
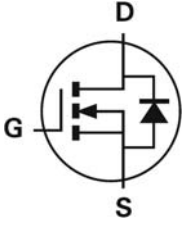



<b>V<sub>DSS</sub> , 60V</b> <b>R<sub>DS(ON)</sub> , 4.2mΩ (max.) @ V<sub>GS</sub>=10V</b> <b>I<sub>D</sub> , 125A</b>	<b>TO-220AB</b>	 
		

Description	Features
The SG60N03P uses advanced Trench technology and designs to provide excellent R <sub>DS(ON)</sub> with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications.	<ul style="list-style-type: none"> <li>• Low On-Resistance</li> <li>• Low Input Capacitance</li> <li>• Low Miller Charge</li> <li>• Low Input / Output Leakage</li> <li>• Pb-free lead plating; RoHS compliant</li> </ul>
	Applications
	<ul style="list-style-type: none"> <li>• Lithium-Ion Secondary Batteries</li> <li>• Load Switch</li> <li>• DC-DC converters and Off-line UPS</li> </ul>

### Ordering Information

Ordering Code	RoHS Status	Package	Package Code	Packing	Quantity
SG60N03P	Halogen-Free	TO-220AB	P	Tube	50

### Absolute Maximum Ratings (T<sub>A</sub>=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DS</sub>	60	V
Gate-Source Voltage	V <sub>GS</sub>	±25	V
Drain Current-Continuous	I <sub>D</sub>	T <sub>C</sub> =25°C	125
		T <sub>C</sub> =70°C	100
Drain Current-Pulsed <sup>Note 1</sup>	I <sub>DM</sub>	450	A
Drain Current-Continuous	I <sub>D</sub>	T <sub>A</sub> =25°C	16
		T <sub>A</sub> =70°C	12.8
Avalanche Current, L=0.5mH	I <sub>AS</sub>	26	A
Avalanche Energy, L=0.5mH	E <sub>AS</sub>	169	mJ
Maximum Power Dissipation	P <sub>D</sub>	T <sub>C</sub> =25°C	83
		T <sub>C</sub> =70°C	53
		T <sub>A</sub> =25°C	2
		T <sub>A</sub> =70°C	1.3
Storage Temperature Range	T <sub>STG</sub>	-55 to +150	°C
Operating Junction Temperature Range	T <sub>J</sub>	-55 to +150	°C

### Thermal Resistance Ratings

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Maximum Junction-to-Ambient	R <sub>θJA</sub>	Steady State	-	-	62	°C/W
Maximum Junction-to-Case	R <sub>θJC</sub>	Steady State	-	-	1.5	°C/W

**Electrical Characteristics (T<sub>J</sub>=25°C unless otherwise noted)**

OFF CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA	60	-	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =48V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage	I <sub>GSS</sub>	V <sub>GS</sub> =±25V, V <sub>DS</sub> =0V	-	-	±100	nA

ON CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA	2	3	4	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>DS</sub> =20A	-	-	4.2	mΩ

DYNAMIC CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, f=1MHz	-	3686	-	pF
Output Capacitance	C <sub>oss</sub>		-	357	-	
Reverse Transfer Capacitance	C <sub>rss</sub>		-	124	-	

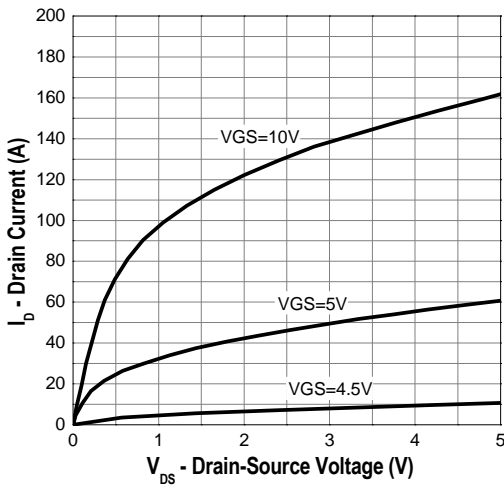
SWITCHING CHARACTERISTICS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Turn-On Delay Time	T <sub>d(on)</sub>	V <sub>DS</sub> =30V, I <sub>D</sub> =20A, V <sub>GS</sub> =10V, R <sub>GEN</sub> =3Ω	-	12	-	ns
Rise Time	t <sub>r</sub>		-	4	-	
Turn-Off Delay Time	T <sub>d(off)</sub>		-	50	-	
Fall Time	t <sub>f</sub>		-	6	-	
Total Gate Charge at 10V	Q <sub>g</sub>	V <sub>DS</sub> =30V, I <sub>DS</sub> =20A, V <sub>GS</sub> =10V	-	50	-	nC
Gate to Source Gate Charge	Q <sub>gs</sub>		-	15	-	
Gate to Drain "Miller" Charge	Q <sub>gd</sub>		-	2.5	-	

