

Description

GT58N12 use advanced technology to provide low $R_{DS(on)}$, low gate charge, fast switching and excellent avalanche characteristics. This device is specially designed to get better ruggedness and suitable to use in motor control applications.

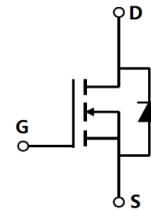
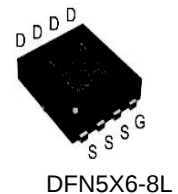
General Features

- Low $R_{DS(on)}$ & FOM
- Extremely low switching loss
- Excellent stability and uniformity
- Fast switching and soft recovery
- RoHS Compliant

Application

- Consumer electronic power supply
- Motor control
- Synchronous-rectification
- Isolated DC/DC convertor
- Invertors

VDSS	$R_{DS(on)}$ @4.5V (typ)	$R_{DS(on)}$ @10V (typ)	ID
120V	13 m Ω	10 m Ω	50A

**Schematic diagram****Ordering Information**

Part Number	Marking	Case	Packaging
GT58N12K	GT58N12	TO-252	2500pcs/Reel
GT58N12D5	GT58N12	DFN5X6-8L	2500pcs/Reel

■ **Absolute Maximum Ratings** at $T_j=25^{\circ}\text{C}$ unless otherwise noted

Parameter	Symbol	Value	Unit
Drain source voltage	V_{DS}	120	V
Gate source voltage	V_{GS}	± 20	V
Continuous drain current ¹⁾ , $T_C=25^{\circ}\text{C}$	I_D	50	A
Pulsed drain current ²⁾ , $T_C=25^{\circ}\text{C}$	$I_{D, pulse}$	150	A
Power dissipation ³⁾ , $T_C=25^{\circ}\text{C}$	P_D	140	W
Single pulsed avalanche energy ⁴⁾	E_{AS}	53.8	mJ
Operation and storage temperature	T_{stg}, T_j	-55 to 150	$^{\circ}\text{C}$

■ Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal resistance, junction-case	$R_{\theta JC}$	0.89	$^{\circ}\text{C}/\text{W}$
Thermal resistance, junction-ambient ⁵⁾	$R_{\theta JA}$	62	$^{\circ}\text{C}/\text{W}$

■ Electrical Characteristics at $T_j=25^{\circ}\text{C}$ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Drain-source breakdown voltage	BV_{DSS}	120		200	V	$V_{GS}=0\text{ V}$, $I_D=250\text{ }\mu\text{A}$
Gate threshold voltage	$V_{GS(th)}$	1.5		2.5	V	$V_{DS}=V_{GS}$, $I_D=250\text{ }\mu\text{A}$
Drain-source on-state resistance	$R_{DS(ON)}$		10.0	12.0	$\text{m}\Omega$	$V_{GS}=10\text{ V}$, $I_D=30\text{ A}$
Drain-source on-state resistance	$R_{DS(ON)}$		13.0	15.0	$\text{m}\Omega$	$V_{GS}=4.5\text{ V}$, $I_D=20\text{ A}$
Gate-source leakage current	I_{GSS}			100	nA	$V_{GS}=20\text{ V}$
				-100		$V_{GS}=-20\text{ V}$
Drain-source leakage current	I_{DSS}			1	μA	$V_{DS}=120\text{ V}$, $V_{GS}=0\text{ V}$

■ Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Input capacitance	C_{iss}		2640.1		pF	$V_{GS}=0\text{ V}$, $V_{DS}=50\text{ V}$, $f=100\text{ kHz}$
Output capacitance	C_{oss}		330.1		pF	
Reverse transfer capacitance	C_{rss}		11.2		pF	
Turn-on delay time	$t_{d(on)}$		22.3		ns	$V_{GS}=10\text{ V}$, $V_{DS}=50\text{ V}$, $R_G=2\text{ }\Omega$, $I_D=25\text{ A}$
Rise time	t_r		9.7		ns	
Turn-off delay time	$t_{d(off)}$		85		ns	
Fall time	t_f		112.3		ns	

■ Gate Charge Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Total gate charge	Q_g		33.1		nC	$I_D=25\text{ A}$, $V_{DS}=50\text{ V}$, $V_{GS}=10\text{ V}$
Gate-source charge	Q_{gs}		5.6		nC	
Gate-drain charge	Q_{gd}		7.2		nC	
Gate plateau voltage	V_{plateau}		3.1		V	

