



CMOS 1.8 V to 5.5 V, 2.5 Ω SPDT Switch/2:1 Mux In Tiny SC70 Package

ADG779

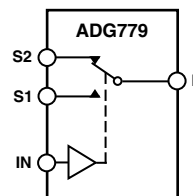
FEATURES

- 1.8 V to 5.5 V Single Supply
- 2.5 Ω On Resistance
- 0.75 Ω On-Resistance Flatness
- 3 dB Bandwidth >200 MHz
- Rail-to-Rail Operation
- 6-Lead SC70 Package
- Fast Switching Times
 - t_{ON} 20 ns
 - t_{OFF} 6 ns
- Typical Power Consumption (<0.01 μ W)
- TTL/CMOS-Compatible

APPLICATIONS

- Battery-Powered Systems
- Communication Systems
- Sample Hold Systems
- Audio Signal Routing
- Video Switching
- Mechanical Reed Relay Replacement

FUNCTIONAL BLOCK DIAGRAM



SWITCHES SHOWN FOR
A LOGIC "1" INPUT

GENERAL DESCRIPTION

The ADG779 is a monolithic CMOS SPDT (single-pole, double-throw) switch. This switch is designed on a submicron process that provides low power dissipation yet gives high switching speed, low on resistance and low leakage currents.

The ADG779 operates from a single supply range of 1.8 V to 5.5 V, making it ideal for use in battery-powered instruments and with the new generation of DACs and ADCs from Analog Devices.

Each switch of the ADG779 conducts equally well in both directions when on. The ADG779 exhibits break-before-make switching action.

Because of the advanced submicron process, -3 dB bandwidth of greater than 200 MHz can be achieved.

The ADG779 is available in a 6-lead SC70 package.

PRODUCT HIGHLIGHTS

1. Tiny 6-Lead SC70 Package.
2. 1.8 V to 5.5 V Single Supply Operation. The ADG779 offers high performance, including low on resistance and fast switching times, and is fully specified and guaranteed with 3 V and 5 V supply rails.
3. Very Low R_{ON} (5 Ω max at 5 V, 10 Ω max at 3 V). At 1.8 V operation, R_{ON} is typically 40 Ω over the temperature range.
4. On-Resistance Flatness ($R_{FLAT(ON)}$) (0.75 Ω typ).
5. -3 dB Bandwidth >200 MHz.
6. Low Power Dissipation. CMOS construction ensures low power dissipation.
7. 14 ns Switching Times.

REV. 0

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ADG779—SPECIFICATIONS¹ ($V_{DD} = 5\text{ V} \pm 10\%$, $GND = 0\text{ V}$)

Parameter	B Version		Unit	Test Conditions/Comments
	25°C	−40°C to +85°C		
ANALOG SWITCH				
Analog Signal Range		0 V to V _{DD}	V	
On Resistance (R _{ON})	2.5	6	Ω typ	V _S = 0 V to V _{DD} , I _S = −10 mA, Test Circuit 1
	5		Ω max	
On Resistance Match Between Channels (ΔR _{ON})		0.1	Ω typ	V _S = 0 V to V _{DD} , I _S = −10 mA
		0.8	Ω max	
On-Resistance Flatness (R _{FLAT(ON)})	0.75		Ω typ	V _S = 0 V to V _{DD} , I _S = −10 mA
		1.2	Ω max	
LEAKAGE CURRENTS ²				
Source OFF Leakage I _S (OFF)	±0.01	±0.05	nA typ	V _{DD} = 5.5 V V _S = 4.5 V/1 V, V _D = 1 V/4.5 V, Test Circuit 2
Channel ON Leakage I _D , I _S (ON)	±0.01	±0.05	nA typ	V _S = V _D = 1 V, or V _S = V _D = 4.5 V, Test Circuit 3
DIGITAL INPUTS				
Input High Voltage, V _{INH}		2.4	V min	
Input Low Voltage, V _{INL}		0.8	V max	
Input Current				
I _{INL} or I _{INH}	0.005		μA typ	V _{IN} = V _{INL} or V _{INH}
		±0.1	μA max	
DYNAMIC CHARACTERISTICS ²				
t _{ON}	14	20	ns typ	R _L = 300 Ω, C _L = 35 pF
			ns max	V _S = 3 V, Test Circuit 4
t _{OFF}	3	6	ns typ	R _L = 300 Ω, C _L = 35 pF
			ns max	V _S = 3 V, Test Circuit 4
Break-Before-Make Time Delay, t _D	8	1	ns typ	R _L = 300 Ω, C _L = 35 pF,
			ns min	V _{S1} = V _{S2} = 3 V, Test Circuit 5
Off Isolation	−67		dB typ	R _L = 50 Ω, C _L = 5 pF, f = 10 MHz
	−87		dB typ	R _L = 50 Ω, C _L = 5 pF, f = 1 MHz, Test Circuit 6
Channel-to-Channel Crosstalk	−62		dB typ	R _L = 50 Ω, C _L = 5 pF, f = 10 MHz
	−82		dB typ	R _L = 50 Ω, C _L = 5 pF, f = 1 MHz, Test Circuit 7
Bandwidth −3 dB	200		MHz typ	R _L = 50 Ω, C _L = 5 pF, Test Circuit 8
C _S (OFF)	7		pF typ	f = 1 MHz
C _D , C _S (ON)	27		pF typ	f = 1 MHz
POWER REQUIREMENTS				
I _{DD}	0.001	1.0	μA typ	V _{DD} = 5.5 V
			μA max	Digital Inputs = 0 V or 5 V

