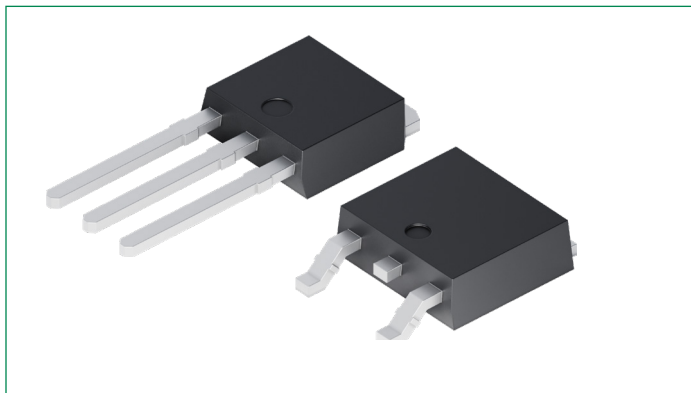


MCR12DSM & MCR12DSN

100 V–600 V Surface Mount SCRs



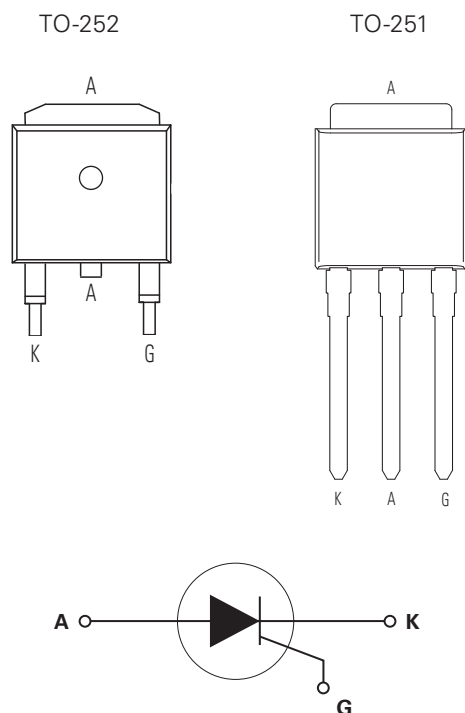
Description

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
- Low-level triggering and holding characteristics
- UL Recognized compound meeting flammability rating V-0
- Passivated die surface for reliability and uniformity
- Small size

Pinout Diagram



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

Product Summary

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

Maximum Ratings ($T_{vj} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)

Symbol	Characteristics	Conditions		Value	Units
$V_{\text{DRM}}/V_{\text{RRM}}$	Repetitive Peak Off-state Voltage ¹	$T_{\text{vj}} = -40$ to $+110$ °C, Sine Wave, 50 to 60 Hz, $R_{\text{GK}} = 1$ k Ω	MCR12DSM	600	V
			MCR12DSN	800	
$I_{\text{T(RMS)}}$	On-state RMS Current	180° Conduction Angles; $T_{\text{C}} = 75$ °C		12	A
$I_{\text{T(AV)}}$	Average On-state Current	180° Conduction Angles; $T_{\text{C}} = 75$ °C		7.6	A
I_{TSM}	Non-repetitive Surge Peak On-state Current	$\frac{1}{2}$ cycle, sine wave, 60 Hz, $T_{\text{vj}} = 110$ °C		100	A
I^2t	I^2t Value for Fusing	$t_{\text{p}} = 8.3$ ms		41	A ² s
P_{GM}	Forward Peak Gate Power	$P_{\text{W}} \leq 1$ μ s, $T_{\text{C}} = 75$ °C		5	A
$P_{\text{G(AV)}}$	Average Gate Power Dissipation	$t_{\text{p}} = 8.3$ ms, $T_{\text{C}} = 75$ °C		0.5	W
I_{GM}	Peak Gate Current	$P_{\text{W}} \leq 1$ μ s, $T_{\text{C}} = 75$ °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 ($T_{vj} = 25\text{ }^{\circ}\text{C}$, 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	μ A
			T_{vj} = 110 °C	–	–	500	

Note 2: Ratings apply for negative gate voltage or $R_{GK} = 1.0\text{ k}\Omega$. 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 ($T_{vj} = 25\text{ }^{\circ}\text{C}$, 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 $\leq 2.0\text{ msec}$, Duty Cycle $\leq 2\%$.

