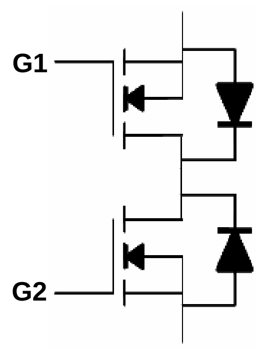
GWS6967

Dual N-Channel MOSFET



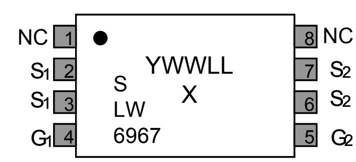
General Description

- Advanced **Lateral Power™** technology
- Specially designed for Li-Ion battery packs and battery switch applications
- TSSOP-8 package

Features

- $r_{DS(ON)}$ = 24mΩ typical at 4.5 Volts
- $r_{DS(ON)}$ = 37mΩ typical at 2.7 Volts

TSSOP-8



Top view

YWWLLX = assembly year, week and lot number, full or partial lot

Maximum Ratings and Thermal Characteristics (T_A=25°C unless otherwise noted)

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	20	V
Gate-Source Voltage		V_{GS}	± 12	
Continuous Drain Current[1]		I_D	5	A
Pulsed Drain Current[2]		I_{DM}	30	
Maximum Power Dissipation[1]	T_A=25°C	P_D	1.5	W
	T_A=70°C		0.96	
Operating Junction and Storage Temperature Range		T_J, T_{stg}	-55 to 150	°C
Junction-to-Ambient Thermal Resistance[3]	t < 10 sec	R_{thJA}	83	°C/W
	Steady-State	R_{thJA}	120	
Junction-to-Foot (Drain) Thermal Resistance[3]		R_{thJF}	70	

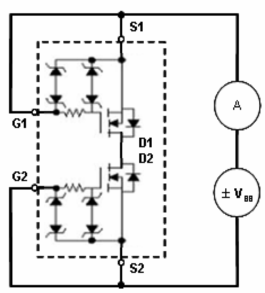
Notes: 1. Surface mounted on FR4 board. t < 10 s.
2. Pulse test; pulse width < 300 us, duty cycle <2%.
3. Surface mounted on FR4 board.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static[1]						
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 250uA	20	-	-	V
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS} = 4.5V, I_D = 2.5A	-	24	40	mΩ
		V_{GS} = 2.7V, I_D = 2.5A	-	37	45	
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS} = V_{GS}, I_D = 250uA	0.6		-	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0V, V_{DS} = 20V	-	-	1	uA
Gate Body Leakage	I_{GSS}	V_{DS} = 0V V_{GS} = ±12V	-	-	±10	uA
Forward Transconductance	gfs	V_{DS} = 10V, I_D = 2.5A	-	25	-	S
Dynamic						
Total Gate Charge	Q_g	V_{DS} = 10V, I_D = 5A, V_{GS} = 4.5V	-	7		nC
Gate-Source Charge	Q_{gs}		-	1.5	-	
Gate-Drain Charge	Q_{gd}		-	2.3	-	
Turn-On Delay Time	$t_{d(on)}$	V_{DD} = 10V, I_D = 2.5A, V_{GEN} = 4.5V, R_G = 4.7 ohms	-	7		nS
TurnOn Rise Time	t_r		-	33		
Turn-Off Delay Time	$t_{d(off)}$		-	27		
Turn-Off Fall Time	t_f		-	10		
Input Capacitance	C_{iss}	V_{DS} = 10V, V_{GS} = 0V, f = 1 MH_Z	-	450	-	
Output Capacitance	C_{oss}		-	165	-	
Reverse Transfer Capacitance	C_{rss}		-	125	-	
Source Drain Diode[1]						
Diode Forward Voltage	V_{SD}	I_S = 1.5A, V_{GS} = 0V	-	0.71	1.2	V

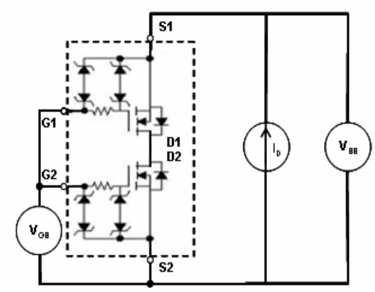
Note: 1. Pulse test; pulse width < 300 us, duty cycle <2%.

