.2 V
R1514H043B	M 0 4 3	4.3 V
R1514H044B	M 0 4 4	4.4 V
R1514H045B	M 0 4 5	4.5 V
R1514H046B	M 0 4 6	4.6 V
R1514H047B	M 0 4 7	4.7 V
R1514H048B	M 0 4 8	4.8 V
R1514H049B	M 0 4 9	4.9 V
R1514H050B	M 0 5 0	5.0 V
R1514H051B	M 0 5 1	5.1 V
R1514H052B	M 0 5 2	5.2 V
R1514H053B	M 0 5 3	5.3 V
R1514H054B	M 0 5 4	5.4 V
R1514H055B	M 0 5 5	5.5 V
R1514H056B	M 0 5 6	5.6 V
R1514H057B	M 0 5 7	5.7 V
R1514H058B	M 0 5 8	5.8 V
R1514H059B	M 0 5 9	5.9 V

Product Name	①②③④	V_{OUT}
R1514H060B	M 0 6 0	6.0 V
R1514H061B	M 0 6 1	6.1 V
R1514H062B	M 0 6 2	6.2 V
R1514H063B	M 0 6 3	6.3 V
R1514H064B	M 0 6 4	6.4 V
R1514H065B	M 0 6 5	6.5 V
R1514H066B	M 0 6 6	6.6 V
R1514H067B	M 0 6 7	6.7 V
R1514H068B	M 0 6 8	6.8 V
R1514H069B	M 0 6 9	6.9 V
R1514H070B	M 0 7 0	7.0 V
R1514H071B	M 0 7 1	7.1 V
R1514H072B	M 0 7 2	7.2 V
R1514H073B	M 0 7 3	7.3 V
R1514H074B	M 0 7 4	7.4 V
R1514H075B	M 0 7 5	7.5 V
R1514H076B	M 0 7 6	7.6 V
R1514H077B	M 0 7 7	7.7 V
R1514H078B	M 0 7 8	7.8 V
R1514H079B	M 0 7 9	7.9 V
R1514H080B	M 0 8 0	8.0 V
R1514H081B	M 0 8 1	8.1 V
R1514H082B	M 0 8 2	8.2 V
R1514H083B	M 0 8 3	8.3 V
R1514H084B	M 0 8 4	8.4 V
R1514H085B	M 0 8 5	8.5 V
R1514H086B	M 0 8 6	8.6 V
R1514H087B	M 0 8 7	8.7 V
R1514H088B	M 0 8 8	8.8 V
R1514H089B	M 0 8 9	8.9 V
R1514H090B	M 0 9 0	9.0 V
R1514H091B	M 0 9 1	9.1 V
R1514H092B	M 0 9 2	9.2 V
R1514H093B	M 0 9 3	9.3 V
R1514H094B	M 0 9 4	9.4 V
R1514H095B	M 0 9 5	9.5 V
R1514H096B	M 0 9 6	9.6 V
R1514H097B	M 0 9 7	9.7 V
R1514H098B	M 0 9 8	9.8 V
R1514H099B	M 0 9 9	9.9 V

Product Name	①②③④	V_{OUT}
R1514H100B	M 1 0 0	10.0 V
R1514H101B	M 1 0 1	10.1 V
R1514H102B	M 1 0 2	10.2 V
R1514H103B	M 1 0 3	10.3 V
R1514H104B	M 1 0 4	10.4 V
R1514H105B	M 1 0 5	10.5 V
R1514H106B	M 1 0 6	10.6 V
R1514H107B	M 1 0 7	10.7 V
R1514H108B	M 1 0 8	10.8 V
R1514H109B	M 1 0 9	10.9 V
R1514H110B	M 1 1 0	11.0 V
R1514H111B	M 1 1 1	11.1 V
R1514H112B	M 1 1 2	11.2 V
R1514H113B	M 1 1 3	11.3 V
R1514H114B	M 1 1 4	11.4 V
R1514H115B	M 1 1 5	11.5 V
R1514H116B	M 1 1 6	11.6 V
R1514H117B	M 1 1 7	11.7 V
R1514H118B	M 1 1 8	11.8 V
R1514H119B	M 1 1 9	11.9 V
R1514H120B	M 1 2 0	12.0 V

POWER DISSIPATION (HSOP-6J)

The power dissipation of the package is dependent on PCB material, layout, and environmental conditions. The following conditions are used in this measurement.

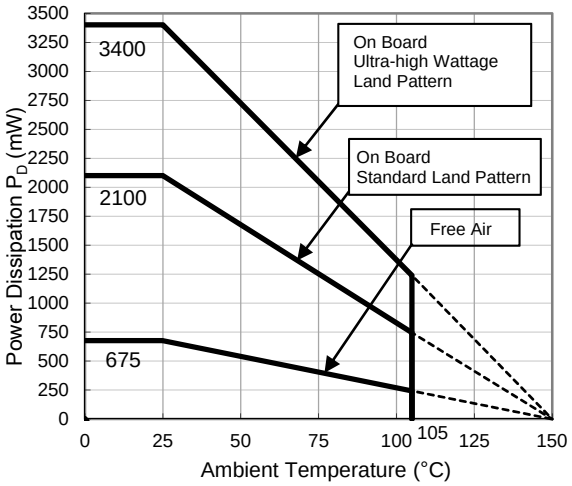
Measurement Conditions

	Ultra-high Wattage Land Pattern	Standard Land Pattern
Environment	Mounting on Board (Wind Velocity = 0 m/s)	Mounting on Board (Wind Velocity = 0 m/s)
Board Material	Glass Cloth Epoxy Plastic (Four-Layer Board)	Glass Cloth Epoxy Plastic (Double-sided Board)
Board Dimensions	76.2 mm × 114.3 mm × 0.8 mm	50 mm × 50 mm × 1.6 mm
Copper Ratio	96%	50%
Through-holes	ϕ 0.3 mm × 28 pcs	ϕ 0.5 mm × 24 pcs