Note 4: R_{GK} current not included in measurement

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

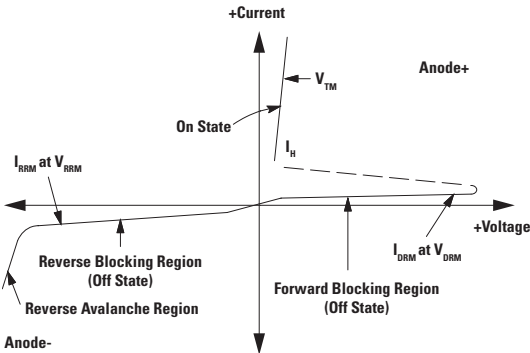
Note 5: These ratings are applicable when surface mounted on the minimum pad sizes recommended.
Note 6: 1/8" from case for 10 seconds

Dynamic Characteristics

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

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



Characteristic Curves

Fig. 1. Average Current Derating

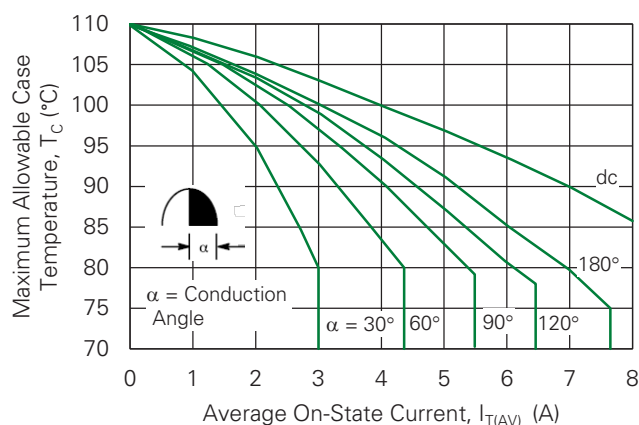


Fig. 2. On-state Power Dissipation

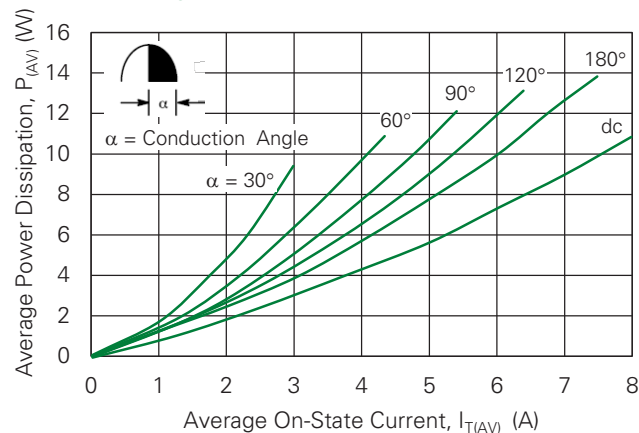


Fig. 3. Typical On-state Current vs. On-state Voltage

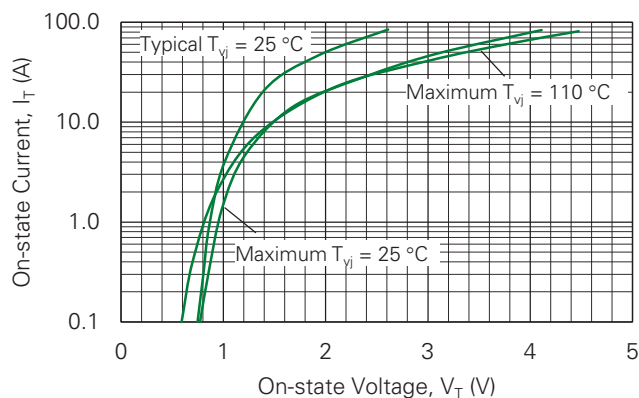


Fig. 4. Transient Thermal Response

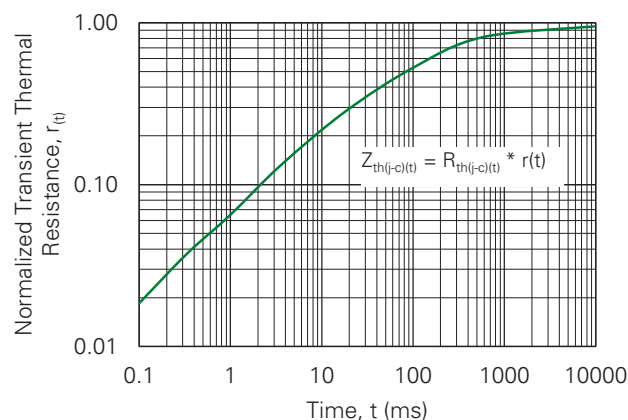


Fig. 5. Typical Gate Trigger Current vs. Junction Temperature

