V_{DSS} = 275 V, $R_{DS(ON)}$ = 0.26 Ω
Dual N-channel Power MOSFET

SPF0004

Data Sheet

Description

SPF0004 includes two N-channel power MOSFETs with zener diode for ESD protection. The package of SPF0004 isolates each MOSFET, and has heatsink connected to each drain.

Features

- Automotive Qualified
- Low On Resistance
- ESD Protection Zener on Gate
- 100% Avalanche Tested
- Compliant with RoHS directive

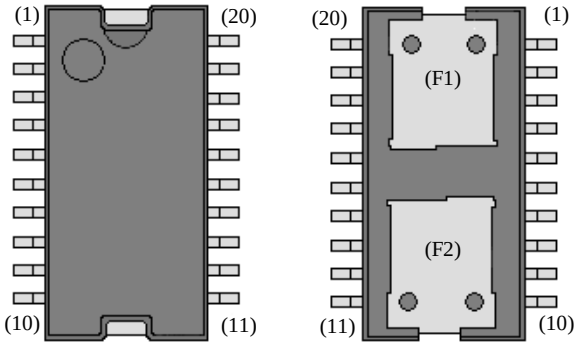
- V_{DSS} ---------- 275 V (I_D = 100 µA)
- I_D ---------- ± 6 A
- $R_{DS(ON)}$ ----------0.26 Ω max. (I_D = 6 A, V_{GS} = 10 V)
- trr ---------- 117 ns (typ.)

Applications

- DC/DC Converter
- Other Switched-mode Power Supply

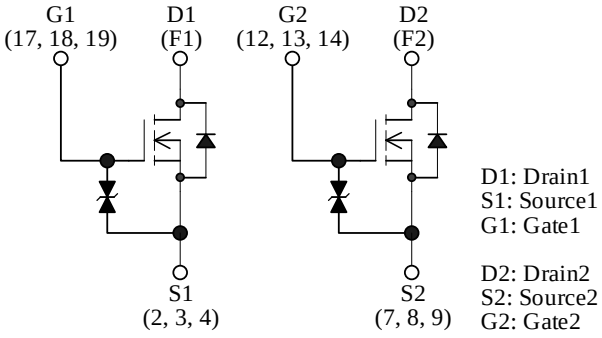
Package

HSOP20



Not to scale

Internal Schematic Diagram



Absolute Maximum Ratings

Unless otherwise specified, T_A = 25 °C

Parameter	Symbol	Test conditions	Rating	Unit
Drain to Source Voltage	V_{DSS}		275	V
Gate to Source Voltage	V_{GSS}		± 20	V
Continuous Drain Current	I_D		± 6	A
Pulsed Drain Current	$I_{D(PULSE)}$	Pulse width ≤ 100µs Duty cycle ≤ 1 %	± 30	A
Single Pulse Avalanche Energy	E_{AS}	V_{DD} = 49 V, L = 0.05 mH, I_{AS} = 40A, V_{GS} = +16 V, −13 V, R_G = 1.5 kΩ, unclamped, see Figure 1	47.5	mJ
Avalanche Current	I_{AS}		30	A
Power Dissipation	P_D	T_C = 25 °C	2.5	W
Drain to Source dv/dt 1	dv/dt 1	V_{DD} = 200 V, L = 0.035 mH, R_G = 150Ω, I_{DP} = 30 A, V_{GS} = +16 V, −16 V, di/dt ≥ −125 A/µs, see Figure 2	5.6	V/ns
Peak Diode Recovery dv/dt 2	dv/dt 2	V_{DD} = 200 V, L = 0.2 mH, I_{SDP} = 30 A, See Figure 3	8.5	V/ns
Peak Diode Recovery di/dt	di/dt	V_{DD} = 200 V, L = 0.2 mH, I_{SDP} = 30 A, See Figure 3	220	A/µs
Operating Junction Temperature	T_J		150	°C
Storage Temperature Range	T_{STG}		− 55 to 150	°C

Thermal Characteristics

Unless otherwise specified, T_A = 25 °C

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Thermal Resistance (Junction to Case)	$R_{\theta JC}$		−	−	4.7	°C/W