Test Circuit 1: I_{DSS}, Zero Gate Voltage Drain Current



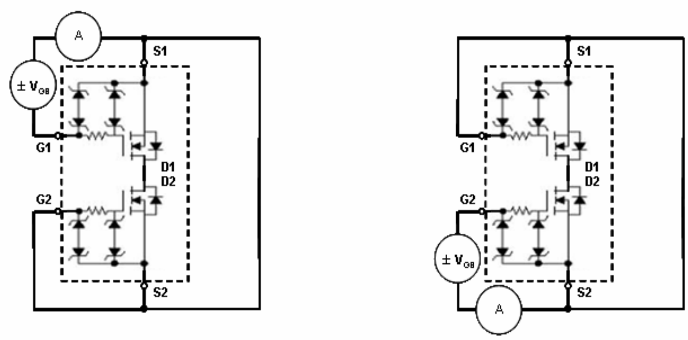
FET (1) I_{DSS}: VS2=VG2=20V, VS1=VG1=0V
FET (2) I_{DSS}: VS1=VG1=20V, VS2=VG2=0V

Test Circuit 2: $R_{DS(ON)}$, Drain-to-Source ON State Resistance



FET (1 or 2) $R_{DS(ON)}$ = $(V_{SS} / I_D) / 2$

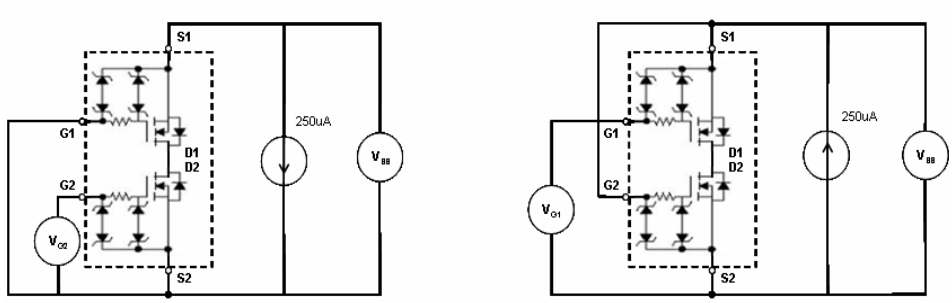
Test Circuit 3: I_{GSS}, Gate Body Leakage



FET (1) I_{GSS}: V_{GS1}= ± 12V, V_{S1}=V_{S2}=V_{G2}=0V

FET (2) I_{GSS}: V_{GS2}= ± 12V, V_{S1}=V_{S2}=V_{G1}=0V

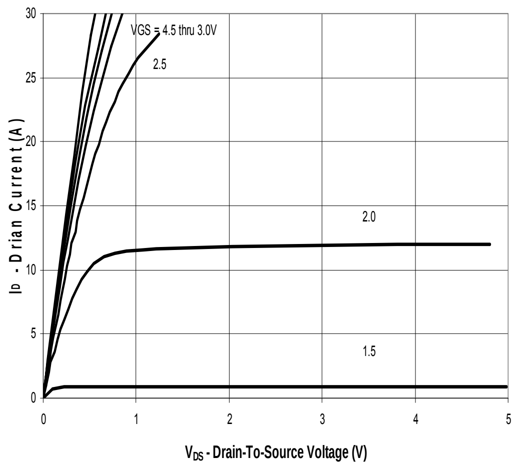
Test Circuit 4: $V_{GS(th)}$, Gate Body Leakage



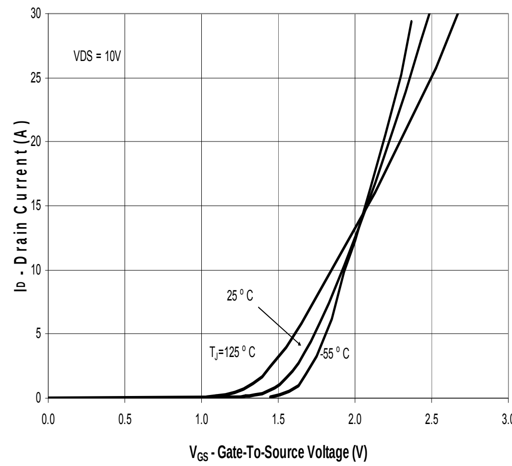
FET (1) $V_{GS(th)1}$ = Vss
Where: V_{G1}=V_{S2}, V_{S1}=0V, V_{G2}=4.5V, I_{SS}=250uA

