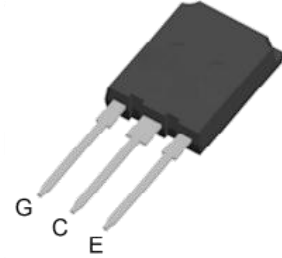


### 1200V 75A CoolFAST™ 7 Technology IGBT With Internal Isolation

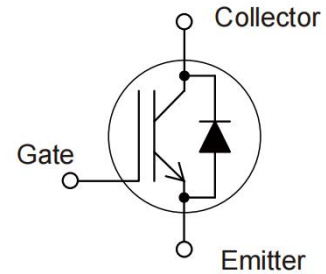
#### Features:

- Low Switching Power Loss
- Low Switching Surge And Noise
- Advanced Field Stop Technology
- Low EMI
- Maximum Junction Temperature 175°C
- Qualified According To JEDEC For Target Applications
- Pb-free Lead Plating, Halogen-free Mold Compound, RoHS Compliant
- Internal Insulation



#### Applications:

- Industrial UPS
- Welding Machine
- Solar Converters
- Energy Storage
- EV Charger



#### Key Performance and Package Parameters

Type	V <sub>CE</sub>	I <sub>C</sub>	V <sub>CEsat</sub> , T <sub>vj</sub> =25°C	T <sub>vjmax</sub>	Marking	Package
DKI75N120EF7	1200V	75A	1.96V	175°C	DKI75N120EF7	TO247iPS-3L

#### Maximum Ratings and Characteristics

##### Absolute Maximum Ratings at T<sub>vj</sub>= 25°C (unless otherwise specified)

Items	Symbols	Value	Units
Collector-emitter voltage	V <sub>CEs</sub>	1200	V
Gate-emitter voltage	V <sub>GES</sub>	±20	V
Transient gate-emitter voltage (t <sub>p</sub> ≤ 10μs, D < 0.010)		±30	V
DC collector current, limited by T <sub>vjmax</sub> T <sub>c</sub> = 25°C T <sub>c</sub> = 100°C	I <sub>C</sub>	115 82	A
Pulsed collector current, t <sub>p</sub> limited by T <sub>vjmax</sub>	I <sub>CP</sub>	300	A
Turn-off safe operating area V <sub>ce</sub> ≤ 1200V, T <sub>j</sub> ≤ 175°C, t <sub>p</sub> = 1μs	-	300	A
Diode forward current, limited by T <sub>vjmax</sub> T <sub>c</sub> = 25°C T <sub>c</sub> = 100°C	I <sub>F</sub>	150 75	A
Diode pulsed collector current, t <sub>p</sub> limited by T <sub>vjmax</sub>	I <sub>FP</sub>	300	A
IGBT max. power dissipation	P <sub>D_IGBT</sub>	487	W
FWD max. power dissipation	P <sub>D_FWD</sub>	255	W
Operating junction temperature	T <sub>vj</sub>	-40 ~ +175	°C
Storage temperature	T <sub>stg</sub>	-55 ~ +150	°C

### Electrical Characteristics at $T_{vj}= 25^{\circ}\text{C}$ (unless otherwise specified)

Description	Symbols	Conditions	Characteristics			Unit
			Min	Typ	Max	
Collector-emitter breakdown voltage	$V_{(BR)CES}$	$V_{GE}= 0\text{V}, I_C= 0.50\text{mA}$	1200	-	-	V
Zero gate voltage collector current	$I_{CES}$	$V_{CE}= 1200\text{V}, V_{GE}= 0\text{V}$	-	-	200	$\mu\text{A}$
Gate-emitter leakage current	$I_{GES}$	$V_{CE}= 0\text{V}, V_{GE}= \pm 20\text{V}$	-	-	$\pm 200$	nA
Gate-emitter threshold voltage	$V_{GE(th)}$	$V_{CE}= V_{GE}, I_C= 250\mu\text{A}$	5.0	5.9	6.6	V
Collector-emitter saturation voltage	$V_{CE(sat)}$	$V_{GE}= 15\text{V}, I_C= 75\text{A}$	-	1.96	2.40	V
		$T_{vj}= 25^{\circ}\text{C}$ $T_{vj}= 175^{\circ}\text{C}$	-	2.72	-	
Input capacitance	$C_{ies}$	$V_{CE}= 25\text{V}, V_{GE}= 0\text{V}$ $f= 1\text{MHz}$	-	19.5	-	nF
Output capacitance	$C_{oes}$		-	240	-	pF
Reverse transfer capacitance	$C_{res}$		-	130	-	pF
Gate charge	$Q_G$	$V_{CC}= 960\text{V}, I_C= 75\text{A}, V_{GE}= 15\text{V}$	-	570	-	nC
Forward voltage drop	$V_F$	$I_F= 75\text{A}$	-	2.3	3.0	V
		$T_{vj}= 25^{\circ}\text{C}$ $T_{vj}= 175^{\circ}\text{C}$	-	1.8	-	