Electrical Characteristics

Unless otherwise specified, T_A = 25 °C

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	I_D = 100 µA, V_{GS} = 0 V	275	–	–	V
Drain to Source Leakage Current	I_{DSS}	V_{DS} = 275 V, V_{GS} = 0 V	–	–	100	µA
Gate to Source Leakage Current	I_{GSS}	V_{GS} = ± 20 V	–	–	10	µA
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = 10 V, I_D = 1 mA	1.90	2.25	2.60	V
Forward Transconductance	$R_{e(yfs)}$	V_{DS} = 10 V, I_D = 6 A	–	20	—	S
Static Drain to Source On-Resistance	$R_{DS(ON)}$	I_D = 6 A, V_{GS} = 10 V	–	0.20	0.26	Ω
Input Capacitance	C_{iss}	V_{DS} = 10 V V_{GS} = 0 V f = 1 MHz	–	960	–	pF
Output Capacitance	C_{oss}		–	250	–	
Reverse Transfer Capacitance	C_{rss}		–	36	–	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 200 V I_D = 6 A V_{GS} = 10 V, R_G = 10 Ω Refer to Figure 4	–	15	–	ns
Rise Time	t_r		–	34	–	
Turn-Off Delay Time	$t_{d(off)}$		–	112	–	
Fall Time	t_f		–	144	–	
Source to Drain Diode Forward Voltage	V_{SD}	I_{SD} = 6 A, V_{GS} = 0 V	–	–	1.2	V
Source to Drain Diode Reverse Recovery Time	t_{rr}	I_{SDP} = 6 A di/dt = 100 A/µs Refer to Figure 3	–	117	–	ns

