

Dual N-Channel Enhancement Mode MOSFET

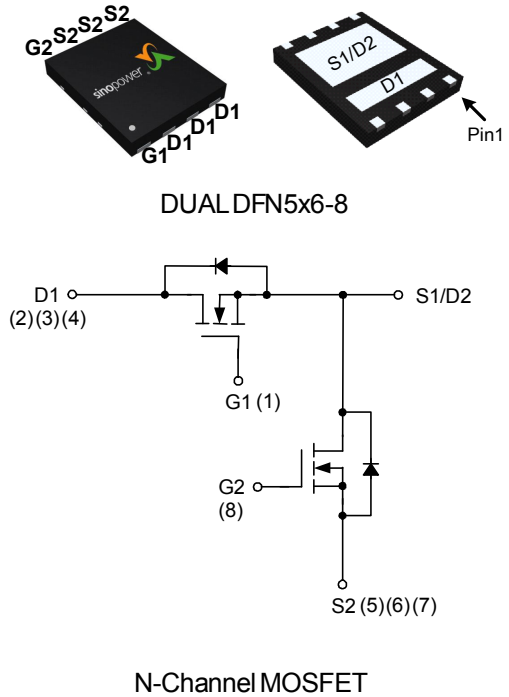
Features

- **Channel 1**
30V/64A,
 $R_{DS(ON)} = 5.2m\Omega$ (max.) @ $V_{GS} = 10V$
 $R_{DS(ON)} = 7.5m\Omega$ (max.) @ $V_{GS} = 4.5V$
- **Channel 2**
30V/85A,
 $R_{DS(ON)} = 1.8m\Omega$ (max.) @ $V_{GS} = 10V$
 $R_{DS(ON)} = 2.5m\Omega$ (max.) @ $V_{GS} = 4.5V$
- 100% UIS Tested
- Reliable and Rugged
- Lead Free Available (RoHS Compliant)


Applications

- Power Management in Desktop Computer or DC/DC Converters.

Pin Description



Ordering and Marking Information

<p>SM7320ES □□□-□□□</p> <div style="margin-left: 20px;"> <p>└─ Assembly Material</p> <p>└─ Handling Code</p> <p>└─ Temperature Range</p> <p>└─ Package Code</p> </div>	<p>Package Code QG : DFN5x6-8</p> <p>Operating Junction Temperature Range C : -55 to 150 °C</p> <p>Handling Code TR : Tape & Reel (2500ea/reel)</p> <p>Assembly Material G : Halogen and Lead Free Device</p>
<p>SM7320ES QG : </p>	<p>XXXXX - Lot Code</p>

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).

SINOPOWER reserves the right to make changes to improve reliability or manufacturability without notice, and advise customers to obtain the latest version of relevant information to verify before placing orders.

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Channel 1	Channel 2	Unit	
Common Ratings					
V_{DSS}	Drain-Source Voltage	30		V	
V_{GSS}	Gate-Source Voltage	± 20		V	
T_J	Maximum Junction Temperature	150		$^\circ\text{C}$	
T_{STG}	Storage Temperature Range	-55 to 150		$^\circ\text{C}$	
I_S	Diode Continuous Forward Current	30	75	A	
I_{DP}^b	Pulse Drain Current Tested	200	300	A	
I_D^a	Continuous Drain Current	$T_C=25^\circ\text{C}$	64	85	A
		$T_C=100^\circ\text{C}$	40	80	
P_D	Maximum Power Dissipation	$T_C=25^\circ\text{C}$	35	83	W
		$T_C=100^\circ\text{C}$	14	33	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	Steady State	3.5	1.5	$^\circ\text{C/W}$
I_D	Continuous Drain Current	$T_A=25^\circ\text{C}$	16	30	A
		$T_A=70^\circ\text{C}$	13	24	
P_D	Maximum Power Dissipation	$T_A=25^\circ\text{C}$	2.08	2.38	W
		$T_A=70^\circ\text{C}$	1.33	1.52	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	$t \leq 10\text{s}$	30	28	$^\circ\text{C/W}$
		Steady State	60	52.5	
I_{AS}^c	Avalanche Current, Single pulse (L=0.1mH)	30	50	A	
E_{AS}^c	Avalanche Energy, Single pulse (L=0.1mH)	45	125	mJ	

Note a : Package is limited to 85A.

Note b : Pulse width is limited by max. junction temperature.

Note c : UIS tested and pulse width are limited by maximum junction temperature 150°C (initial temperature $T_J=25^\circ\text{C}$).

Channel 1 Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Channel 1			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	30	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =24V, V _{GS} =0V T _J =85°C	-	-	1	μA
			-	-	30	
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	1.5	1.8	2.5	V
I _{GSS}	Gate Leakage Current	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^d	Drain-Source On-state Resistance	V _{GS} =10V, I _{DS} =20A T _J =125°C	-	4.3	5.2	mΩ
			-	6	-	
		V _{GS} =4.5V, I _{DS} =15A	-	5.7	7.5	
Gfs	Forward Transconductance	V _{DS} =5V, I _{DS} =15A	-	30	-	S
Diode Characteristics						
V _{SD} ^d	Diode Forward Voltage	I _{SD} =10A, V _{GS} =0V	-	0.75	1.1	V
t _{rr}	Reverse Recovery Time	I _{DS} =5A, dI _{SD} /dt=100A/μs	-	17.1	-	ns
t _a	Charge Time		-	9.4	-	
t _b	Discharge Time		-	7.7	-	
Q _{rr}	Reverse Recovery Charge		-	9.3	-	
Dynamic Characteristics^e						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	0.4	0.6	1.5	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, Frequency=1.0MHz	1160	1450	1740	pF
C _{oss}	Output Capacitance		181	258	335	
C _{rss}	Reverse Transfer Capacitance		80	133	186	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =15V, R _L =15Ω, I _{DS} =1A, V _{GEN} =10V, R _G =6Ω	-	10	19	ns
t _r	Turn-on Rise Time		-	11	21	
t _{d(OFF)}	Turn-off Delay Time		-	25	46	
t _f	Turn-off Fall Time		-	8	15	
Gate Charge Characteristics^e						
Q _g	Total Gate Charge	V _{DS} =15V, V _{GS} =4.5V, I _{DS} =20A	-	12.5	-	nC
Q _g	Total Gate Charge		-	26.2	37	
Q _{gth}	Threshold Gate Charge	V _{DS} =15V, V _{GS} =10V, I _{DS} =20A	-	1.9	-	
Q _{gs}	Gate-Source Charge		-	3.2	-	
Q _{gd}	Gate-Drain Charge		-	5.6	-	

