

Normally-On Trench Silicon Carbide Power JFET

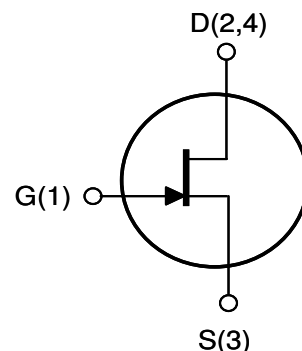
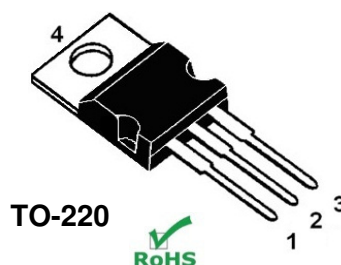
Product Summary		
BV_{DS}	650	V
$R_{DS(on)max}$	0.055	Ω

Features:

- Positive Temperature Coefficient for Ease of Paralleling
- Extremely Fast Switching with No "Tail" Current at 150 °C
- $R_{DS(on)max}$ of 0.055 Ω
- Voltage Controlled
- Low Gate Charge
- Low Intrinsic Capacitance

Applications:

- Solar Inverter
- SMPS
- Power Factor Correction
- Induction Heating
- UPS
- Motor Drive



Internal Schematic

MAXIMUM RATINGS

Parameter	Symbol	Conditions	Value	Unit
Continuous Drain Current	$I_{D, TC=25}$	$T_C = 25\text{ }^\circ\text{C}$	30	A
	$I_{D, TC=100}$	$T_C = 100\text{ }^\circ\text{C}$	20	
Pulsed Drain Current ⁽¹⁾	I_{DM}	$T_j = 25\text{ }^\circ\text{C}$	80	A
Short Circuit Withstand Time	t_{SC}	$V_{DD} < 800\text{ V}, T_C < 125\text{ }^\circ\text{C}$	50	μs
Power Dissipation	P_D	$T_C = 25\text{ }^\circ\text{C}$	114	W
Gate-Source Voltage	V_{GS}	AC ⁽²⁾	-15 to +15	V
Operating and Storage Temperature	T_j, T_{stg}		-55 to +150	$^\circ\text{C}$
Lead Temperature for Soldering	T_{sold}	1/8" from case < 10 s	260	$^\circ\text{C}$

⁽¹⁾ Pulse width limited by maximum junction temperature

⁽²⁾ $R_{g(EXT)} = 1\text{ } \Omega, t_p \leq 200\text{ ns}$, see Figure 6 for static conditions

THERMAL CHARACTERISTICS

Parameter	Symbol	Value		Unit
		Typ	Max	
Thermal Resistance, junction-to-case	$R_{th,JC}$	-	1.1	$^\circ\text{C} / \text{W}$
Thermal Resistance, junction-to-ambient	$R_{th,JA}$	-	50	

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	

Off Characteristics

Drain-Source Blocking Voltage	BV_{DS}	$V_{GS} = -15\text{ V}, I_D = 600\ \mu\text{A}$	650	-	-	V
Total Drain Leakage Current	I_{DSS}	$V_{DS} = 650\text{ V}, V_{GS} = -15\text{ V}, T_j = 25\text{ }^\circ\text{C}$	-	10	-	μA
		$V_{DS} = 1200\text{ V}, V_{GS} = -15\text{ V}, T_j = 150\text{ }^\circ\text{C}$	-	100	-	
Total Gate Reverse Leakage	I_{GSS}	$V_{GS} = -15\text{ V}, V_{DS} = 0\text{ V}$	-	0.1	0.3	mA
		$V_{GS} = -15\text{ V}, V_{DS} = 650\text{ V}$	-	0.1	-	

On Characteristics

Drain-Source On-resistance	$R_{DS(on)}$	$I_D = 20\text{ A}, V_{GS} = 2\text{ V}, T_j = 25\text{ }^\circ\text{C}$	-	0.050	0.055	Ω
		$I_D = 20\text{ A}, V_{GS} = 2\text{ V}, T_j = 100\text{ }^\circ\text{C}$	-	0.07	-	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = 1\text{ V}, I_D = 30\text{ mA}$	-	-5	-	V
Gate Forward Current	I_{GFWD}	$V_{GS} = 2\text{ V}$	-	23	-	μA
Gate Resistance	R_G	$f = 1\text{ MHz}, \text{ drain-source shorted}$	-	6	-	Ω

