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Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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MOS FIELD EFFECT TRANSISTOR

2SK4143

SWITCHING

N-CHANNEL POWER MOS FET

DESCRIPTION

The 2SK4143 is N-channel MOS Field Effect Transistor designed for high current switching applications.

FEATURES

- Low on-state resistance
 $R_{DS(on)1} = 44 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 10 \text{ A)}$
 $R_{DS(on)2} = 78 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.0 \text{ V, } I_D = 10 \text{ A)}$
- Low input capacitance
 $C_{iss} = 820 \text{ pF TYP.}$
- Built-in gate protection diode

ORDERING INFORMATION

PART NUMBER	LEAD PLATING	PACKING	PACKAGE
2SK4143-S17-AY ^{Note}	Pure Sn (Tin)	Tube 50 p/tube	Isolated TO-220 typ. 2.2 g

Note Pb-free (This product does not contain Pb in the external electrode).

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Drain to Source Voltage (V _{GS} = 0 V)	V _{DSS}	60	V	(Isolated TO-220)
Gate to Source Voltage (V _{DS} = 0 V)	V _{GSS}	±20	V	
Drain Current (DC) (T _C = 25°C)	I _{D(DC)}	±20	A	
Drain Current (pulse) ^{Note1}	I _{D(pulse)}	±50	A	
Total Power Dissipation (T _C = 25°C)	P _{T1}	20	W	
Total Power Dissipation (T _A = 25°C)	P _{T2}	2.0	W	
Channel Temperature	T _{ch}	150	°C	
Storage Temperature	T _{stg}	-55 to +150	°C	
Single Avalanche Current ^{Note2}	I _{AS}	15	A	
Single Avalanche Energy ^{Note2}	E _{AS}	22.5	mJ	

Notes 1. PW ≤ 10 μs, Duty Cycle ≤ 1%

2. T_{ch} ≤ 150°C, V_{DD} = 30 V, R_G = 25 Ω, V_{GS} = 20 → 0 V, L = 100 μH

THERMAL RESISTANCE

Channel to Case Thermal Resistance	R _{th(ch-C)}	6.25	°C/W
Channel to Ambient Thermal Resistance	R _{th(ch-A)}	62.5	°C/W

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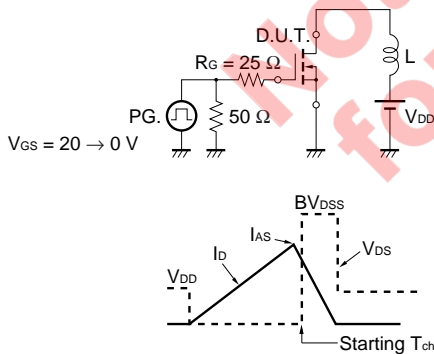


ELECTRICAL CHARACTERISTICS (T_A = 25°C)

