

### SWITCHING N-CHANNEL POWER MOS FET INDUSTRIAL USE

#### DESCRIPTION

The 2SK3357 is N-channel MOS Field Effect Transistor designed for high current switching applications.

#### FEATURES

- Super low on-state resistance:  
 $R_{DS(on)1} = 5.8 \text{ m}\Omega \text{ MAX. (} V_{GS} = 10 \text{ V, } I_D = 38 \text{ A)}$   
 $R_{DS(on)2} = 8.8 \text{ m}\Omega \text{ MAX. (} V_{GS} = 4.0 \text{ V, } I_D = 38 \text{ A)}$
- Low  $C_{iss}$ :  $C_{iss} = 9800 \text{ pF TYP.}$
- Built-in gate protection diode

#### ORDERING INFORMATION

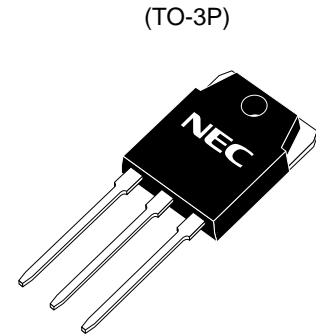
PART NUMBER	PACKAGE
2SK3357	TO-3P

#### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

Drain to Source Voltage	$V_{DSS}$	60	V
Gate to Source Voltage	$V_{GSS(AC)}$	$\pm 20$	V
Drain Current (DC)	$I_{D(DC)}$	$\pm 75$	A
Drain Current (pulse) <sup>Note1</sup>	$I_{D(pulse)}$	$\pm 300$	A
Total Power Dissipation ( $T_C = 25^\circ\text{C}$ )	$P_T$	150	W
Total Power Dissipation ( $T_A = 25^\circ\text{C}$ )	$P_T$	3.0	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-55 to +150	$^\circ\text{C}$
Single Avalanche Current <sup>Note2</sup>	$I_{AS}$	75	A
Single Avalanche Energy <sup>Note2</sup>	$E_{AS}$	562	mJ

**Notes 1.**  $PW \leq 10 \mu\text{s}$ , Duty cycle  $\leq 1\%$

**2.** Starting  $T_{ch} = 25^\circ\text{C}$ ,  $R_G = 25 \Omega$ ,  $V_{GS} = 20 \text{ V} \rightarrow 0 \text{ V}$



#### THERMAL RESISTANCE

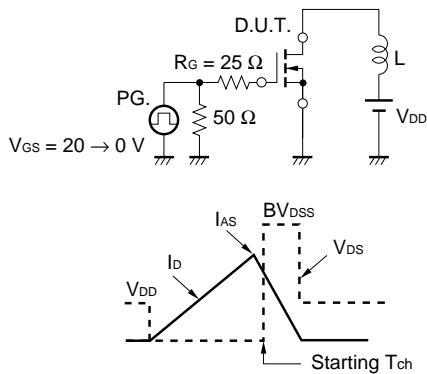
Channel to Case	$R_{th(ch-C)}$	0.83	$^\circ\text{C/W}$
Channel to Ambient	$R_{th(ch-A)}$	41.7	$^\circ\text{C/W}$

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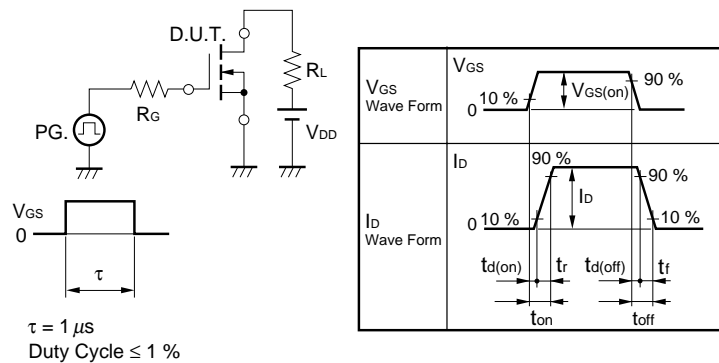
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)**