### Switching Characteristics at $T_{vj}= 25^{\circ}\text{C}$

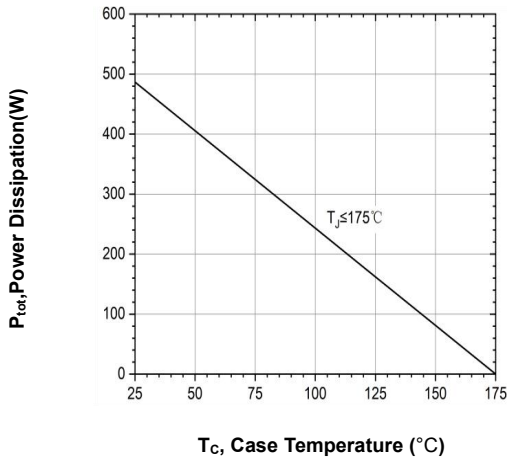
Description	Symbols	Conditions	Characteristics			Unit
			Min	Typ	Max	
<b>IGBT Characteristics</b>						
Turn-on delay time	$t_{d(on)}$	$V_{CC}= 600\text{V}$ $I_C= 75\text{A}$ $V_{GE}= 15\text{V}$ $R_G= 10\Omega$	-	118	-	ns
Rise time	$t_r$		-	138	-	ns
Turn-off delay time	$t_{d(off)}$		-	472	-	ns
Fall time	$t_f$		-	82	-	ns
Turn-on energy	$E_{on}$		-	4.97	-	mJ
Turn-off energy	$E_{off}$		-	3.52	-	mJ
Total switching energy	$E_{ts}$		-	8.49	-	mJ
<b>Diode Characteristics</b>						
Diode reverse recovery time	$t_{rr}$	$V_{CC}= 600\text{V}$	-	127.9	-	ns
Diode reverse recovery charge	$Q_{rr}$	$I_F= 75\text{A}$	-	2.97	-	$\mu\text{C}$
Diode peak reverse recovery current	$I_{rrm}$	$di_F/dt= 1000\text{A}/\mu\text{s}$	-	66.18	-	A

### Switching Characteristics at $T_{vj}= 175^{\circ}\text{C}$

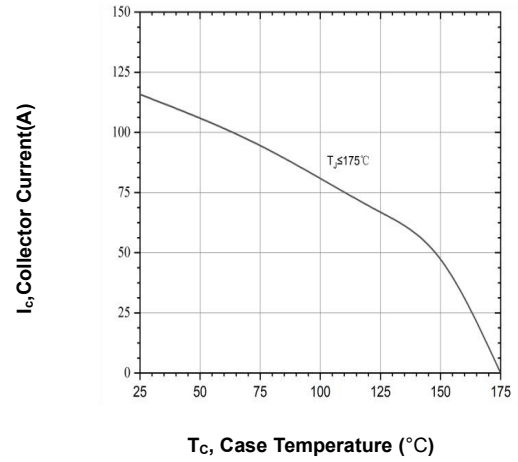
Description	Symbols	Conditions	Characteristics			Unit
			Min	Typ	Max	
<b>IGBT Characteristics</b>						
Turn-on delay time	$t_{d(on)}$	$V_{CC}= 600\text{V}$ $I_C= 75\text{A}$ $V_{GE}= 15\text{V}$ $R_G= 10\Omega$	-	100	-	ns
Rise time	$t_r$		-	128	-	ns
Turn-off delay time	$t_{d(off)}$		-	534	-	ns
Fall time	$t_f$		-	104	-	ns
Turn-on energy	$E_{on}$		-	4.86	-	mJ
Turn-off energy	$E_{off}$		-	4.04	-	mJ
Total switching energy	$E_{ts}$		-	8.9	-	mJ
<b>Diode Characteristics</b>						
Diode reverse recovery time	$t_{rr}$	$V_{CC}= 600\text{V}$	-	301.3	-	ns
Diode reverse recovery charge	$Q_{rr}$	$I_F= 75\text{A}$	-	12.78	-	$\mu\text{C}$
Diode peak reverse recovery current	$I_{rrm}$	$di_F/dt= 1000\text{A}/\mu\text{s}$	-	86.19	-	A

