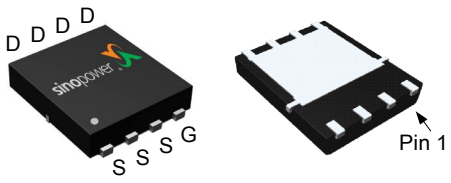
SM4031NHKP

N-Channel Enhancement Mode MOSFET

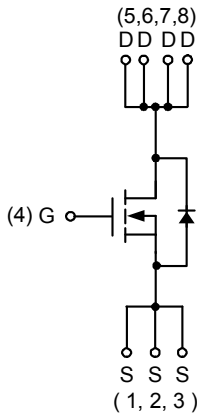
Features

- 40V/100A,
  $R_{DS(ON)}$= 1.35mΩ (max.) @ V_{GS}=10V
- 100% UIS + R_g Tested
- Reliable and Rugged
- Lower $R_{DS(ON)}$ to Minimize Conduction Losses
- Lead Free and Green Devices Available
  (RoHS Compliant)

Pin Description



DFN5x6A-8_EP

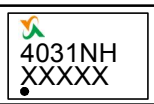


N-Channel MOSFET

Applications

- SMPS Synchronous Rectification
- Load Switch
- DC-DC Conversion
- Or-ing

Ordering and Marking Information

SM4031NH □□□-□□ □ Assembly Material Handling Code Temperature Range Package Code	Package Code KP : DFN5x6A-8_EP Operating Junction Temperature Range C : -55 to 175 °C Handling Code TR : Tape & Reel Assembly Material G : Halogen and Lead Free Device
SM4031NH KP : 	XXXXX - Lot Code

Note : SINOPOWER lead-free products contain molding compounds/die attach materials and 100% matte tin plate termination finish; which are fully compliant with RoHS. SINOPOWER lead-free products meet or exceed the lead-free requirements of IPC/JEDEC J-STD-020D for MSL classification at lead-free peak reflow temperature. SINOPOWER defines "Green" to mean lead-free (RoHS compliant) and halogen free (Br or Cl does not exceed 900ppm by weight in homogeneous material and total of Br and Cl does not exceed 1500ppm by weight).

Absolute Maximum Ratings (T_A = 25°C Unless Otherwise Noted)

Symbol	Parameter		Rating	Unit
Common Ratings				
V_{DSS}	Drain-Source Voltage		40	V
V_{GSS}	Gate-Source Voltage		±20	
T_J	Maximum Junction Temperature		175	°C
T_{STG}	Storage Temperature Range		-55 to 175	
I_S [a]	Diode Continuous Forward Current	T_C=25°C	100	A
I_D [a]	Continuous Drain Current	T_C=25°C	100	
		T_C=100°C	100	
I_{DM} [b]	Pulsed Drain Current	T_C=25°C	400	
P_D [c,d]	Maximum Power Dissipation	T_C=25°C	150	W
		T_C=100°C	75	
$R_{\theta JC}$ [c]	Thermal Resistance-Junction to Case	Steady State	1	°C/W
I_D [e,f]	Continuous Drain Current	T_A=25°C	36	A
		T_A=70°C	30	
I_{DM}	Pulsed Drain Current	T_A=25°C	90	A
P_D [e,f]	Maximum Power Dissipation	T_A=25°C	2.72	W
		T_A=70°C	1.9	
$R_{\theta JA}$ [e]	Thermal Resistance-Junction to Ambient	t ≤ 10s	17	°C/W
		Steady State	55	
I_{AS} [g]	Avalanche Current, Single pulse	L=0.5mH	45	A
E_{AS} [g]	Avalanche Energy, Single pulse	L=0.5mH	506	mJ

Note a：Maximum continue current is limited by package and equal to 100A.

Note b：Pulse width is limited by maximum junction temperature 175°C.