CHARACTERISTICS	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Drain to Source On-state Resistance	R <sub>DS(on)1</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 38 A		4.6	5.8	mΩ
	R <sub>DS(on)2</sub>	V <sub>GS</sub> = 4.0 V, I <sub>D</sub> = 38 A		6.1	8.8	mΩ
Gate to Source Cut-off Voltage	V <sub>GS(off)</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.5	2.0	2.5	V
Forward Transfer Admittance	y <sub>fs</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 38 A	38	72		S
Drain Leakage Current	I <sub>DSS</sub>	V <sub>DS</sub> = 60 V, V <sub>GS</sub> = 0 V			10	μA
Gate to Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V			±10	μA
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 10 V, V <sub>GS</sub> = 0 V, f = 1 MHz		9800		pF
Output Capacitance	C <sub>oss</sub>			1500		pF
Reverse Transfer Capacitance	C <sub>rss</sub>			630		pF
Turn-on Delay Time	t <sub>d(on)</sub>	I <sub>D</sub> = 38 A, V <sub>GS(on)</sub> = 10 V, V <sub>DD</sub> = 30 V, R <sub>G</sub> = 10 Ω		105		ns
Rise Time	t <sub>r</sub>			1350		ns
Turn-off Delay Time	t <sub>d(off)</sub>			500		ns
Fall Time	t <sub>f</sub>			480		ns
Total Gate Charge	Q <sub>G</sub>	I <sub>D</sub> = 75 A, V <sub>DD</sub> = 48 V, V <sub>GS</sub> = 10 V		170		nC
Gate to Source Charge	Q <sub>GS</sub>			28		nC
Gate to Drain Charge	Q <sub>GD</sub>			46		nC
Body Diode Forward Voltage	V <sub>F(S-D)</sub>	I <sub>F</sub> = 75 A, V <sub>GS</sub> = 0 V		0.96		V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> = 75 A, V <sub>GS</sub> = 0 V, di/dt = 100 A/μs		64		ns
Reverse Recovery Charge	Q <sub>rr</sub>			130		nC

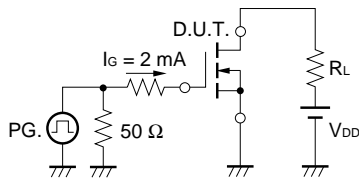
**TEST CIRCUIT 1 AVALANCHE CAPABILITY**



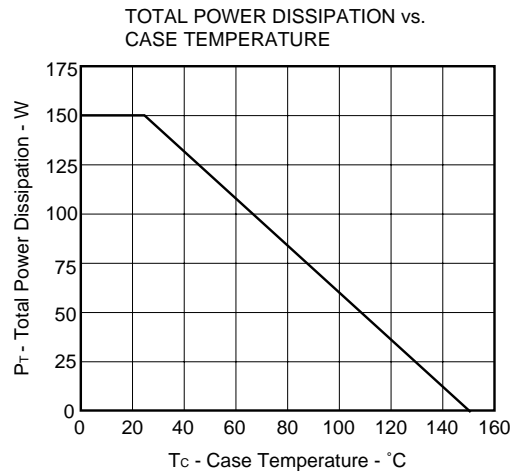
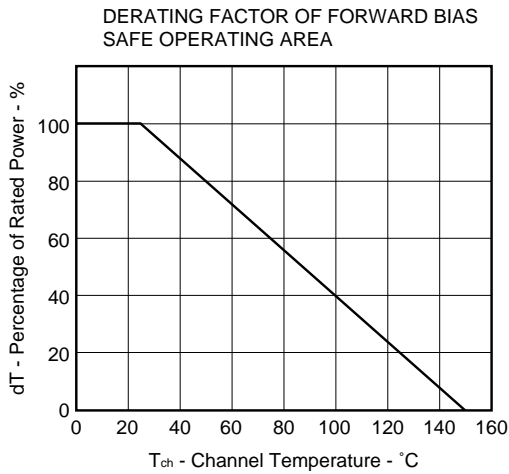
**TEST CIRCUIT 2 SWITCHING TIME**