Test Circuits and Waveforms

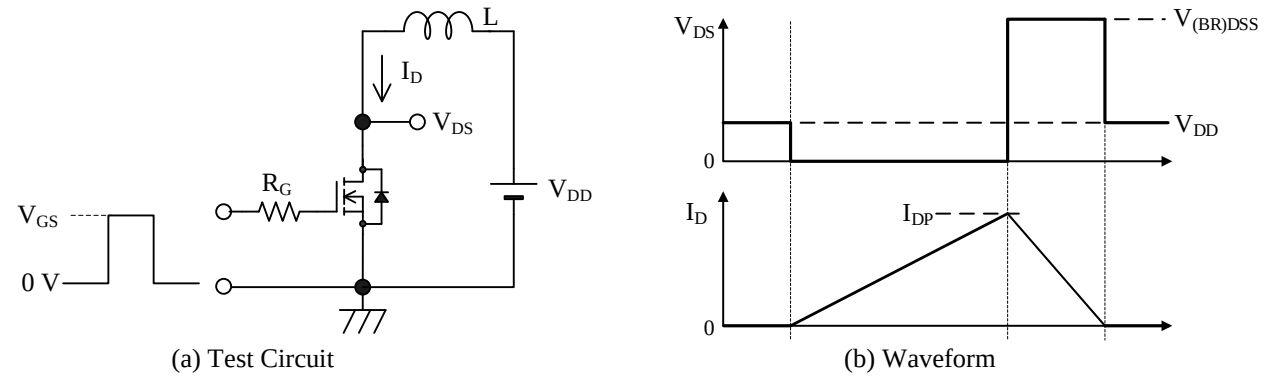


Figure 1 Unclamped Inductive Switching

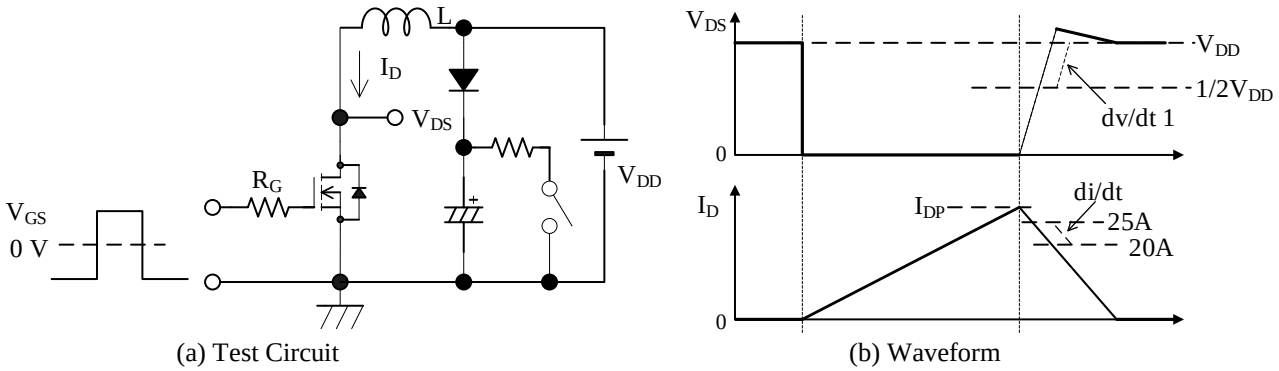


Figure 2 dv/dt Strength

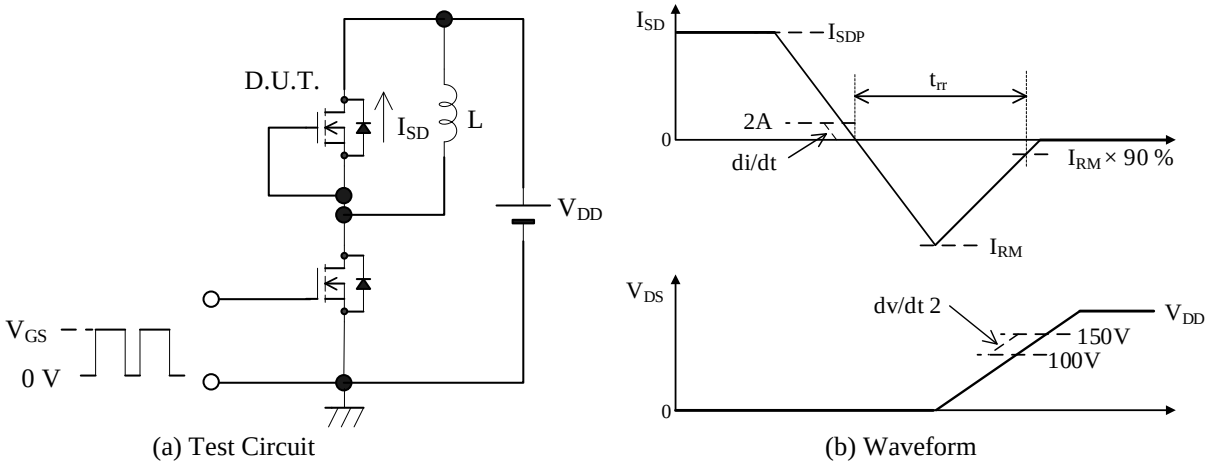


Figure 3 Diode Reverse Recovery Time

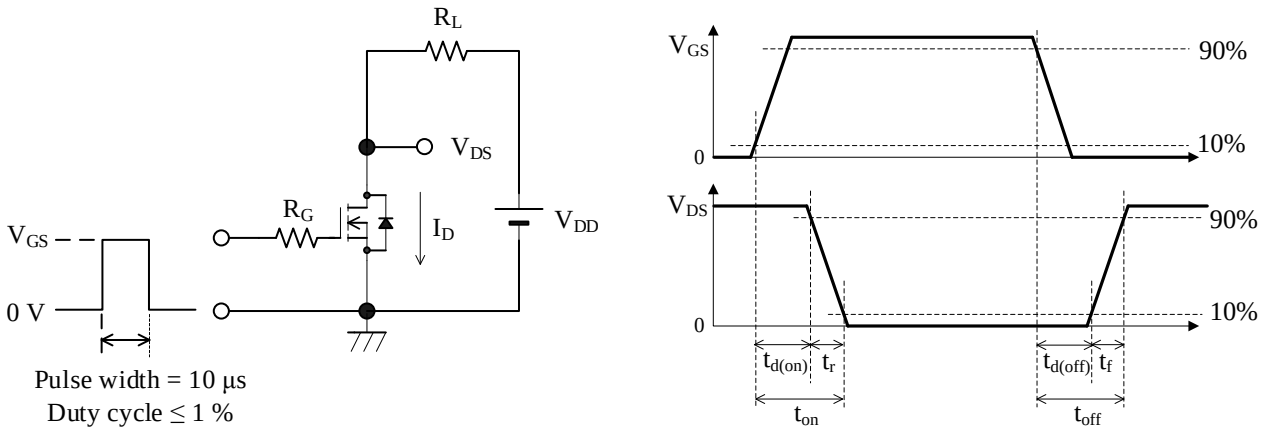


Figure 4 Switching Time

Ratings and Characteristics Curves

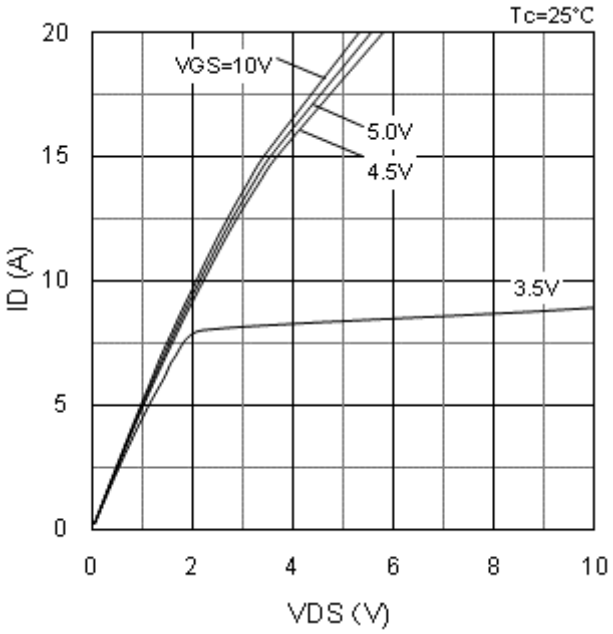


Figure 5 I_D vs. V_{DS} characteristics (typ.)