Dynamic Characteristics

Input Capacitance	C_{iss}	$V_{DD} = 100\text{ V}, V_{GS} = -15\text{ V}, f = 100\text{ kHz}$	-	470	-	pF
Output Capacitance	C_{oss}		-	130	-	
Reverse Transfer Capacitance	C_{rss}		-	120	-	
Effective Output Capacitance, energy related	$C_{o(er)}$	$V_{DS} = 0\text{ V to } 400\text{ V}, V_{GS} = -15\text{ V}$	-	90	-	

Switching Characteristics

Turn-on Delay	t_{on}	$V_{DS} = 325\text{ V}, I_D = 20\text{ A}, \text{ Inductive Load}, T_j = 25\text{ }^\circ\text{C}$ $\text{Gate Driver} = +15\text{ V}, -15\text{ V}, R_{g(EXT)} = 1\ \Omega$	-	10	-	ns
Rise Time	t_r		-	20	-	
Turn-off Delay	t_{off}		-	20	-	
Fall Time	t_f		-	16	-	
Turn-on Energy	E_{on}		-	56	-	
Turn-off Energy	E_{off}	See Figure 13	-	63	-	μJ
Total Switching Energy	E_{ts}		-	119	-	
Turn-on Delay	t_{on}	$V_{DS} = 325\text{ V}, I_D = 20\text{ A}, \text{ Inductive Load}, T_j = 150\text{ }^\circ\text{C}$ $\text{Gate Driver} = +15\text{ V}, -15\text{ V}, R_{g(EXT)} = 1\ \Omega$	-	TBD	-	ns
Rise Time	t_r		-	TBD	-	
Turn-off Delay	t_{off}		-	TBD	-	
Fall Time	t_f		-	TBD	-	
Turn-on Energy	E_{on}		-	TBD	-	
Turn-off Energy	E_{off}	See Figure 13	-	TBD	-	μJ
Total Switching Energy	E_{ts}		-	TBD	-	
Total Gate Charge	Q_g	$V_{DS} = 400\text{ V}, I_D = 20\text{ A}, V_{GS} = -15\text{ V to } +2\text{ V}$	-	70	-	nC
Gate-Source Charge	Q_{gs}		-	6	-	
Gate-Drain Charge	Q_{gd}		-	48	-	