■ Body Diode Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test condition
Diode forward current	I_S			50	A	$V_{GS}<V_{th}$
Pulsed source current	I_{SP}			150		
Diode forward voltage	V_{SD}			1.3	V	$I_S=12\text{ A}$, $V_{GS}=0\text{ V}$
Reverse recovery time	t_{rr}		62.3		ns	$I_S=25\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$
Reverse recovery charge	Q_{rr}		135.3		nC	
Peak reverse recovery current	I_{rrm}		3.5		A	

■ Note

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3) P_d is based on max. junction temperature, using junction-case thermal resistance.
- 4) $V_{DD}=50\text{ V}$, $R_G=50\ \Omega$, $L=0.3\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.
- 5) The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper, in a still air environment with $T_a=25\text{ }^\circ\text{C}$.

■ Electrical Characteristics Diagrams

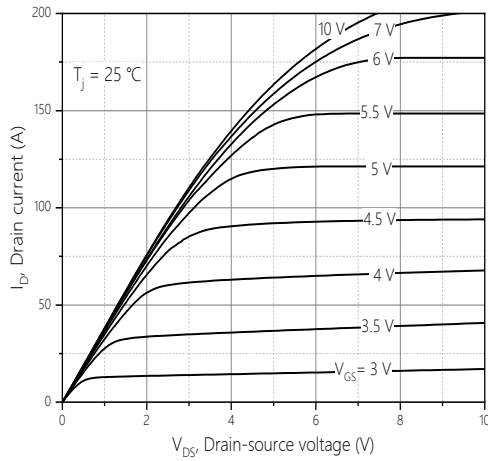


Figure 1, Typ. output characteristics

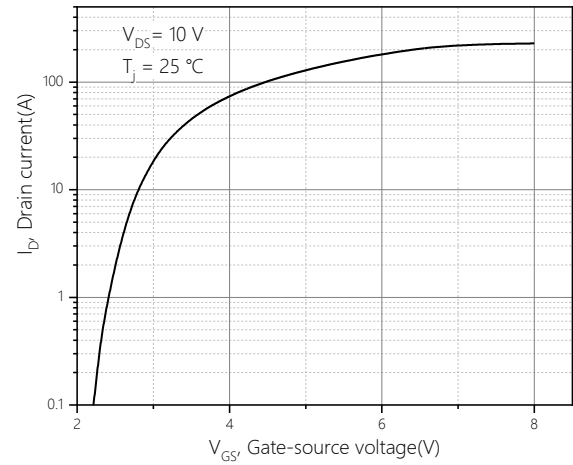


Figure 2, Typ. transfer characteristics

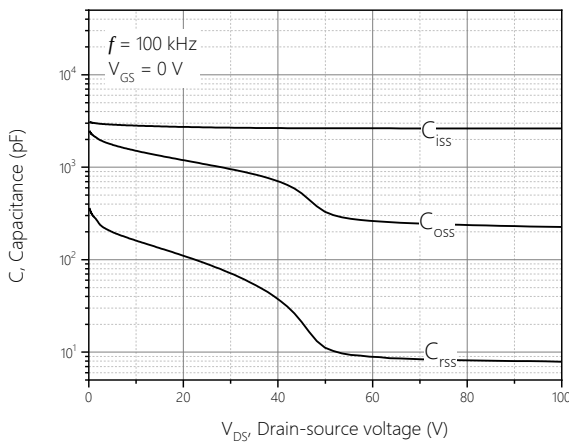