DRAIN-SOURCE DIODE CHARACTERISTICS AND MAXIMUM RATINGS						
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Drain-Source Diode Forward Voltage	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>DS</sub> =20A	-	-	1.3	V
Body Diode Reverse Recovery Time	t <sub>rr</sub>	I <sub>F</sub> =20A, dI/dt=100A/μs	-	22	-	ns
Body Diode Reverse Recovery Charge	Q <sub>rr</sub>		-	120	-	nC

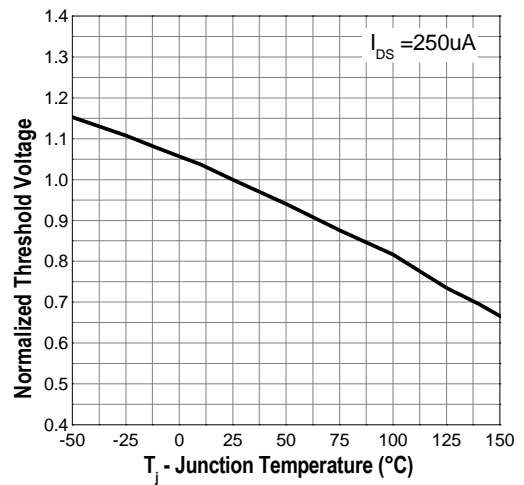
- Notes:**
1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
  2. R<sub>θJA</sub> is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. R<sub>θJC</sub> is guaranteed by design while R<sub>θCA</sub> is determined by the user's board design. R<sub>θJA</sub> shown below for single device operation on FR-4 in still air.