FET (2) $V_{GS(th)2}$ = V_{SS}
Where: V_{G2}=V_{S2}, V_{S2}=0V, V_{G1}=4.5V, I_{SS}=250uA

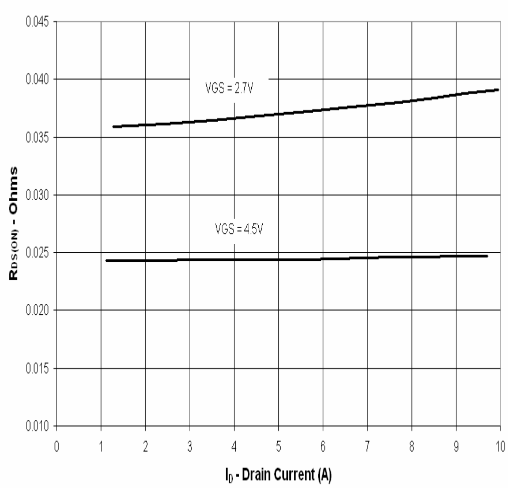
Output Characteristics



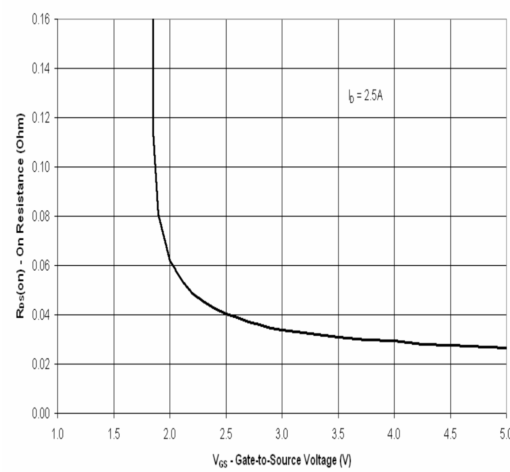
Transfer Characteristics



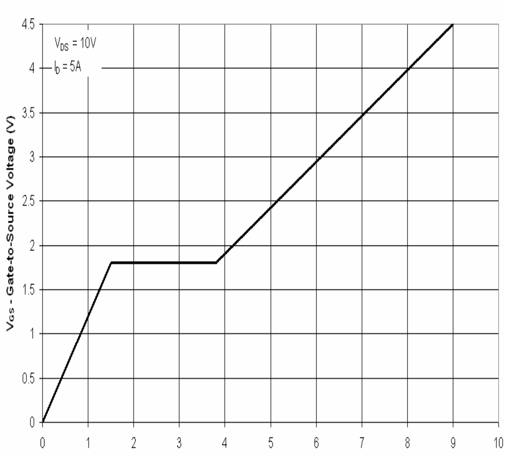
On Resistance Vs. Drain Current



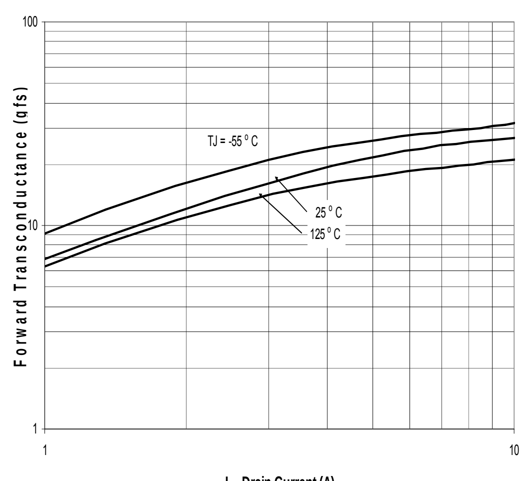
On Resistance Vs. Gate-to-Source Voltage