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

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

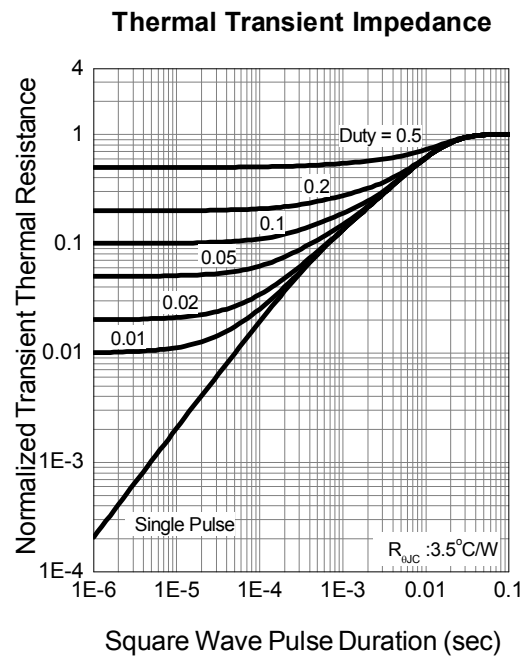
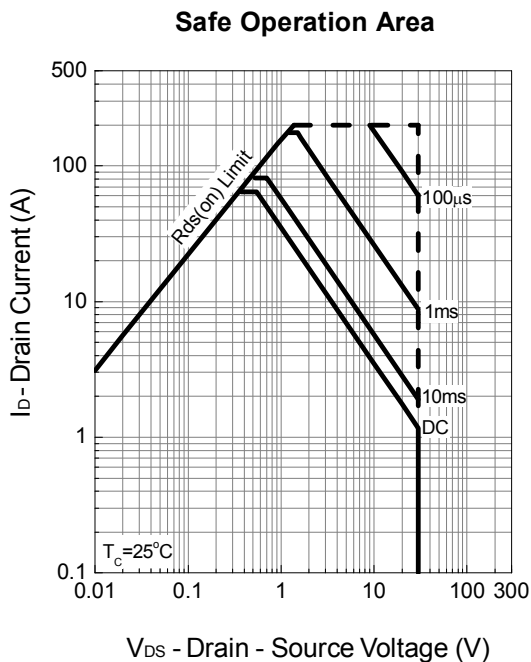
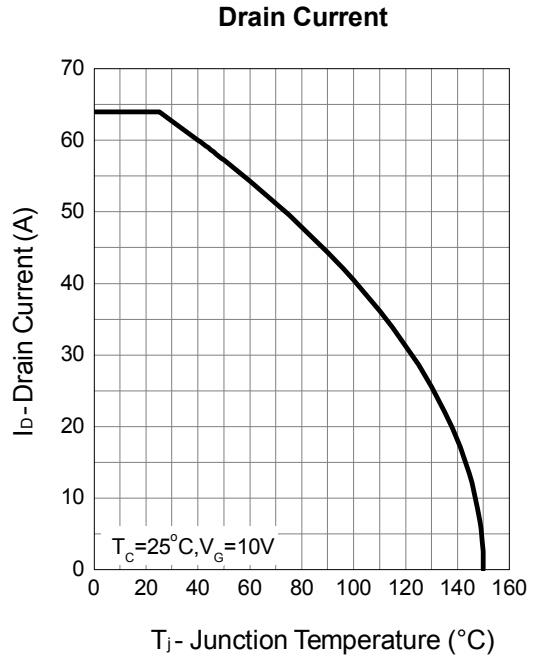
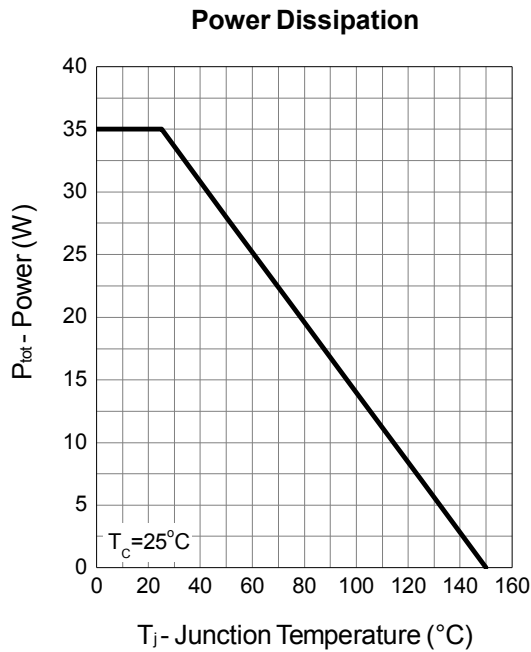
Channel 2 Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Channel 2			Unit
			Min.	Typ.	Max.	
Static Characteristics						
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _{DS} =250μA	30	-	-	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =24V, V _{GS} =0V T _J =85°C	-	-	1 30	μA
V _{GS(th)}	Gate Threshold Voltage	V _{DS} =V _{GS} , I _{DS} =250μA	1.4	1.7	2.5	V
I _{GSS}	Gate Leakage Current	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
R _{DS(ON)} ^d	Drain-Source On-state Resistance	V _{GS} =10V, I _{DS} =30A T _J =125°C	-	1.5 2	1.8 -	mΩ
		V _{GS} =4.5V, I _{DS} =15A	-	1.9	2.5	
G _{fs}	Forward Transconductance	V _{DS} =5V, I _{DS} =15A	-	37	-	S
Diode Characteristics						
V _{SD} ^d	Diode Forward Voltage	I _{SD} =20A, V _{GS} =0V	-	0.75	1.1	V
t _{rr}	Reverse Recovery Time	I _{DS} =30A, dI _{SD} /dt=100A/μs	-	31.4	-	ns
t _a	Charge Time		-	14.7	-	
t _b	Discharge Time		-	16.7	-	
Q _{rr}	Reverse Recovery Charge		-	22.9	-	nC
Dynamic Characteristics^e						
R _G	Gate Resistance	V _{GS} =0V, V _{DS} =0V, F=1MHz	0.5	0.7	1.5	Ω
C _{iss}	Input Capacitance	V _{GS} =0V, V _{DS} =15V, Frequency=1.0MHz	3160	3950	4938	pF
C _{oss}	Output Capacitance		602	860	1118	
C _{rss}	Reverse Transfer Capacitance		237	395	572	
t _{d(ON)}	Turn-on Delay Time	V _{DD} =15V, R _L =15Ω, I _{DS} =1A, V _{GEN} =10V, R _G =6Ω	-	18	33	ns
t _r	Turn-on Rise Time		-	12	23	
t _{d(OFF)}	Turn-off Delay Time		-	47	86	
t _f	Turn-off Fall Time		-	27	50	
Gate Charge Characteristics^e						
Q _g	Total Gate Charge	V _{DS} =15V, V _{GS} =4.5V, I _{DS} =30A	-	29.9	-	nC
Q _g	Total Gate Charge	V _{DS} =15V, V _{GS} =10V, I _{DS} =30A	-	65.2	91	
Q _{gth}	Threshold Gate Charge		-	4.8	-	
Q _{gs}	Gate-Source Charge		-	8.6	-	
Q _{gd}	Gate-Drain Charge		-	13	-	