NOTES

¹Temperature ranges are as follows: B Version, −40°C to +85°C.

²Guaranteed by design, not subject to production test.

Specifications subject to change without notice.

SPECIFICATIONS¹ ($V_{DD} = 3\text{ V} \pm 10\%$, $GND = 0\text{ V}$)

Parameter	B Version		Unit	Test Conditions/Comments
	25°C	−40°C to +85°C		
ANALOG SWITCH				
Analog Signal Range	6	0 V to V _{DD}	V	V _S = 0 V to V _{DD} , I _S = −10 mA, Test Circuit 1
On Resistance (R _{ON})		7	Ω typ	
		10	Ω max	
On Resistance Match Between Channels (ΔR _{ON})		0.1	Ω typ	V _S = 0 V to V _{DD} , I _S = −10 mA
		0.8	Ω max	
On-Resistance Flatness (R _{FLAT(ON)})		2.5	Ω typ	V _S = 0 V to V _{DD} , I _S = −10 mA
LEAKAGE CURRENTS ²				
Source OFF Leakage I _S (OFF)	±0.01	±0.05	nA typ	V _{DD} = 3.3 V V _S = 3 V/1 V, V _D = 1 V/3 V, Test Circuit 2
Channel ON Leakage I _D , I _S (ON)	±0.01	±0.05	nA typ	V _S = V _D = 1 V, or V _S = V _D = 3 V, Test Circuit 3
DIGITAL INPUTS				
Input High Voltage, V _{INH}		2.0	V min	V _{IN} = V _{INL} or V _{INH}
Input Low Voltage, V _{INL}		0.8	V max	
Input Current	0.005			
I _{INL} or I _{INH}		±0.1	μA typ μA max	
DYNAMIC CHARACTERISTICS ²				
t _{ON}	16	24	ns typ ns max	R _L = 300 Ω, C _L = 35 pF V _S = 2 V, Test Circuit 4
t _{OFF}	4	7	ns typ ns max	R _L = 300 Ω, C _L = 35 pF V _S = 2 V, Test Circuit 4
Break-Before-Make Time Delay, t _D	8	1	ns typ ns min	R _L = 300 Ω, C _L = 35 pF V _{S1} = V _{S2} = 2 V, Test Circuit 5
Off Isolation	−67 −87		dB typ dB typ	R _L = 50 Ω, C _L = 5 pF, f = 10 MHz R _L = 50 Ω, C _L = 5 pF, f = 1 MHz, Test Circuit 6
Channel-to-Channel Crosstalk	−62 −82		dB typ dB typ	R _L = 50 Ω, C _L = 5 pF, f = 10 MHz R _L = 50 Ω, C _L = 5 pF, f = 1 MHz, Test Circuit 7
Bandwidth −3 dB	200		MHz typ	R _L = 50 Ω, C _L = 5 pF, Test Circuit 8
C _S (OFF)	7		pF typ	f = 1 MHz
C _D , C _S (ON)	27		pF typ	f = 1 MHz
POWER REQUIREMENTS				
I _{DD}	0.001	1.0	μA typ μA max	V _{DD} = 3.3 V Digital Inputs = 0 V or 3 V

NOTES¹Temperature ranges are as follows: B Version, −40°C to +85°C.²Guaranteed by design, not subject to production test.

