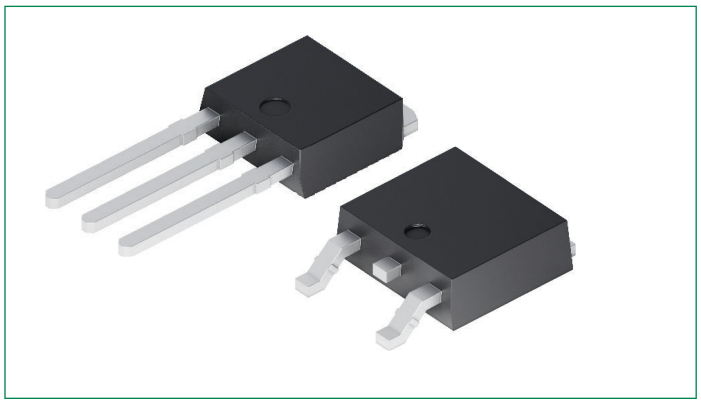
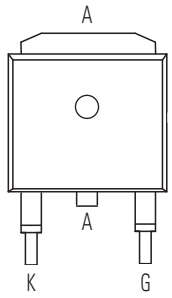
MCR12DSM & MCR12DSN

100 V–600 V Surface Mount SCRs

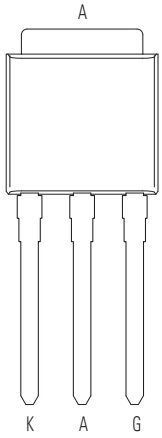


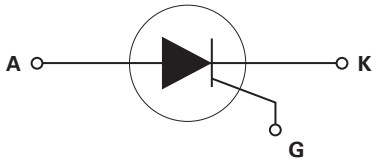
Pinout Diagram

TO-252



TO-251





K: Cathode; **A**: Anode; **G**: Gate

Description

The MCR12DSM and MCR12DSN devices are designed for high- volume, low-cost industrial and consumer applications such as motor control, process control, temperature, light and speed control, Capacitive Discharge Ignition (CDI), and small engines.

Features

- ESD Ratings: Human Body Model – 3B > 8000 V, Machine Model – C > 400 V
- UL Recognized compound meeting flammability rating V-0
- Low-level triggering and holding characteristics
- Passivated die surface for reliability and uniformity
- Small size

Product Summary

Characteristic	Value	Unit
$I_{T(RMS)}$	12	A
V_{DRM}/V_{RRM}	600 or 800	V
I_{GT}	200 or 300	mA

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Maximum Ratings (T_{vj} = 25 °C, unless otherwise specified)

Symbol	Characteristics	Conditions		Value	Units
V_{DRM}/V_{RRM}	Repetitive Peak Off-state Voltage[1]	T_{vj} = – 40 to +110 °C, Sine Wave, 50 to 60 Hz, R_{GK} = 1 k Ω	MCR12DSM	600	V
			MCR12DSN	800	
$I_{T(RMS)}$	On-state RMS Current	180° Conduction Angles; T_C = 75 °C		12	A
$I_{T(AV)}$	Average On-state Current	180° Conduction Angles; T_C = 75 °C		7.6	A
I_{TSM}	Non-repetitive Surge Peak On-state Current	½ cycle, sine wave, 60 Hz, T_{vj} = 110 °C		100	A
I^2t	I^2t Value for Fusing	t_p = 8.3 ms		41	A^2s
P_{GM}	Forward Peak Gate Power	P_W ≤ 1 µs, T_C = 75 °C		5	A
$P_{G(AV)}$	Average Gate Power Dissipation	t_p = 8.3 ms, T_C = 75 °C		0.5	W
I_{GM}	Peak Gate Current	P_W ≤ 1 µs, T_C = 75 °C		2	A
T_{stg}	Storage Temperature Range	–		–40 to 150	°C
T_{vj}	Virtual Junction Temperature Range	–		–40 to 110	°C

Note 1: V_{DRM} and V_{RRM} for all types can be applied on a continuous basis. Ratings apply for zero or negative gate voltage; however, positive gate voltage shall not be applied concurrent with negative potential on the anode. Blocking voltages shall not be tested with a constant current source such that the voltage ratings of the component are exceeded.