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

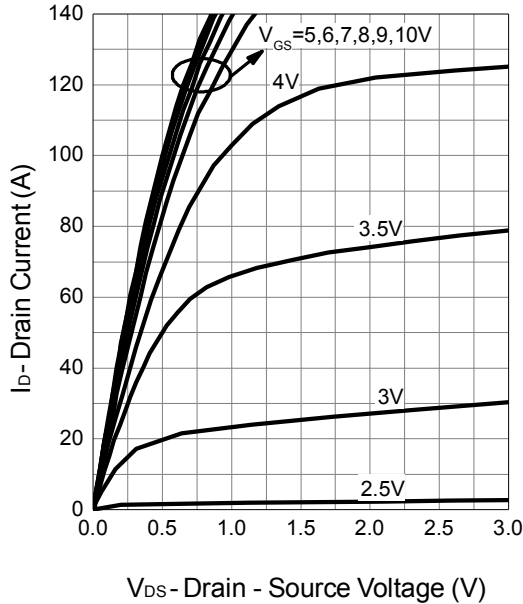
Note e : Guaranteed by design, not subject to production testing.

Channel 1 Typical Operating Characteristics

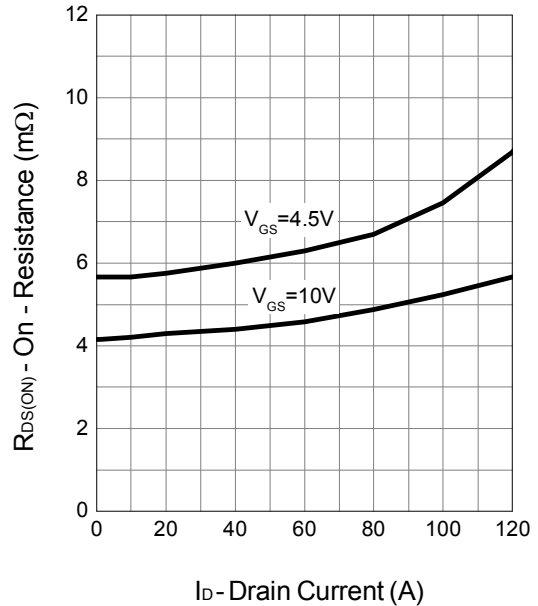


Channel 1 Typical Operating Characteristics (Cont.)