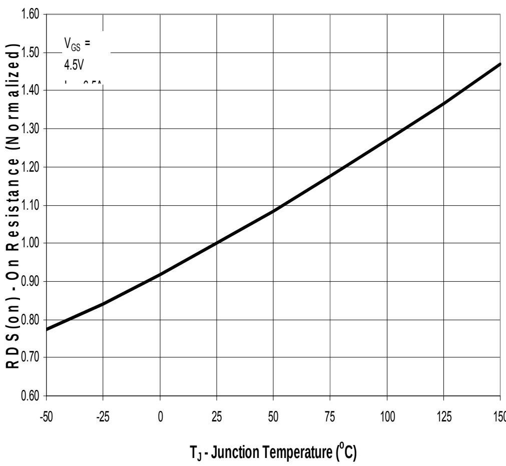
Gate Charge



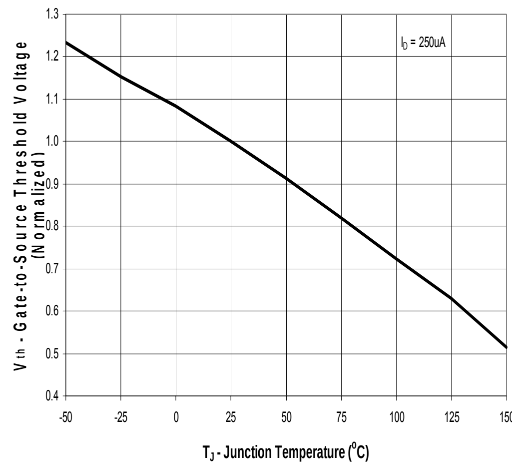
Forward Transconductance Vs. Drain Current



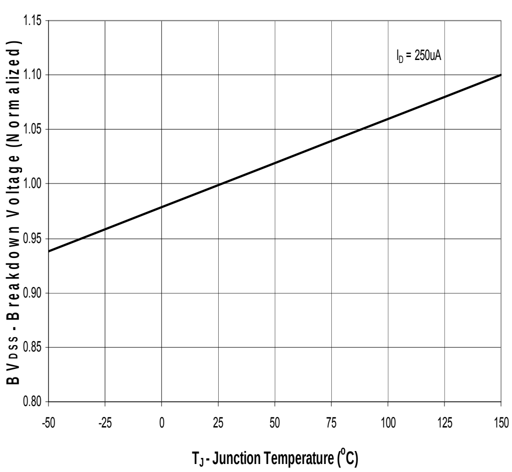
On Resistance Vs. Junction Temperature



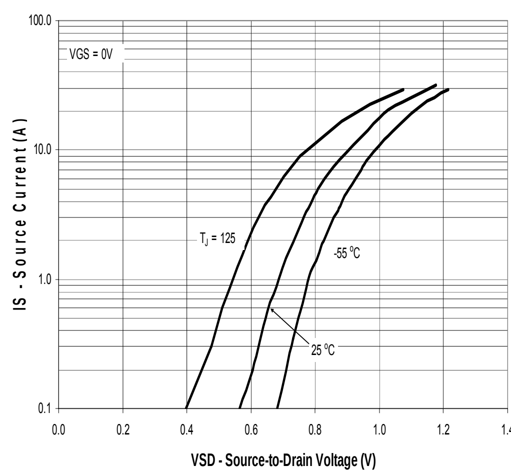
Threshold Voltage Vs. Temperature



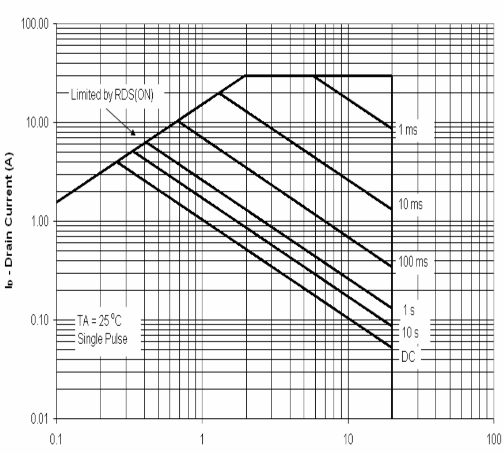
Breakdown Voltage Vs. Junction Temperature