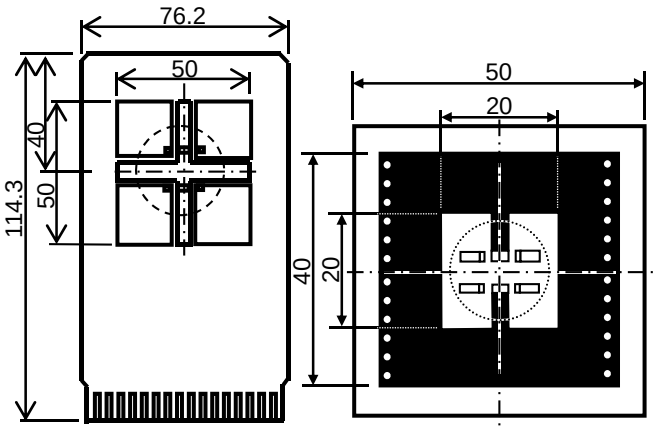
Measurement Result

(Ta = 25°C, Tjmax = 150°C)

	Ultra-high Wattage Land Pattern	Standard Land Pattern	Free Air
Power Dissipation	3400 mW	2100 mW	675 mW
Thermal Resistance	37°C/W	59°C/W	185°C/W

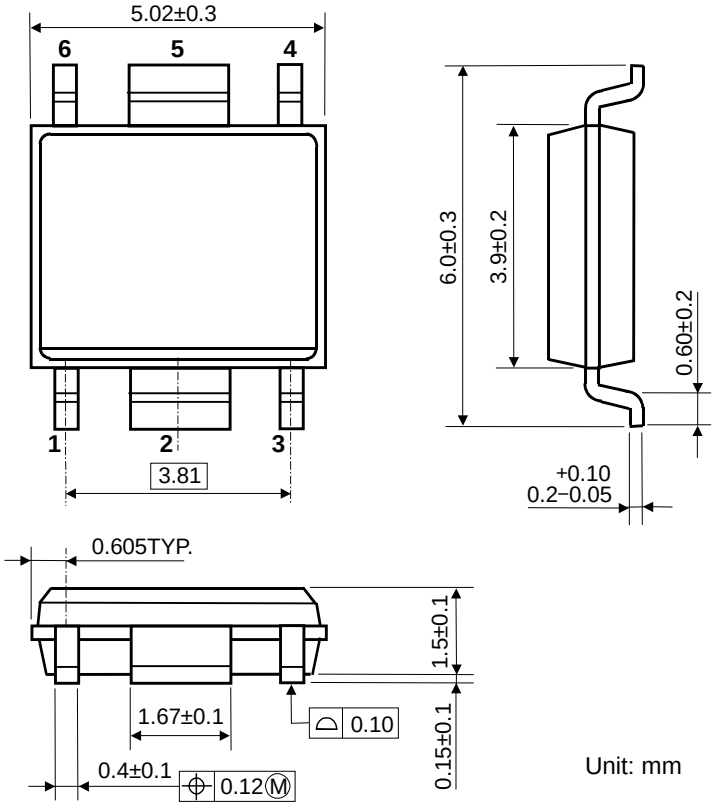


Power Dissipation vs. Ambient Temperature



Measurement Board Pattern

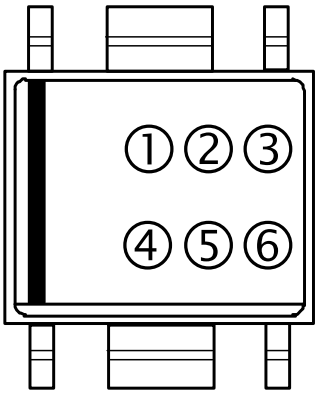
PACKAGE DIMENSIONS (HSOP-6J)



Unit: mm

MARK SPECIFICATION (HSOP-6J)

①②③④: Product Code … **Refer to *R1514S MARK SPECIFICATION TABLE (HSOP-6J)***
⑤⑥: Lot Number … Alphanumeric Serial Number



R1514S MARK SPECIFICATION TABLE (HSOP-6J)

Product Name	①②③④	V_{OUT}
R1514S020B	E 0 2 0	2.0 V
R1514S021B	E 0 2 1	2.1 V
R1514S022B	E 0 2 2	2.2 V
R1514S023B	E 0 2 3	2.3 V
R1514S024B	E 0 2 4	2.4 V
R1514S025B	E 0 2 5	2.5 V
R1514S026B	E 0 2 6	2.6 V
R1514S027B	E 0 2 7	2.7 V
R1514S028B	E 0 2 8	2.8 V
R1514S029B	E 0 2 9	2.9 V
R1514S030B	E 0 3 0	3.0 V
R1514S031B	E 0 3 1	3.1 V
R1514S032B	E 0 3 2	3.2 V
R1514S033B	E 0 3 3	3.3 V
R1514S034B	E 0 3 4	3.4 V
R1514S035B	E 0 3 5	3.5 V
R1514S036B	E 0 3 6	3.6 V
R1514S037B	E 0 3 7	3.7 V
R1514S038B	E 0 3 8	3.8 V
R1514S039B	E 0 3 9	3.9 V
R1514S040B	E 0 4 0	4.0 V
R1514S041B	E 0 4 1	4.1 V
R1514S042B	E 0 4 2	4.2 V
R1514S043B	E 0 4 3	4.3 V
R1514S044B	E 0 4 4	4.4 V
R1514S045B	E 0 4 5	4.5 V
R1514S046B	E 0 4 6	4.6 V
R1514S047B	E 0 4 7	4.7 V
R1514S048B	E 0 4 8	4.8 V
R1514S049B	E 0 4 9	4.9 V
R1514S050B	E 0 5 0	5.0 V
R1514S051B	E 0 5 1	5.1 V
R1514S052B	E 0 5 2	5.2 V
R1514S053B	E 0 5 3	5.3 V
R1514S054B	E 0 5 4	5.4 V
R1514S055B	E 0 5 5	5.5 V
R1514S056B	E 0 5 6	5.6 V
R1514S057B	E 0 5 7	5.7 V
R1514S058B	E 0 5 8	5.8 V
R1514S059B	E 0 5 9	5.9 V