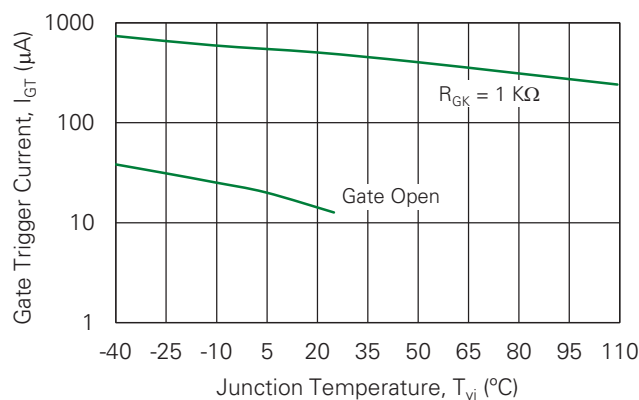


Fig. 6. Typical Gate Trigger Voltage vs. Junction Temperature

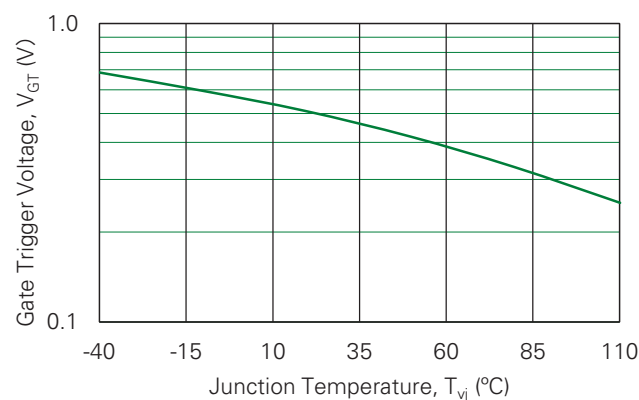
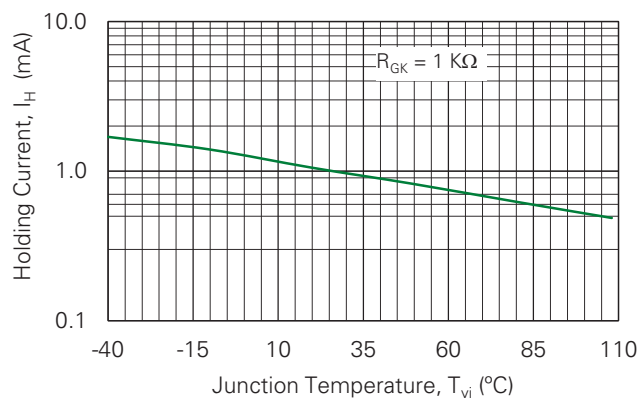
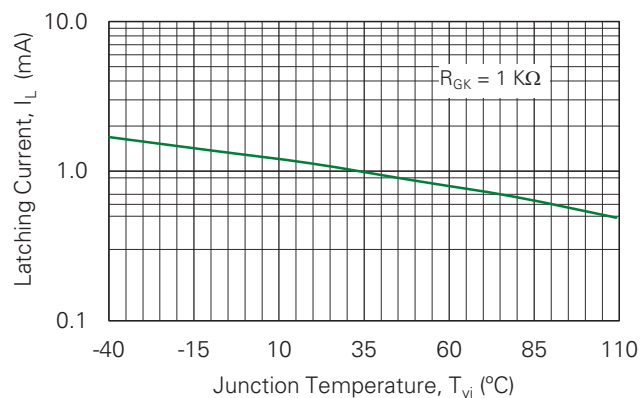
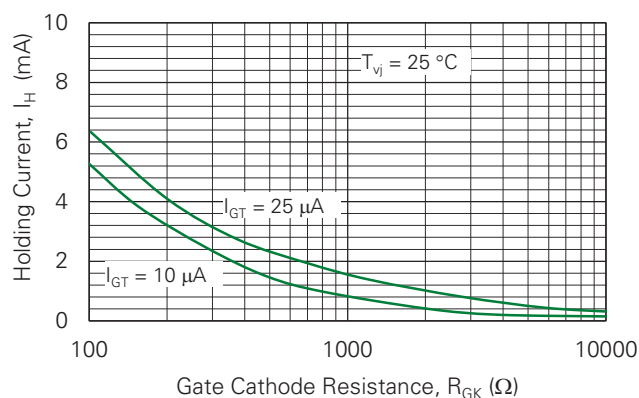
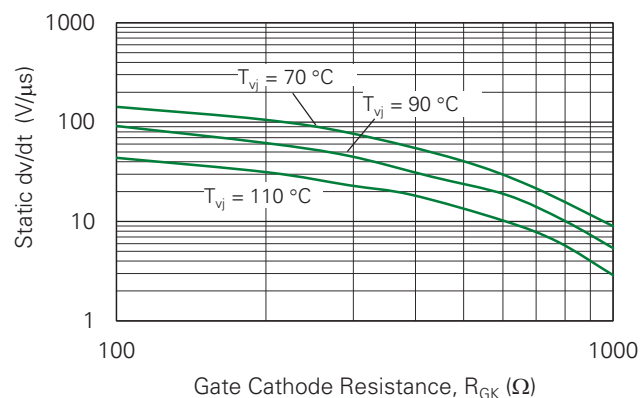
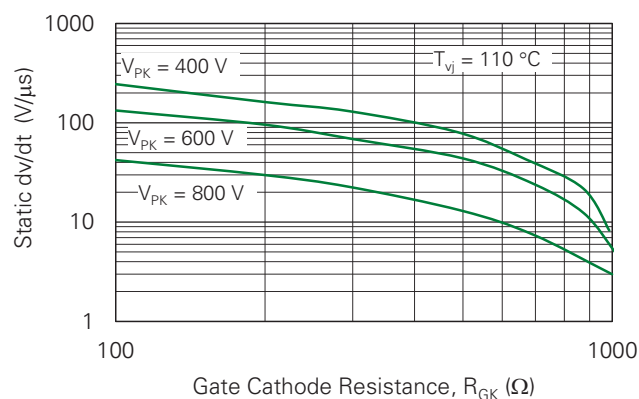
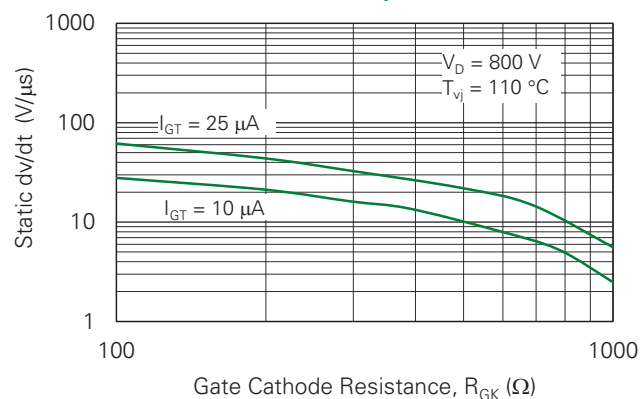
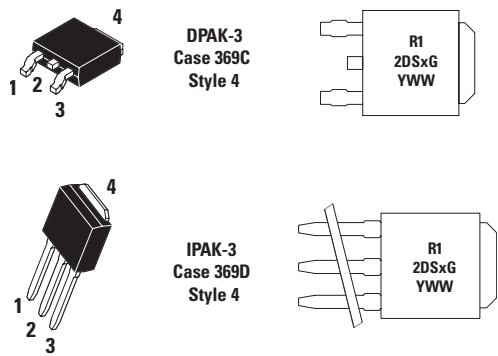