Note c：$R_{\theta JC}$ steady state t<0.1s. It is more useful by using large thermal heat sink and minimizes variation of case temperature w/o cumulative effect of heat. (JESD51-1)

Note d：Power dissipation (T_C) is based on $R_{\theta JC}$ and the maximum junction temperature is equal to 175°C.

Note e：$R_{\theta JA}$ steady state t=999s. $R_{\theta JA}$ is measured with the device mounted on 1in^2，FR-4 board with 2oz. Copper, in the air environment with T_A =25°C. The thermal resistance of $R_{\theta JA}$ = $R_{\theta JC}$ (junction to case) + $R_{\theta CA}$ (case to ambient). $R_{\theta CA}$ is determined by the user's board design.

Note f：Power dissipation and I_D are based on $R_{\theta JA}$ and the maximum junction temperature is equal to 175°C.

Note g：UIS tested and pulse width limited by maximum junction temperature 175°C (Initial temperature Tj=25°C).

Electrical Characteristics (T_A = 25°C unless otherwise noted)

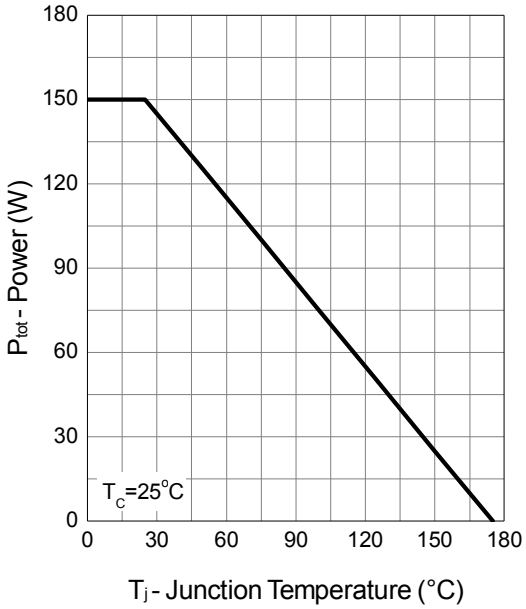
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V, I_{DS}=250μA	40	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=32V, V_{GS}=0V	-	-	1	μA
		T_J=85°C	-	-	30	
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS}, I_{DS}=250μA	2	3	4	V
I_{GSS}	Gate Leakage Current	V_{GS}=±20V, V_{DS}=0V	-	-	±100	nA
$R_{DS(ON)}$ [h]	Drain-Source On-state Resistance	V_{GS}=10V, I_{DS}=25A	-	1.1	1.35	mΩ
		T_J=125°C	-	1.95	-	
Gfs	Forward Transconductance	V_{DS}=5V, I_{DS}=30A	-	40	-	S
Diode Characteristics						
V_{SD} [h]	Diode Forward Voltage	I_{SD}=20A, V_{GS}=0V	-	0.76	1.1	V
t_{rr}	Reverse Recovery Time	I_{SD}=20A, dI_{SD}/dt=100A/μs V_{dd}=20V	-	60	-	ns
t_a	Charge Time		-	29	-	
t_b	Discharge Time		-	31	-	
Q_{rr}	Reverse Recovery Charge		-	70	-	nC
Dynamic Characteristics [i]						
R_G	Gate Resistance	V_{GS}=0V,V_{DS}=0V,F=1MHz	0.6	0.9	2	Ω
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=20V, Frequency=1.0MHz	-	5020	-	pF
C_{oss}	Output Capacitance		-	1770	-	
C_{rss}	Reverse Transfer Capacitance		-	150	-	
$t_{d(ON)}$	Turn-on Delay Time	V_{DD}=20V, R_L=20Ω, I_{DS}=1A, V_{GEN}=10V, R_G=6Ω	-	30	-	ns
t_r	Turn-on Rise Time		-	11.2	-	
$t_{d(OFF)}$	Turn-off Delay Time		-	66	-	
t_f	Turn-off Fall Time		-	108	-	
Gate Charge Characteristics [i]						
Q_g	Total Gate Charge	V_{DS}=20V, V_{GS}=10V, I_{DS}=25A	-	89	-	nC
Q_{gth}	Threshold Gate Charge		-	14	-	
Q_{gs}	Gate-Source Charge		-	24	-	
Q_{gd}	Gate-Drain Charge		-	18	-	

Note h : Pulse test ; pulse width≤300μs, duty cycle≤2%.