Specifications subject to change without notice.

ADG779

ABSOLUTE MAXIMUM RATINGS¹

(T_A = 25°C unless otherwise noted)

V _{DD} to GND	−0.3 V to +7 V
Analog, Digital Inputs ²	−0.3 V to V _{DD} + 0.3 V or 30 mA, Whichever Occurs First
Peak Current, S or D	100 mA (Pulsed at 1 ms, 10% Duty Cycle max)
Continuous Current, S or D	30 mA
Operating Temperature Range	
Industrial (B Version)	−40°C to +85°C
Storage Temperature Range	−65°C to +150°C
Junction Temperature	150°C
SC70 Package, Power Dissipation	315 mW
θ _{JA} Thermal Impedance	332°C/W
θ _{JC} Thermal Impedance	120°C/W
Lead Temperature, Soldering	
Vapor Phase (60 sec)	215°C
Infrared (15 sec)	220°C

NOTES

¹Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; functional operation of the device at these or any other conditions above those listed in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Only one absolute maximum rating may be applied at any one time.

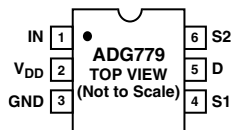
²Overvoltages at IN, S or D will be clamped by internal diodes. Current should be limited to the maximum ratings given.

Table I. Truth Table

ADG779 IN	Switch S1	Switch S2
0	ON	OFF
1	OFF	ON

PIN CONFIGURATION

6-Lead SC70



TERMINOLOGY

V _{DD}	Most Positive Power Supply Potential.
GND	Ground (0 V) Reference.
S	Source Terminal. May be an input or output.
D	Drain Terminal. May be an input or output.
IN	Logic Control Input.
R _{ON}	Ohmic resistance between D and S.
ΔR _{ON}	On resistance match between any two channels i.e., R _{ON} max – R _{ON} min.
R _{FLAT(ON)}	Flatness is defined as the difference between the maximum and minimum value of on resistance as measured over the specified analog signal range.
I _S (OFF)	Source Leakage Current with the switch “OFF.”
I _D , I _S (ON)	Channel Leakage Current with the switch “ON.”
V _D (V _S)	Analog Voltage on Terminals D, S.
C _S (OFF)	“OFF” Switch Source Capacitance.
C _D , C _S (ON)	“ON” Switch Capacitance.
t _{ON}	Delay between applying the digital control input and the output switching on.
t _{OFF}	Delay between applying the digital control input and the output switching off.
t _D	“OFF” time or “ON” time measured between the 90% points of both switches, when switching from one address state to another.
Crosstalk	A measure of unwanted signal that is coupled through from one channel to another as a result of parasitic capacitance.
Off Isolation	A measure of unwanted signal coupling through an “OFF” switch.
On Response	The frequency response of the “ON” switch.
On Loss	The loss due to the “ON” resistance of the switch.

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option	Branding Information*
ADG779BKS	−40°C to +85°C	SC70 (Plastic Surface Mount)	KS-6	SKB

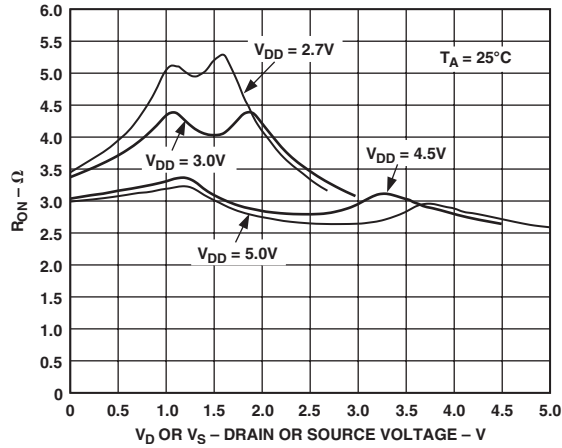
*Brand = Brand on these packages is limited to three characters due to space constraints.