**Thermal Resistance**

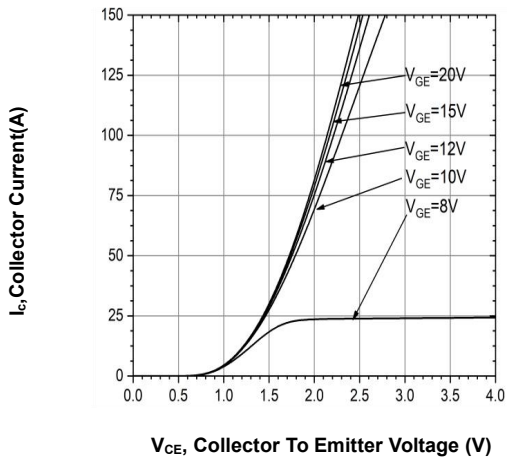
Items	Symbols	Characteristics			Unit
		Min	Typ	Max	
Thermal resistance, junction-ambient	$R_{th(j-a)}$	-	-	50	°C/W
Thermal resistance, IGBT junction to case	$R_{th(j-c)}$	-	-	0.31	
Thermal resistance, diodes junction to case	$R_{th(j-c)}$	-	-	0.58	



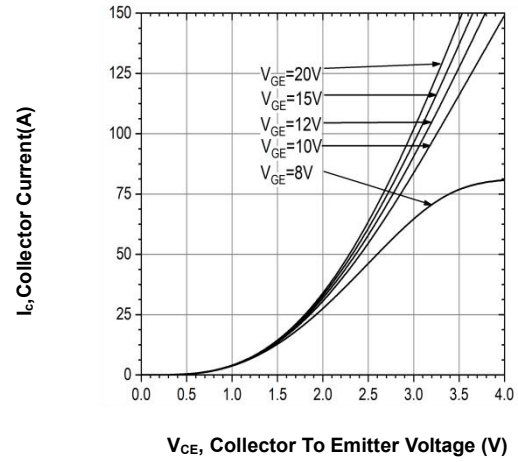
**Figure 1. Power dissipation vs. case temperature**  
( $T_{vj} \leq 175^\circ\text{C}$ )



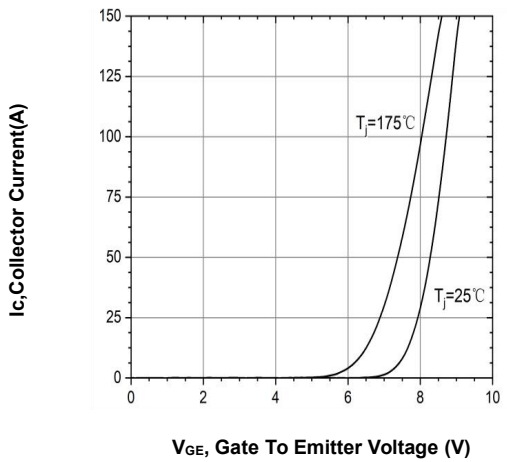
**Figure 2. DC Collector current vs. Case temperature**  
( $V_{GE} \leq 15\text{V}$ ,  $T_{vj} \leq 175^\circ\text{C}$ )



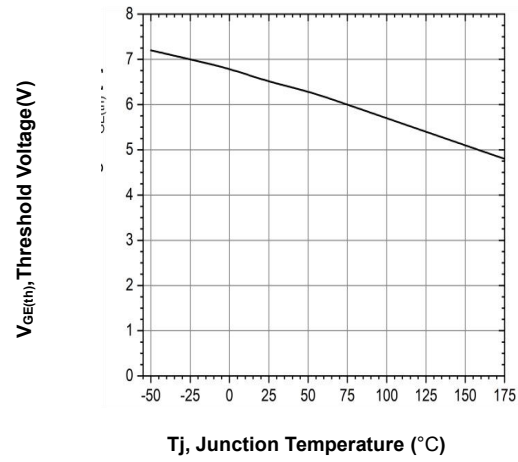
**Figure 3. Typical output characteristic**  
( $T_{vj} = 25^\circ\text{C}$ )