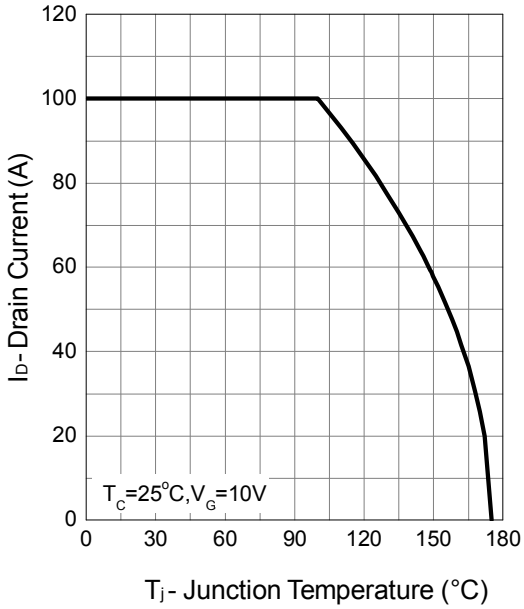
Note i : Guaranteed by design, not subject to production testing.

Typical Operating Characteristics

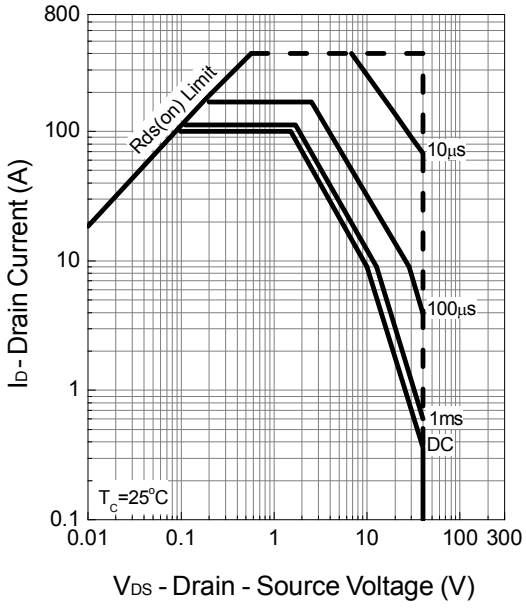
Power Dissipation