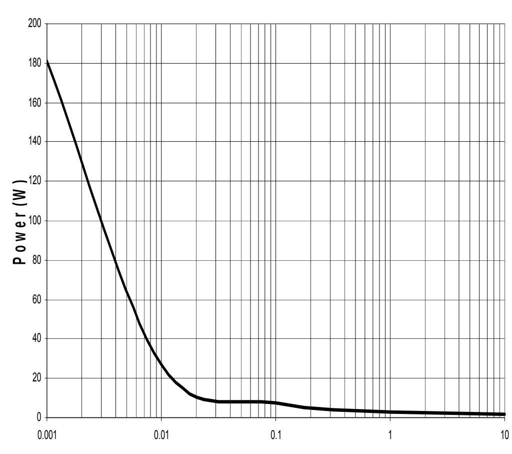
Source Drain Diode Forward Voltage

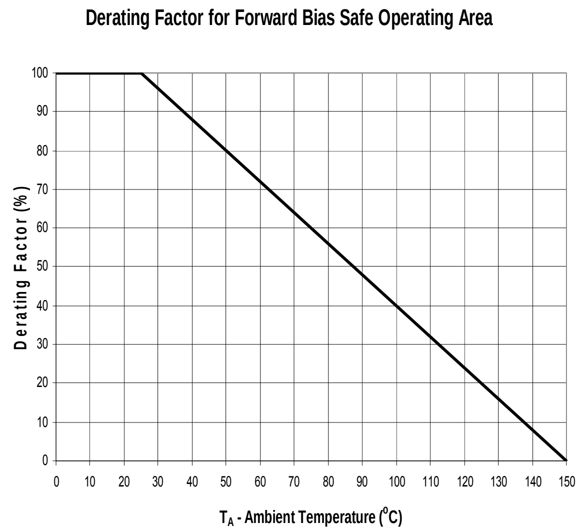


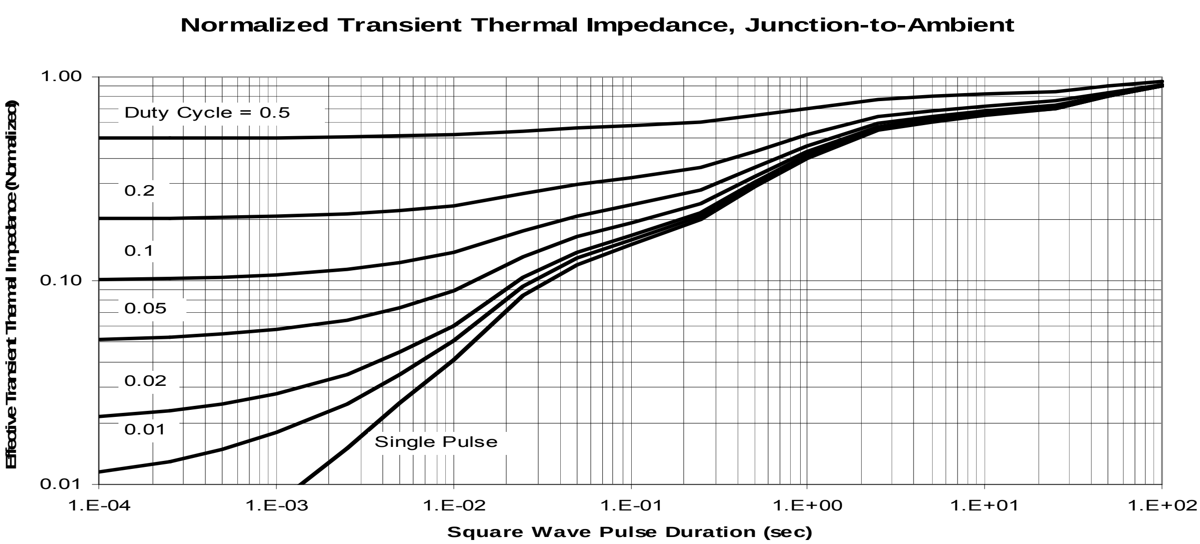
Safe Operating Area, Junction-to-Ambient