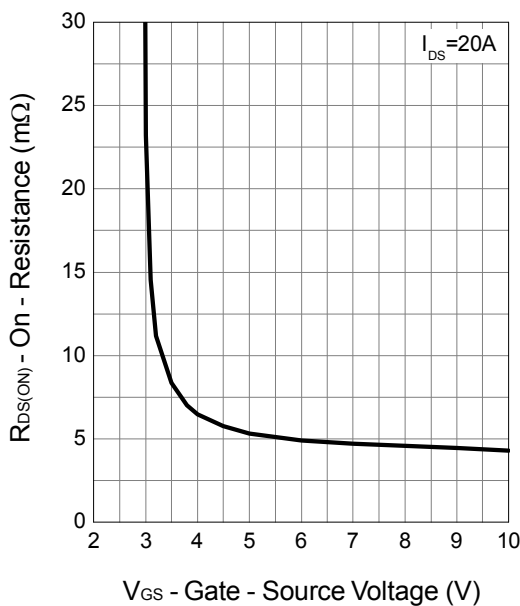
Output Characteristics



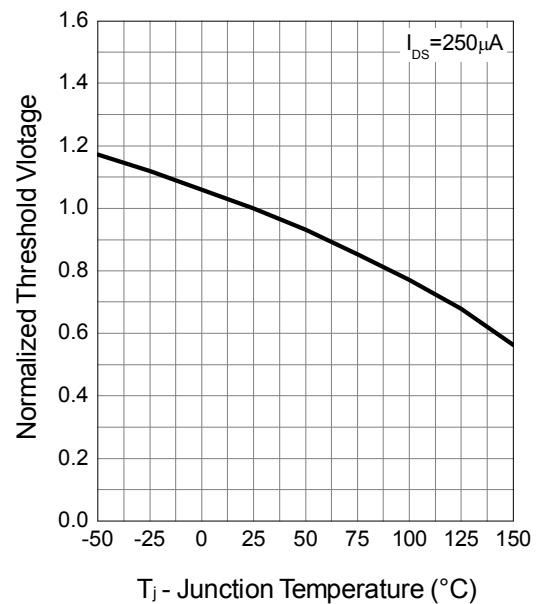
Drain-Source On Resistance



Gate-Source On Resistance

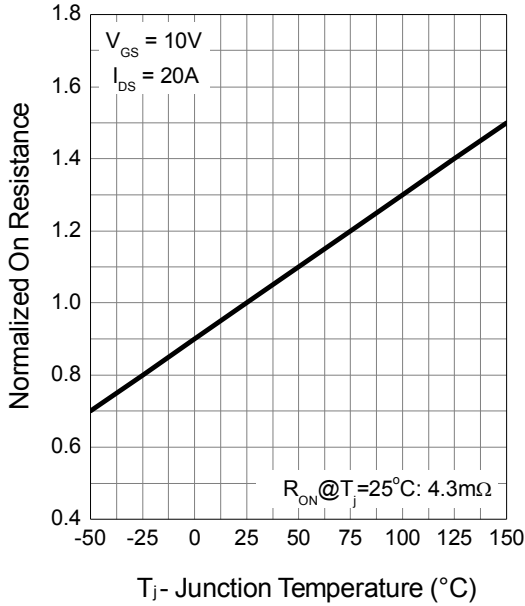


Gate Threshold Voltage

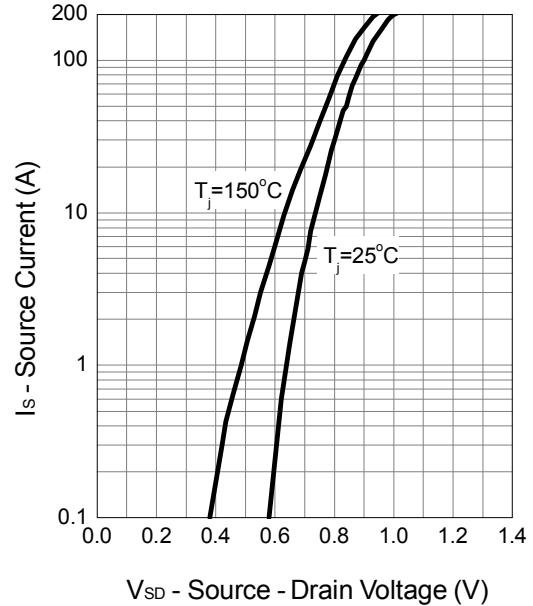


Channel 1 Typical Operating Characteristics (Cont.)

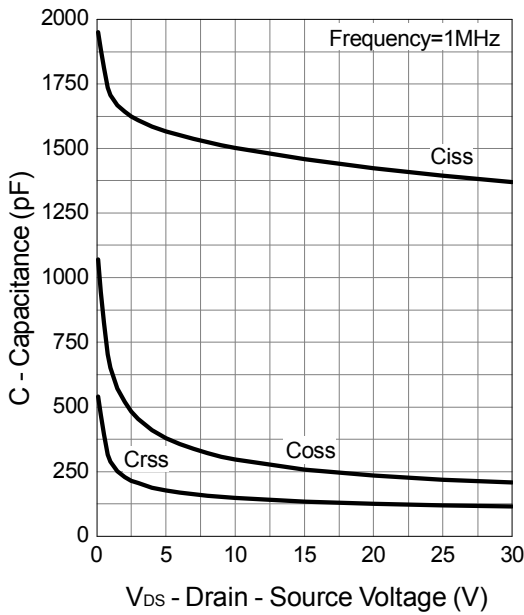
Drain-Source On Resistance



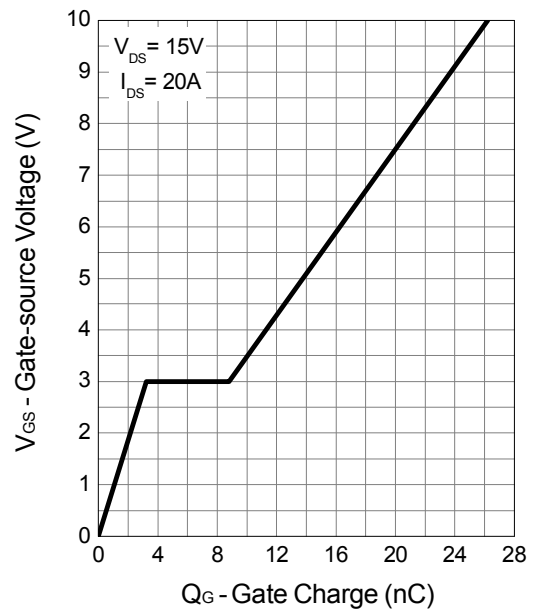
Source-Drain Diode Forward



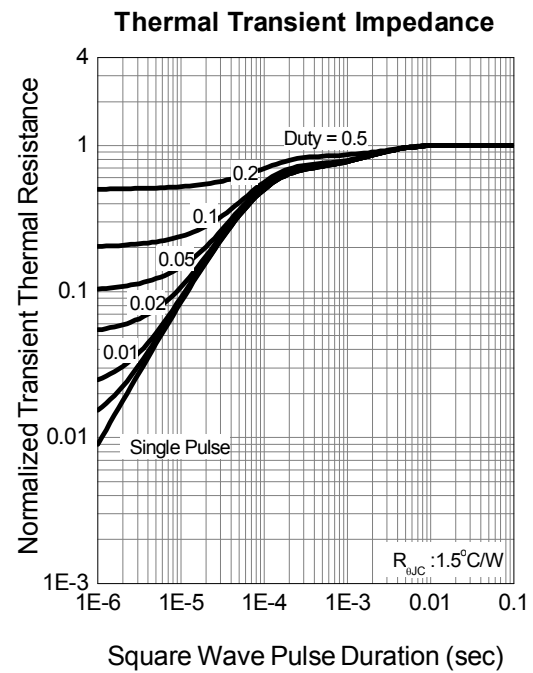
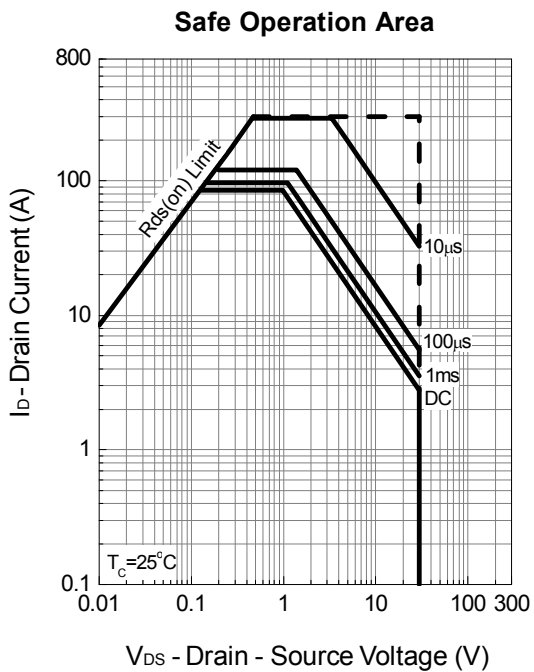
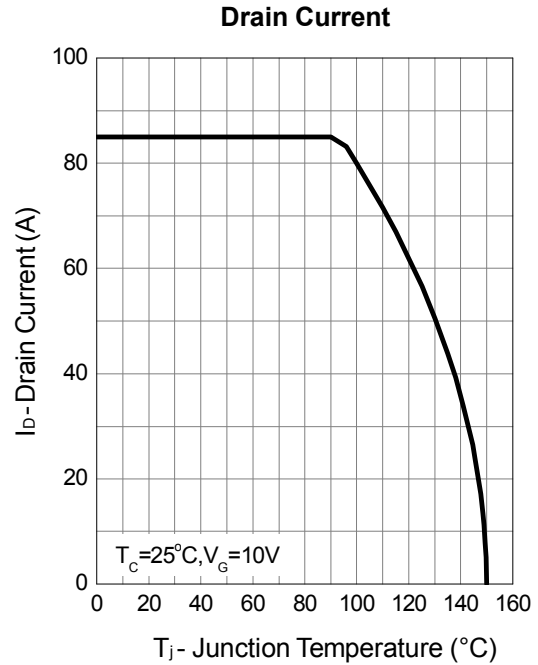
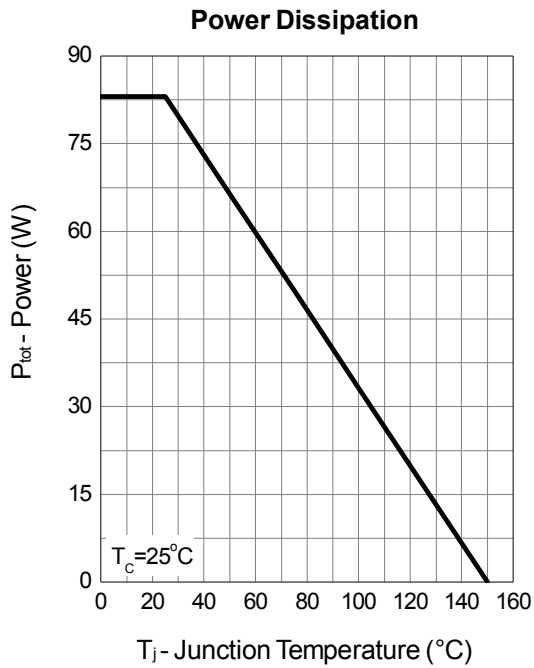
Capacitance