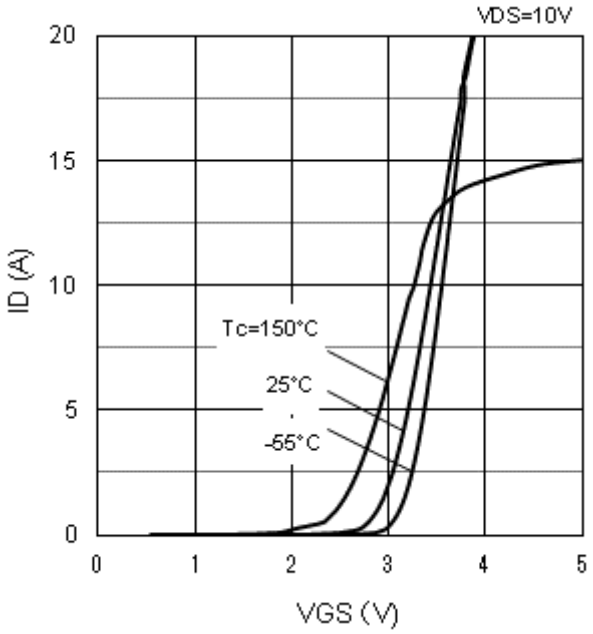


Figure 6 I_D vs. V_{GS} characteristics (typ.)

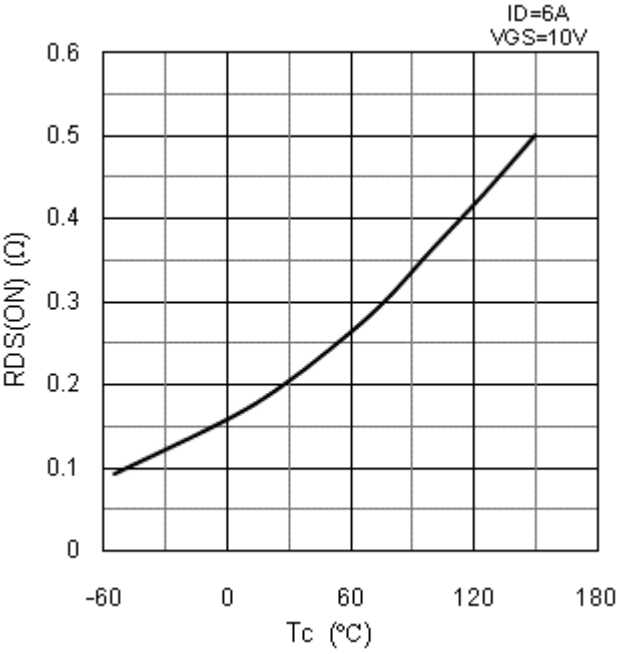


Figure 7 $R_{DS(ON)}$ vs. T_C characteristics (typ.)

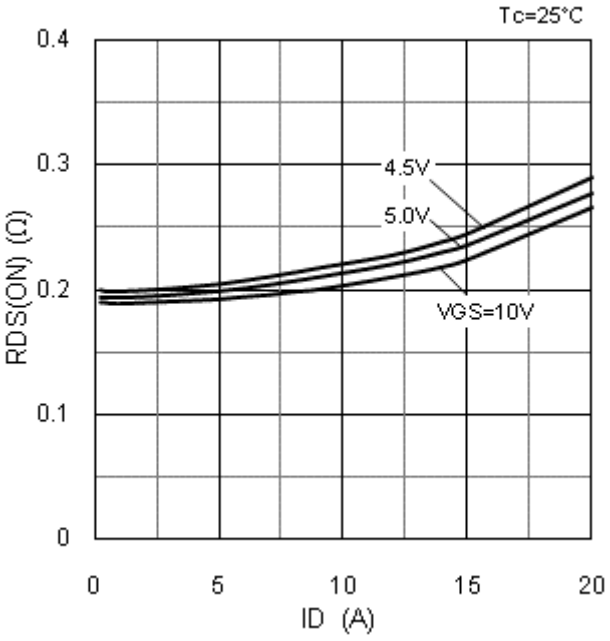


Figure 8 $R_{DS(ON)}$ vs. I_D characteristics (typ.)