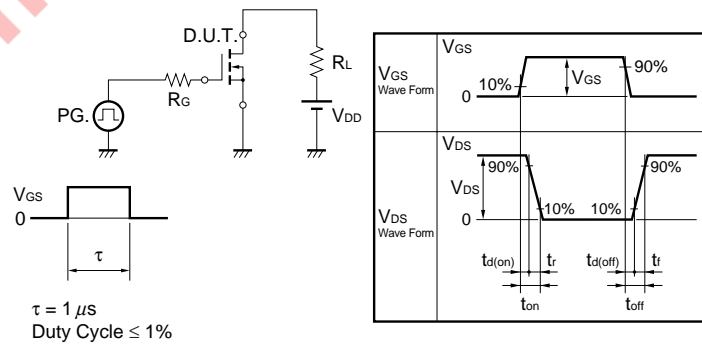
CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 60 V, V _{GS} = 0 V			10	μA
Gate Leakage Current	I _{GSS}	V _{GS} = ±20 V, V _{DS} = 0 V			±10	μA
Gate to Source Cut-off Voltage	V _{GS(off)}	V _{DS} = 10 V, I _D = 1 mA	1.5	2.0	2.5	V
Forward Transfer Admittance ^{Note}	y _{fs}	V _{DS} = 10 V, I _D = 10 A	5	10		S
Drain to Source On-state Resistance ^{Note}	R _{DS(on)1}	V _{GS} = 10 V, I _D = 10 A		37	44	mΩ
	R _{DS(on)2}	V _{GS} = 4.0 V, I _D = 10 A		44	78	mΩ
Input Capacitance	C _{iss}	V _{DS} = 10 V,		820		pF
Output Capacitance	C _{oss}	V _{GS} = 0 V,		150		pF
Reverse Transfer Capacitance	C _{rss}	f = 1 MHz		62		pF
Turn-on Delay Time	t _{d(on)}	V _{DD} = 30 V, I _D = 10 A,		8.6		ns
Rise Time	t _r	V _{GS} = 10 V,		8.6		ns
Turn-off Delay Time	t _{d(off)}	R _G = 10 Ω		38		ns
Fall Time	t _f			7.1		ns
Total Gate Charge	Q _G	V _{DD} = 48 V,		18		nC
Gate to Source Charge	Q _{GS}	V _{GS} = 10 V,		2.4		nC
Gate to Drain Charge	Q _{GD}	I _D = 20 A		4.8		nC
Body Diode Forward Voltage ^{Note}	V _{F(S-D)}	I _F = 20 A, V _{GS} = 0 V		1.0	1.5	V
Reverse Recovery Time	t _{rr}	I _F = 20 A, V _{GS} = 0 V,		39		ns
Reverse Recovery Charge	Q _{rr}	di/dt = 100 A/μs		50		nC

Note Pulsed

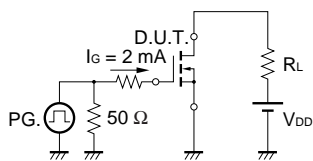
TEST CIRCUIT 1 AVALANCHE CAPABILITY



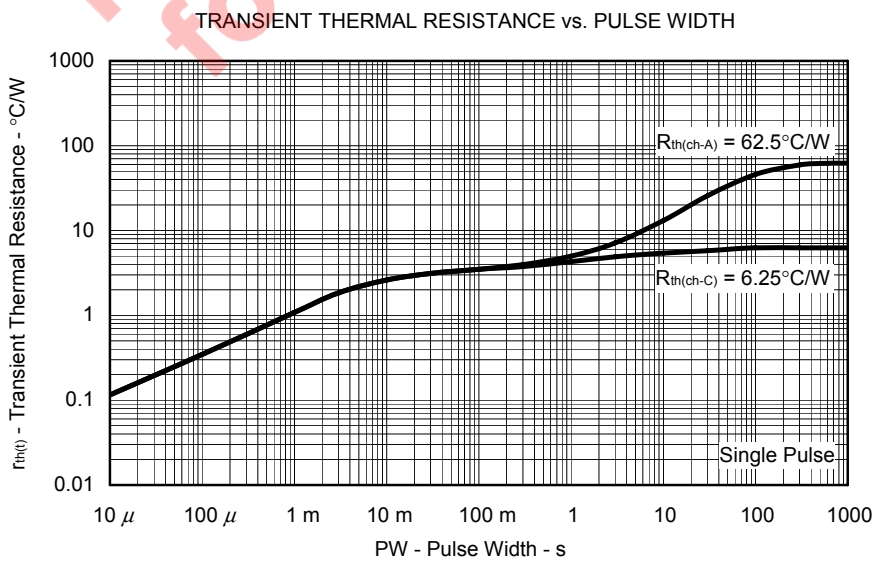
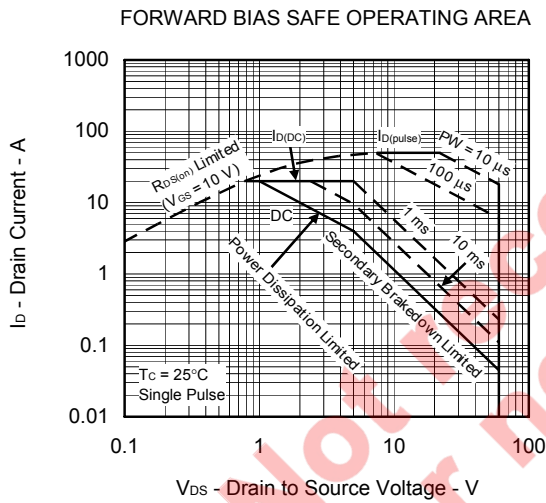
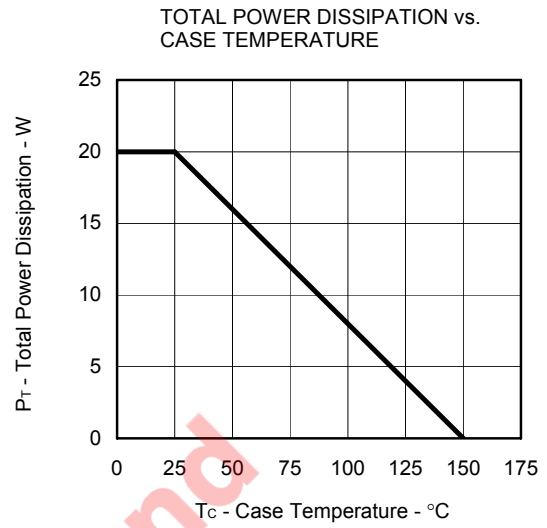
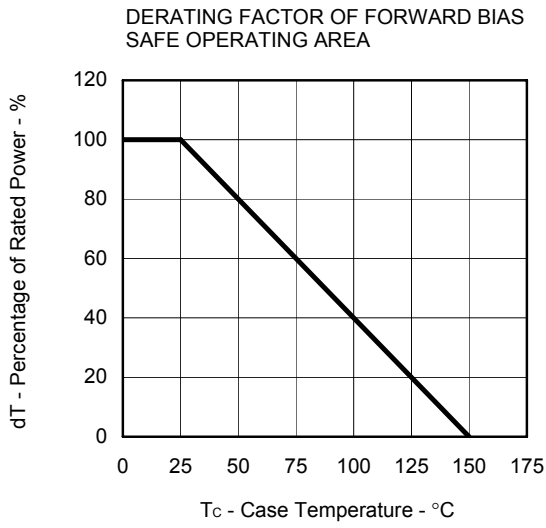
TEST CIRCUIT 2 SWITCHING TIME