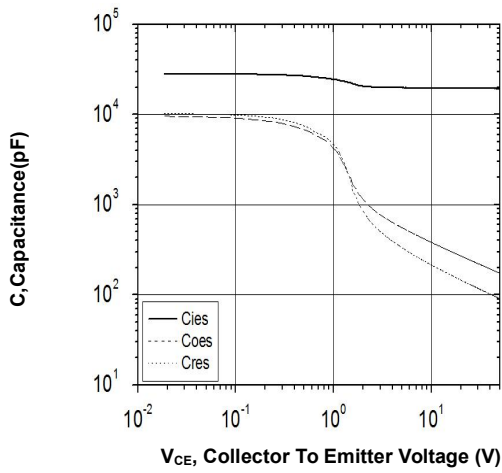
**Figure 4. Typical output characteristic**  
( $T_{vj} = 175^\circ\text{C}$ )



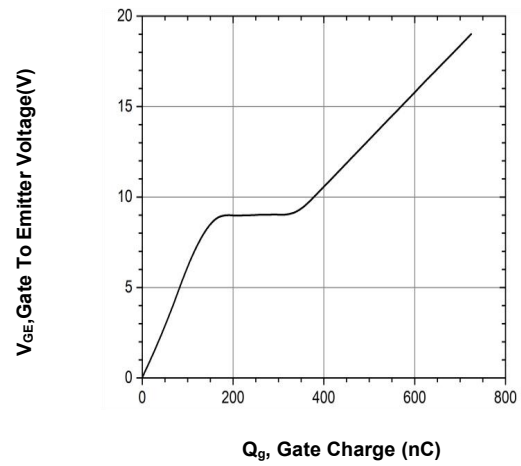
**Figure 5. Typical transfer characteristic**  
( $V_{CE} = 20\text{V}$ )



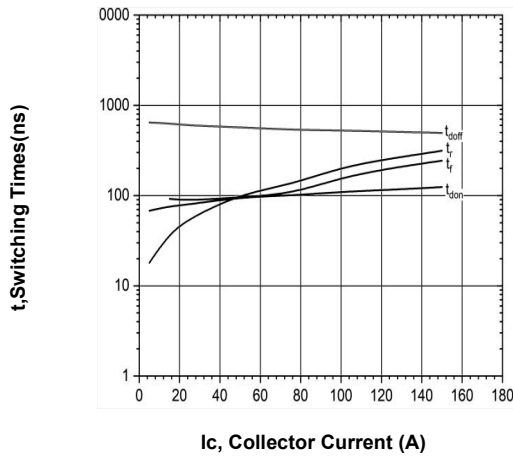
**Figure 6. Gate threshold voltage**  
( $I_c = 75\text{mA}$ ,  $V_{CE} = 20\text{V}$ )



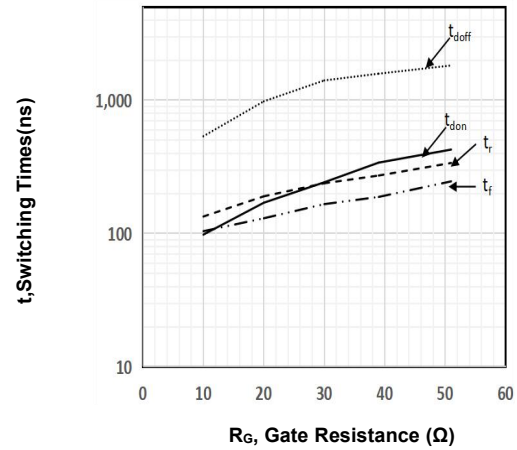
**Figure 7. Typical capacitance vs. collector-emitter voltage** ( $V_{GE}=0V, f=1MHz$ )