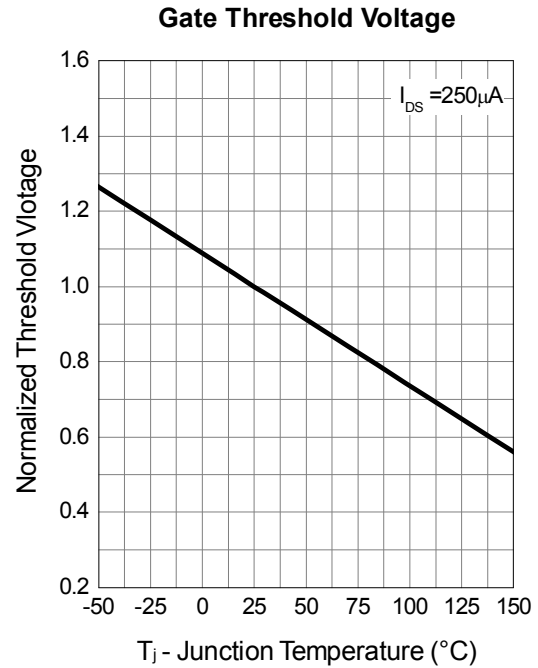
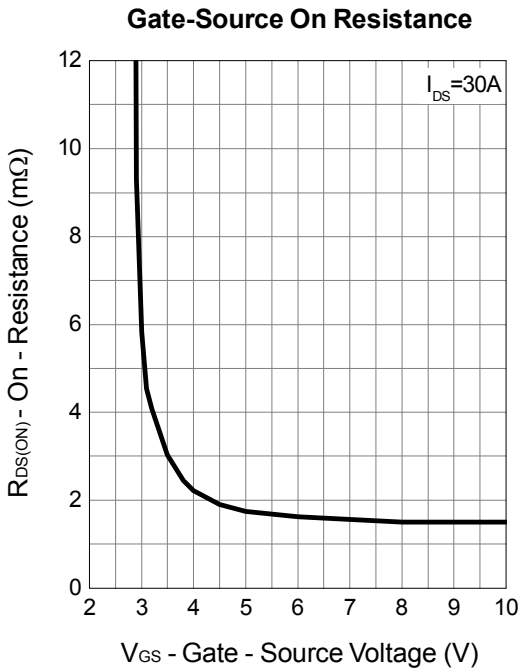
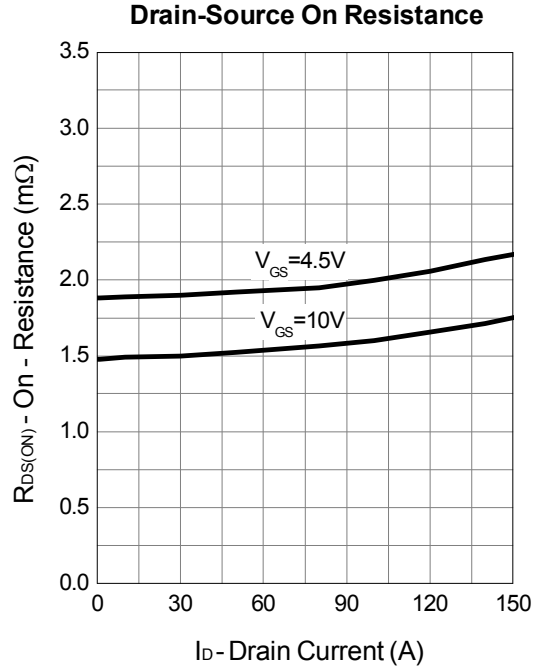
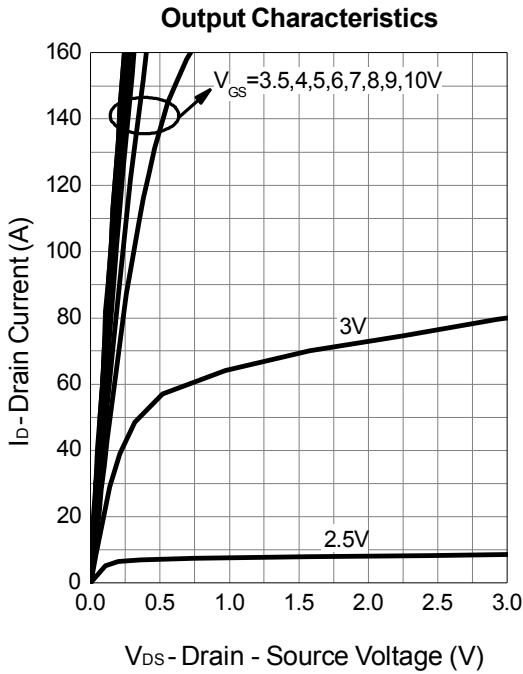
Gate Charge