Figure 1. Typical Output Characteristics

$I_D = f(V_{DS}); T_j = 25\text{ }^\circ\text{C}; \text{parameter: } V_{GS}$

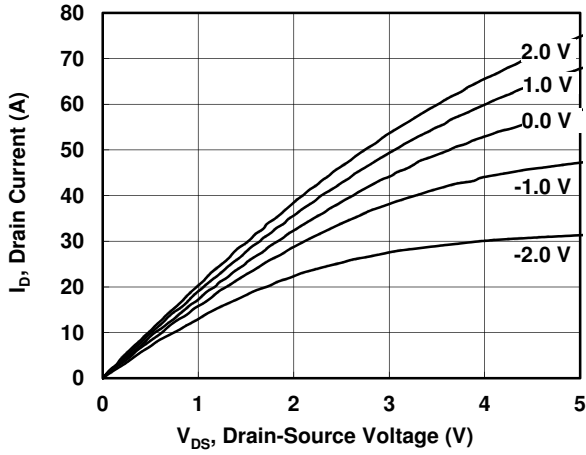


Figure 2. Typical Output Characteristics

$I_D = f(V_{DS}); T_j = 100\text{ }^\circ\text{C}; \text{parameter: } V_{GS}$

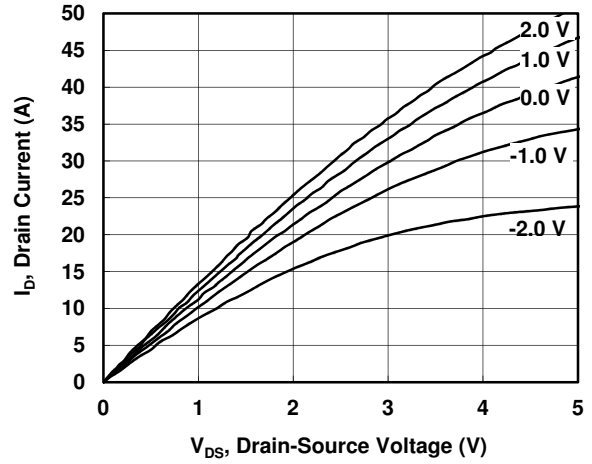


Figure 3. Typical Output Characteristics

$I_D = f(V_{DS}); T_j = 150\text{ }^\circ\text{C}; \text{parameter: } V_{GS}$

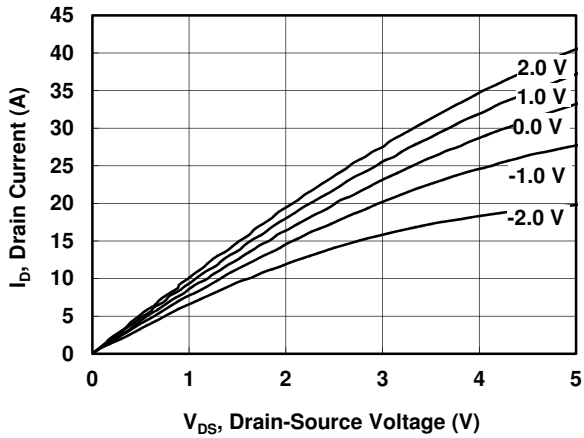


Figure 4. Safe Operating Area

$I_D = f(V_{DS}); T_C = 25\text{ }^\circ\text{C}$

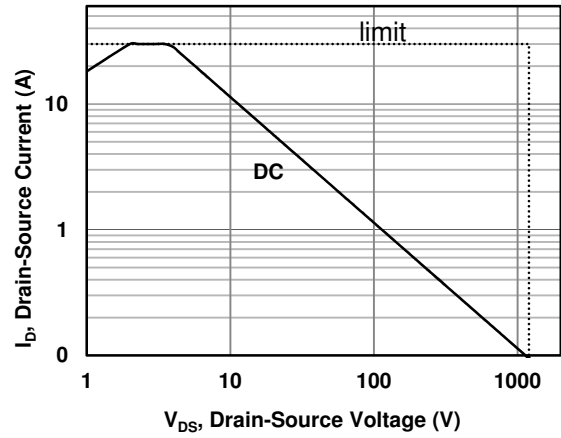


Figure 5. Typical Transfer Characteristics

$I_D = f(V_{GS}); V_{DS} = 5\text{ V}; T_j = 25\text{ }^\circ\text{C}$

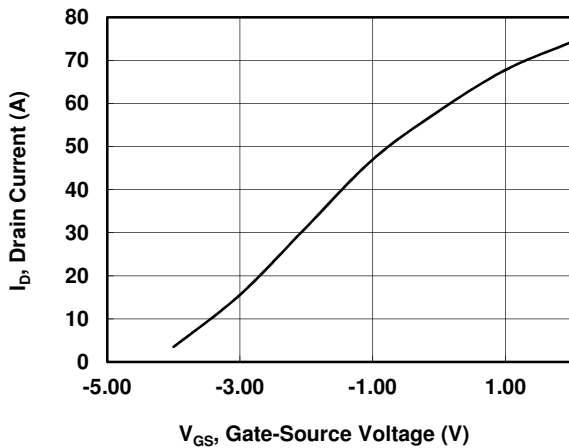


Figure 6. Gate Current