Figure 3, Typ. capacitances

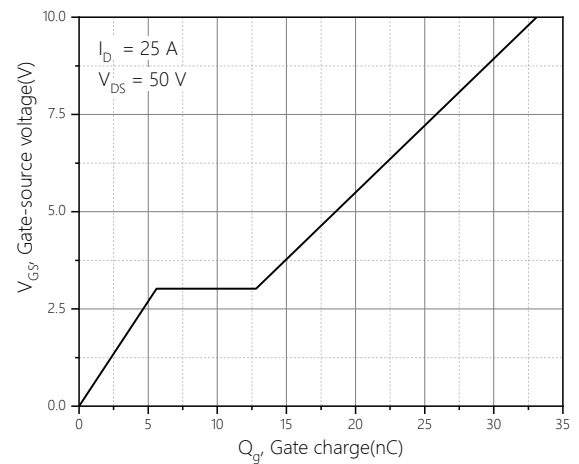


Figure 4, Typ. gate charge

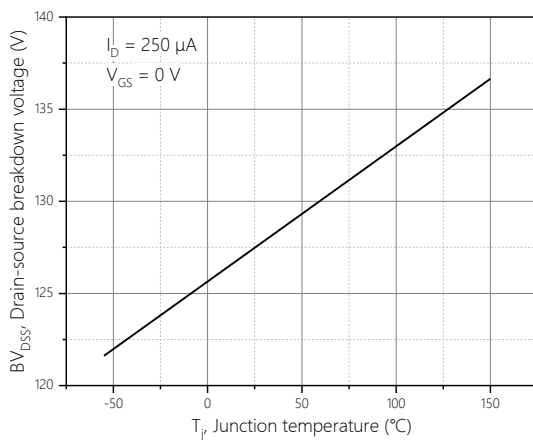


Figure 5, Drain-source breakdown voltage

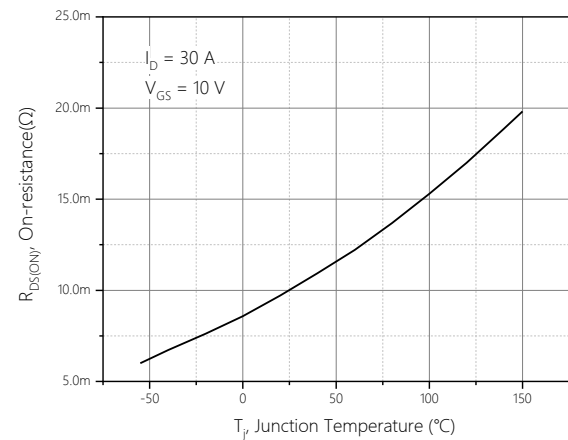


Figure 6, Drain-source on-state resistance

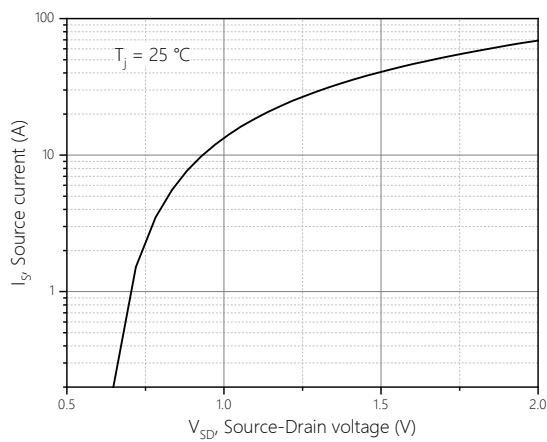


Figure 7, Forward characteristic of body diode

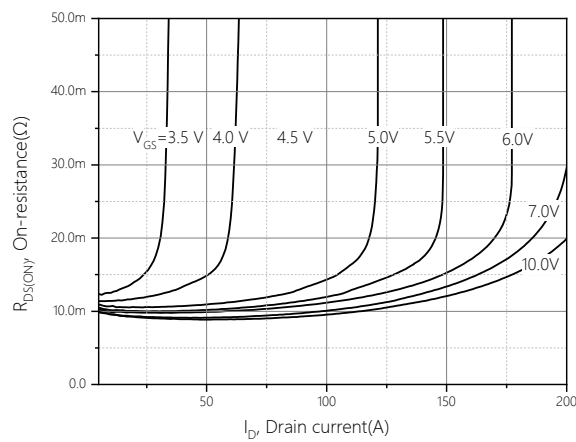


Figure 8, Drain-source on-state resistance

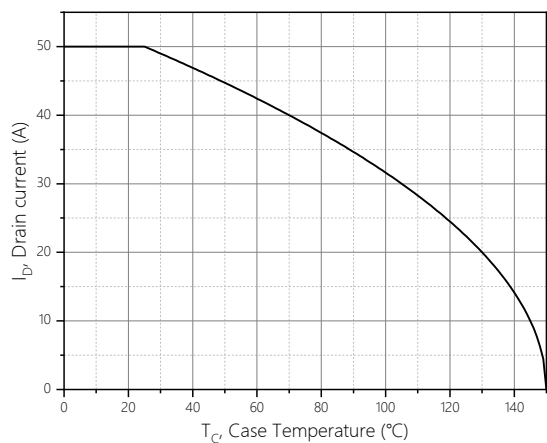


Figure 9, Drain current