Product Name	①②③④	V_{OUT}
R1514S060B	E 0 6 0	6.0 V
R1514S061B	E 0 6 1	6.1 V
R1514S062B	E 0 6 2	6.2 V
R1514S063B	E 0 6 3	6.3 V
R1514S064B	E 0 6 4	6.4 V
R1514S065B	E 0 6 5	6.5 V
R1514S066B	E 0 6 6	6.6 V
R1514S067B	E 0 6 7	6.7 V
R1514S068B	E 0 6 8	6.8 V
R1514S069B	E 0 6 9	6.9 V
R1514S070B	E 0 7 0	7.0 V
R1514S071B	E 0 7 1	7.1 V
R1514S072B	E 0 7 2	7.2 V
R1514S073B	E 0 7 3	7.3 V
R1514S074B	E 0 7 4	7.4 V
R1514S075B	E 0 7 5	7.5 V
R1514S076B	E 0 7 6	7.6 V
R1514S077B	E 0 7 7	7.7 V
R1514S078B	E 0 7 8	7.8 V
R1514S079B	E 0 7 9	7.9 V
R1514S080B	E 0 8 0	8.0 V
R1514S081B	E 0 8 1	8.1 V
R1514S082B	E 0 8 2	8.2 V
R1514S083B	E 0 8 3	8.3 V
R1514S084B	E 0 8 4	8.4 V
R1514S085B	E 0 8 5	8.5 V
R1514S086B	E 0 8 6	8.6 V
R1514S087B	E 0 8 7	8.7 V
R1514S088B	E 0 8 8	8.8 V
R1514S089B	E 0 8 9	8.9 V
R1514S090B	E 0 9 0	9.0 V
R1514S091B	E 0 9 1	9.1 V
R1514S092B	E 0 9 2	9.2 V
R1514S093B	E 0 9 3	9.3 V
R1514S094B	E 0 9 4	9.4 V
R1514S095B	E 0 9 5	9.5 V
R1514S096B	E 0 9 6	9.6 V
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R1514S099B	E 0 9 9	9.9 V

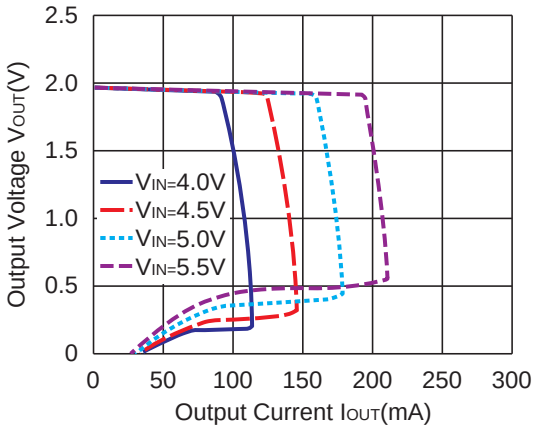
Product Name	①②③④	V_{OUT}
R1514S100B	E 1 0 0	10.0 V
R1514S101B	E 1 0 1	10.1 V
R1514S102B	E 1 0 2	10.2 V
R1514S103B	E 1 0 3	10.3 V
R1514S104B	E 1 0 4	10.4 V
R1514S105B	E 1 0 5	10.5 V
R1514S106B	E 1 0 6	10.6 V
R1514S107B	E 1 0 7	10.7 V
R1514S108B	E 1 0 8	10.8 V
R1514S109B	E 1 0 9	10.9 V
R1514S110B	E 1 1 0	11.0 V
R1514S111B	E 1 1 1	11.1 V
R1514S112B	E 1 1 2	11.2 V
R1514S113B	E 1 1 3	11.3 V
R1514S114B	E 1 1 4	11.4 V
R1514S115B	E 1 1 5	11.5 V
R1514S116B	E 1 1 6	11.6 V
R1514S117B	E 1 1 7	11.7 V
R1514S118B	E 1 1 8	11.8 V
R1514S119B	E 1 1 9	11.9 V
R1514S120B	E 1 2 0	12.0 V

TYPICAL CHARACTERISTICS

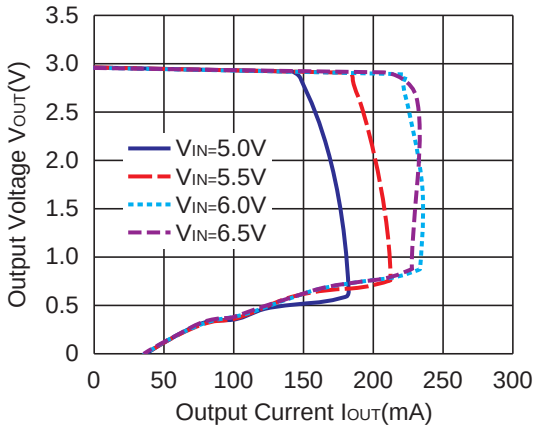
Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

1) Output Voltage vs. Output Current (Ta = 25°C)

