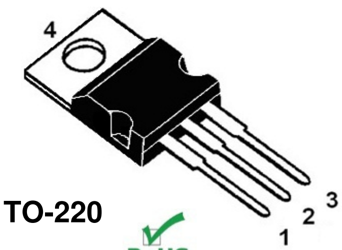
Normally-On Trench Silicon Carbide Power JFET

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

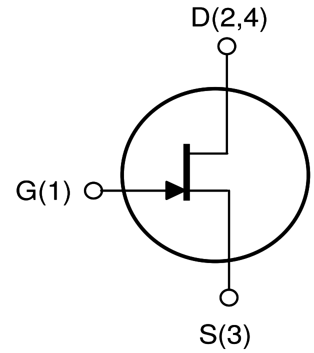
Features:

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



TO-220

RoHS



Internal Schematic

Applications:

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

MAXIMUM RATINGS

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

(1) Pulse width limited by maximum junction temperature

(2) $Rg_{(EXT)}$ = 1 Ω, $t_p \leq$ 200 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	℃ / W
Thermal Resistance, junction-to-ambient	$R_{th,JA}$	-	50	

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Conditions	Value			Unit
			Min	Typ	Max	

Off Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Drain-Source Blocking Voltage	BV_{DS}	V_{GS} = -15 V, I_D = 600 µA	650	-	-	V
Total Drain Leakage Current	I_{DSS}	V_{DS} = 650 V, V_{GS} = -15 V, T_j = 25 °C	-	10	-	µA
		V_{DS} = 1200 V, V_{GS} = -15 V, T_j = 150 °C	-	100	-	
Total Gate Reverse Leakage	I_{GSS}	V_{GS} = -15 V, V_{DS} = 0 V	-	0.1	0.3	mA
		V_{GS} = -15 V, V_{DS} = 650 V	-	0.1	-	

On Characteristics

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

Dynamic Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input Capacitance	C_{iss}	V_{DD} = 100 V, V_{GS} = -15 V, f = 100 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 V to 400 V, V_{GS} = -15 V	-	90	-	

Switching Characteristics

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Turn-on Delay	t_{on}	V_{DS} = 325 V, I_D = 20 A, Inductive Load, T_j = 25 °C, Gate Driver = +15 V, -15 V, $Rg_{(EXT)}$ = 1 Ω, See Figure 13	-	10	-	ns
Rise Time	t_r		-	20	-	
Turn-off Delay	t_{off}		-	20	-	
Fall Time	t_f		-	16	-	
Turn-on Energy	E_{on}		-	56	-	µJ
Turn-off Energy	E_{off}		-	63	-	
Total Switching Energy	E_{ts}		-	119	-	
Turn-on Delay	t_{on}	V_{DS} = 325 V, I_D = 20 A, Inductive Load, T_j = 150 °C, Gate Driver = +15 V, -15 V, $Rg_{(EXT)}$ = 1 Ω, See Figure 13	-	TBD	-	ns
Rise Time	t_r		-	TBD	-	
Turn-off Delay	t_{off}		-	TBD	-	
Fall Time	t_f		-	TBD	-	
Turn-on Energy	E_{on}		-	TBD	-	µJ
Turn-off Energy	E_{off}		-	TBD	-	
Total Switching Energy	E_{ts}		-	TBD	-	
Total Gate Charge	Q_g	V_{DS} = 400 V, I_D = 20 A, V_{GS} = -15 V to + 2 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 °C; parameter: V_{GS}

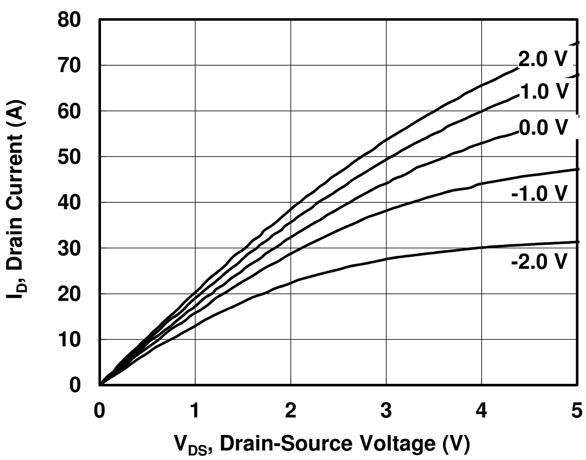


Figure 2. Typical Output Characteristics
$I_D = f(V_{DS})$; T_j = 100 °C; parameter: V_{GS}