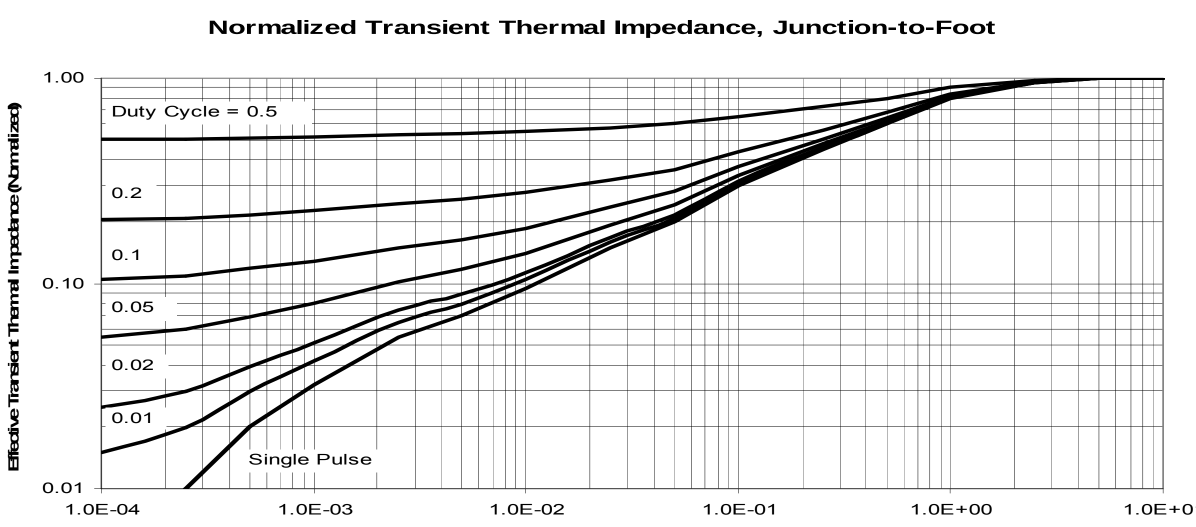


Single Pulse Power

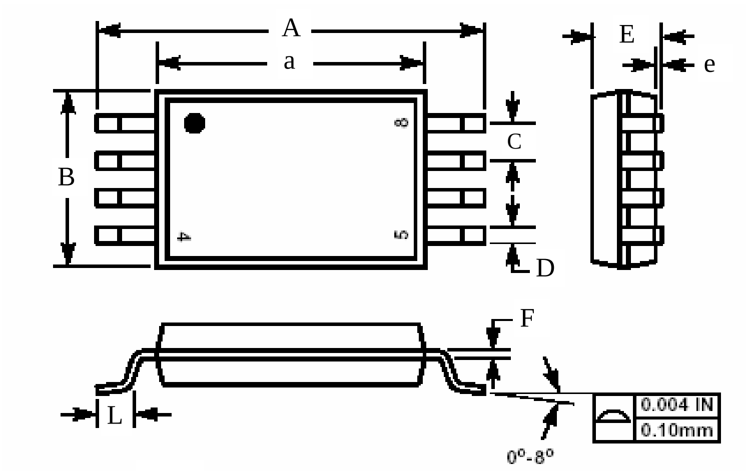



Derating Factor for Forward Bias Safe Operating Area
Derating Factor (%)
100
90
80
70
60
50
40
30
20
10
0
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
T_A - Ambient Temperature (°C)


Normalized Transient Thermal Impedance, Junction-to-Ambient
Effective Transient Thermal Impedance (Normalized)
1.00
0.10
0.01
Duty Cycle = 0.5
0.2
0.1
0.05
0.02
0.01
Single Pulse
1.E-04 1.E-03 1.E-02 1.E-01 1.E+00 1.E+01 1.E+02
Square Wave Pulse Duration (sec)

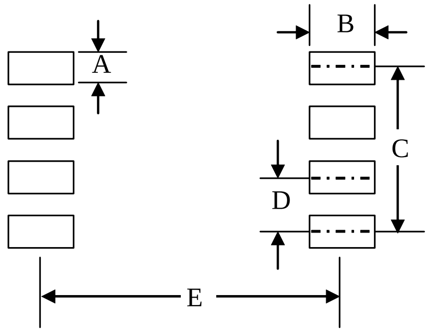

Normalized Transient Thermal Impedance, Junction-to-Foot
Effective Transient Thermal Impedance (Normalized)
1.00
0.10
0.01
Duty Cycle = 0.5
0.2
0.1
0.05
0.02
0.01
Single Pulse
1.0E-04 1.0E-03 1.0E-02 1.0E-01 1.0E+00 1.0E+01
Square Wave Pulse Duration (sec)

Package Outline



Symbol	inches		Millimeters	
	Min	Max	Min	Max
A	0.244	0.260	6.20	6.60
a	0.170	0.177	4.30	4.50
B	0.114	0.122	2.90	3.10
C	0.025BSC		0.65BSC	
D	0.010	0.012	0.25	0.30
E	0.041	0.047	1.05	1.20
e	0.002	0.006	0.05	0.15
F	0.005		0.127	
L	0.020	0.028	0.50	0.70
REF	MO-153AA			

Mounting Pad Layout



Symbol	inches		Millimeters	
	Min	Max	Min	Max
A	0.01	0.012	0.25	0.30
B	0.020	0.028	0.50	0.70
C	0.077	-	1.95	-
D	0.025	-	0.65	-
E	0.260	-	6.60	-