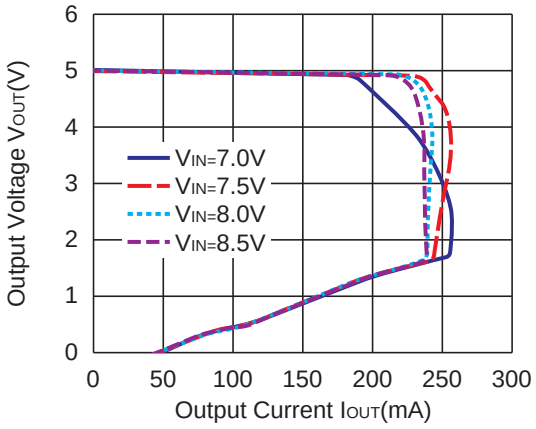
R1514x020B



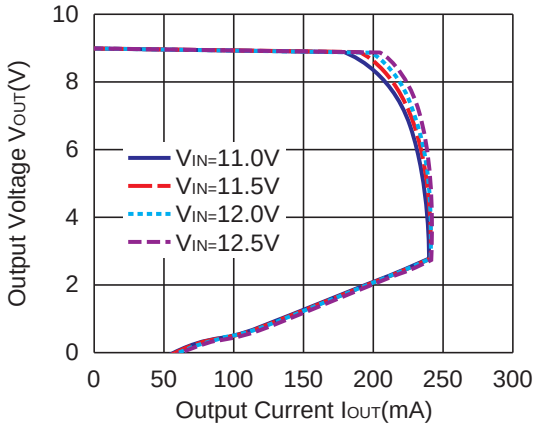
R1514x030B



R1514x050B

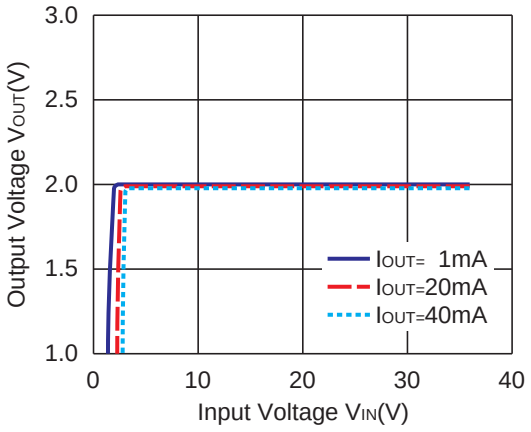


R1514x090B

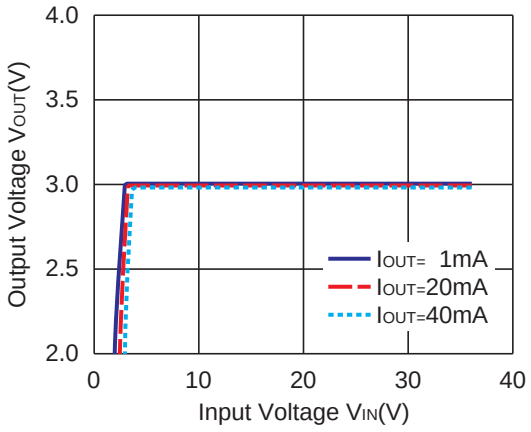


2) Output Voltage vs. Input Voltage (Ta = 25°C)

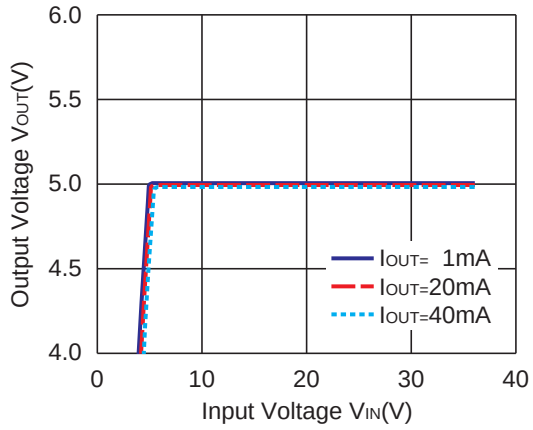
R1514x020B



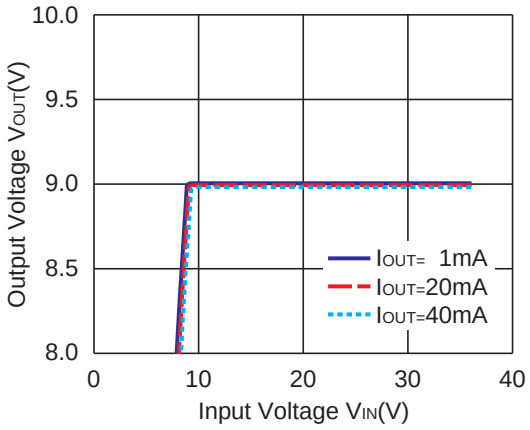
R1514x030B



R1514x050B

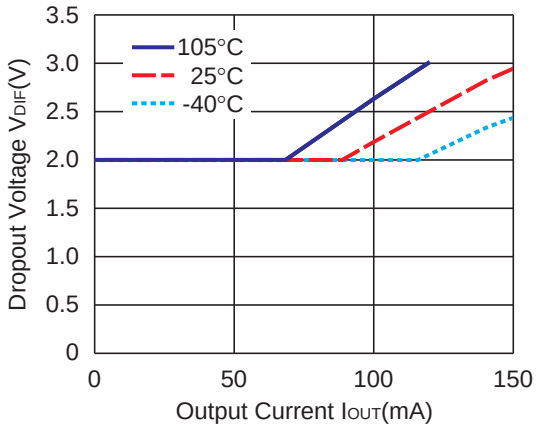


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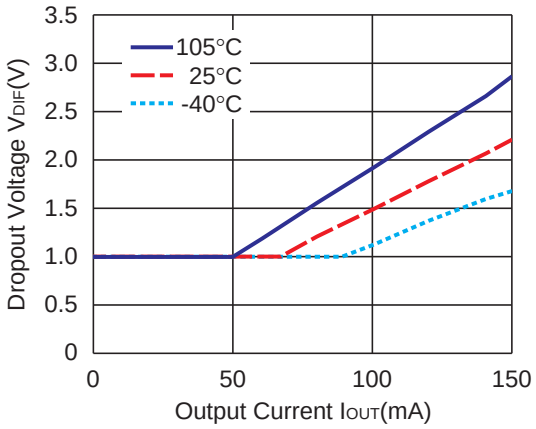