CAUTION

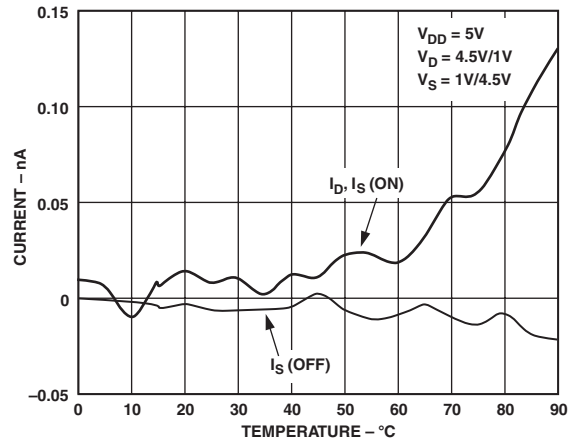
ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the ADG779 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high-energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.



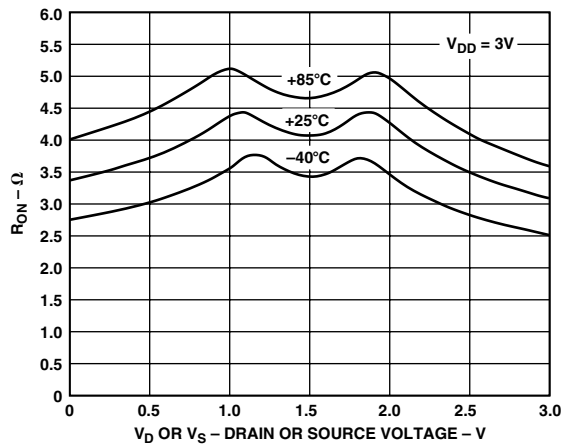
Typical Performance Characteristics—ADG779



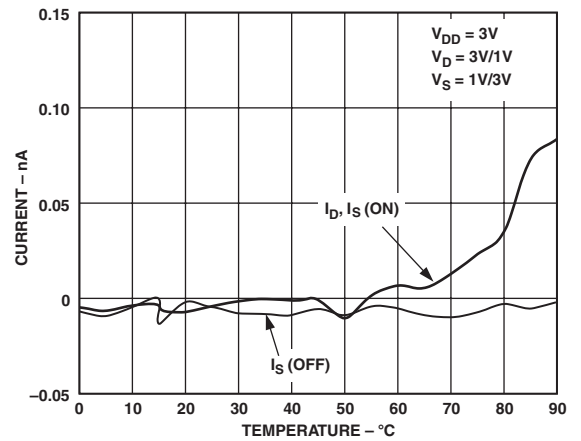
TPC 1. On Resistance as a Function of V_D (V_S) Single Supplies



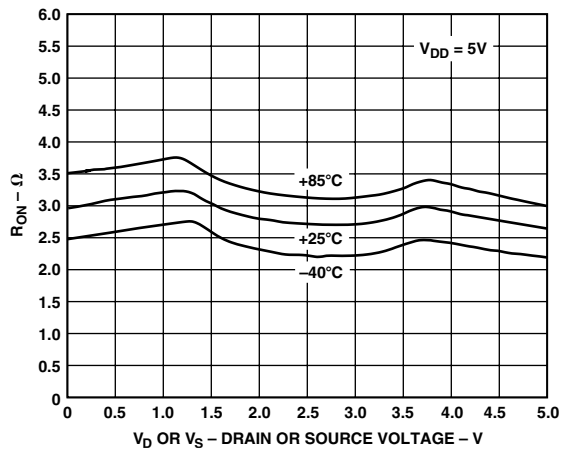
TPC 4. Leakage Currents as a Function of Temperature