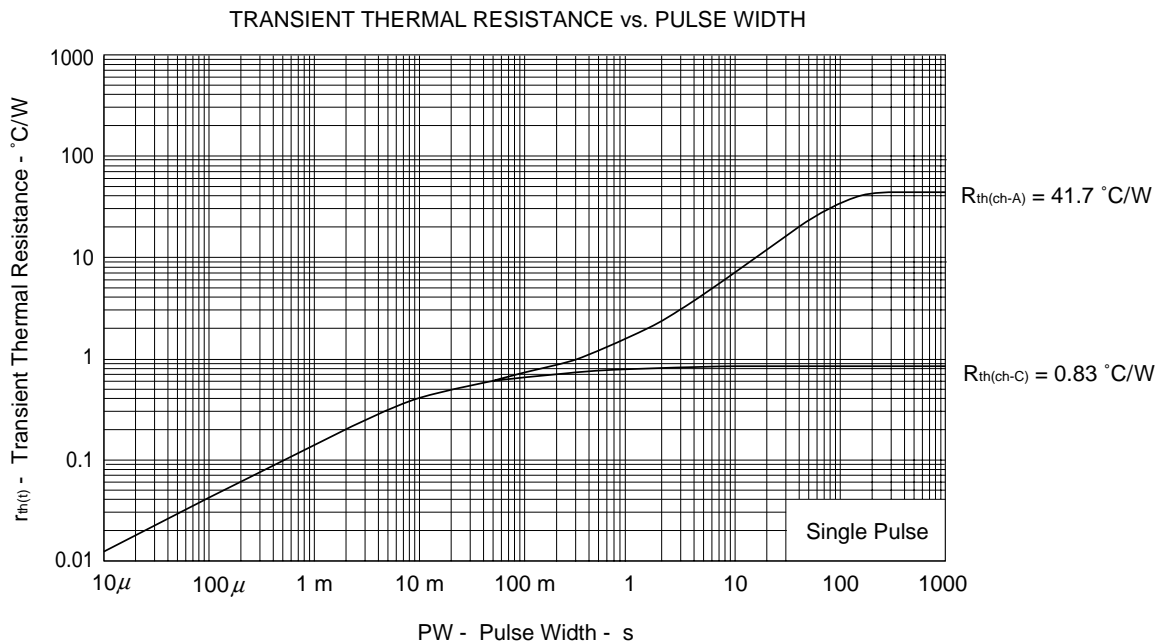
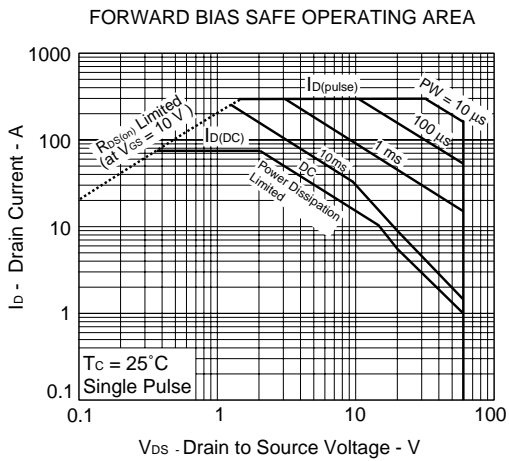
**TEST CIRCUIT 3 GATE CHARGE**



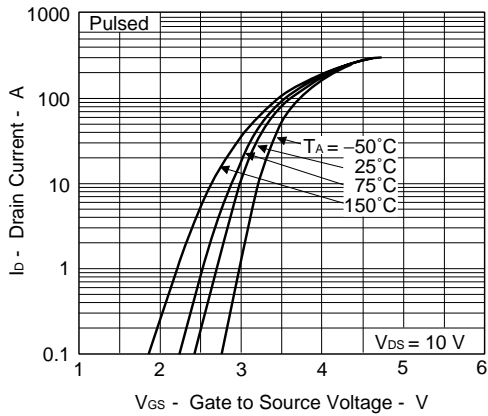
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25°C)