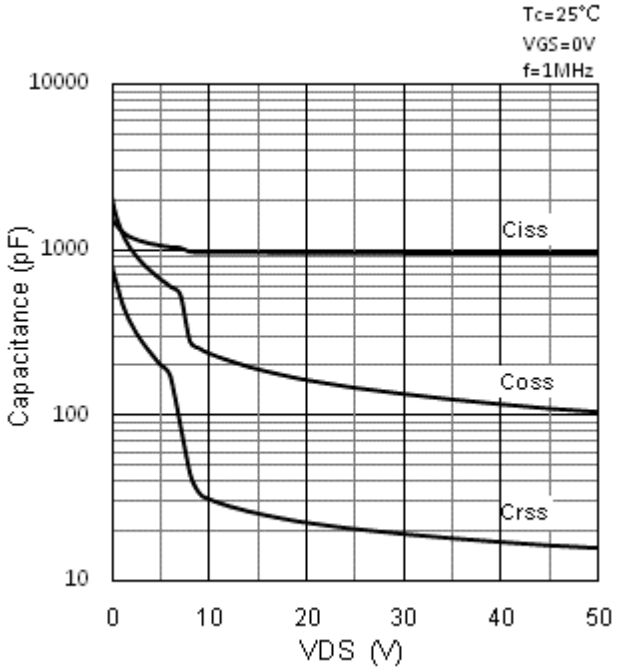


Figure 9 Capacitance vs. V_{DS} characteristics (typ.)

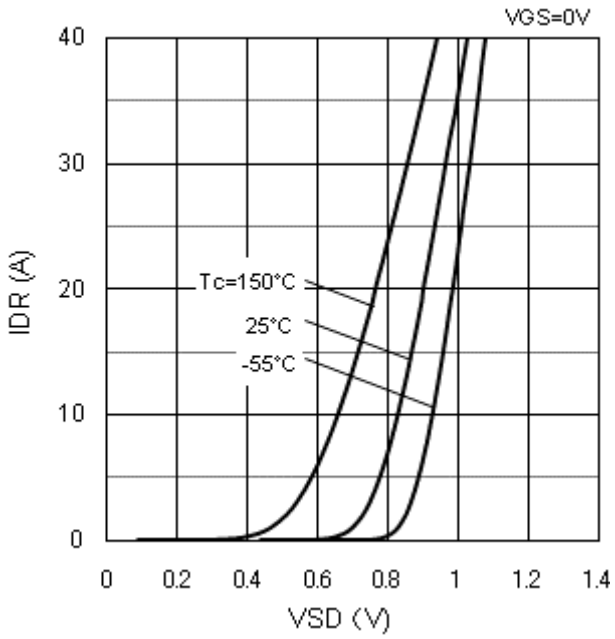


Figure 10 I_{DR} vs. V_{SD} characteristics (typ.)

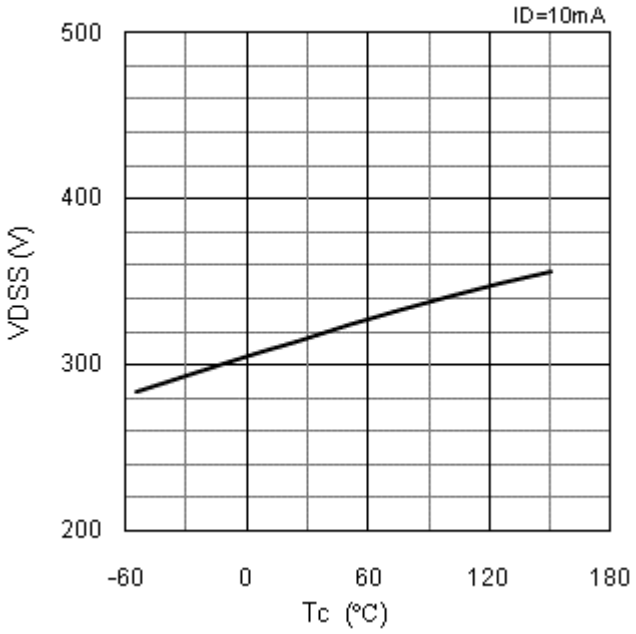


Figure 11 V_{DSS} vs. T_C characteristics (typ.)

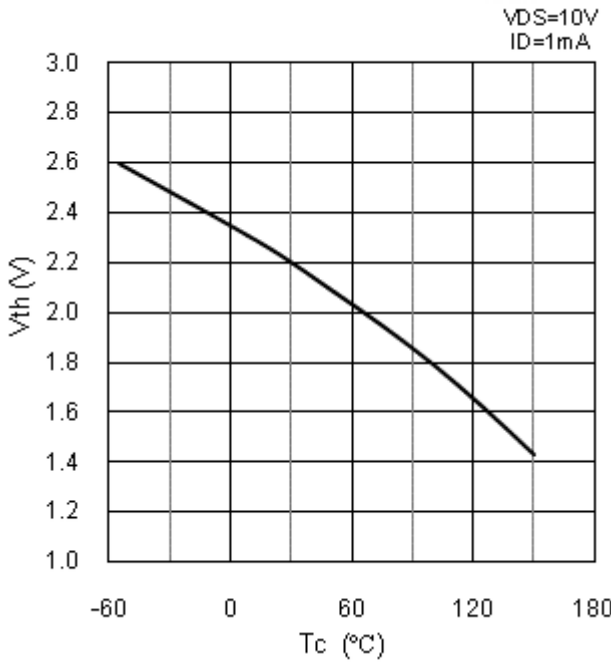


Figure 12 V_{th} vs. T_C characteristics (typ.)