Typical Operating Characteristics

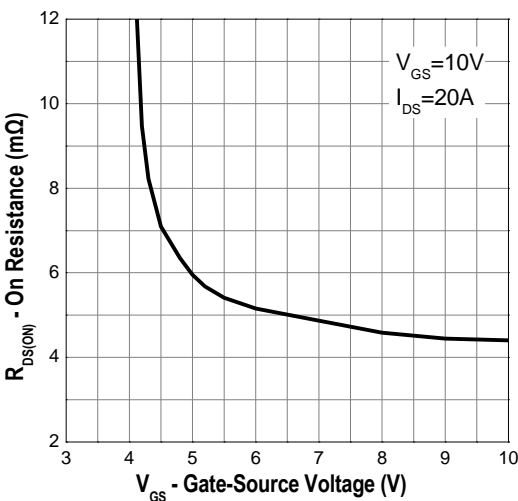
Output Characteristics



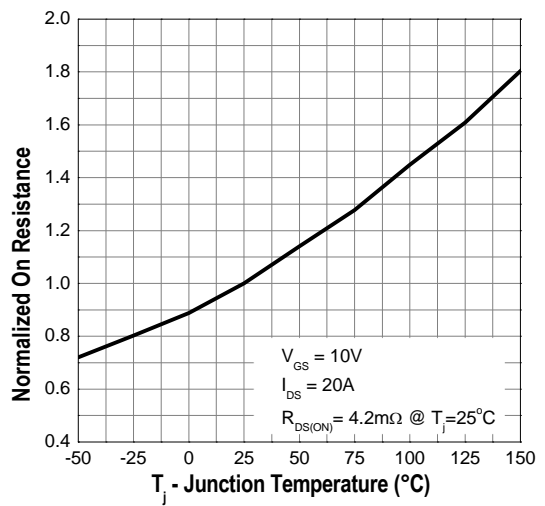
Gate Threshold Voltage



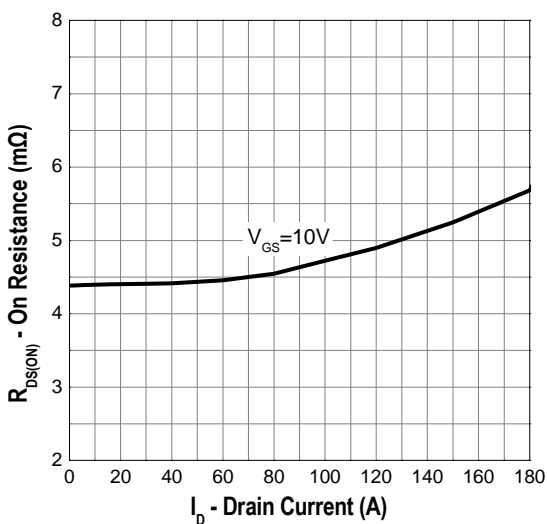
Gate-Source On Resistance



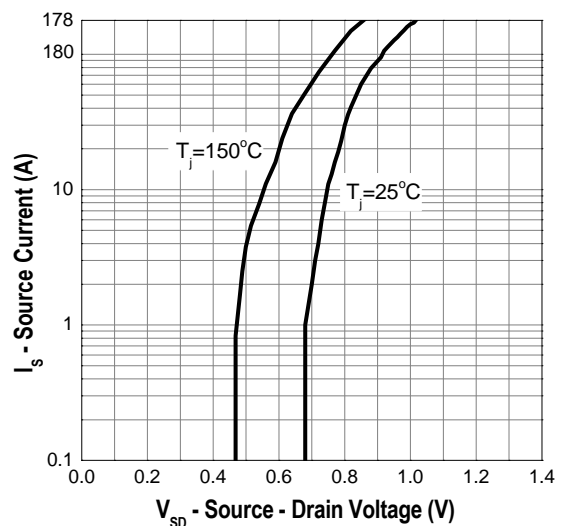
Drain-Source On Resistance



Drain-Source On Resistance

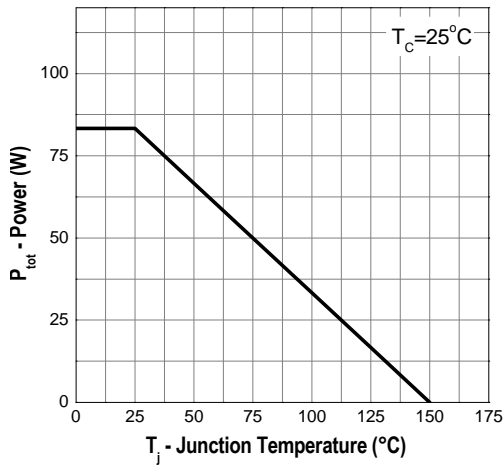


Source-Drain Diode Forward

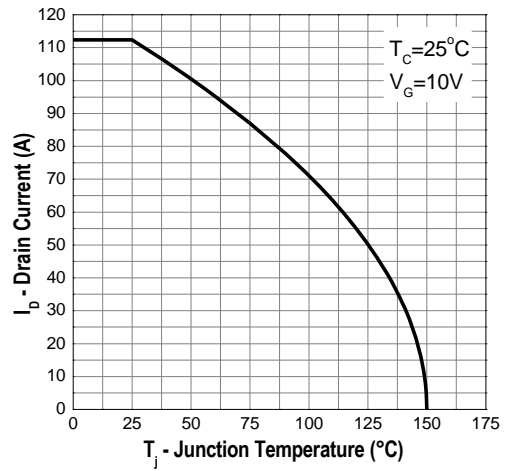


Typical Operating Characteristics (Cont.)