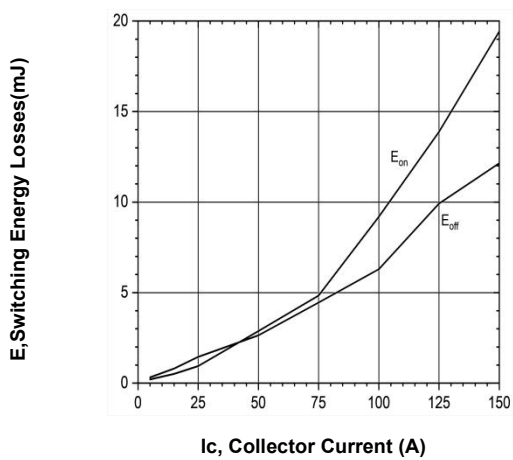
**Figure 8. Typical gate charge** ( $I_C=75A, V_{CE}=960V, T_{vj}=25^\circ C$ )



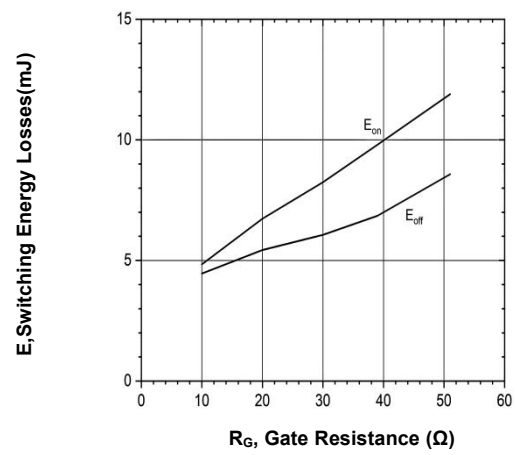
**Figure 9. Typical switching times vs. collector current** ( $T_{vj}=175^\circ C, V_{CE}=600V, V_{GE}=15V, R_g=10\Omega$ )



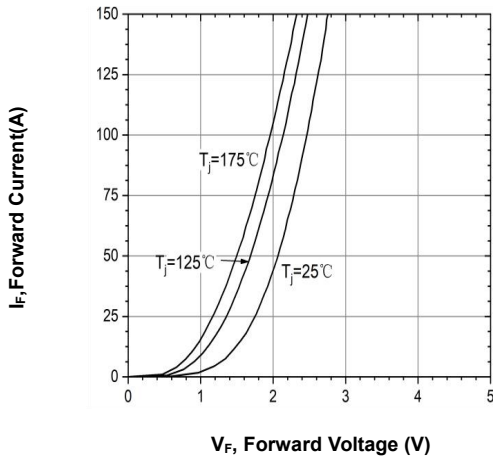
**Figure 10. Typical switching times vs. gate resistor** ( $T_{vj}=175^\circ C, V_{CE}=600V, V_{GE}=15V, I_C=75A$ )



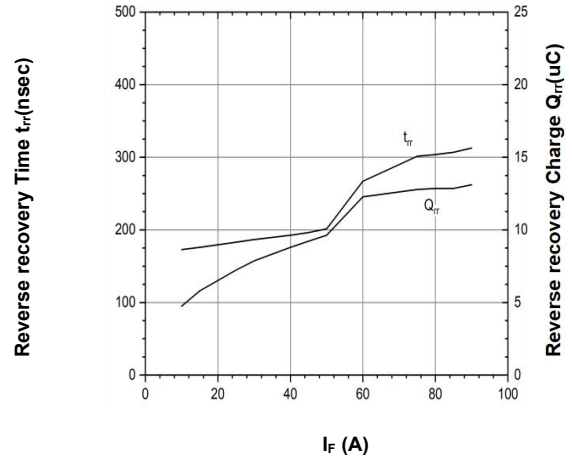
**Figure 11. Typical switching losses vs. Collector current** ( $T_{vj}=175^\circ C, V_{CE}=600V, V_{GE}=15V, R_g=10\Omega$ )



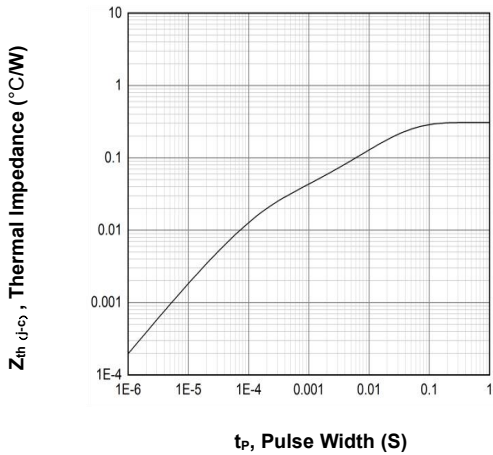
**Figure 12. Typical capacitance vs. collector-emitter voltage** ( $T_{vj}=175^\circ C, V_{CE}=600V, V_{GE}=15V, R_g=10\Omega$ )