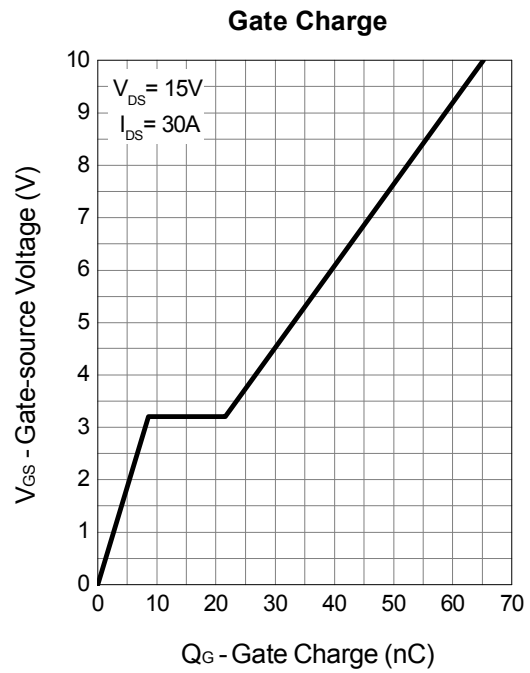
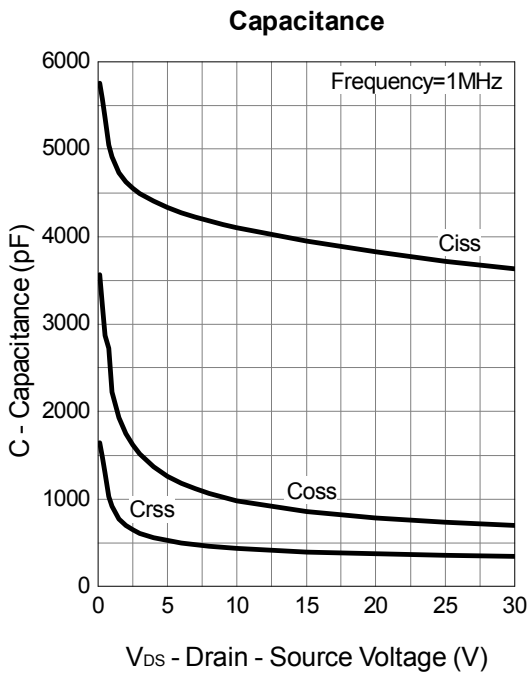
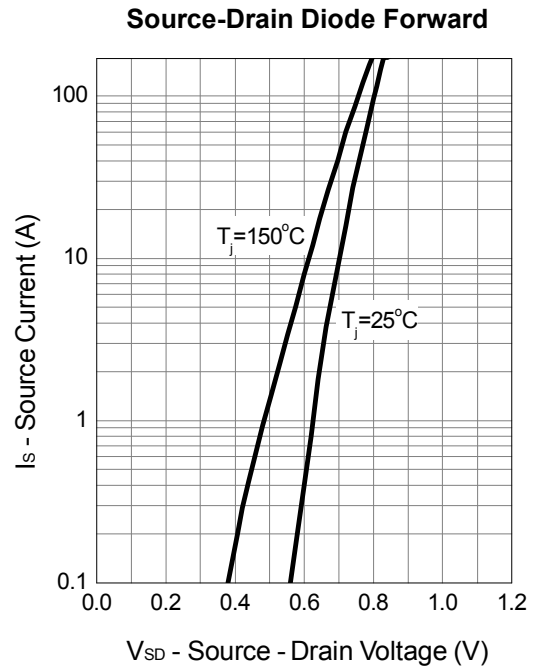
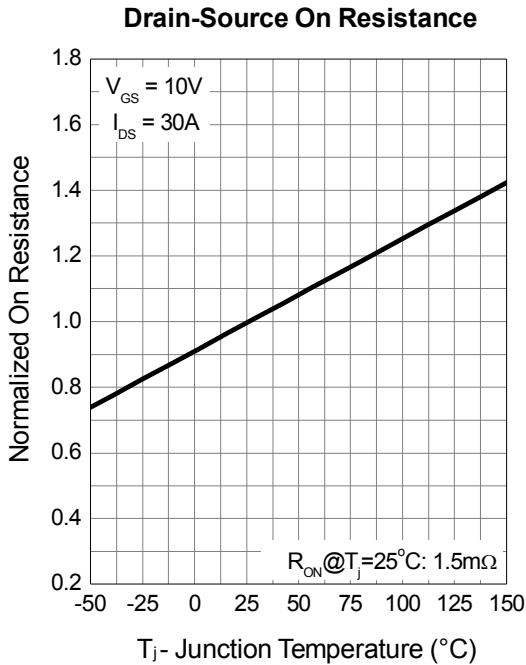
Channel 2 Typical Operating Characteristics



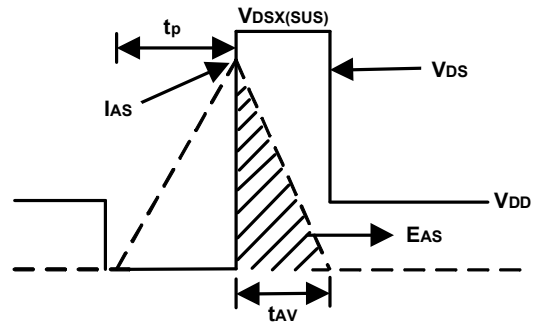
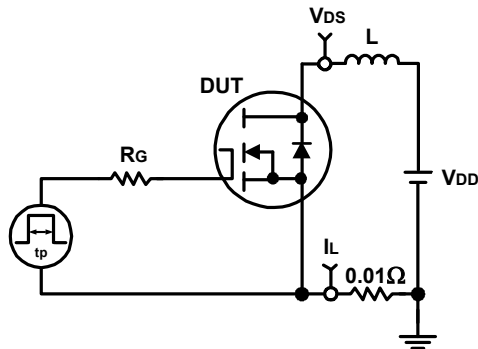
Channel 2 Typical Operating Characteristics (Cont.)