3) Dropout Voltage vs. Output Current

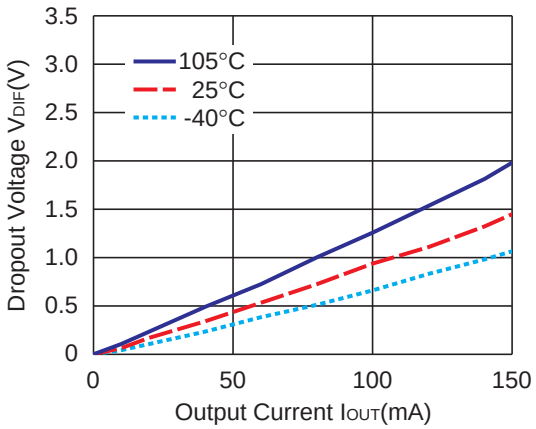
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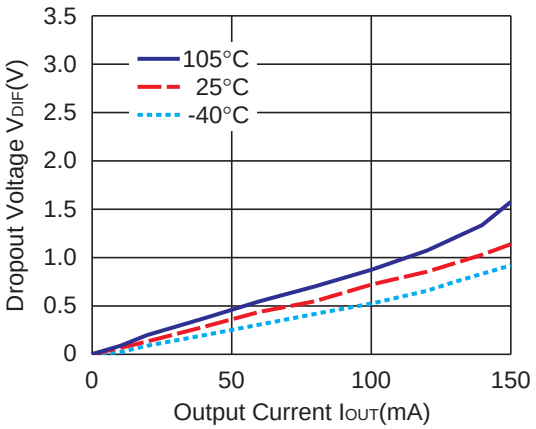
R1514x030B



R1514x050B

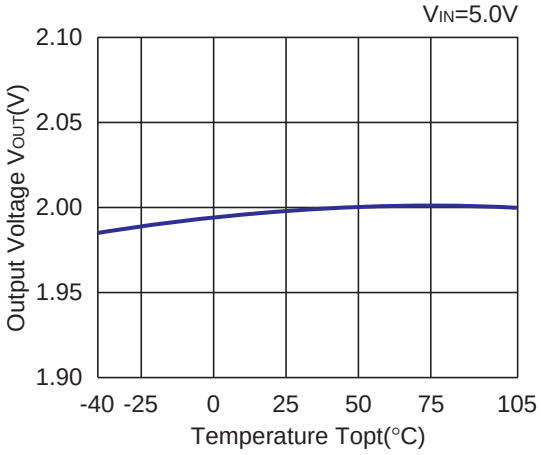


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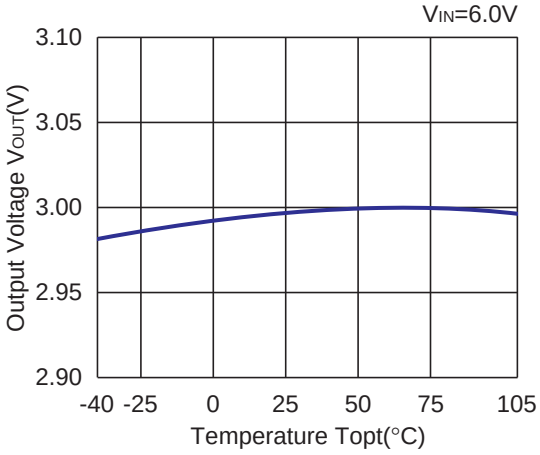