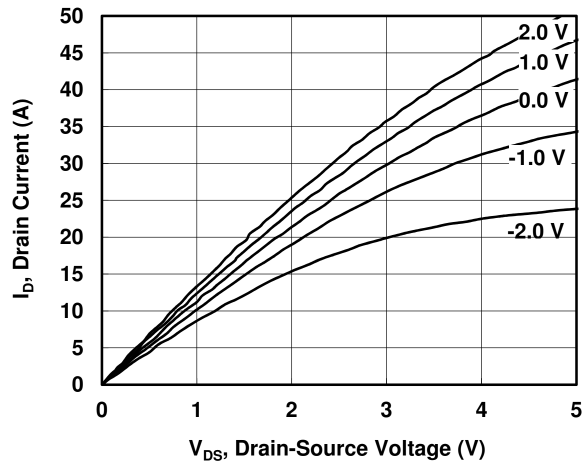


Figure 3. Typical Output Characteristics
$I_D = f(V_{DS})$; T_j = 150 °C; parameter: V_{GS}

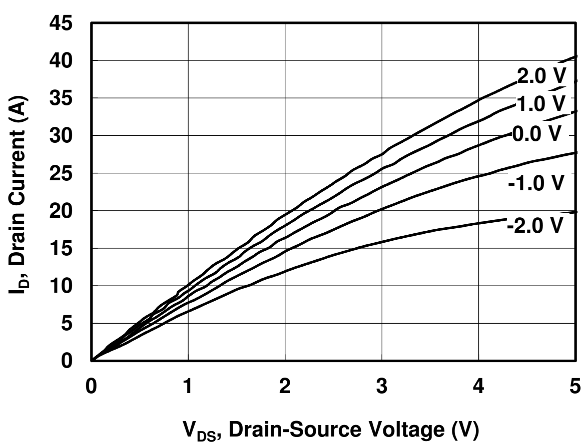


Figure 4. Safe Operating Area
$I_D = f(V_{DS})$; T_C = 25 °C

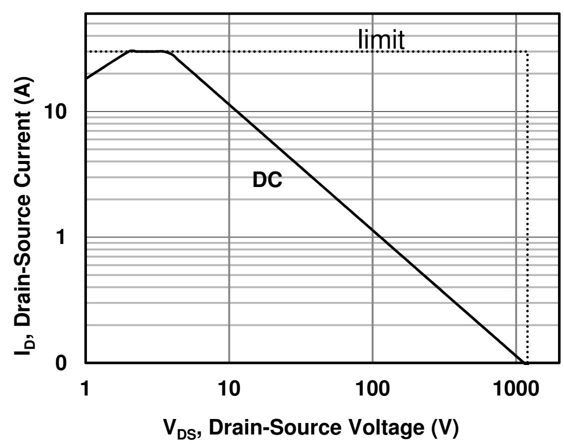


Figure 5. Typical Transfer Characteristics
$I_D = f(V_{GS})$; V_{DS} = 5 V; T_j = 25°C