Electrical Characteristics – OFF (T_{vj} = 25 °C, unless otherwise specified)

Symbol	Characteristics	Conditions		Min.	Typ.	Max.	Units
I_{DRM}/I_{RRM}	Peak Repetitive Forward or Reverse Blocking Current[2]	V_{AK} = Rated V_{DRM} or V_{RRM}, R_{GK} = 1.0 k Ω	T_{vj} = 25 °C	–	–	10	µA
			T_{vj} = 110 °C	–	–	500	

Note 2: Ratings apply for negative gate voltage or R_{GK} = 1.0 kΩ Devices shall not have a positive gate voltage concurrently with a negative voltage on the anode. Component should not be tested with a constant current source for forward and reverse blocking capability such that the voltage applied exceeds the rated blocking voltage.

Electrical Characteristics – ON (T_{vj} = 25 °C, unless otherwise specified)

Symbol	Characteristics	Conditions		Min.	Typ.	Max.	Units
V_{GRM}	Peak Reverse Gate Blocking Voltage	I_{GR} = 10 µA		10	12.5	18	V
I_{GRM}	Peak Reverse Gate Blocking Current	V_{GR} = 10 V		–	–	1.2	µA
V_{TM}	Peak Forward On–State Voltage[3]	I_{TM} = 20 A		–	1.3	1.9	V
I_{GT}	Gate Trigger Voltage[4]	V_{AK}= 12 V_{dc}; R_L = 100 Ω, T_C =110 °C	T_{vj} = 25 °C	5	12	200	µA
			T_{vj} = –40 °C	–	–	300	
V_{GT}	Gate Trigger Voltage (continuous dc)[4]	V_{AK} = 12 V; R_L = 100 Ω)	T_{vj} = 25 °C	0.45	0.65	1	V
			T_{vj} = –40 °C	–	–	1.5	
			T_{vj} = 110 °C	0.2	–	–	
I_H	Holding Current	V_D = 12 V, Initiating Current = 200 mA, R_{GK} = 1 kΩ)	T_{vj} = 25 °C	0.5	1	6	mA
			T_{vj} = –40 °C	–	–	10	
I_L	Latching Current	V_D = 12 V, I_G = 2.0 mA, R_{GK} = 1 kΩ	T_{vj} = 25 °C	0.5	1	6	mA
			T_{vj} = –40 °C	–	–	10	
t_{gt}	Turn-on Time (Source Voltage = 12 V, R_S = 6.0 KΩ, I_T = 16 A(pk), R_{GK} = 1.0 KΩ)	V_D = Rated V_{DRM}, Rise Time = 20 ns, Pulse Width = 10 µs		–	2	5	µs

Note 3: Pulse Test: Pulse Width ≤ 2.0 msec, Duty Cycle ≤ 2%.
Note 4: R_{GK} current not included in measurement

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Thermal Characteristics

Symbol	Characteristics	Value	Units
$R_{th(j-c)}$	Thermal Resistance, Junction to Case	2.2	K/W
$R_{th(j-a)}$	Thermal Resistance, Junction to Ambient	88	
$R_{th(j-a)}$	Thermal Resistance, Junction to Ambient[5]	80	
T_L	Maximum Lead Temperature for Soldering Purposes[6]	260	°C

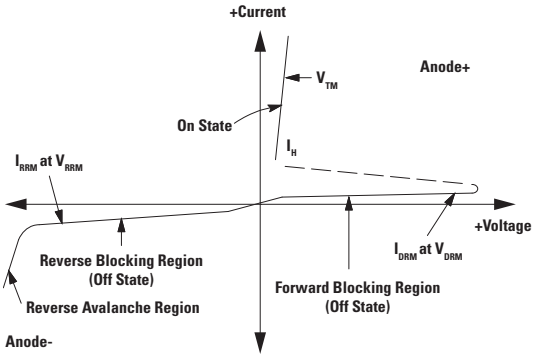
Note 5: These ratings are applicable when surface mounted on the minimum pad sizes recommended.
Note 6: 1/8" from case for 10 seconds