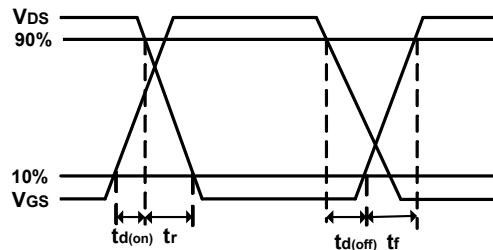
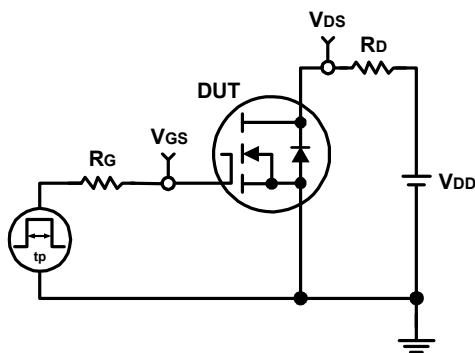
Channel 2 Typical Operating Characteristics (Cont.)



Avalanche Test Circuit and Waveforms

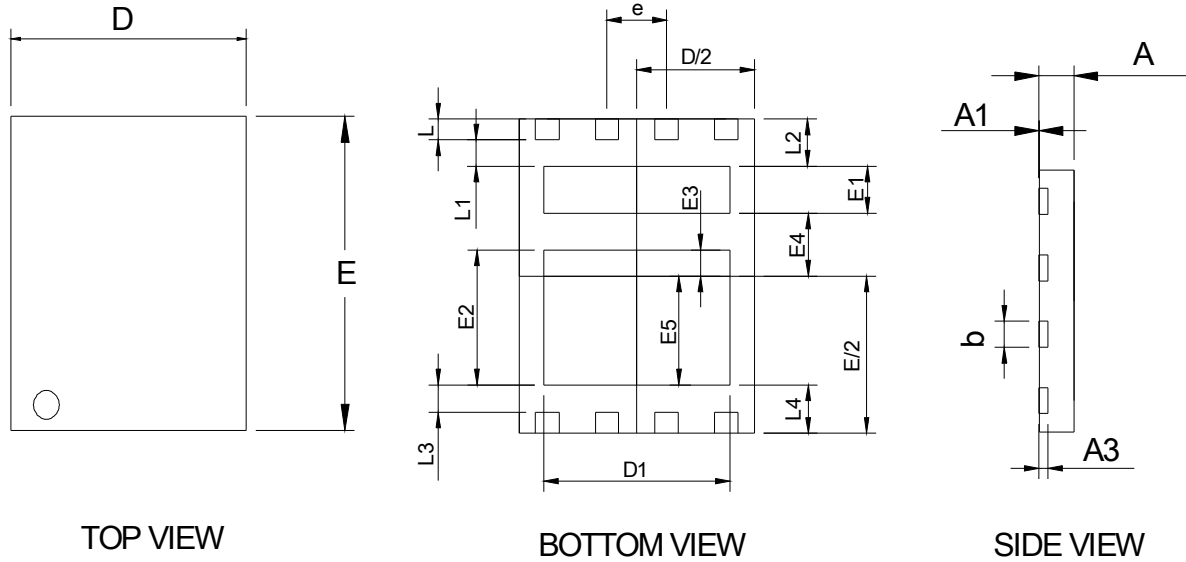


Switching Time Test Circuit and Waveforms



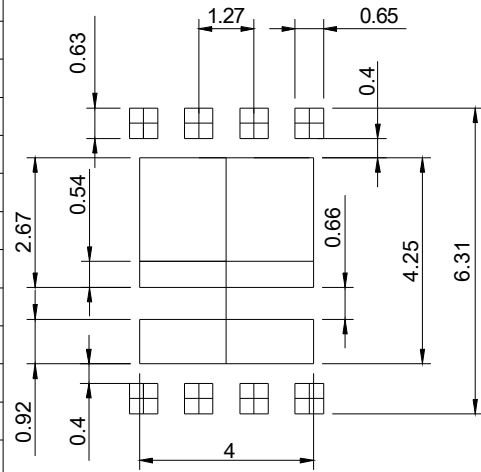
Package Information

DUAL DFN5x6-8



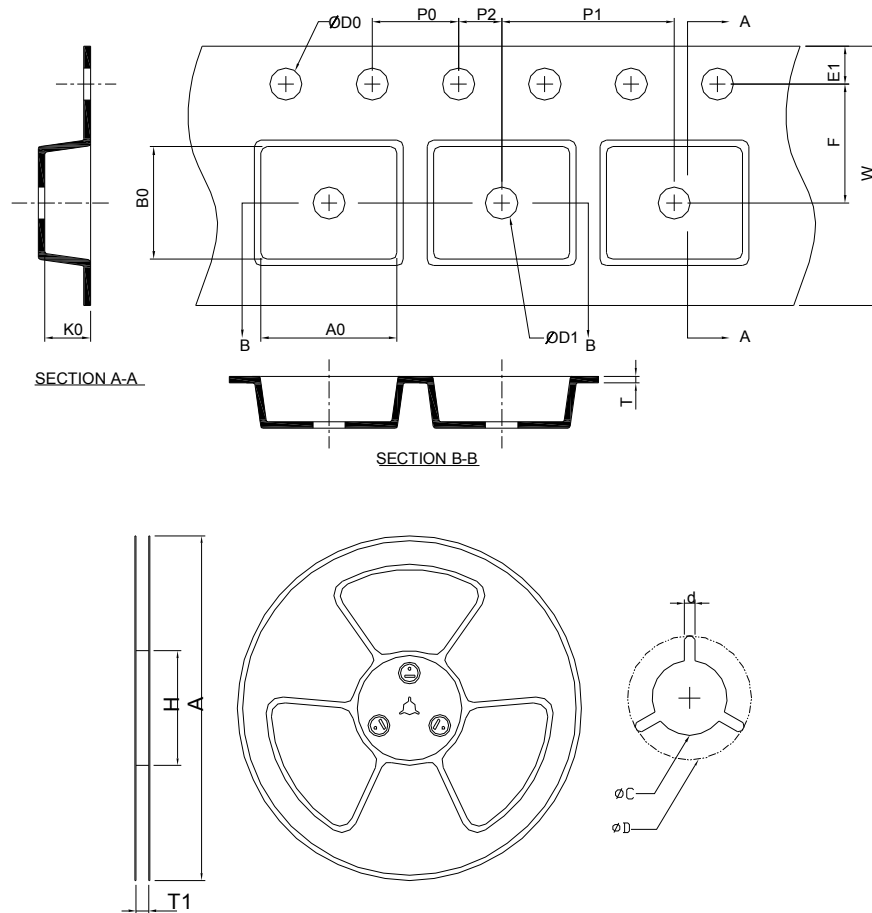
SYMBOL	DUAL DFN5x6-8			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	0.70	0.80	0.0276	0.0315
A1	0.00	0.05	0.000	0.002
A3	0.15	0.25	0.006	0.01
b	0.45	0.55	0.018	0.022
D	4.90	5.10	0.193	0.201
D1	3.80	4.05	0.078	0.088
E	5.90	6.10	0.232	0.240
E1	0.75	1.00	0.030	0.039
E2	2.53	2.63	0.100	0.104
E3	0.35	0.60	0.014	0.024
E4	1.05	1.30	0.041	0.051
E5	1.93	2.18	0.076	0.086
e	1.27 BSC		0.050 BSC	
L	0.30	0.50	0.012	0.020
L1	0.45	0.55	0.018	0.022
L2	0.85	0.95	0.033	0.037
L3	0.47	0.57	0.018	0.022
L4	0.87	0.97	0.034	0.038