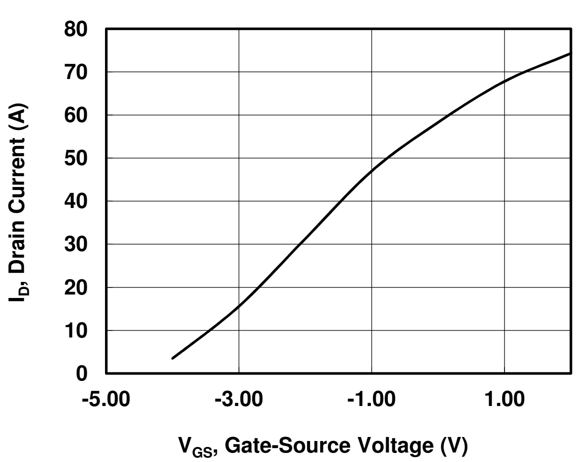


Figure 6. Gate Current
$I_G = f(V_{GS})$; parameter: T_j

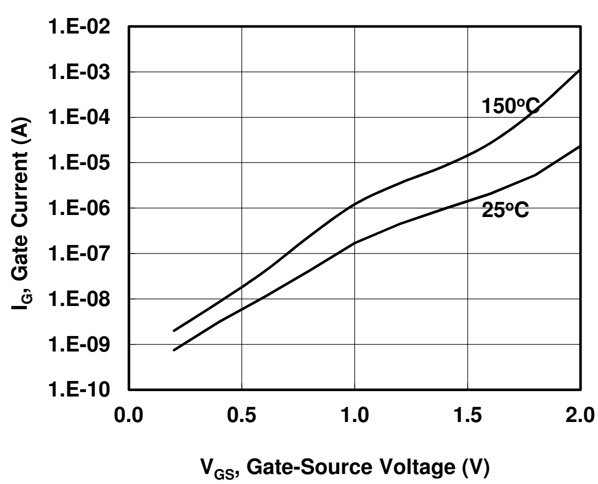


Figure 7. Drain-Source On-resistance

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

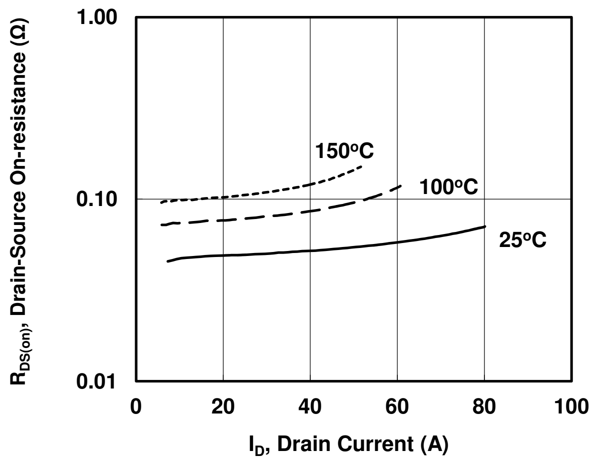


Figure 8. Drain-Source On-resistance

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

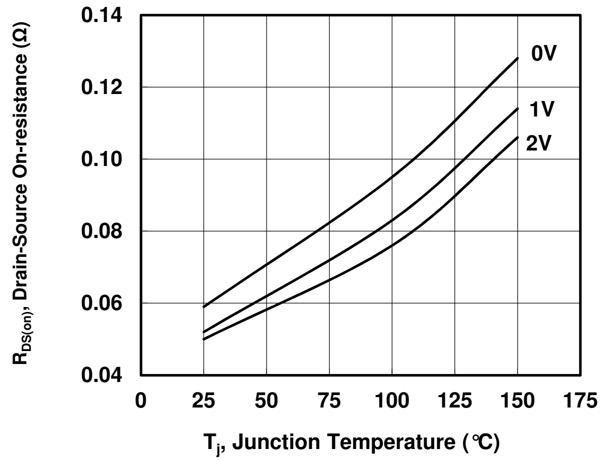