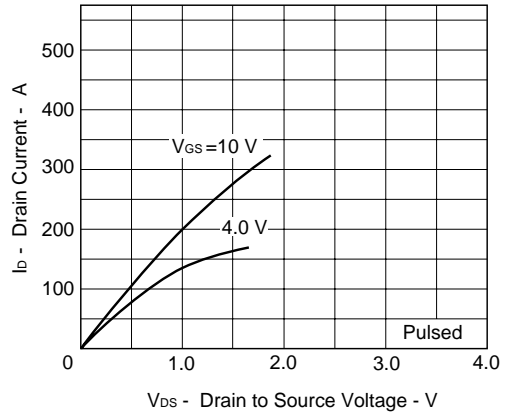
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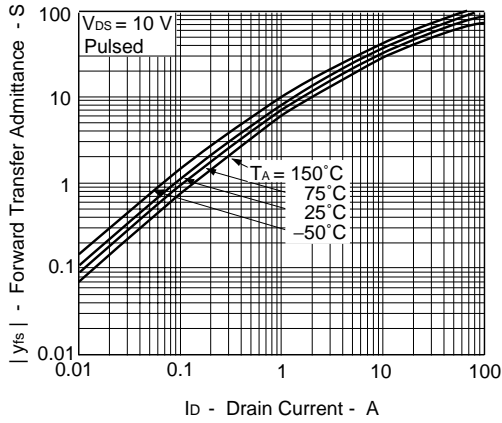
FORWARD TRANSFER CHARACTERISTICS



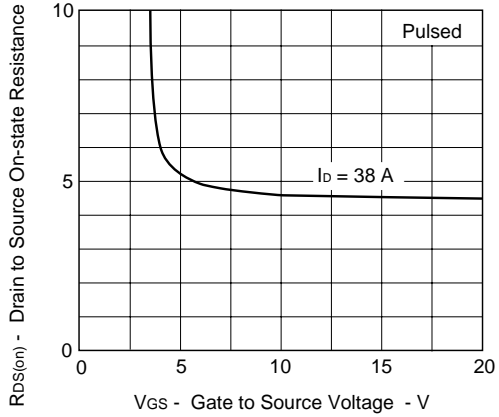
DRAIN CURRENT vs. DRAIN TO SOURCE VOLTAGE



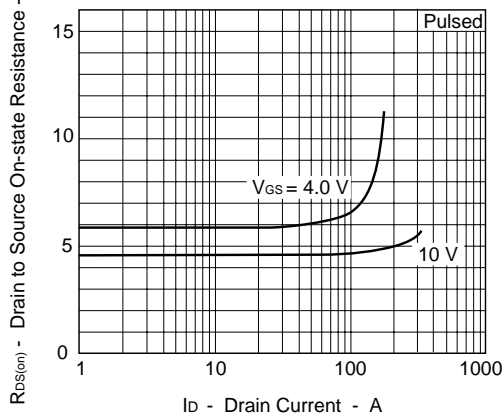
FORWARD TRANSFER ADMITTANCE vs. DRAIN CURRENT



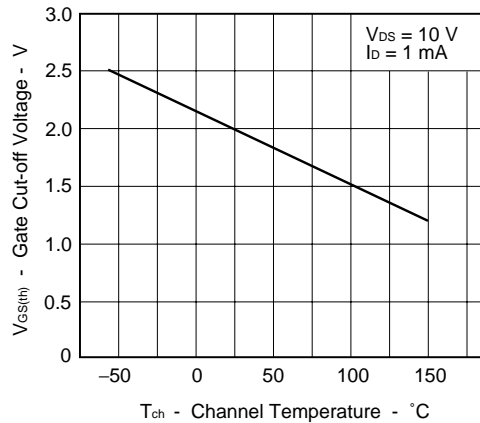
DRAIN TO SOURCE ON-STATE RESISTANCE vs. GATE TO SOURCE VOLTAGE



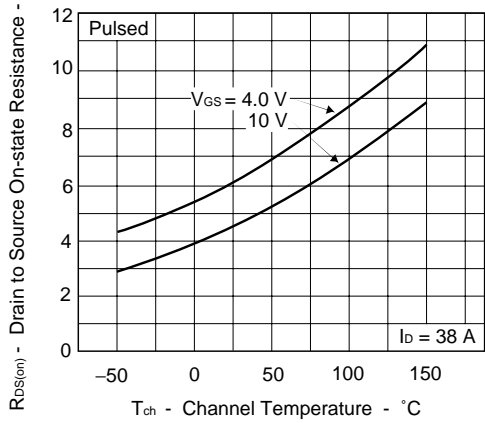
DRAIN TO SOURCE ON-STATE RESISTANCE vs. DRAIN CURRENT