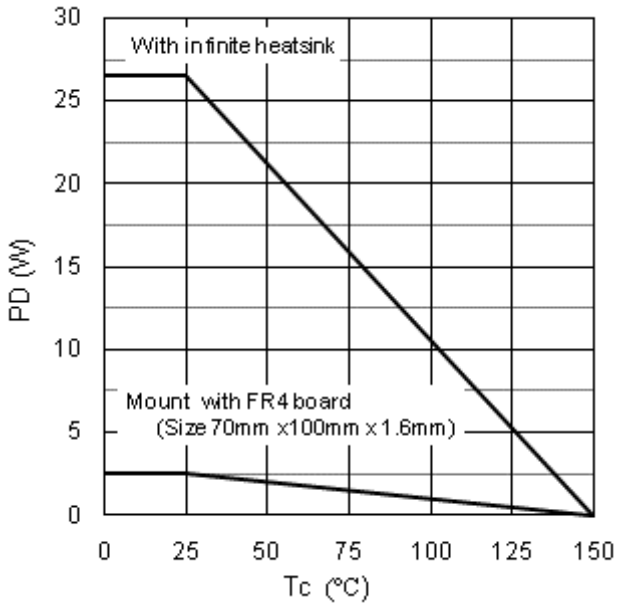


Figure 13 P_D vs. T_C characteristics (typ.)

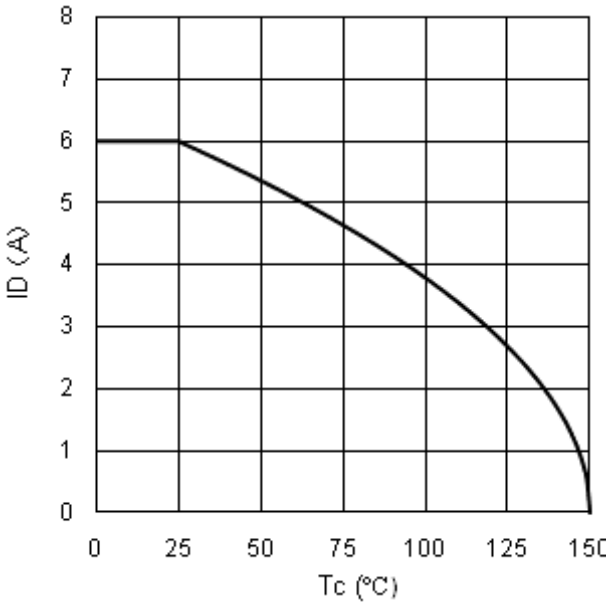


Figure 14 I_D vs. T_C characteristics (typ.)

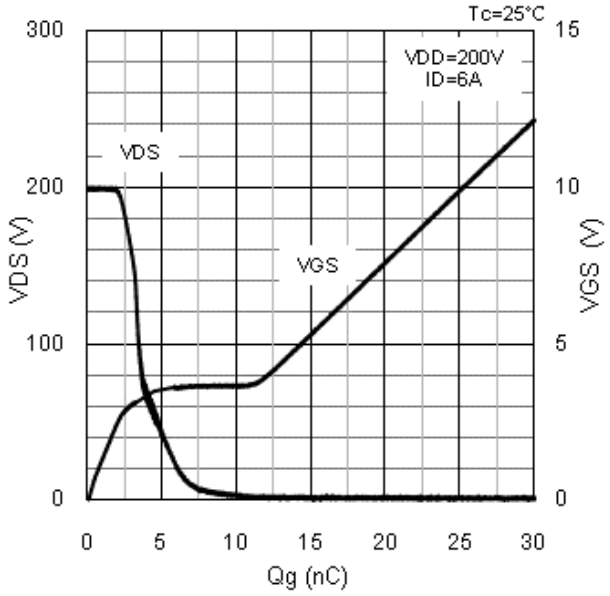


Figure 15 Dynamic input / output characteristics (typ.)