Figure 9. Drain-Source On-resistance

$R_{DS(on)} = f(V_{GS})$; I_D = 20 A; T_j = 25°C

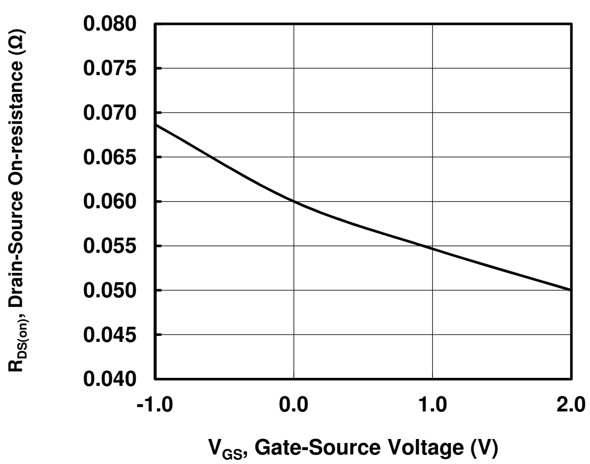


Figure 10. Typical Capacitance

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

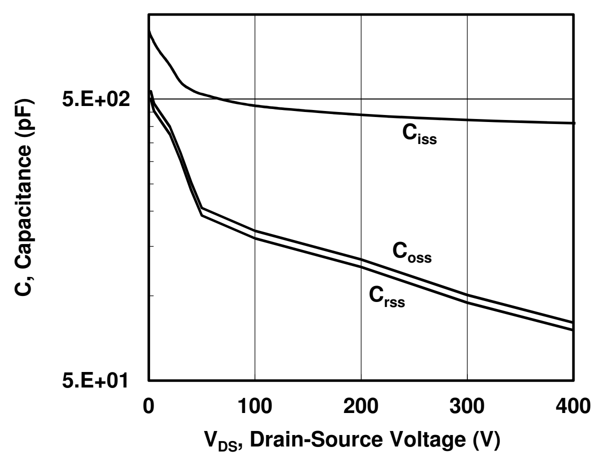


Figure 11. Gate Charge

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

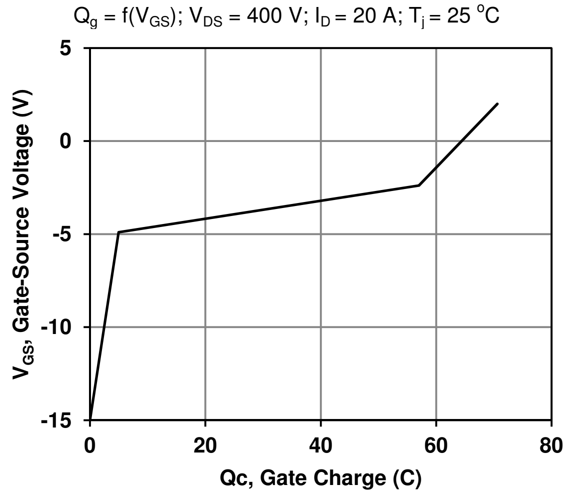