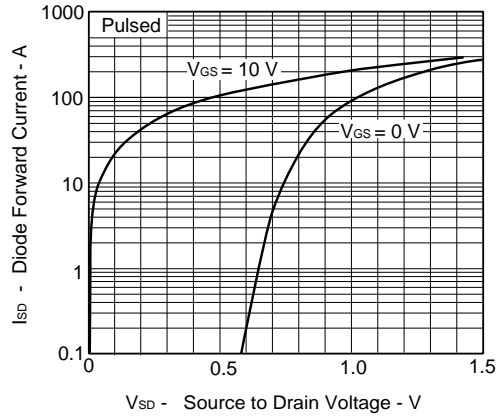
GATE CUT-OFF VOLTAGE vs. CHANNEL TEMPERATURE



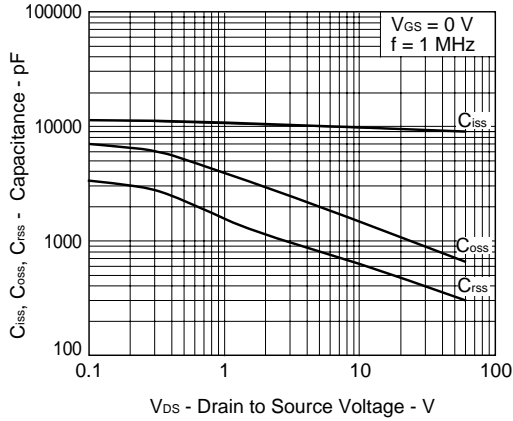
DRAIN TO SOURCE ON-STATE RESISTANCE vs. CHANNEL TEMPERATURE



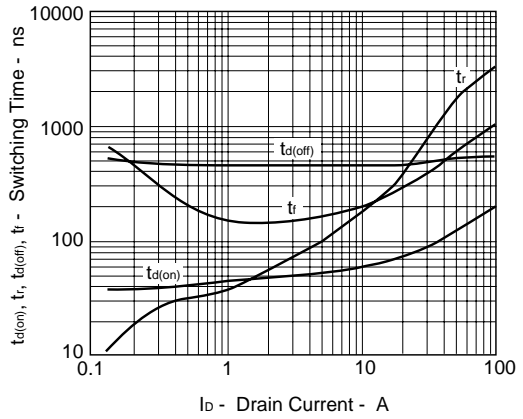
SOURCE TO DRAIN DIODE FORWARD VOLTAGE



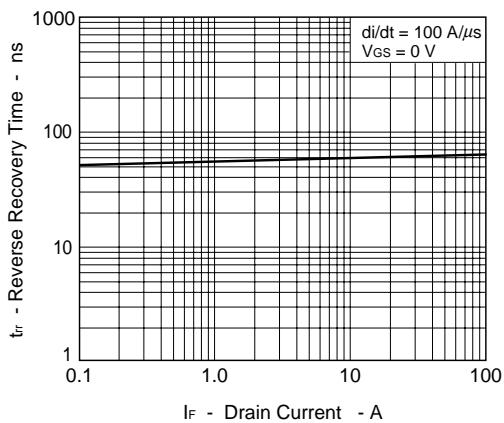
CAPACITANCE vs. DRAIN TO SOURCE VOLTAGE



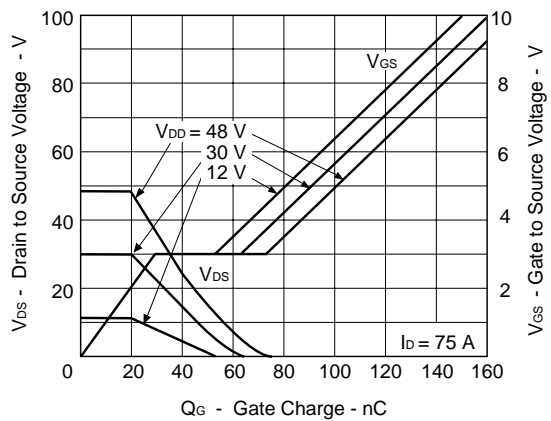
SWITCHING CHARACTERISTICS