Fig. 7. Typical Holding Current vs. Junction Temperature**Fig. 8. Typical Latching Current vs. Junction Temperature****Fig. 9. Holding Current vs. Gate-Cathode Resistance****Fig. 10. Exponential Static dv/dt vs. Gate-Cathode Resistance and Junction Temperature****Fig. 11. Typical Gate Trigger Current vs. Junction Temperature****Fig. 12. Typical Gate Trigger Voltage vs. Junction Temperature**

Part Marking

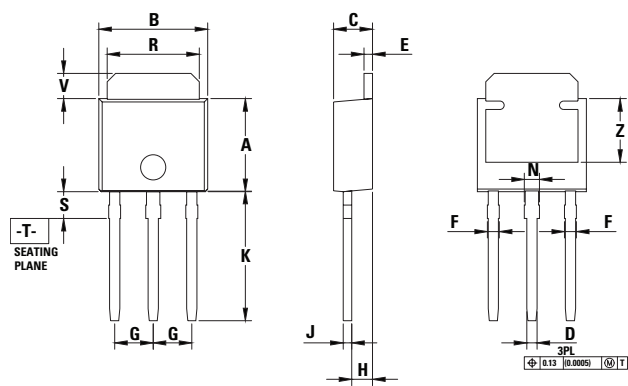


Packing Options

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

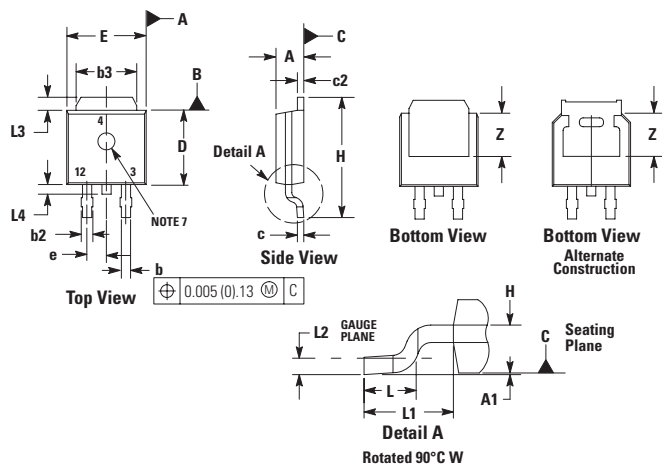
Package Dimensions TO-251 (IPAK-3)

T0251-3L P0D

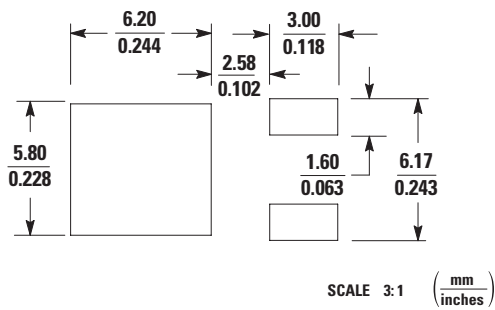


Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max
A	5.40	5.70	0.213	0.224
B	6.40	6.60	0.252	0.260
C	2.20	2.40	0.087	0.094
D	0.60	0.75	0.024	0.030
E	0.55	0.65	0.022	0.026
F	0.58	0.78	0.022	0.030
G	2.30		0.091	
H	1.18	1.28	0.046	0.050
J	0.49	0.59	0.019	0.023
K	7.40	8.00	0.291	0.315
N	0.78	0.98	0.031	0.038
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	

Package Dimensions TO-252 (DPAK-3)



Soldering Footprint



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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