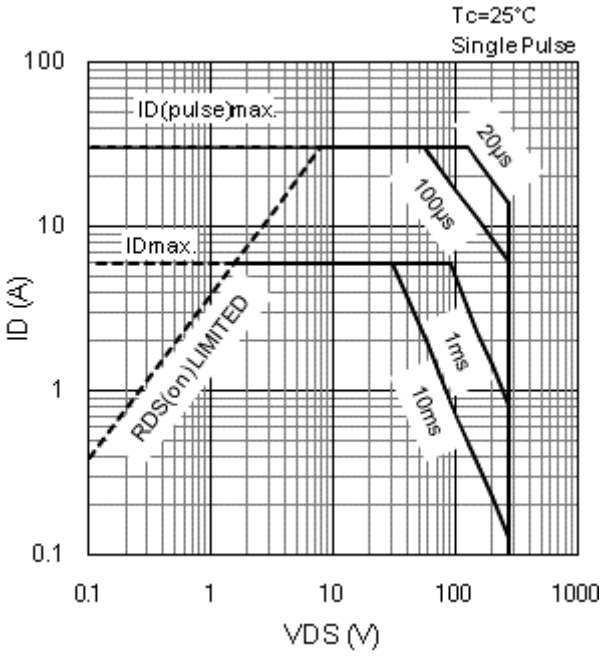


Figure 16 Safe operating area

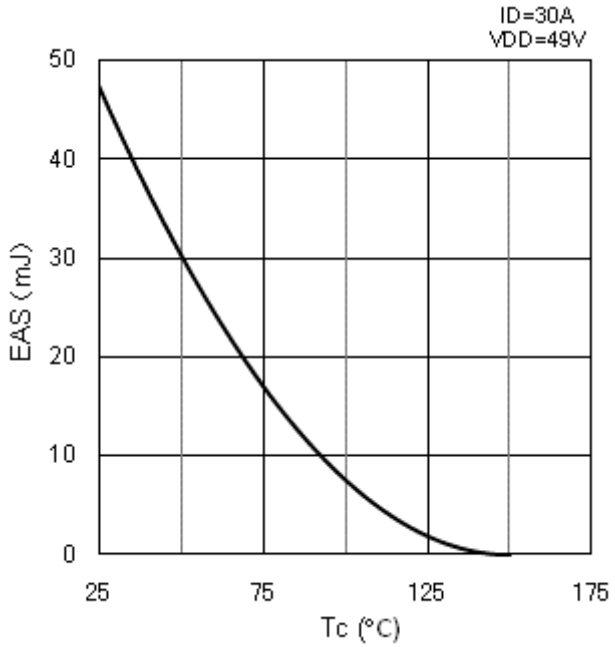


Figure 17. E_{AS} vs. T_C characteristics (typ.)