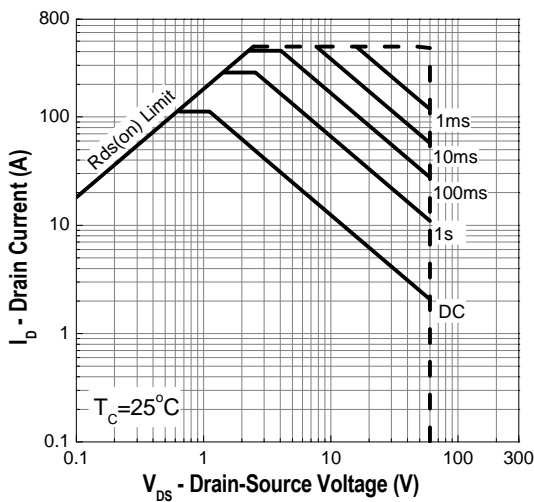
Power Dissipation



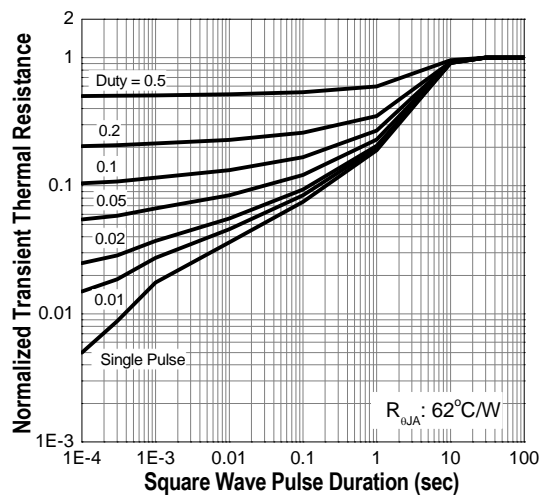
Drain Current



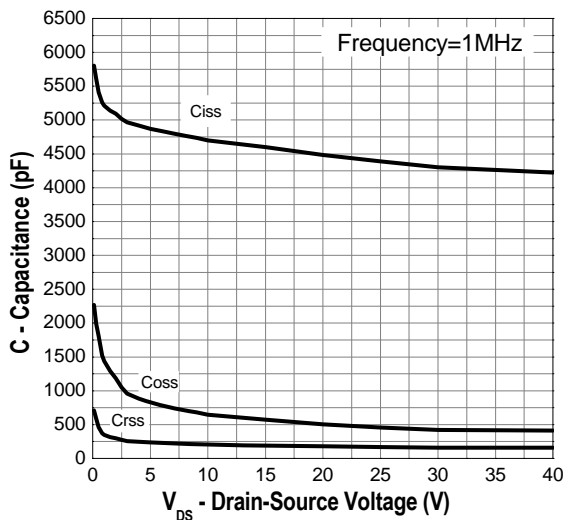
Safe Operation Area



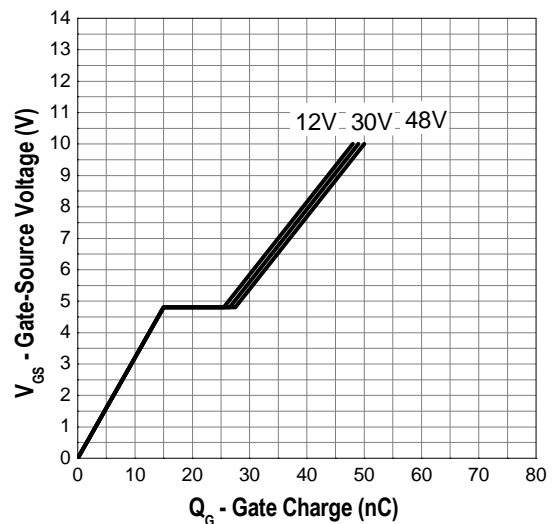
Transient Thermal Impedance



Capacitance

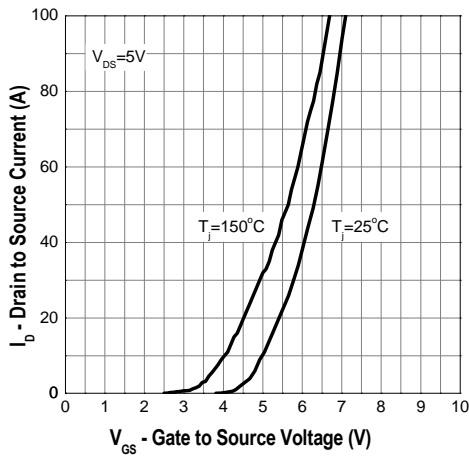


Gate Charge

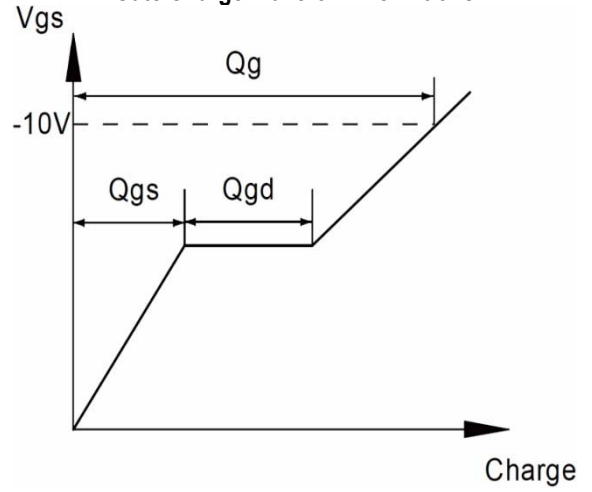


**Typical Operating Characteristics (Cont.)**

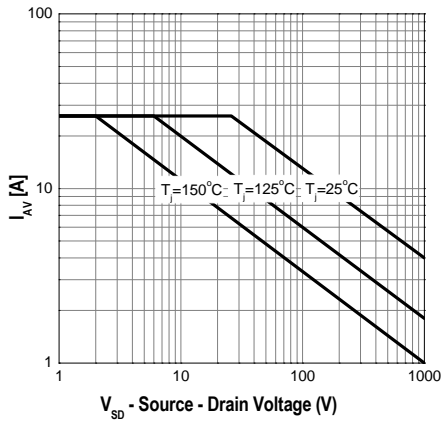
**Typical Transfer Characteristics**



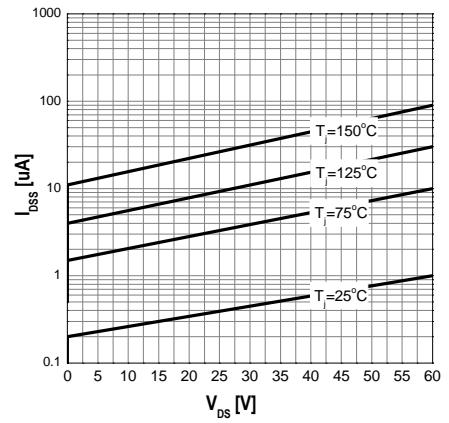