$I_G = f(V_{GS}); \text{parameter: } T_j$

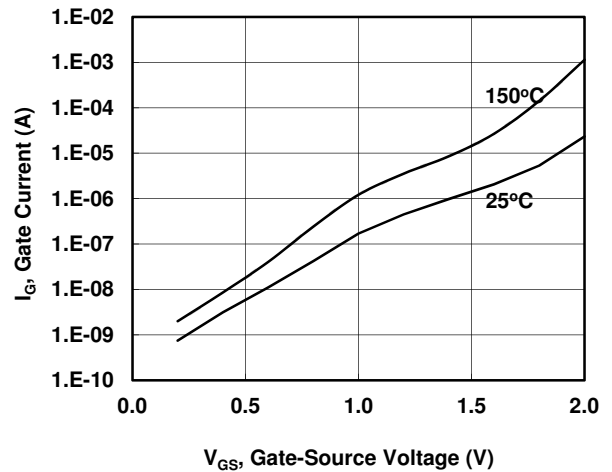


Figure 7. Drain-Source On-resistance

$$R_{DS(on)} = f(I_D); V_{GS} = 2.0 \text{ V}; \text{ parameter: } T_j$$

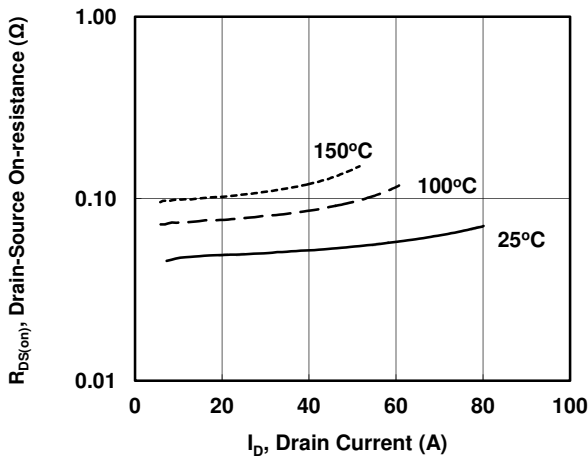


Figure 8. Drain-Source On-resistance

$$R_{DS(on)} = f(T_j); I_D = 20 \text{ A}; \text{ parameter: } V_{GS}$$

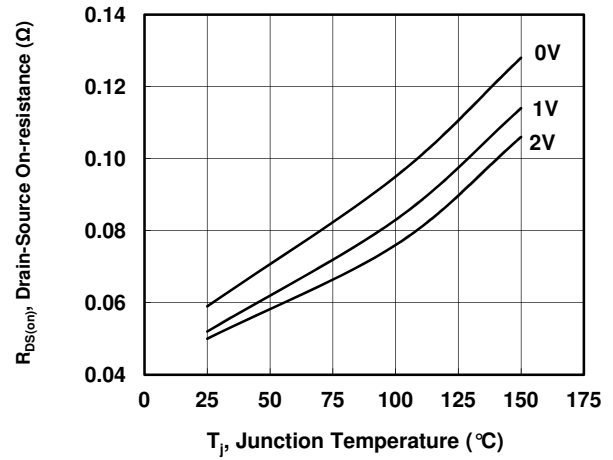


Figure 9. Drain-Source On-resistance

$$R_{DS(on)} = f(V_{GS}); I_D = 20 \text{ A}; T_j = 25^\circ\text{C}$$

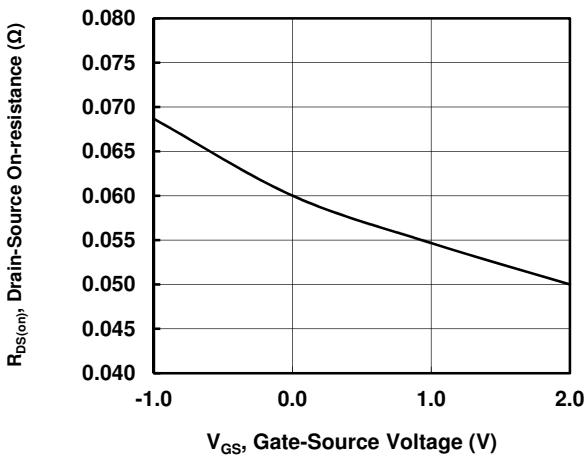


Figure 10. Typical Capacitance

$$C = f(V_{DS}); V_{GS} = -15 \text{ V}; f = 100 \text{ kHz}$$

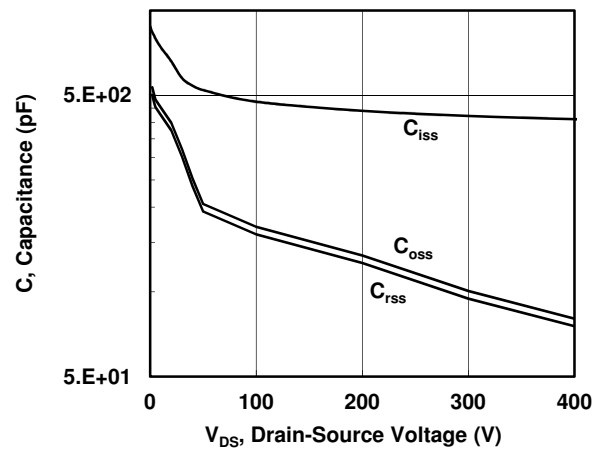


Figure 11. Gate Charge

$$Q_g = f(V_{GS}); V_{DS} = 400 \text{ V}; I_D = 20 \text{ A}; T_j = 25^\circ\text{C}$$