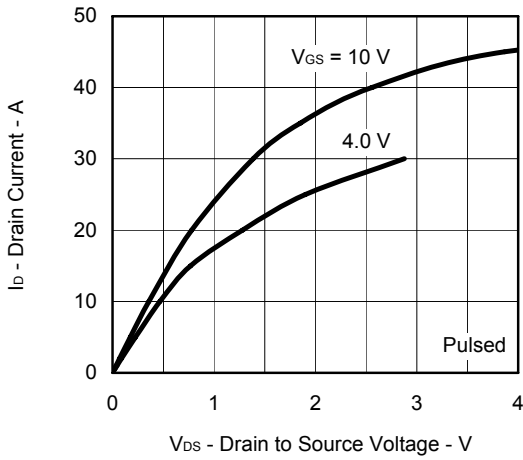
TEST CIRCUIT 3 GATE CHARGE



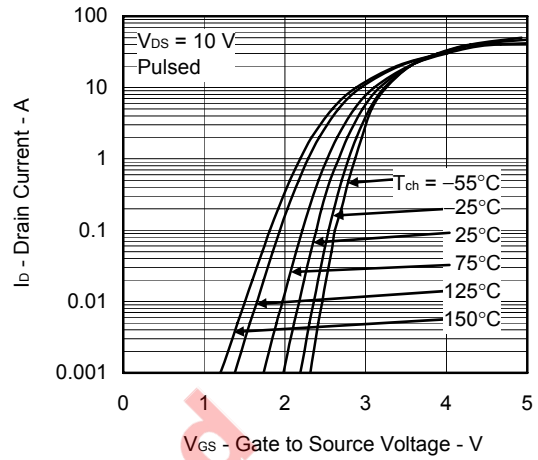
TYPICAL CHARACTERISTICS (T_A = 25°C)