Dynamic Characteristics

Symbol	Characteristics	Conditions	Value			Units
			Min.	Typ.	Max.	
dv/dt	Critical Rate of Rise of Off–State Voltage	V_D = 0.67 x Rated V_{DRM}, Exponential Waveform, 100 ohm, T_{vj} = 110 °C	37	45	–	V/µs
di/dt	Critical Rate of Rise of On–State Current	I_{PK} = 50 A, P_W = 40 sec, diG/dt = 1 A/sec, I_{GT} = 10 mA	–	50	100	A/µs

Voltage Current Characteristics of SCR

Symbol	Characteristics
V_{DRM}	Peak Repetitive Forward Off State Voltage
I_{DRM}	Peak Forward Blocking Current
V_{RRM}	Peak Repetitive Reverse Off State Voltage
I_{RRM}	Peak Reverse Blocking Current
V_{TM}	Maximum On-state Voltage
I_H	Holding Current



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Characteristic Curves

Fig. 1. Average Current Derating

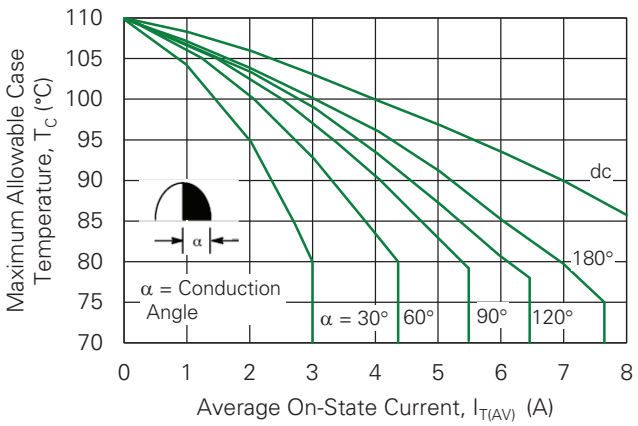

Fig. 2. On-state Power Dissipation

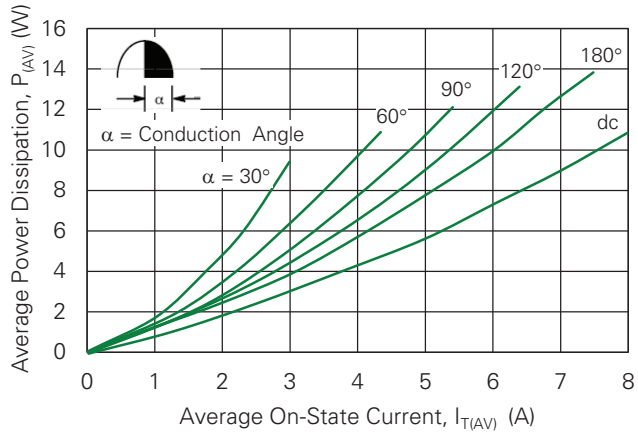

Fig. 3. Typical On-state Current vs. On-state Voltage

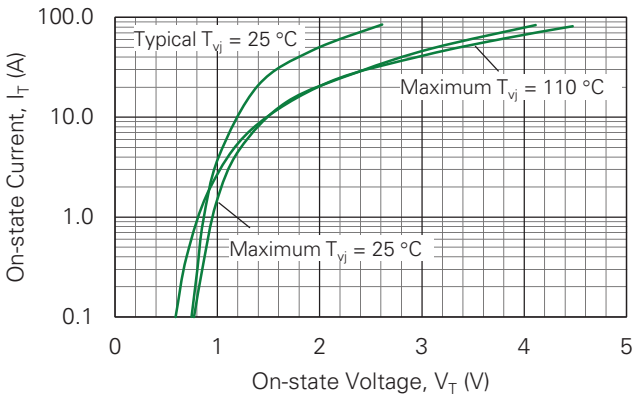

Fig. 4. Transient Thermal Response

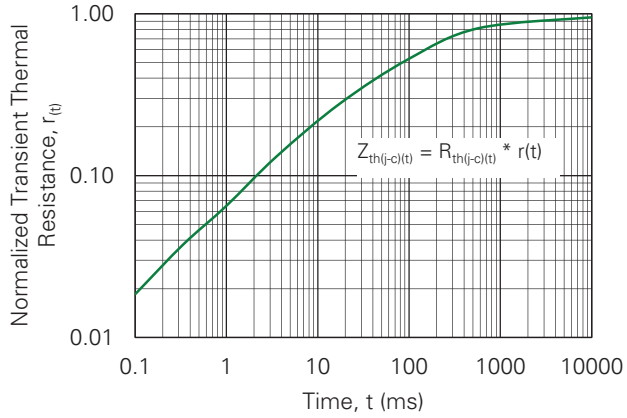

Fig. 5. Typical Gate Trigger Current vs. Junction Temperature

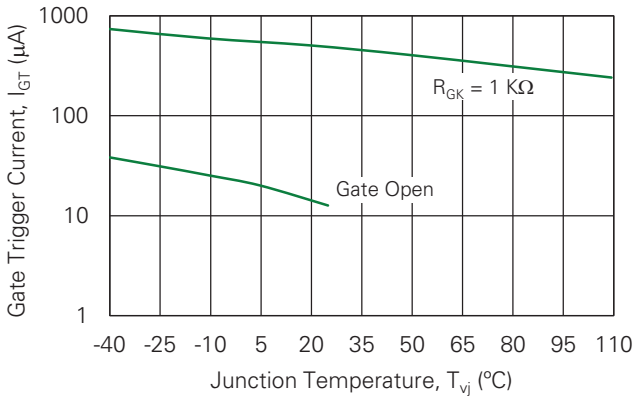

Fig. 6. Typical Gate Trigger Voltage vs. Junction Temperature

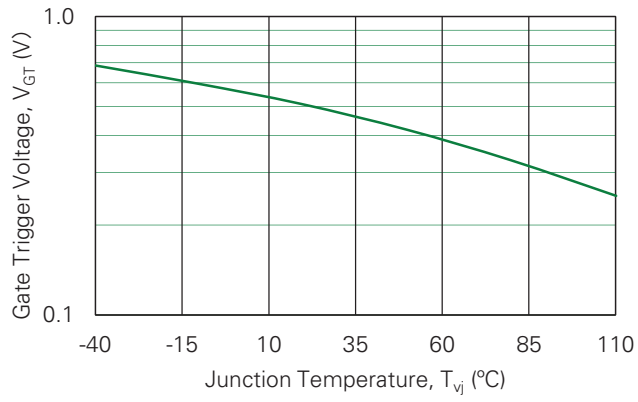

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Fig. 7. Typical Holding Current vs. Junction Temperature