**Gate Charge Waveform Definitions**



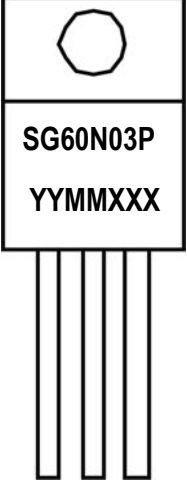
**Avalanche Characteristics**



**Drain-Source Leakage Current**

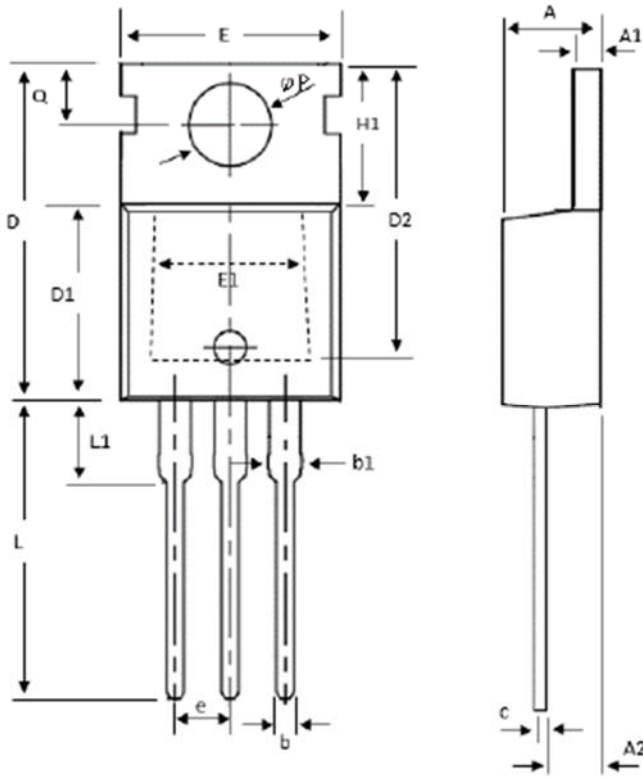


**Marking Information**

TO-220AB (P)	Marking Rule
<p data-bbox="119 369 287 403">Laser Marking</p>  <p data-bbox="395 925 501 956">Diagram</p>	<p data-bbox="805 369 997 403"><u>Line 1</u> : Device</p> <p data-bbox="805 414 949 448">SG60N03P</p> <p data-bbox="805 504 1045 537"><u>Line 2</u> : Date Code</p> <p data-bbox="805 548 949 582">YYMMXXX</p> <p data-bbox="805 638 1005 