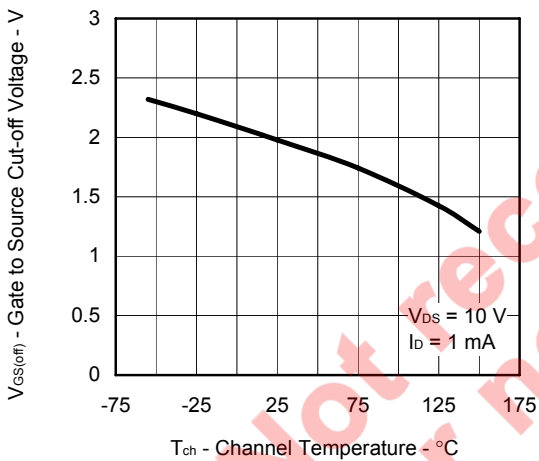
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



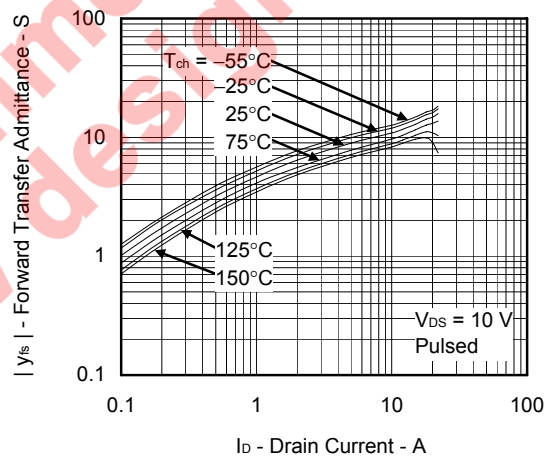
FORWARD TRANSFER CHARACTERISTICS



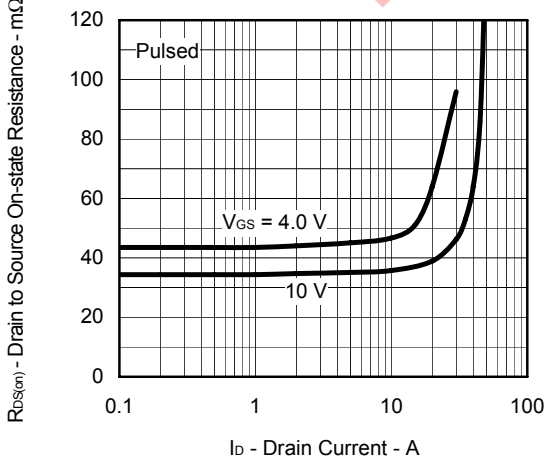
GATE TO SOURCE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



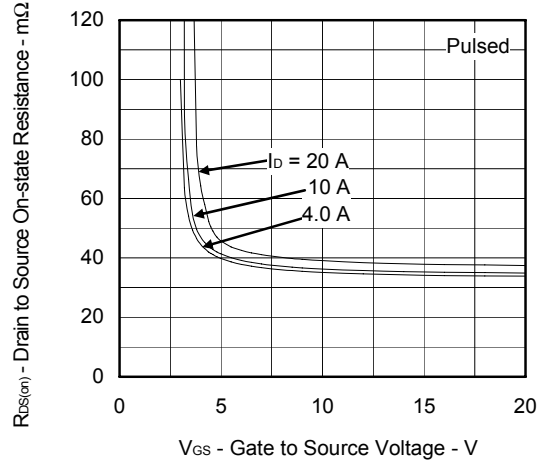
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



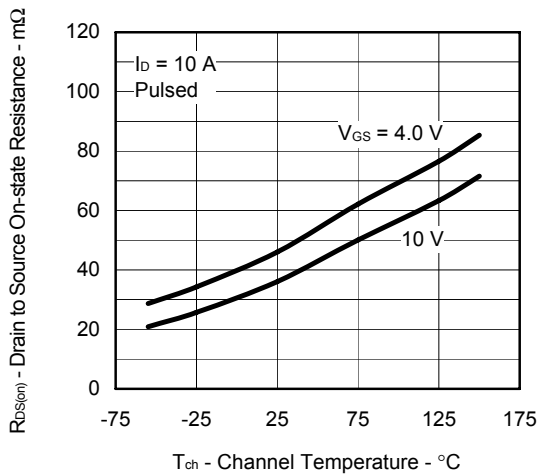
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