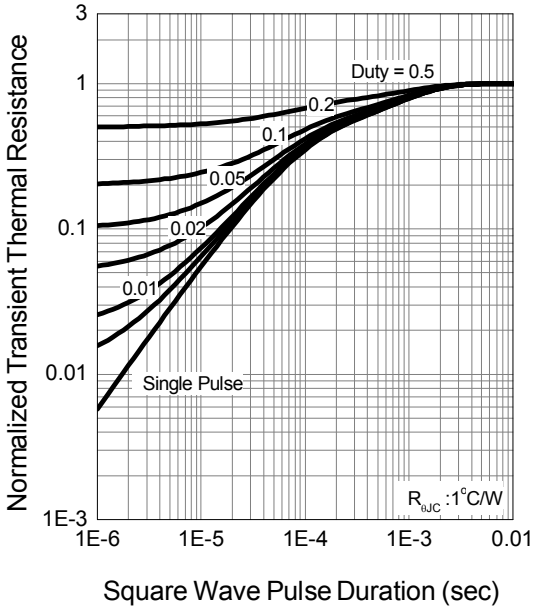
Drain Current



Safe Operation Area

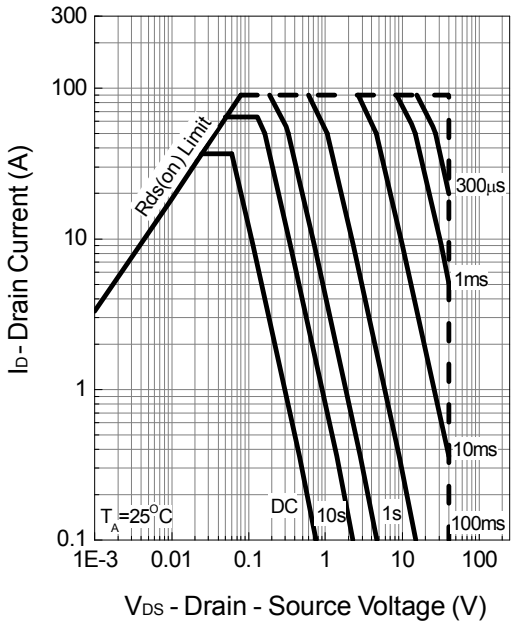


Thermal Transient Impedance

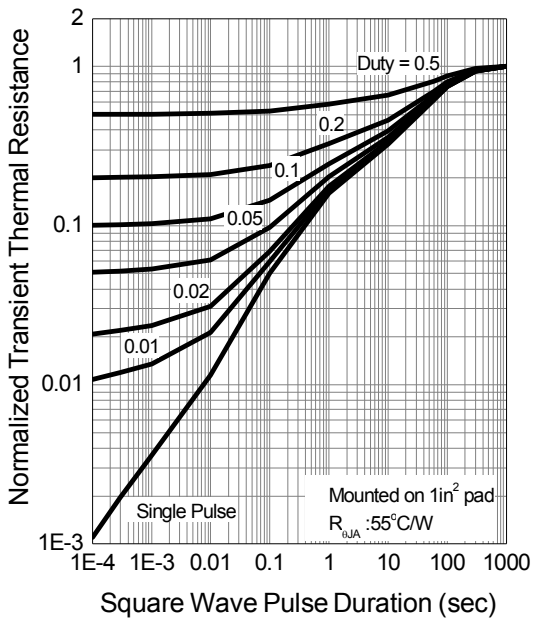


Typical Operating Characteristics (Cont.)