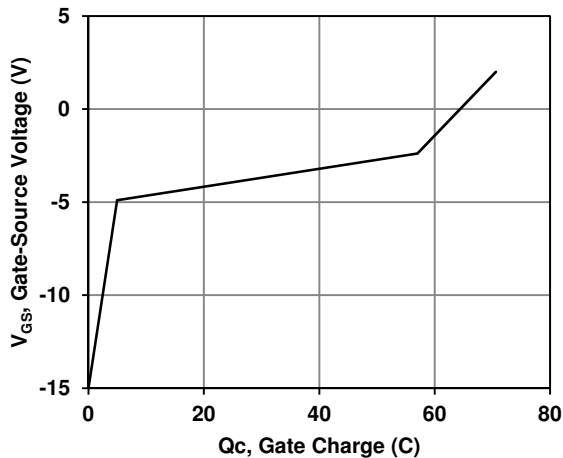


Figure 12. Drain-Source Leakage

$$I_{DSS} = f(V_{DS}); V_{GS} = -15 \text{ V}; \text{ parameter: } T_j$$

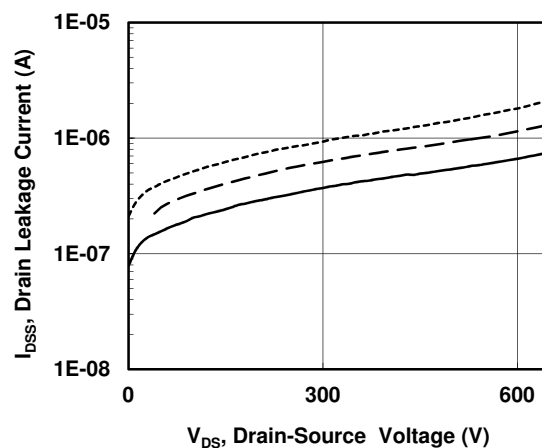


Figure 13. Switching Energy Losses

$$E_s = f(I_D); V_{DS} = 325 \text{ V}; GD = +15 \text{ V}/-15 \text{ V}, R_{GEXT} = 1 \Omega$$