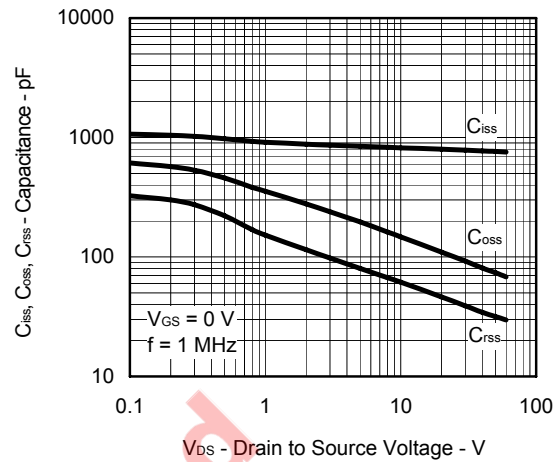
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



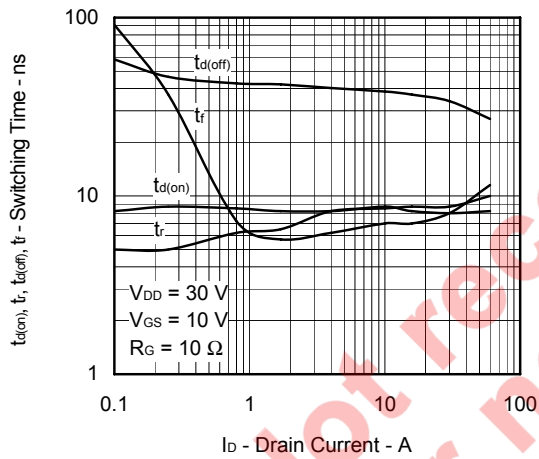
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



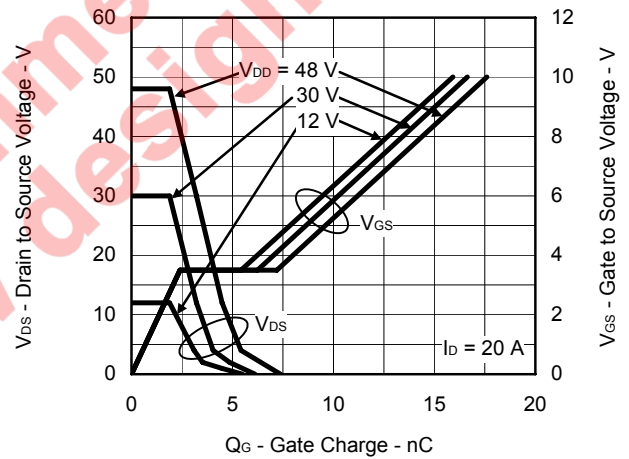
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



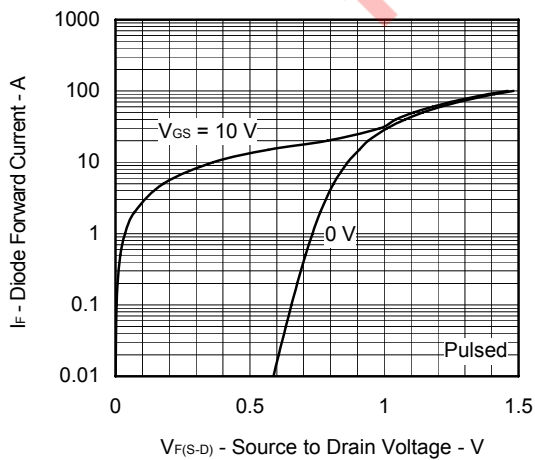
SWITCHING CHARACTERISTICS



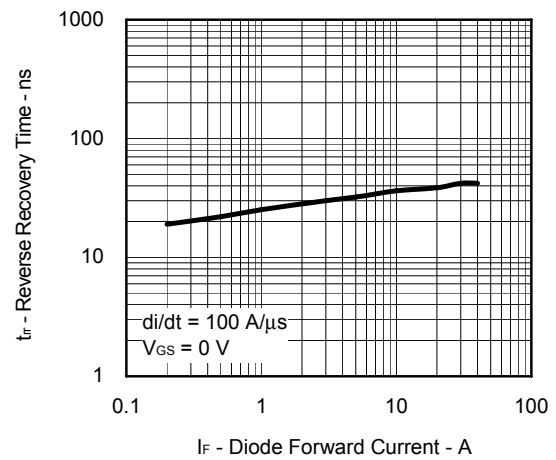
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