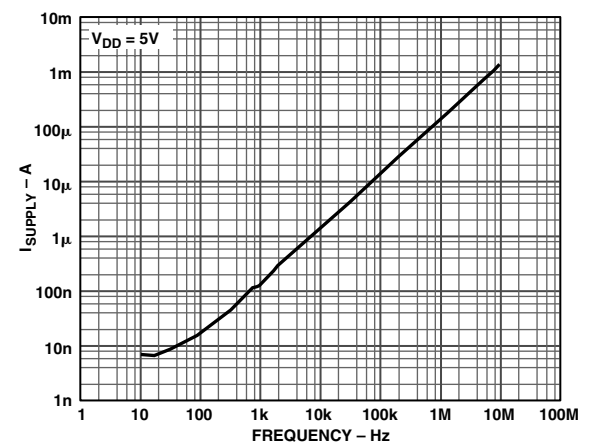
TPC 2. On Resistance as a Function of V_D (V_S) for Different Temperatures $V_{DD} = 3V$



TPC 5. Leakage Currents as a Function of Temperature

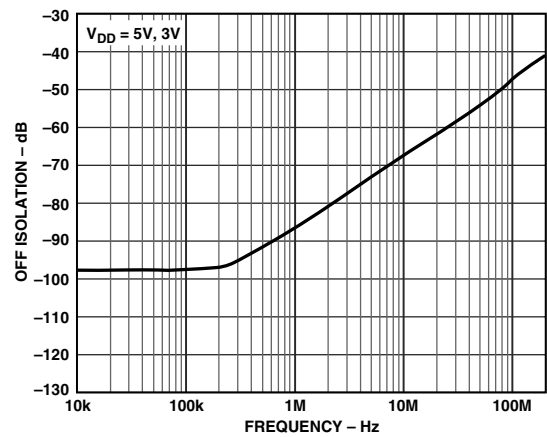


TPC 3. On Resistance as a Function of V_D (V_S) for Different Temperatures $V_{DD} = 5V$

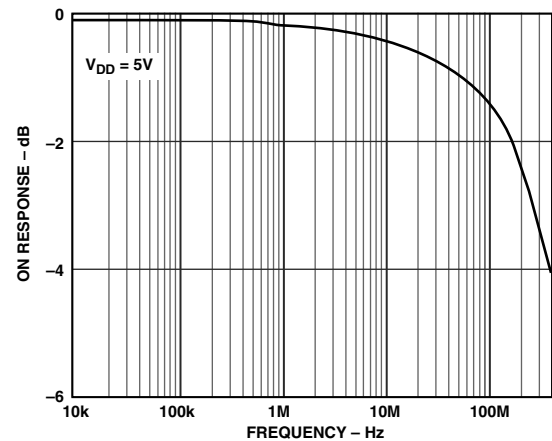


TPC 6. Supply Current vs. Input Switching Frequency

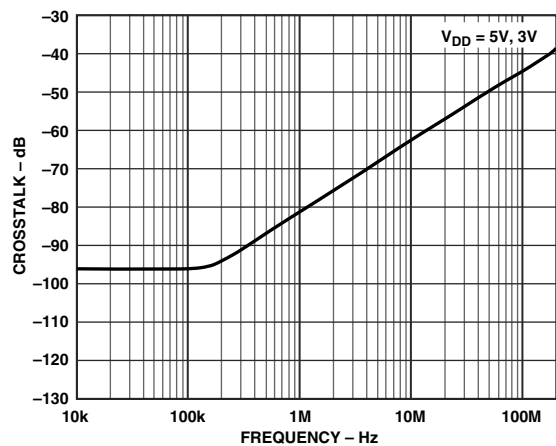
ADG779



TPC 7. Off Isolation vs. Frequency

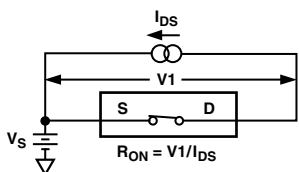


TPC 9. On Response vs. Frequency

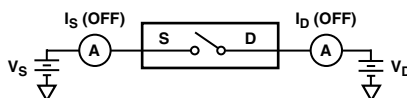


TPC 8. Crosstalk vs. Frequency

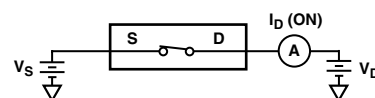
Test Circuits



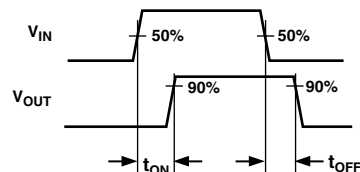
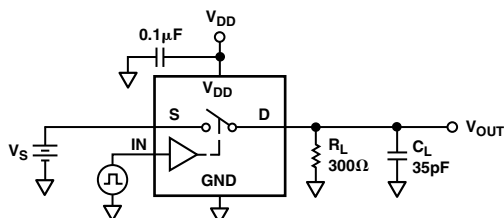
Test Circuit 1. On Resistance