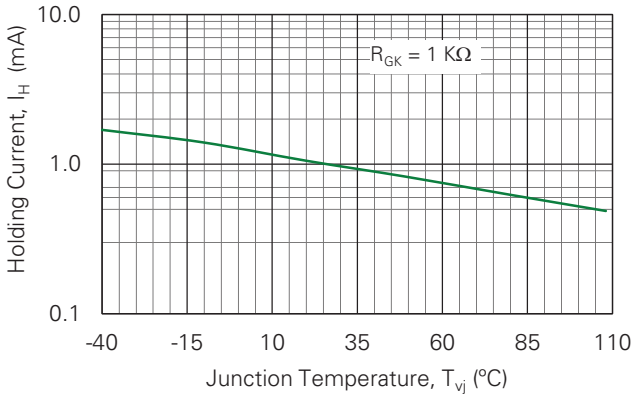


Fig. 8. Typical Latching Current vs. Junction Temperature

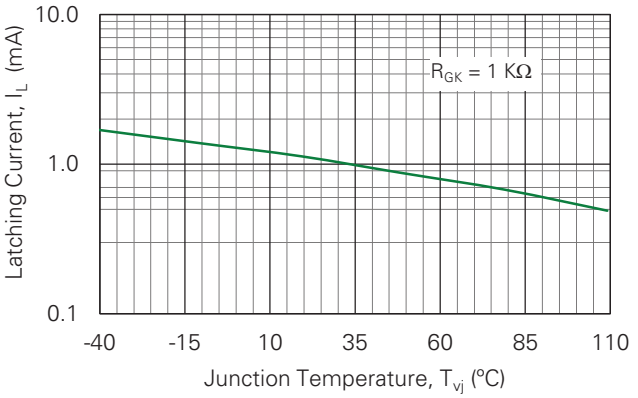


Fig. 9. Holding Current vs. Gate-Cathode Resistance

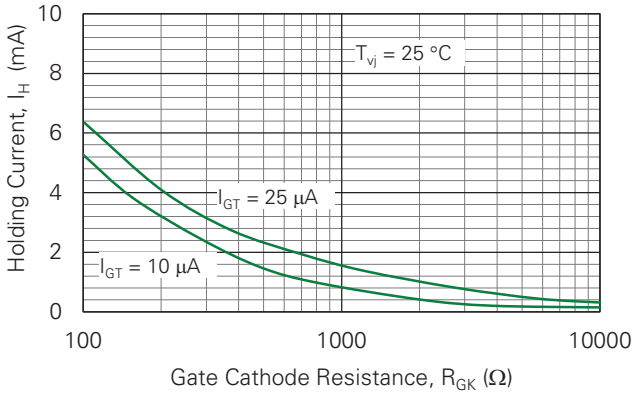


Fig. 10. Exponential Static dv/dt vs. Gate-Cathode Resistance and Junction Temperature

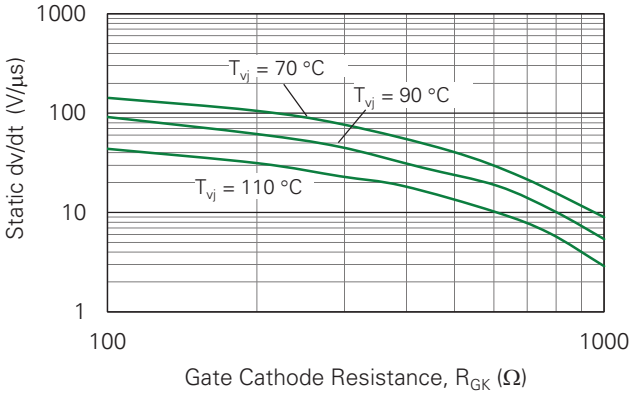


Fig. 11. Typical Gate Trigger Current vs. Junction Temperature

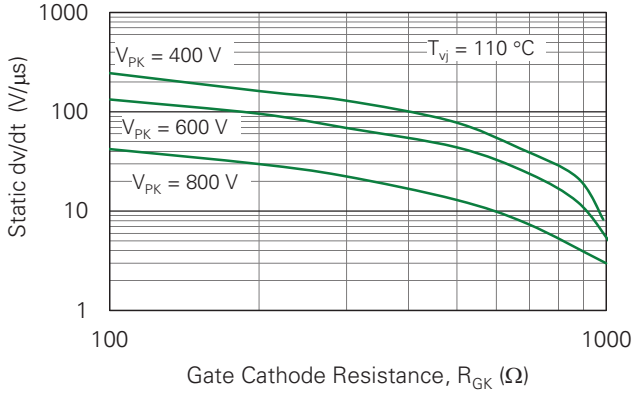
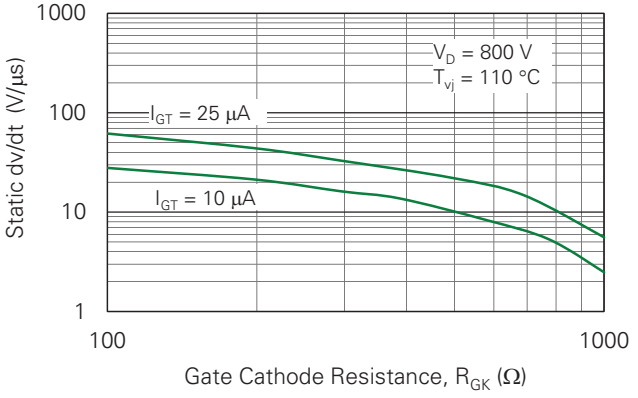


Fig. 12. Typical Gate Trigger Voltage vs. Junction Temperature



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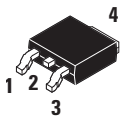
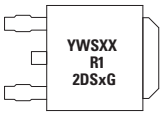
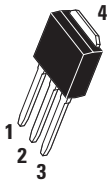
Part Marking