SOURCE TO DRAIN DIODE FORWARD VOLTAGE

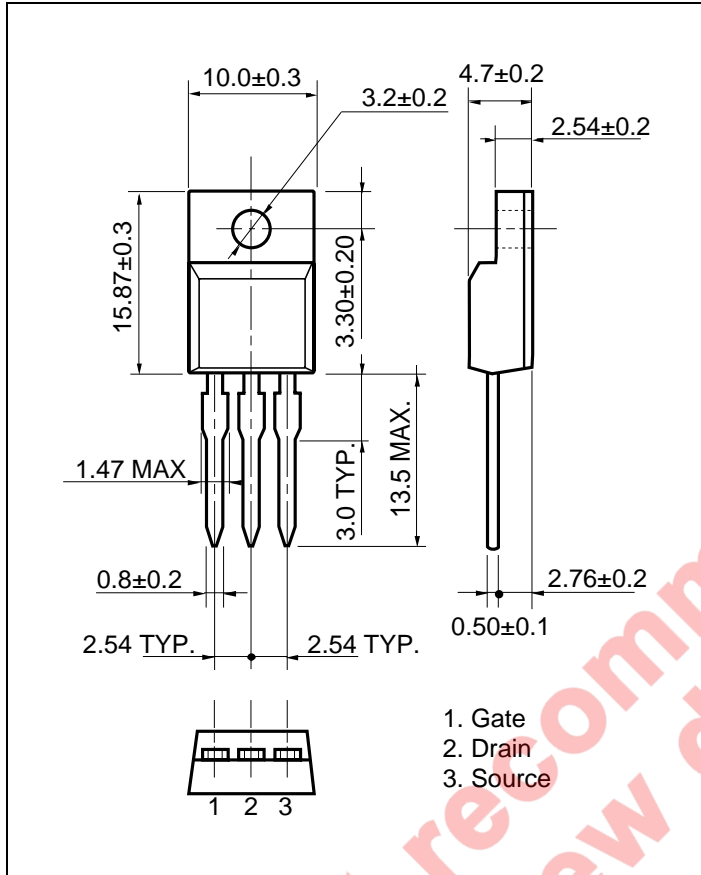


REVERSE RECOVERY TIME vs. DIODE FORWARD CURRENT

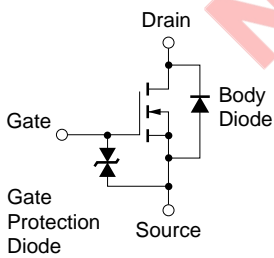


PACKAGE DRAWING (Unit: mm)

Isolated TO-220

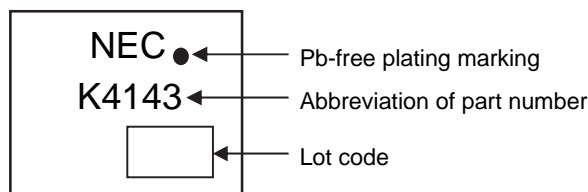


EQUIVALENT CIRCUIT



Remark The diode connected between the gate and source of the transistor serves as a protector against ESD. When this device actually used, an additional protection circuit is externally required if a voltage exceeding the rated voltage may be applied to this device.

MARKING INFORMATION



RECOMMENDED SOLDERING CONDITIONS

The 2SK4143 should be soldered and mounted under the following recommended conditions.

For soldering methods and conditions other than those recommended below, please contact an NEC Electronics sales representative.

For technical information, see the following website.

Semiconductor Device Mount Manual (<http://www.necel.com/pkg/en/mount/index.html>)

Soldering Method	Soldering Conditions	Recommended Condition Symbol
Wave soldering	Maximum temperature (Solder temperature): 260°C or below Time: 10 seconds or less Maximum chlorine content of rosin flux: 0.2% (wt.) or less	THDWS
Partial heating	Maximum temperature (Pin temperature): 350°C or below Time (per side of the device): 3 seconds or less Maximum chlorine content of rosin flux: 0.2% (wt.) or less	P350

Caution Do not use different soldering methods together (except for partial heating).

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