4) Output Voltage vs. Temperature

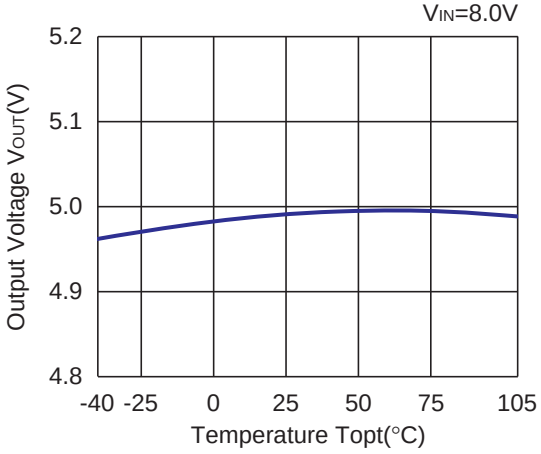
R1514x020B



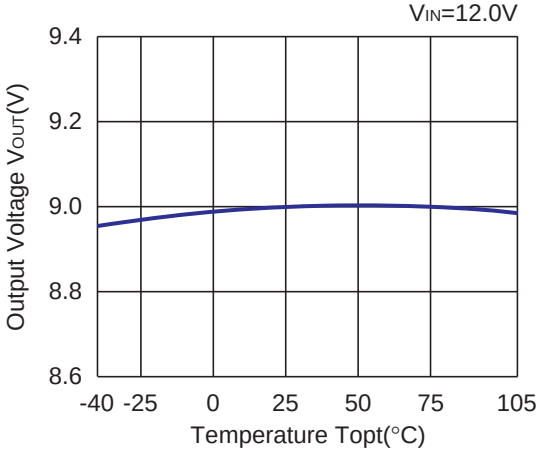
R1514x030B



R1514x050B

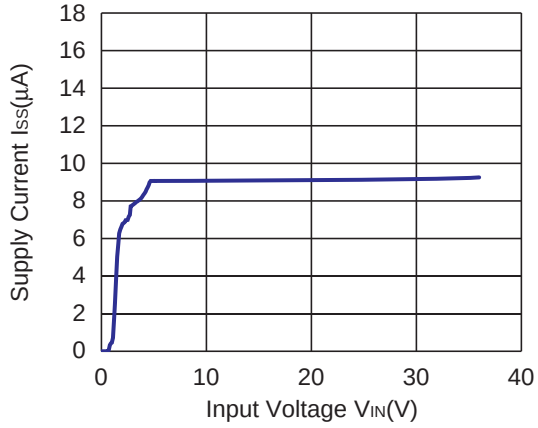


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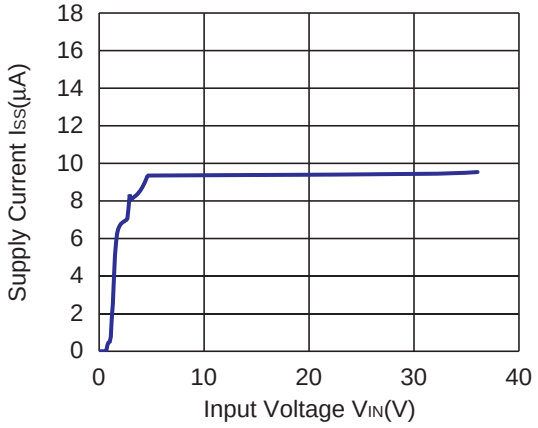


5) Supply Current vs. Input Voltage (Ta = 25°C)

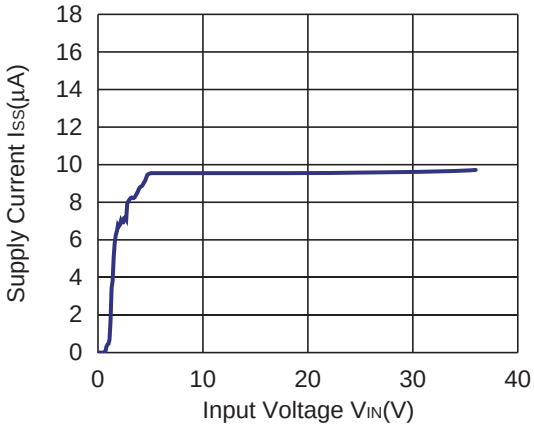
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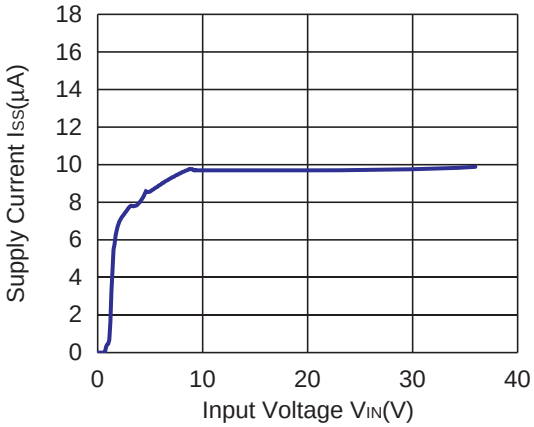
R1514x030B



R1514x050B

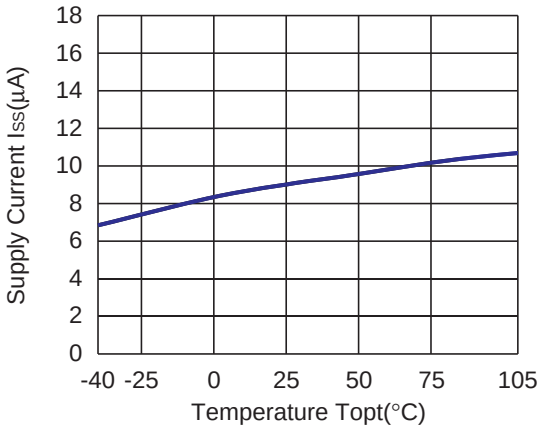


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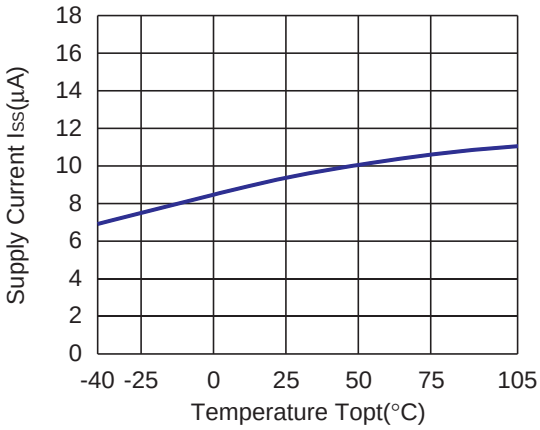