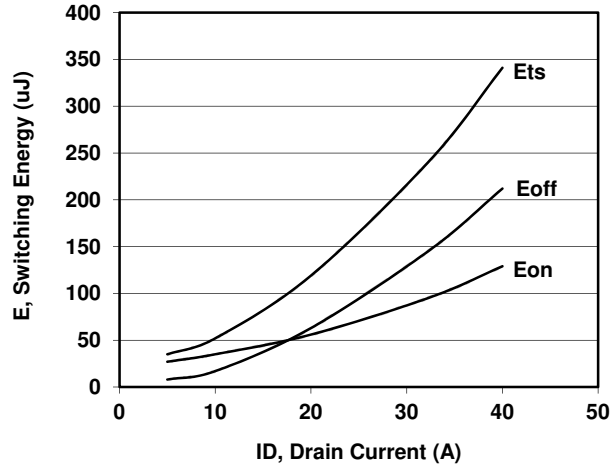
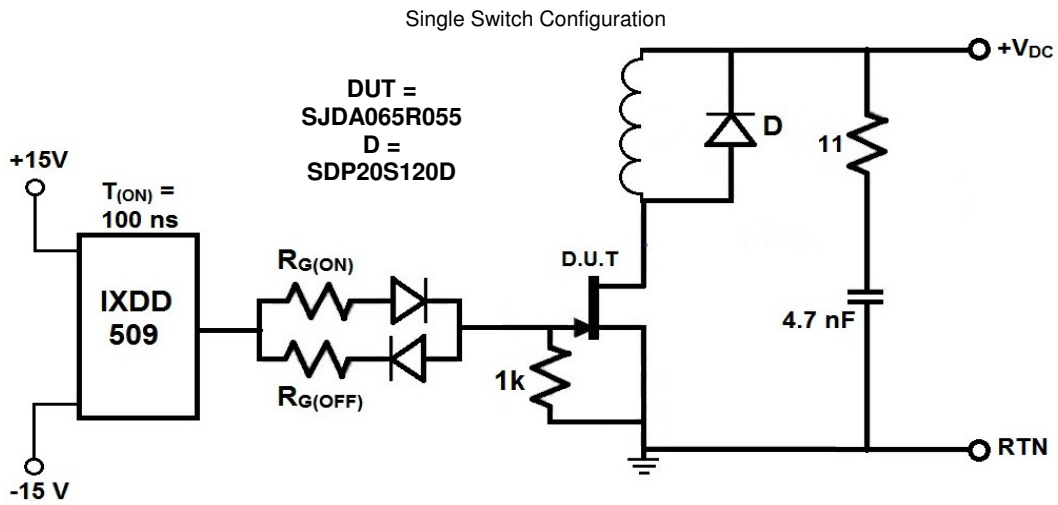
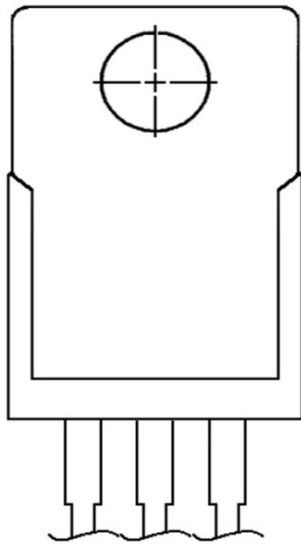
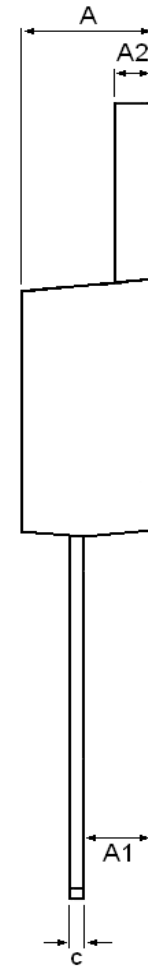
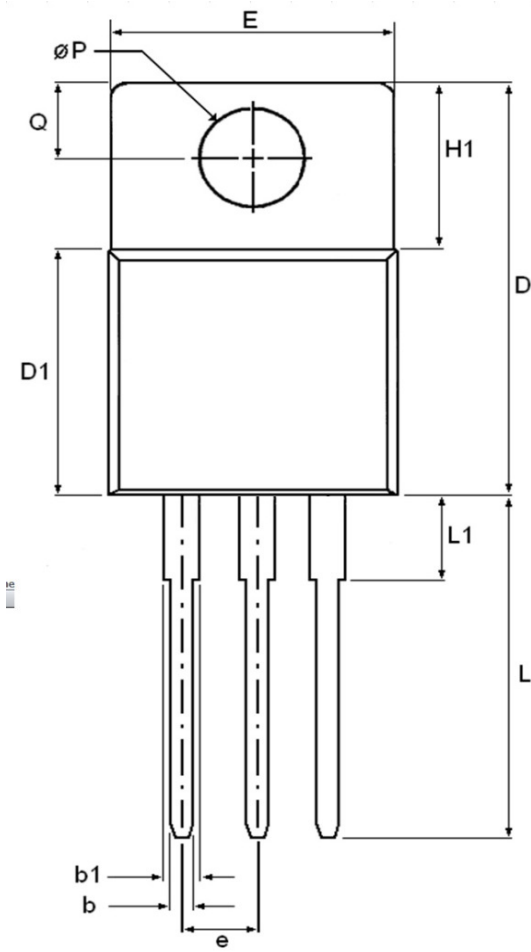


Figure 14. Inductive Load Switching Circuit





DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.191	4.699	0.165	0.185
A1	2.387	2.489	0.094	0.098
A2	1.219	1.321	0.048	0.052
b	0.635	0.889	0.025	0.035
b1	1.143	1.397	0.145	0.055
c	0.458	0.635	0.018	0.025
D	15.113	16.621	0.595	0.615
D1	9.017	9.271	0.355	0.365
e	2.540		0.100	
E	9.677	9.931	0.381	0.391
L	12.700	12.954	0.500	0.510
L1	3.048	3.302	0.120	0.130
Q	2.540	3.048	0.100	0.120
ØP	3.632	3.734	0.143	0.147

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