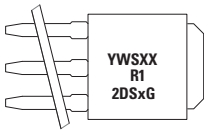


DPAK-3
Case 369C
Style 4





IPAK-3
Case 369D
Style 4

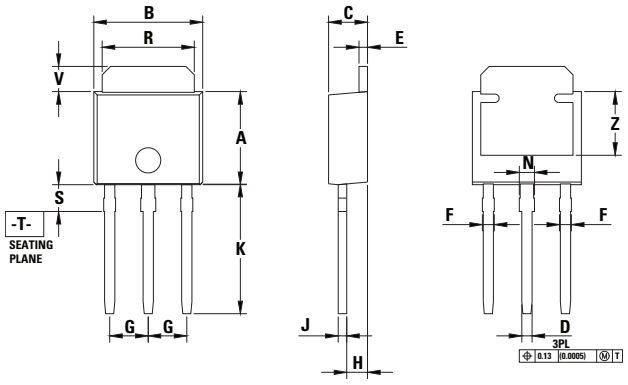


Packing Options

Part Number	Package Type	Packing Mode	Base Quantity
MCR12DSMT4G	DPAK	Tape and Reel	2500
MCR12DSN-1G	IPAK	Box	4000
MCR12DSNT4G	DPAK	Tape and Reel	2500

Package Dimensions TO-251 (IPAK-3)

TO251-3L POD



Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max
A	5.40	5.70	0.213	0.224
B	6.40	6.60	0.252	0.260
C	2.20	2.40	0.087	0.094
D	0.60	0.75	0.024	0.030
E	0.55	0.65	0.022	0.026
F	0.58	0.78	0.022	0.030
G	2.30		0.091	
H	1.18	1.28	0.046	0.050
J	0.49	0.59	0.019	0.023
K	7.40	8.00	0.291	0.315
N	0.78	0.98	0.031	0.038
R	5.30	5.50	0.209	0.217
S	1.60		0.063	
V	1.35	1.65	0.053	0.065
Z	3.80		0.150	

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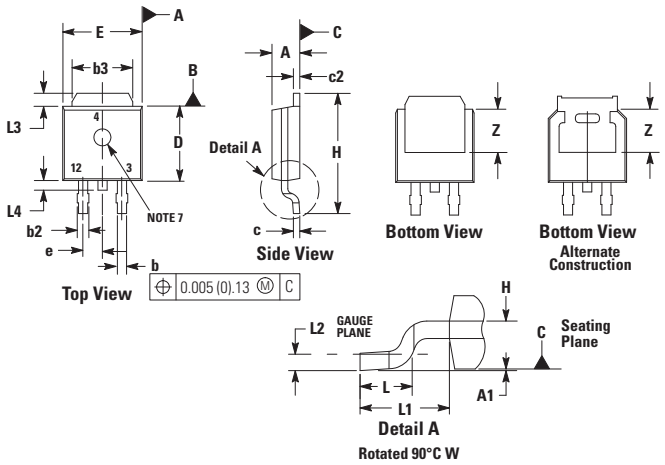
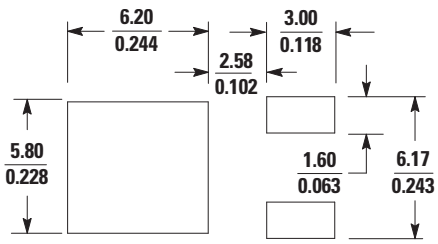
Package Dimensions TO-252 (DPAK-3)



Soldering Footprint



SCALE 3:1 $\left(\frac{mm}{inches}\right)$

Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max
A	2.20	2.40	0.087	0.094
A1	0.00	0.12	0.000	0.005
b	0.55	0.75	0.022	0.030
b2	0.65	0.85	0.026	0.033
b3	5.30	5.50	0.209	0.217
C	0.49	0.59	0.019	0.023
c2	0.49	0.59	0.019	0.023
D	5.40	5.70	0.213	0.224
E	6.40	6.60	0.252	0.260
e	2.30		0.091	
H	9.50	10.30	0.374	0.406
L	1.47	1.78	0.058	0.070
L1	2.90		0.114	
L2	0.49	0.59	0.019	0.023
L3	1.35	1.65	0.053	0.065
L4	0.70	1.00	0.028	0.039
Z	3.90	–	0.154	–

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