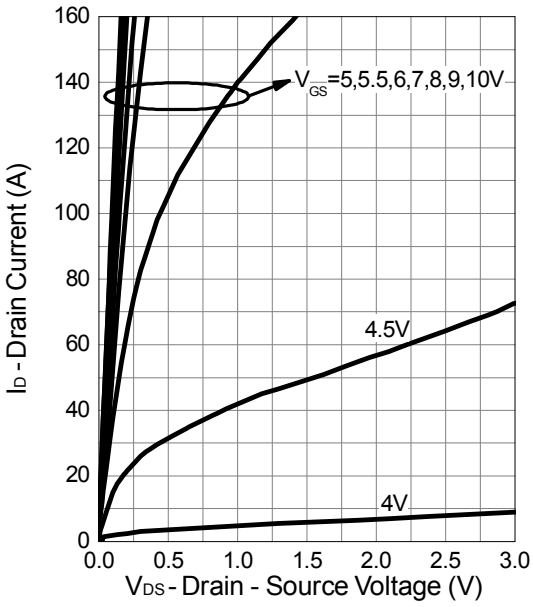
Safe Operation Area



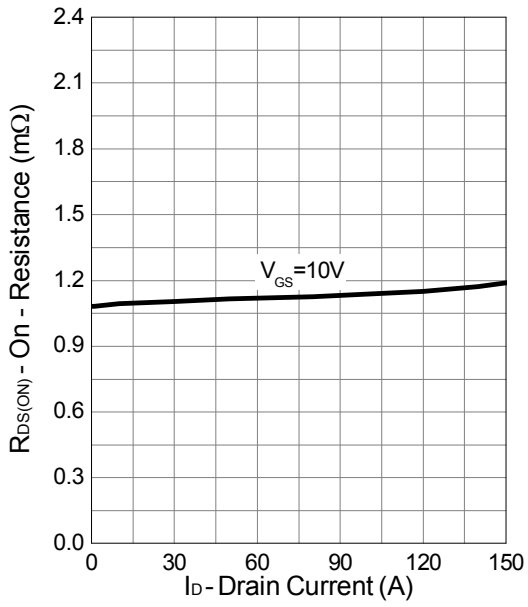
Thermal Transient Impedance



Output Characteristics

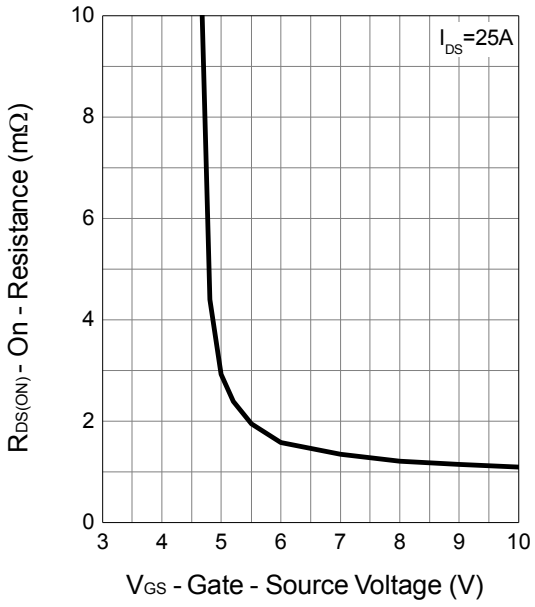


Drain-Source On Resistance

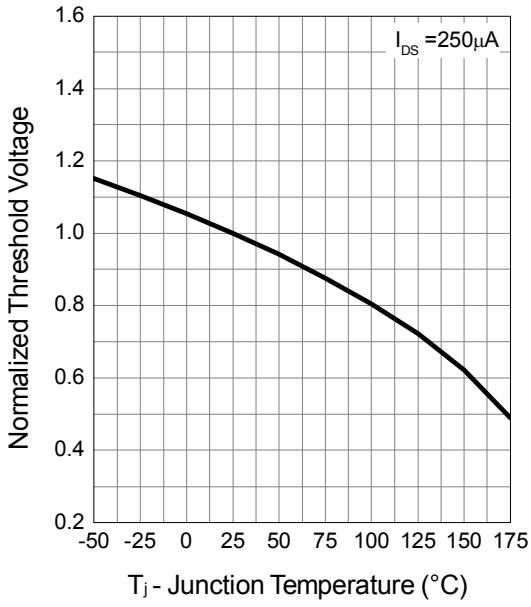


Typical Operating Characteristics (Cont.)