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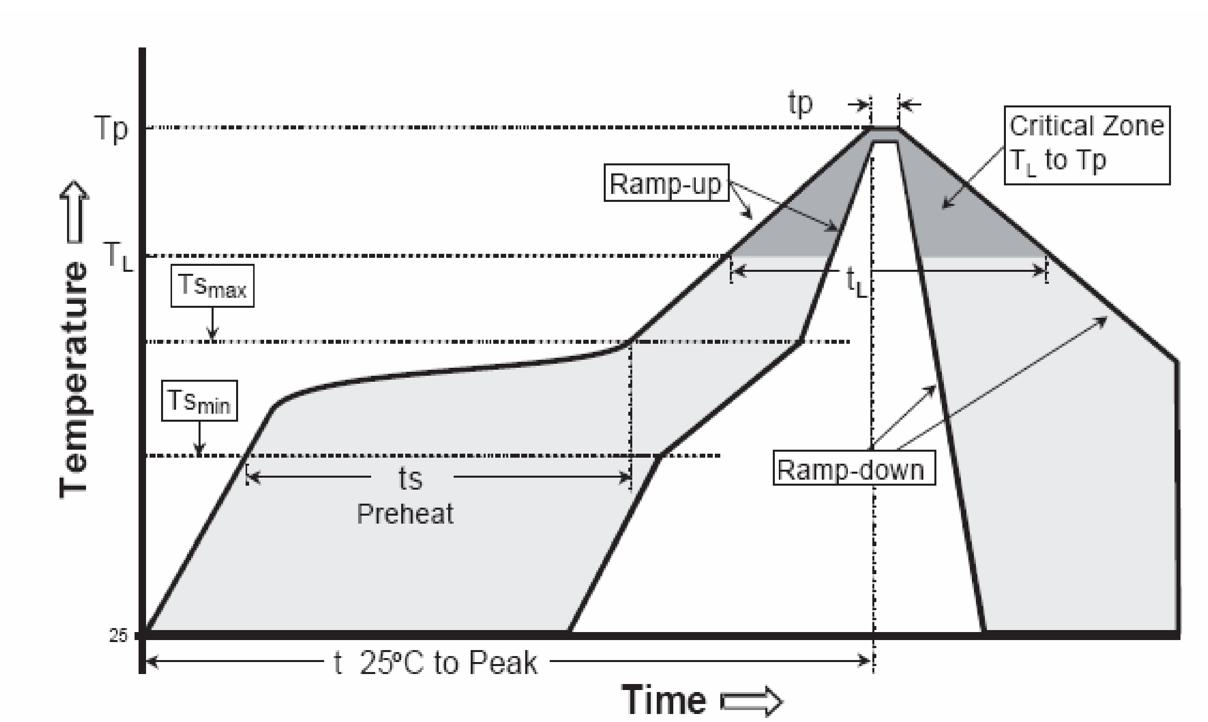
Reflow Profile Classification

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Average Ramp-Up Rate (Ts_{max} to Tp)	3 °C/second max.	3° C/second max.
Preheat – Temperature Min (Ts_{min}) – Temperature Max (Ts_{max}) – Time (ts_{min} to ts_{max})	100 °C 150 °C 60-120 seconds	150 °C 200 °C 60-180 seconds
Time maintained above: – Temperature (T_L) – Time (t_L)	183 °C 60-150 seconds	217 °C 60-150 seconds
Peak/Classification Temperature (Tp)	240°C	260°C
Time within 5 °C of actual Peak Temperature (tp)	10-30 seconds	20-40 seconds
Ramp-Down Rate	6 °C/second max.	6 °C/second max.
Time 25 °C to Peak Temperature	6 minutes max.	8 minutes max.

Note 1: All temperatures refer to topside of the package, measured on the package body surface.

2: GWS devices can be reflowed a max of 2 times when mounted using our recommended reflow conditions.

3: When repairing after solder reflow, complete with-in 10 seconds for iron temperatures of up to 260°C.



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- When the device listed in this document is intended for usage in Lithium Ion Battery charge and discharge control applications, special precautions must be employed by the customer to prevent device damage should a short circuit occur. For example, a PTC Thermistor can be used by the customer to shut off the power supply if a short-circuit occurs. If the power supply is not shut off during a short circuit, a large short circuit current will flow which may cause the device to catch fire or smoke.