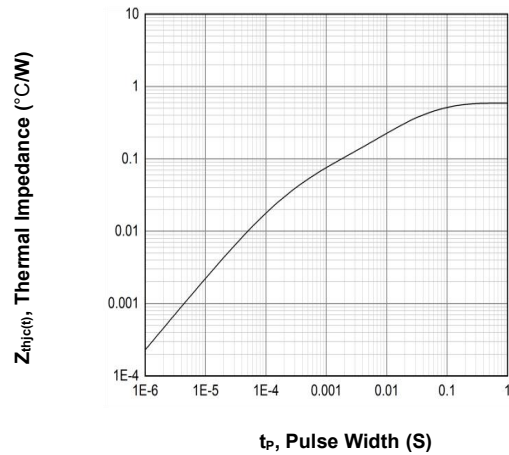
**Figure 13. Typical forward characteristics of diode**  
( $V_{CE} = 600V$ ,  $V_{GE} = 15V$ ,  $R_g = 10\Omega$ )



**Figure 14. Typical reverse recovery characteristics vs. forward current of diode**  
( $T_j = 175^\circ C$ ,  $V_{CE} = 600V$ ,  $V_{GE} = 15V$ ,  $R_g = 10\Omega$ )

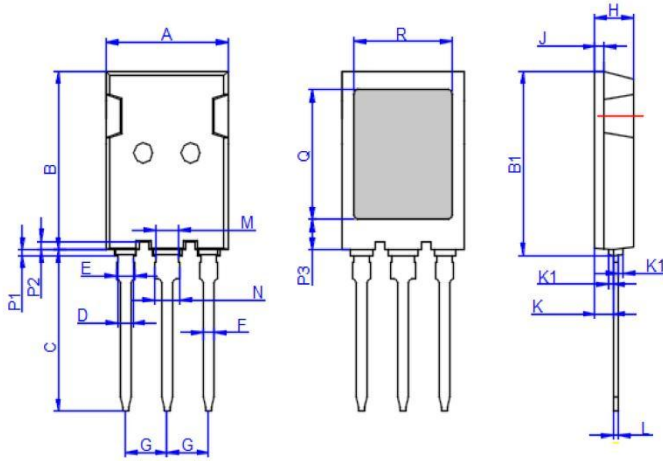


**Figure 15. Transient thermal impedance of IGBT**  
( $D = 0$ )



**Figure 16. Transient thermal impedance of diode**  
( $D = 0$ )

### TO247iPS-3L Package Outline



TO-247iPS-3L

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.70	16.00	16.30	0.618	0.630	0.642
B	21.80	22.00	22.20	0.858	0.866	0.874
B1	22.30	22.50	22.70	0.878	0.886	0.894
C	19.40	19.70	20.00	0.764	0.776	0.787
D	1.80	2.00	2.20	0.071	0.079	0.087
E	2.15	2.35	2.55	0.085	0.093	0.100
F	1.16	1.36	1.56	0.046	0.054	0.061
G	5.25	5.45	5.65	0.207	0.215	0.222
H	4.80	5.00	5.20	0.189	0.197	0.205
J	1.10	1.20	1.30	0.043	0.047	0.051
K	2.20	2.35	2.50	0.087	0.093	0.098
K1	0.45	0.60	0.75	0.018	0.024	0.030
L	0.51	0.70	0.89	0.020	0.028	0.035
M	2.80	3.00	3.20	0.110	0.118	0.126
N	3.15	3.35	3.55	0.124	0.132	0.140
P1	0.44	0.64	0.84	0.017	0.025	0.033
P2	0.80	1.00	1.20	0.031	0.039	0.047
P3	3.55	3.75	3.95	0.140	0.148	0.156
Q	12.60	12.90	13.20	0.496	0.508	0.520
R	15.55	15.85	16.15	0.612	0.624	0.636

**Revision History**

<b>Revision</b>	<b>Date</b>	<b>Subjects (major changes since last revision)</b>
0.1	2021-03-20	Target version
1.1	2022-11-11	Preliminary version
1.2	2024-1-16	Present version

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