672">YY : Year Code</p> <p data-bbox="805 683 965 716">MM : Month</p> <p data-bbox="805 728 1061 761">XXX : Serial Number</p>

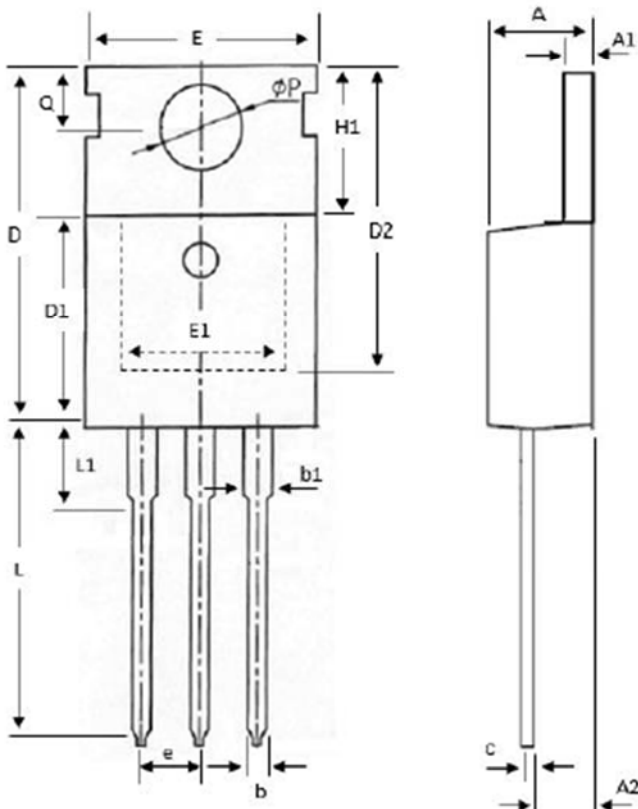
Package of Dimension

G-TYPE



Symbol	Min	Nor	Max
A	4.20	4.45	4.70
A1	1.15	1.28	1.40
A2	2.20	2.45	2.70
b	0.70	0.83	0.95
b1	1.15	1.45	1.75
c	0.40	0.50	0.60
D1	8.80	9.10	9.40
D2	11.75	-	-
E	9.70	10.03	10.36
E1	6.86	-	-
e	2.54 BSC		
H1	6.25	6.55	6.85
L	12.75	13.38	14.00
L1	-	-	4.00
P	3.40	3.70	4.00
Q	2.60	2.80	3.00

P-TYPE  
H-TYPE



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