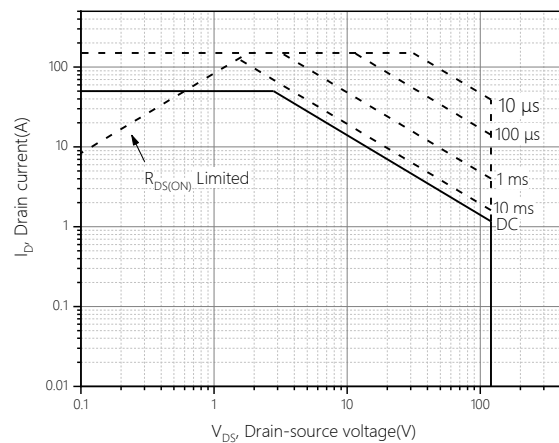


Figure 10, Safe operation area $T_C=25\text{ }^{\circ}\text{C}$

■ Test circuits and waveforms

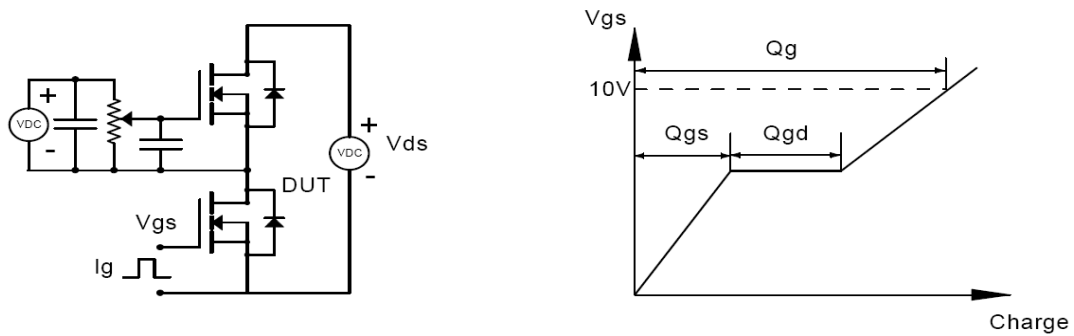


Figure 1, Gate charge test circuit & waveform

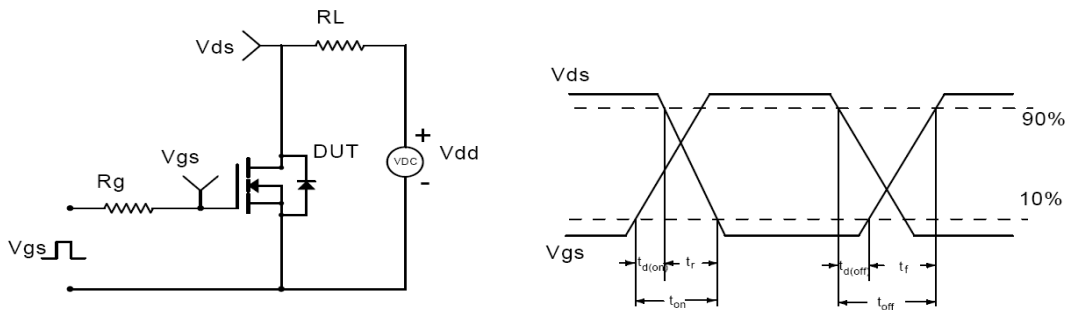


Figure 2, Switching time test circuit & waveforms

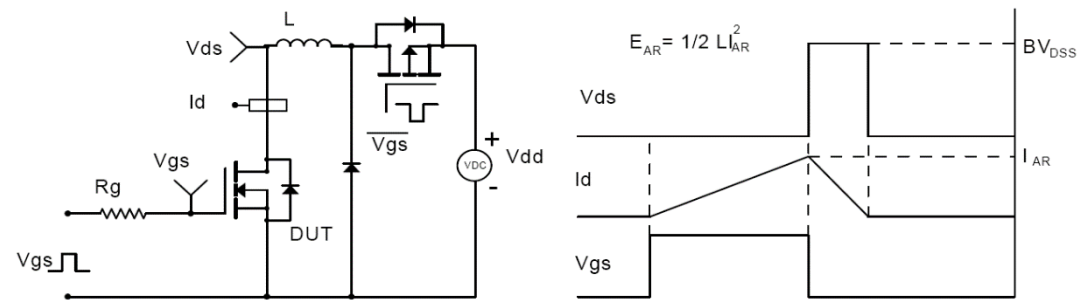


Figure 3, Unclamped inductive switching (UIS) test circuit & waveforms

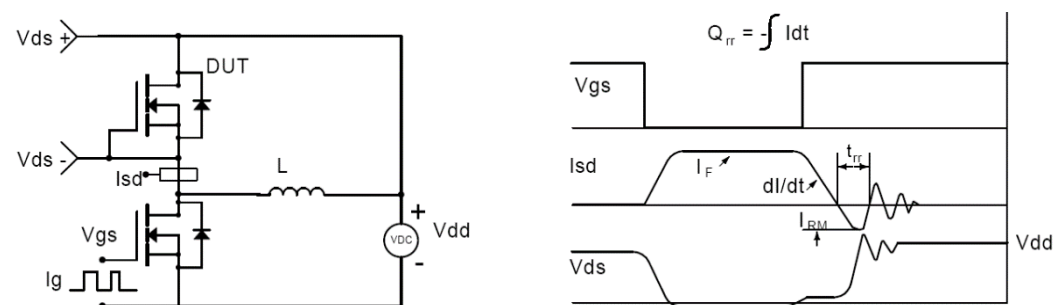
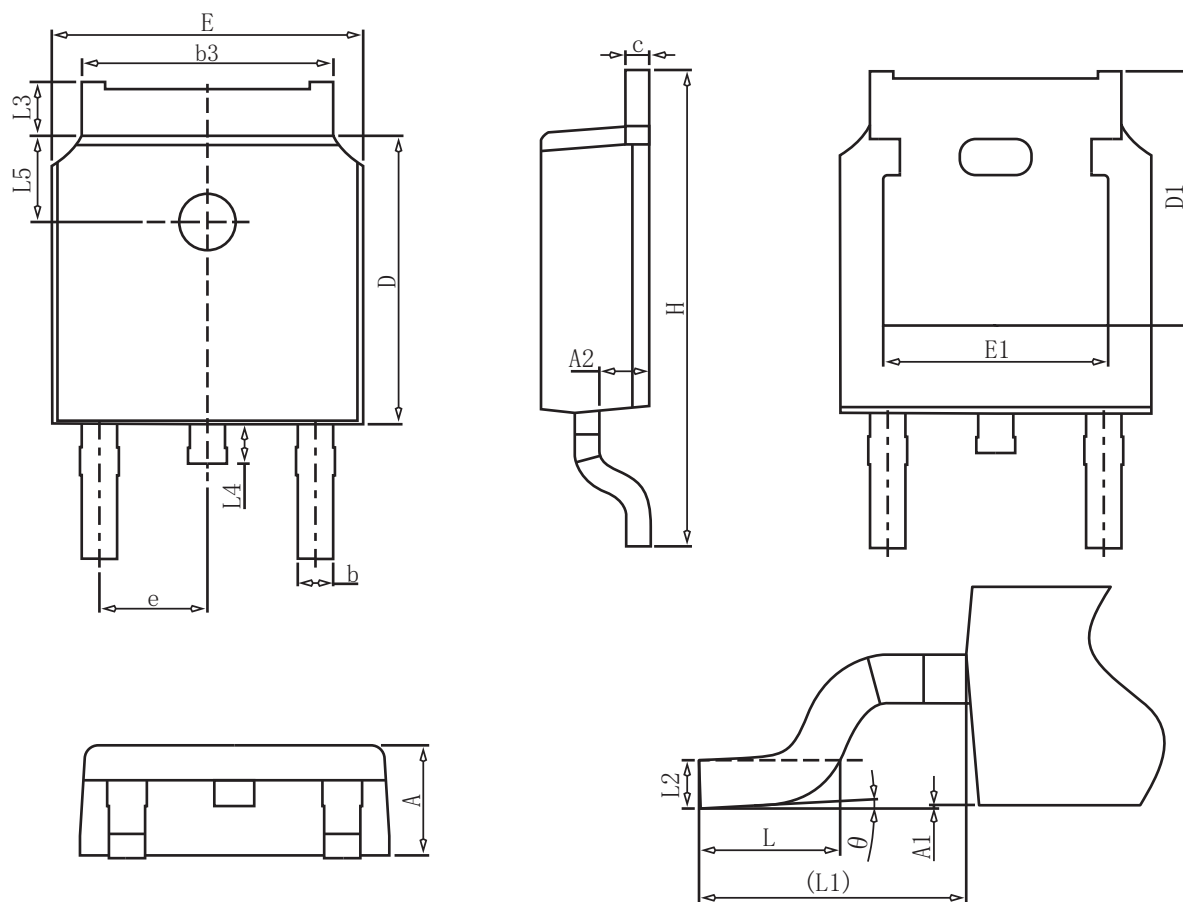