6) Supply Current vs. Temperature

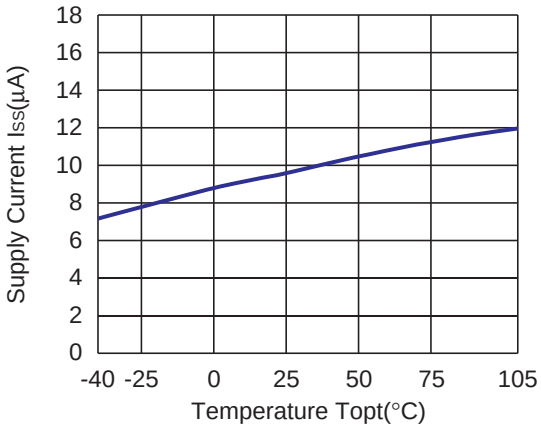
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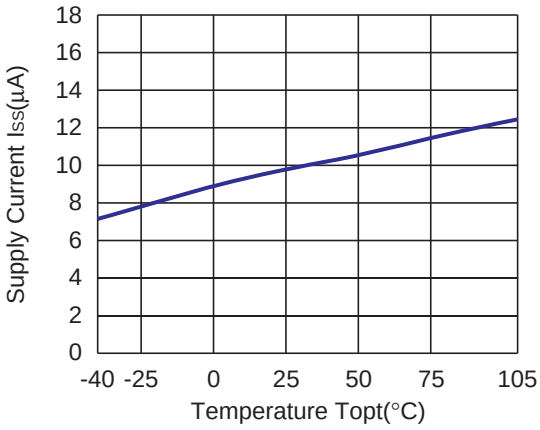
R1514x030B



R1514x050B

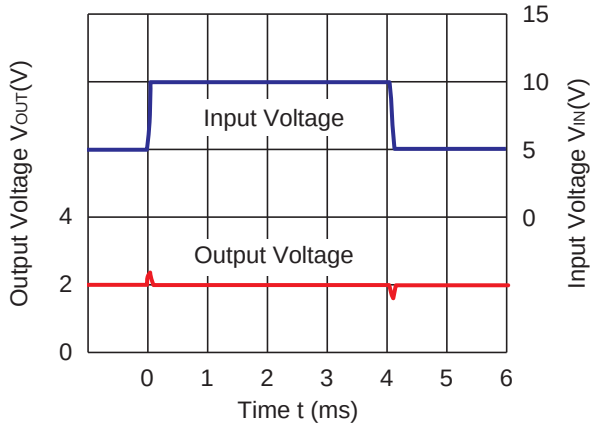


R1514x090B

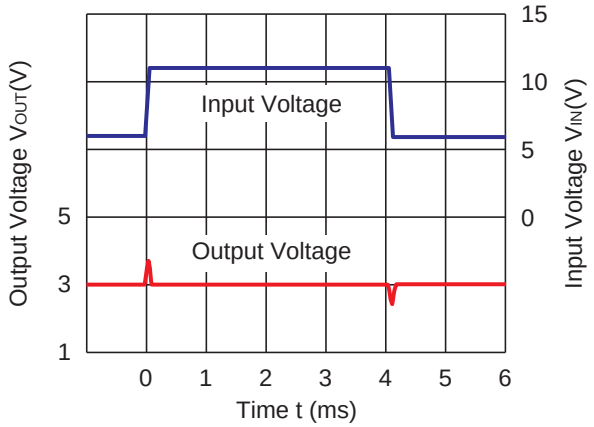


7) Input Transient Response (I_{OUT} = 1 mA, tr = tf = 50 µs, C2 = Ceramic 0.1 µF, Ta = 25°C)

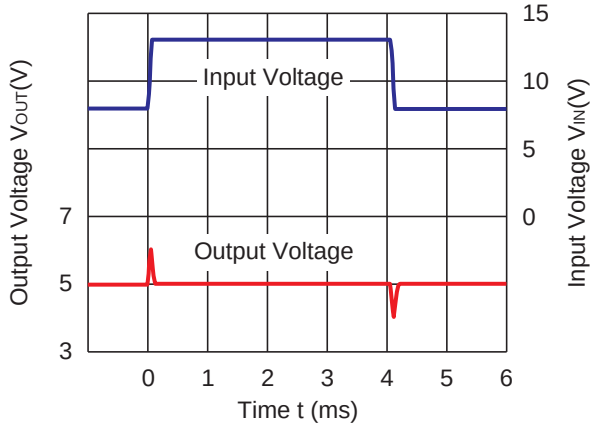
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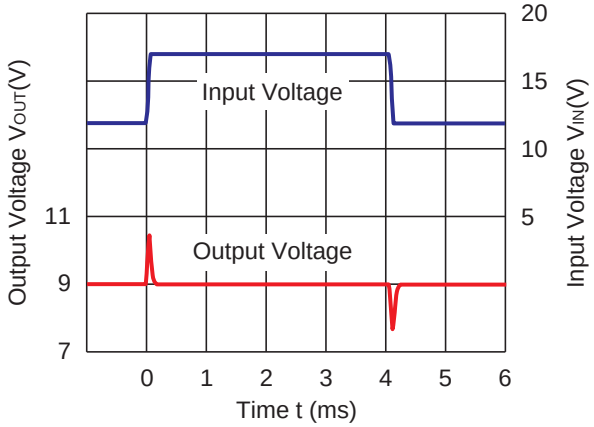
R1514x030B