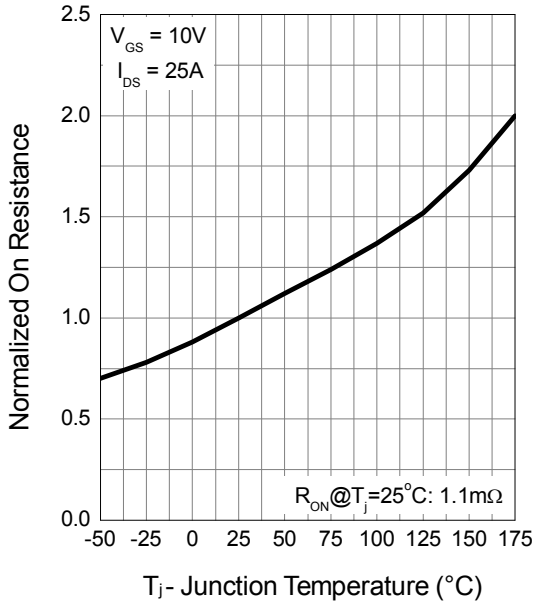
Gate-Source On Resistance



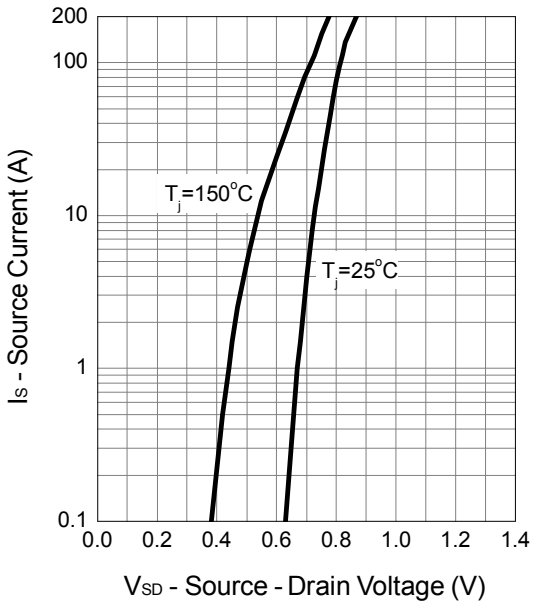
Gate Threshold Voltage



Drain-Source On Resistance

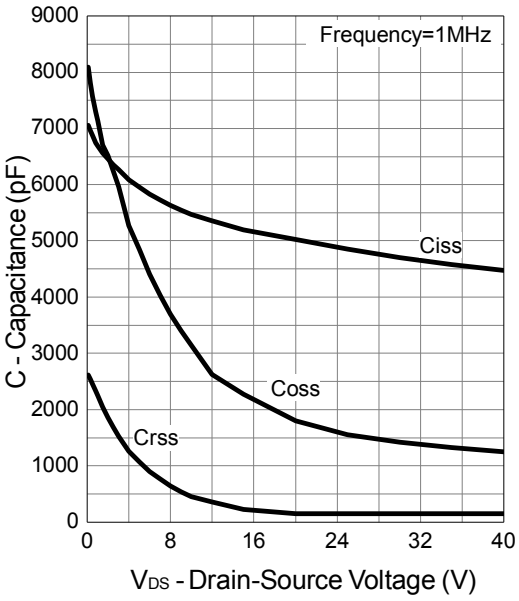


Source-Drain Diode Forward

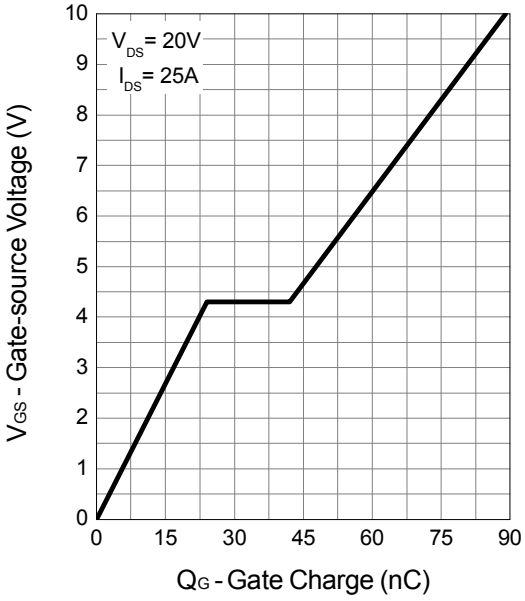


Typical Operating Characteristics (Cont.)