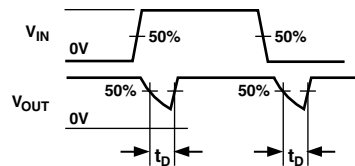
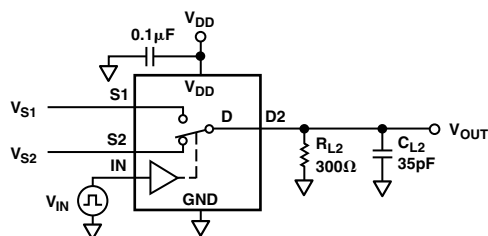
Test Circuit 2. Off Leakage



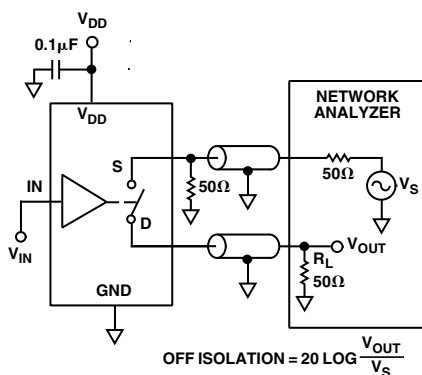
Test Circuit 3. On Leakage



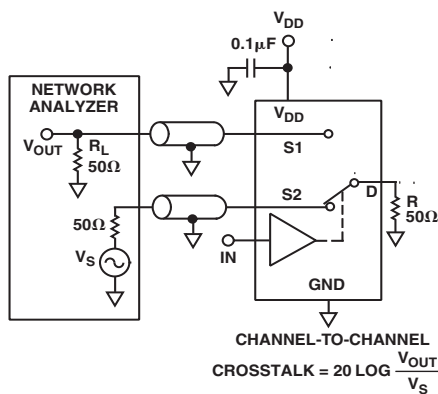
Test Circuit 4. Switching Times



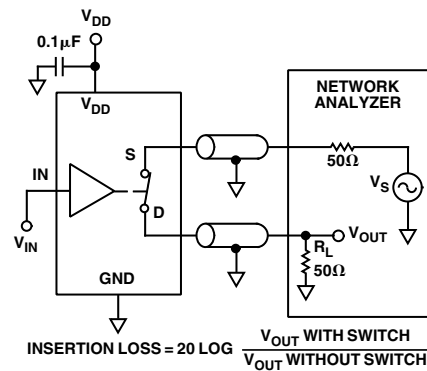
Test Circuit 5. Break-Before-Make Time Delay, t_D



Test Circuit 6. Off Isolation



Test Circuit 7. Channel-to-Channel Crosstalk

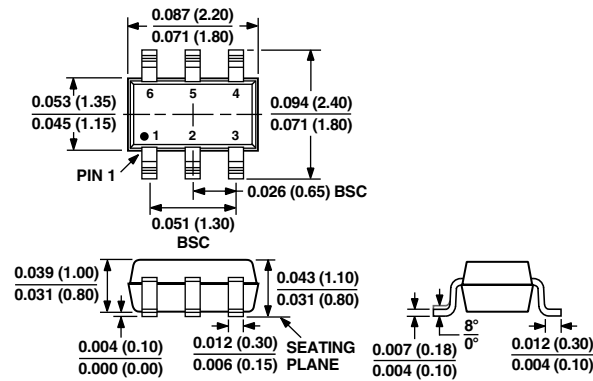


Test Circuit 8. Bandwidth

OUTLINE DIMENSIONS

Dimensions shown in inches and (mm).

6-Lead Plastic Surface Mount Package (SC70)
(KS-6)



C02491-1.5-7/01(0)

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