R1514x050B

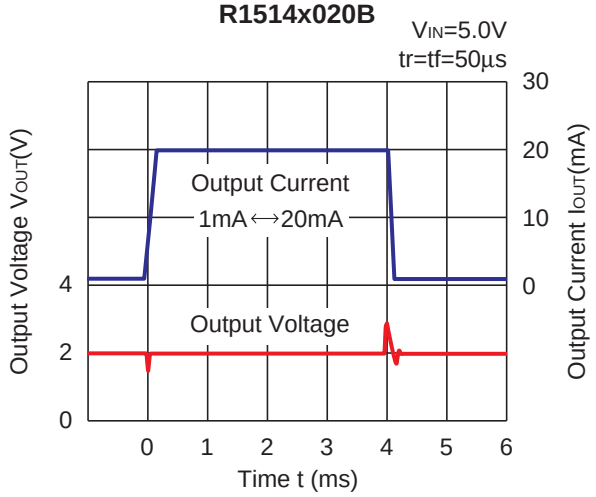


R1514x090B

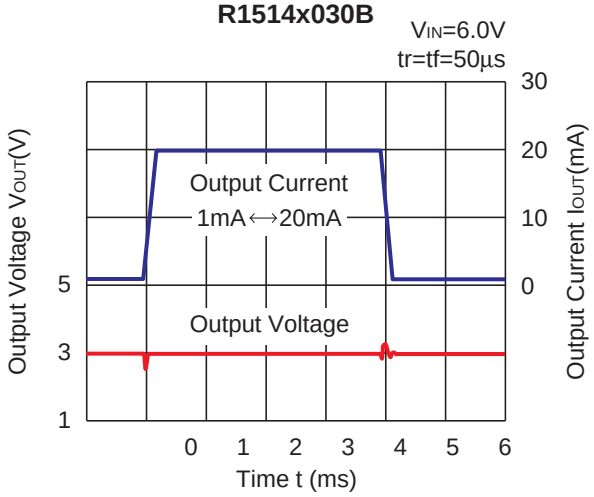


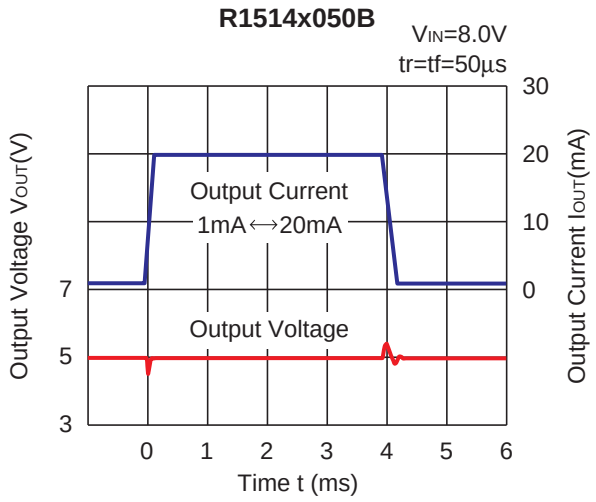
8) Load Transient Response (C2 = Ceramic 0.1 µF, Ta = 25°C)

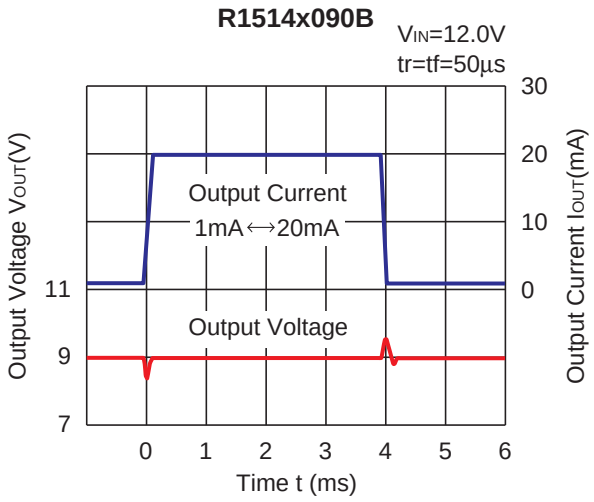
R1514x020B



R1514x030B




R1514x050B
VIN=8.0V
tr=tf=50µs
Output Current
1mA⟷20mA
Output Voltage
Output Voltage VOUT(V)
Output Current IOUT(mA)
Time t (ms)
30
20
10
0
7
5
3
0 1 2 3 4 5 6


R1514x090B
VIN=12.0V
tr=tf=50µs
Output Current
1mA⟷20mA
Output Voltage
Output Voltage VOUT(V)
Output Current IOUT(mA)
Time t (ms)
30
20
10
0
11
9
7
0 1 2 3 4 5 6

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    - Fire Alarms / Intruder Detectors
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    - Various Safety Devices
    - Traffic control system
    - Combustion equipment

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8. Quality Warranty

    8-1. Quality Warranty Period

    In the case of a product purchased through an authorized distributor or directly from us, the warranty period for this product shall be one (1) year after delivery to your company. For defective products that occurred during this period, we will take the quality warranty measures described in section 8-2. However, if there is an agreement on the warranty period in the basic transaction agreement, quality assurance agreement, delivery specifications, etc., it shall be followed.

    8-2. Quality Warranty Remedies

    When it has been proved defective due to manufacturing factors as a result of defect analysis by us, we will either deliver a substitute for the defective product or refund the purchase price of the defective product.
    Note that such delivery or refund is sole and exclusive remedies to your company for the defective product.

    8-3. Remedies after Quality Warranty Period

    With respect to any defect of this product found after the quality warranty period, the defect will be analyzed by us. On the basis of the defect analysis results, the scope and amounts of damage shall be determined by mutual agreement of both parties. Then we will deal with upper limit in Section 8-2. This provision is not intended to limit any legal rights of your company.
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10. The X-ray exposure can influence functions and characteristics of the products. Confirm the product functions and characteristics in the evaluation stage.
11. WLCSP products should be used in light shielded environments. The light exposure can influence functions and characteristics of the products under operation or storage.
12. Warning for handling Gallium and Arsenic (GaAs) products (Applying to GaAs MMIC, Photo Reflector). These products use Gallium (Ga) and Arsenic (As) which are specified as poisonous chemicals by law. For the prevention of a hazard, do not burn, destroy, or process chemically to make them as gas or power. When the product is disposed of, please follow the related regulation and do not mix this with general industrial waste or household waste.
13. Please contact our sales representatives should you have any questions or comments concerning the products or the technical information.

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Üreticileri görün

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