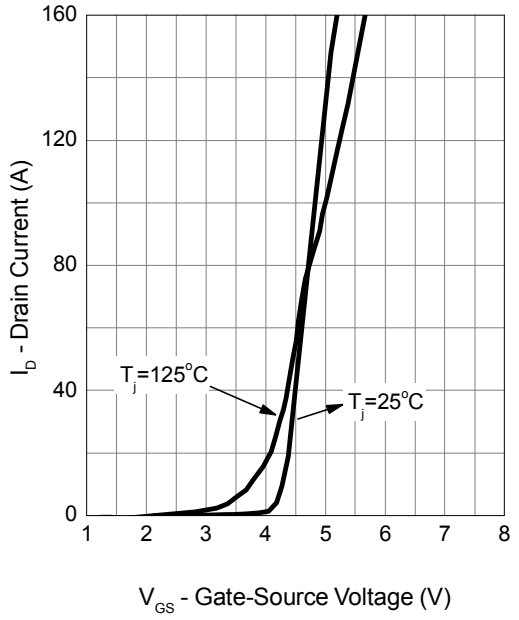
Capacitance



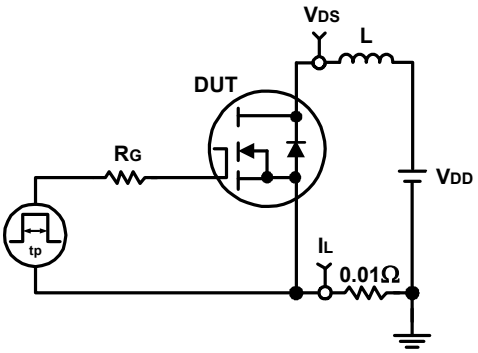
Gate Charge

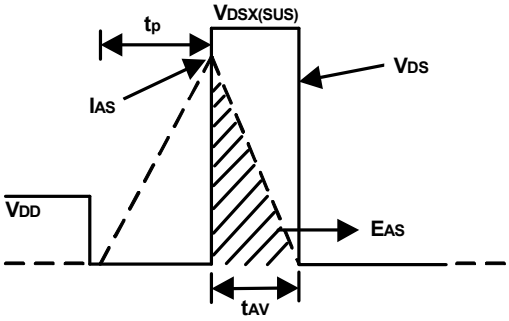


Transfer Characteristics

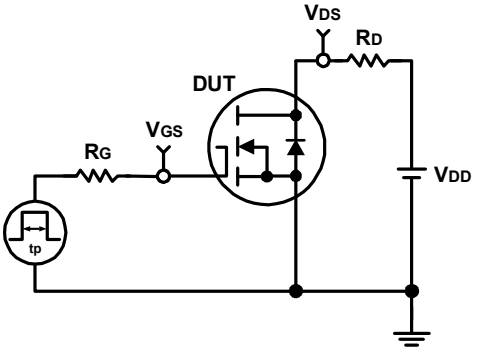


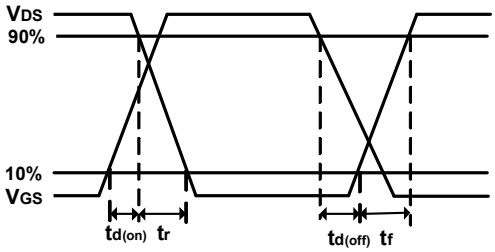
Avalanche Test Circuit and Waveforms





Switching Time Test Circuit and Waveforms





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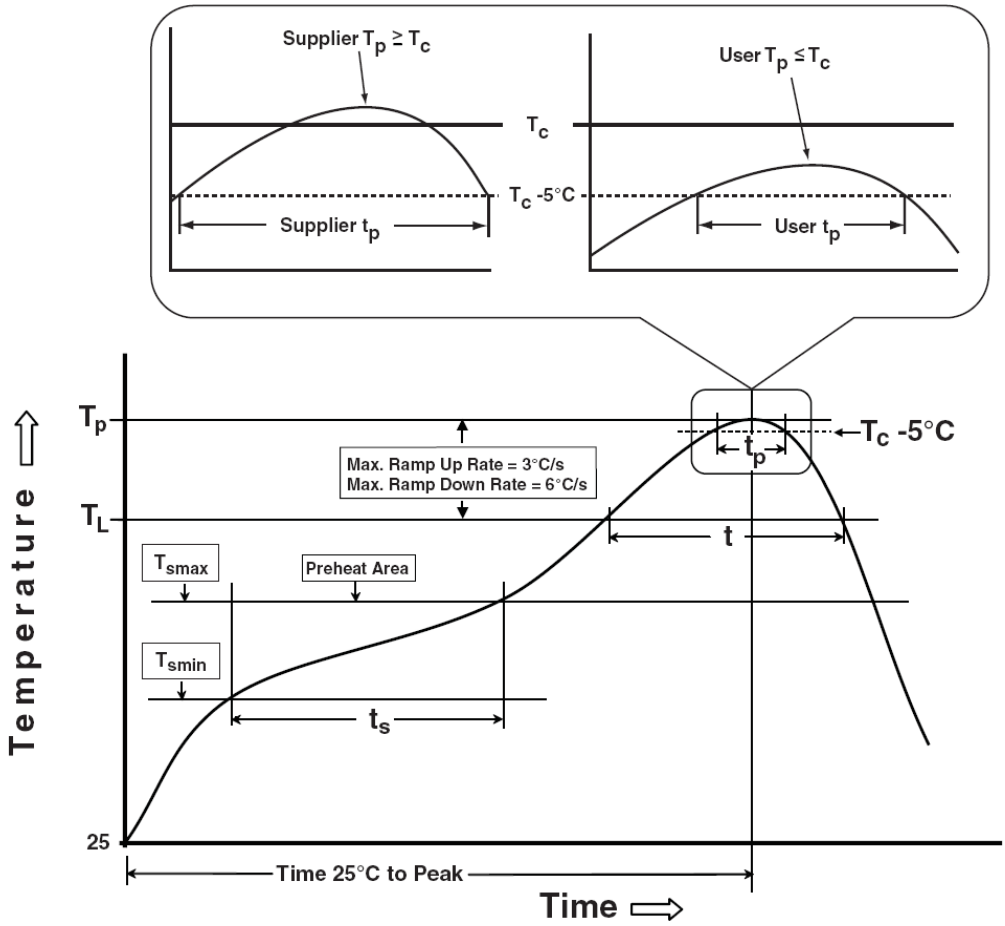
Classification Profile



Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak Temperature min (T_{smin}) Temperature max (T_{smax}) Time (T_{smin} to T_{smax}) (t_s)	100 °C 150 °C 60-120 seconds	150 °C 200 °C 60-120 seconds
Average ramp-up rate (T_{smax} to T_P)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L) Time at liquidous (t_L)	183 °C 60-150 seconds	217 °C 60-150 seconds
Peak package body Temperature (T_p)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (t_P)** within 5°C of the specified classification temperature (T_c)	20** seconds	30** seconds
Average ramp-down rate (T_p to T_{smax})	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile Temperature (T_p) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (t_p) is defined as a supplier minimum and a user maximum.		

Table 1. SnPb Eutectic Process – Classification Temperatures (Tc)

Package Thickness	Volume mm^3 <350	Volume mm^3 ≥350
<2.5 mm	235 °C	220 °C
≥2.5 mm	220 °C	220 °C

Table 2. Pb-free Process – Classification Temperatures (Tc)

Package Thickness	Volume mm^3 <350	Volume mm^3 350-2000	Volume mm^3 >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥2.5 mm	250 °C	245 °C	245 °C

Reliability Test Program

Test item	Method	Description
SOLDERABILITY	JESD-22, B102	5 Sec, 245°C
HTRB	JESD-22, A108	1000 Hrs, 80% of VDS max @ Tjmax
HTGB	JESD-22, A108	1000 Hrs, 100% of VGS max @ Tjmax
PCT	JESD-22, A102	168 Hrs, 100%RH, 2atm, 121°C
TCT	JESD-22, A104	500 Cycles, -65°C~150°C

Customer Service

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