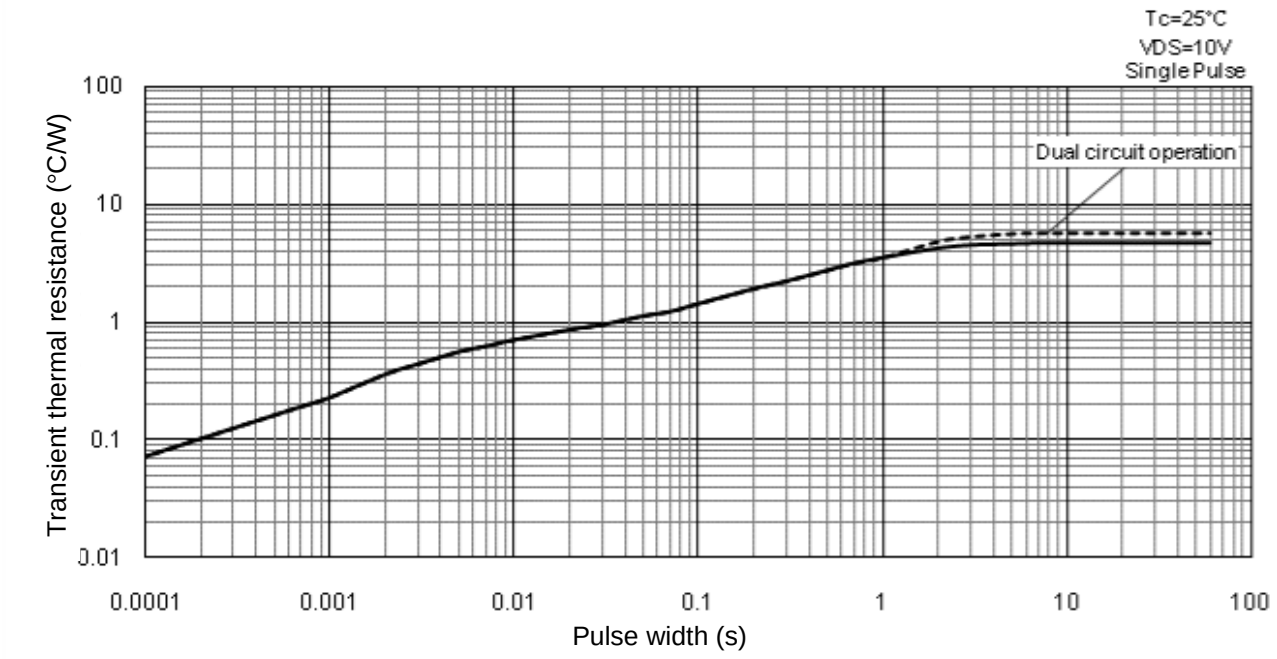
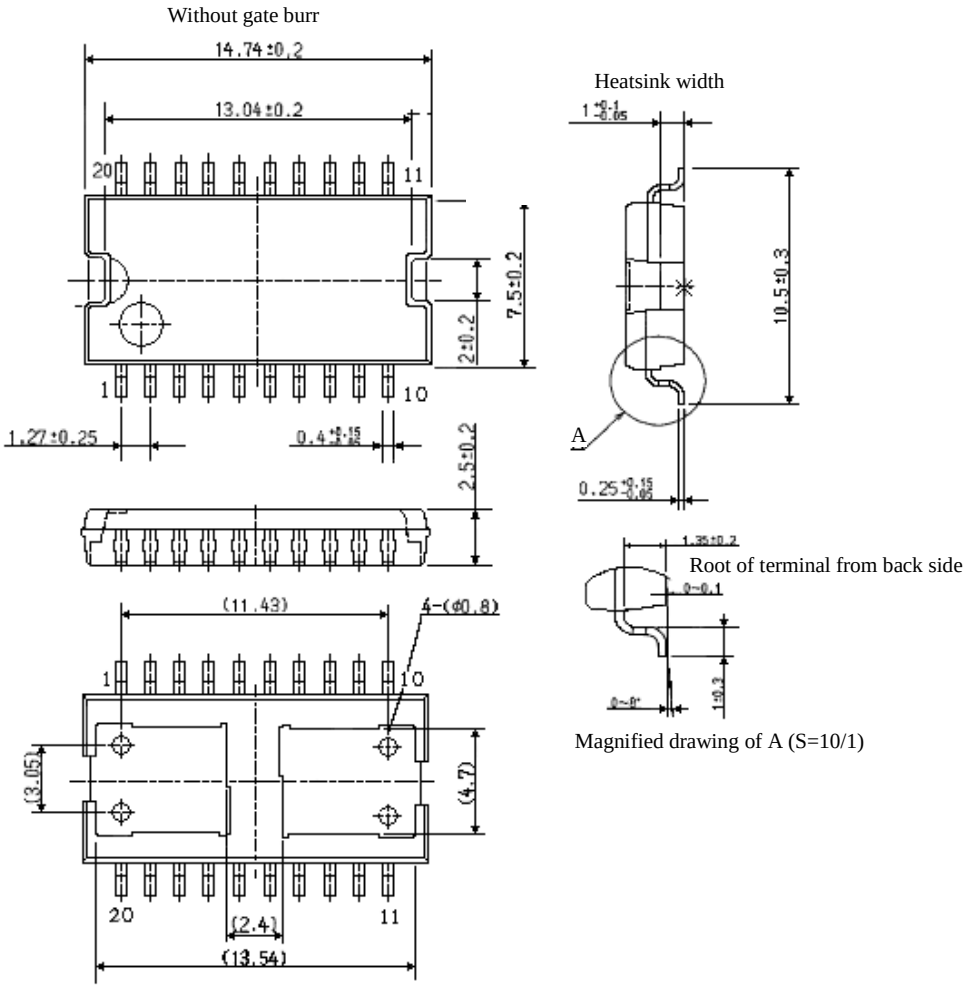


Figure 18. Transient Thermal Resistance

Physical Dimensions

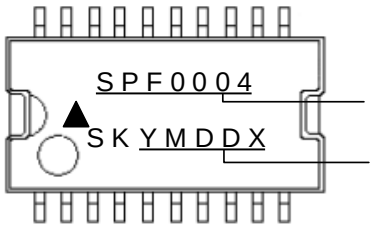
● **HSOP20 package**



NOTES:

- Dimensions in millimeters
- Lead treatment: Pb-free (RoHS compliant)
- When soldering the products, make sure to minimize the working time, within the following limits:
  Reflow (MSL 3)
  Preheat: 170 to 190 °C / 110 s
  Solder heating: 220 to 250 °C / 60s (3 times)
  Soldering iron: 380 ± 10 °C / 3.5 ± 0.5 s, 1 time

Marking Diagram



Part Number

Lot Number

Y is the last digit of the year of manufacture (0 to 9)

M is the month of the year (1 to 9, O, N or D)

DD is the day of the month (01 to 31)

X is control number (A to Z)

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