Figure 4, Diode reverse recovery test circuit & waveforms

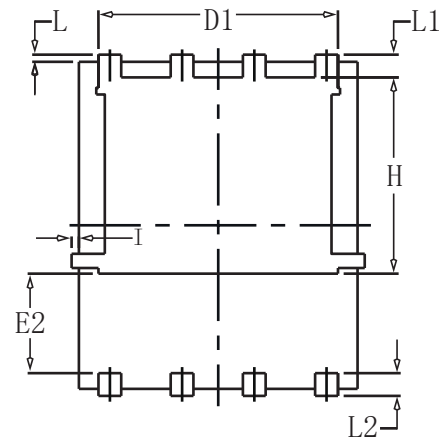
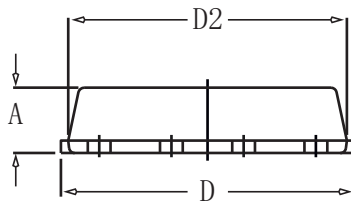
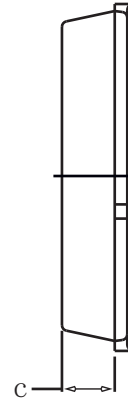
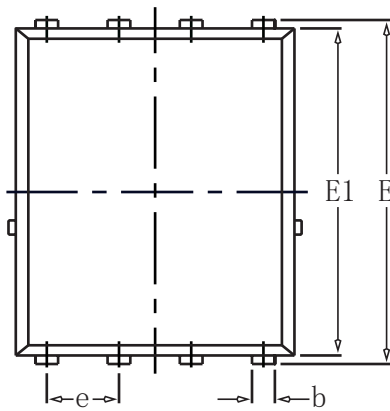
TO-252 Package information



COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	2.20	2.30	2.40
A1	0.00	—	0.20
A2	0.97	1.07	1.17
b	0.68	0.78	0.90
b3	5.20	5.33	5.50
c	0.43	0.53	0.63
D	5.98	6.10	6.22
D1	5.30REF		
E	6.40	6.60	6.80
E1	4.63	—	—
e	2.286BSC		
H	9.40	10.10	10.50
L	1.38	1.50	1.75
L1	2.90REF		
L2	0.51BSC		
L3	0.88	—	1.28
L4	0.50	—	1.00
L5	1.65	1.80	1.95
θ	0°	—	8°

DFN5X6-8L Package information



SYMBOL	COMMON			
	MM		INCH	
	MIN	MAX	MIN	MAX
A	1.03	1.17	0.0406	0.0461
b	0.34	0.48	0.0134	0.0189
c	0.824	0.970	0.0324	0.0382
D	4.80	5.40	0.1890	0.2126
D1	4.11	4.31	0.1618	0.1697
D2	4.80	5.00	0.1890	0.1969
E	5.59	6.15	0.2343	0.2421
E1	5.65	5.85	0.2224	0.2303
E2	1.60	—	0.0630	—
e	1.27 BSC		0.05 BSC	
L	0.05	0.25	0.0020	0.0098
L1	0.38	0.50	0.0150	0.0197
L2	0.38	0.50	0.0150	0.0197
H	3.30	3.50	0.1299	0.1378
I	—	0.18	—	0.0070