RECOMMENDED LAND PATTERN



UNIT: mm

Carrier Tape & Reel Dimensions

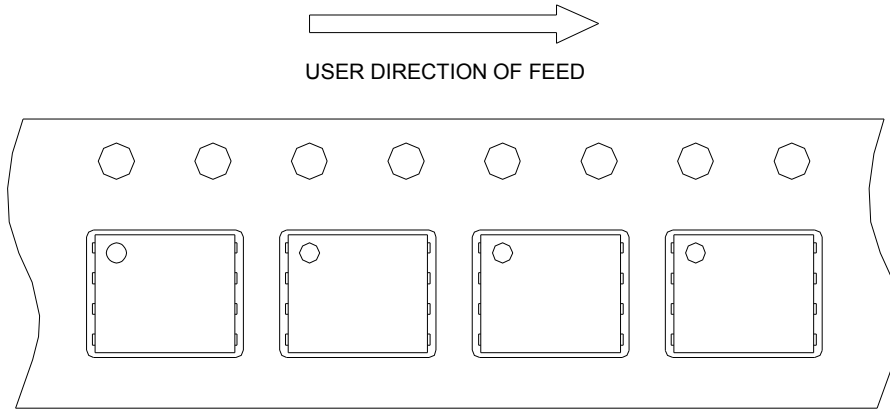


Application	A	H	T1	C	d	D	W	E1	F
DUAL DFN5x6-8	330.0±2.00	50 MIN.	12.4+2.00 -0.00	13.0+0.50 -0.20	1.5 MIN.	20.2 MIN.	12.0±0.30	1.75±0.10	5.5±0.10
	P0	P1	P2	D0	D1	T	A0	B0	K0
	4.0±0.10	8.0±0.10	2.0±0.10	1.5+0.10 -0.00	1.5 MIN.	0.3±0.05	6.5±0.10	5.3±0.10	1.4±0.10

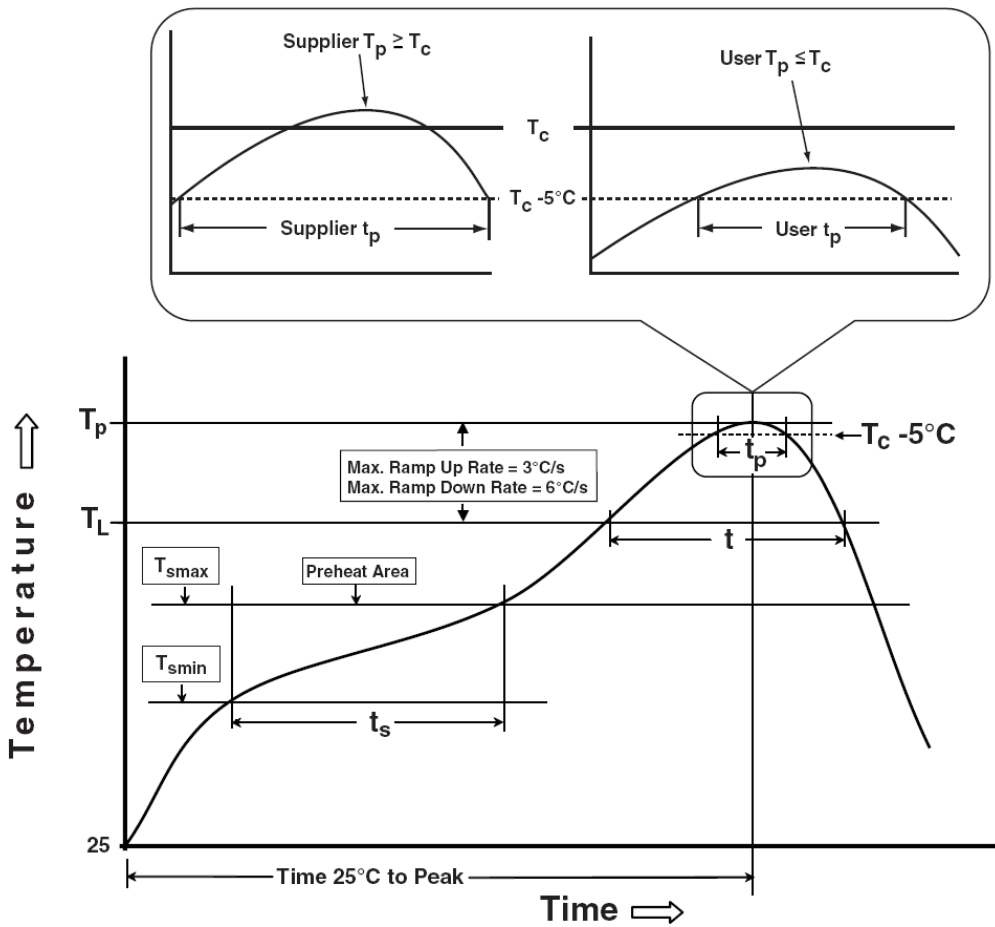
(mm)

Taping Direction Information

DUAL DFN5x6-8



Classification Profile



Classification Reflow Profiles

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T_{smin})	100 °C	150 °C
Temperature max (T_{smax})	150 °C	200 °C
Time (T_{smin} to T_{smax}) (t_s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T_{smax} to T_p)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L)	183 °C	217 °C
Time at liquidous (t_L)	60-150 seconds	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 (T_c)

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 (T_c)

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 @ T_{jmax}
HTGB	JESD-22, A108	1000 Hrs, 100% of VGS max @ T_{jmax}
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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