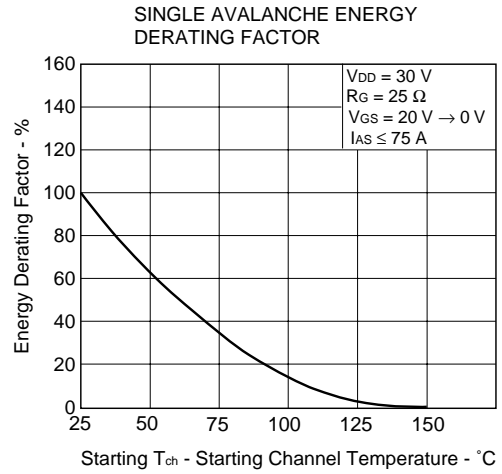
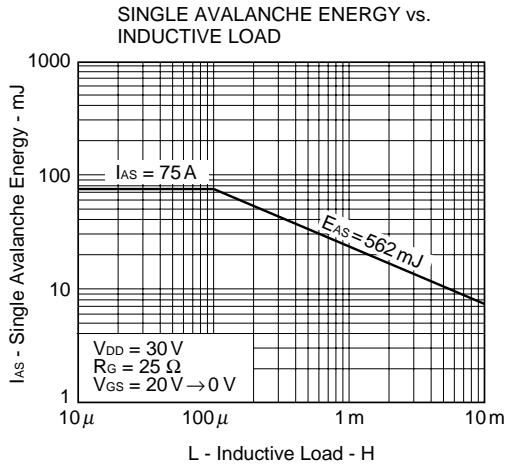


REVERSE RECOVERY TIME vs. DRAIN CURRENT



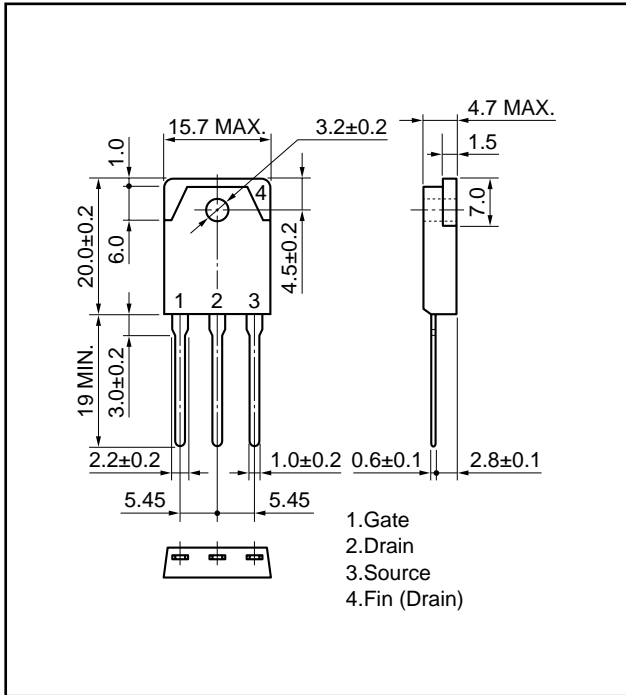
DYNAMIC INPUT/OUTPUT CHARACTERISTICS



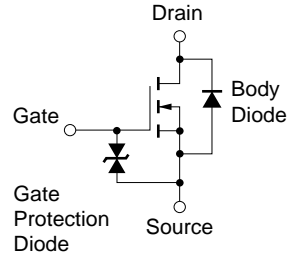


PACKAGE DRAWING (Unit: mm)

TO-3P (MP-88)



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.

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