Figure 12. Drain-Source Leakage

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

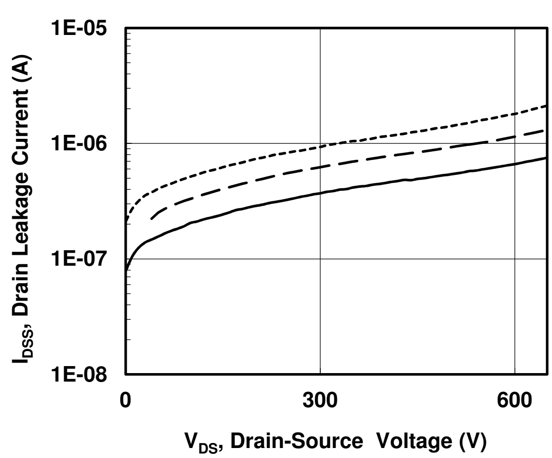


Figure 13. Switching Energy Losses

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

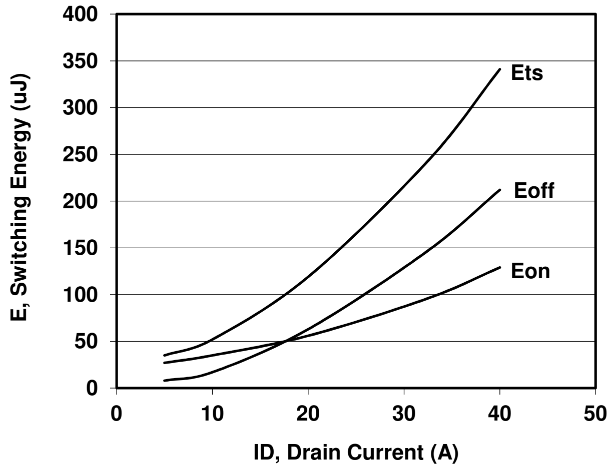
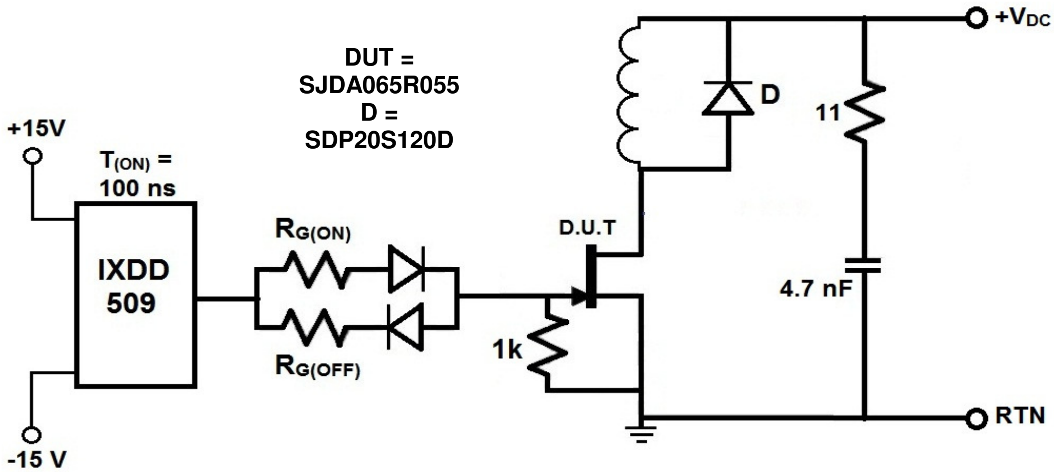
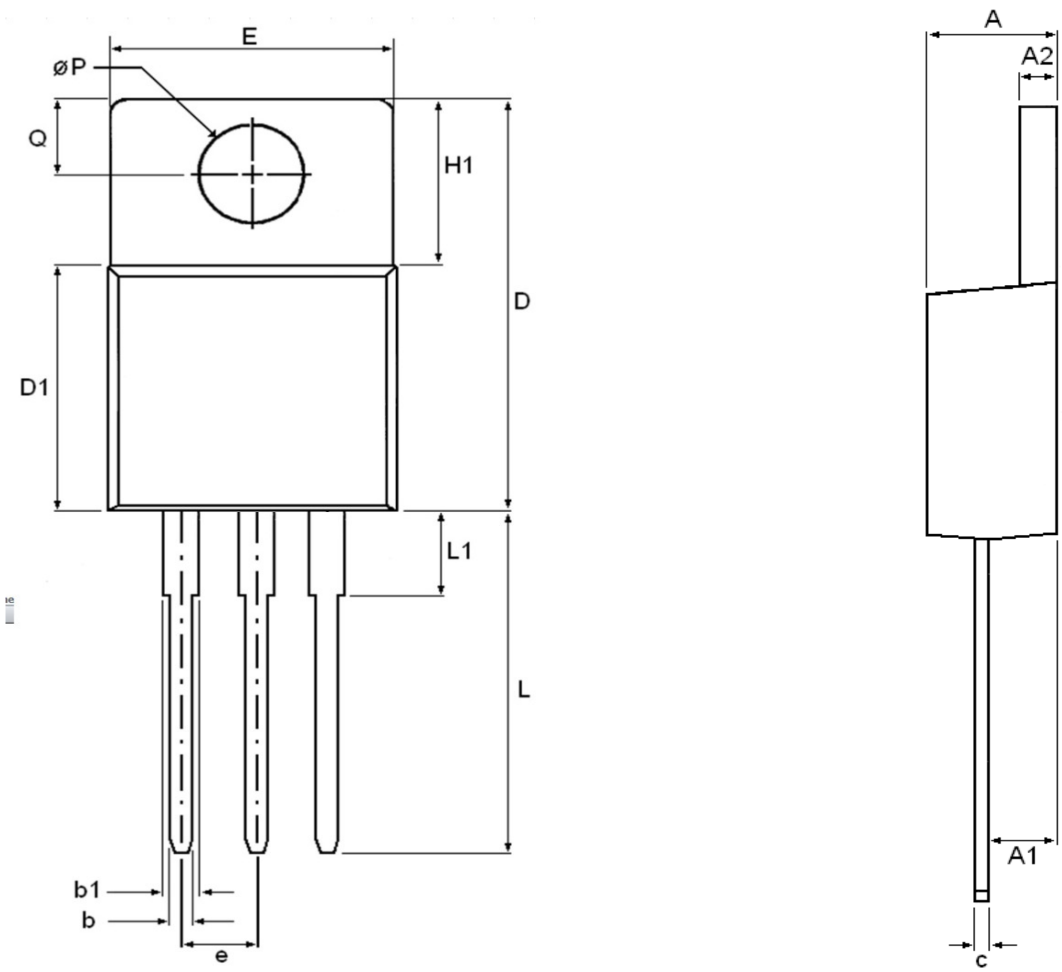
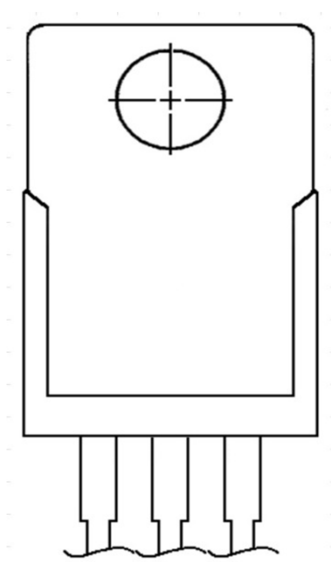


Figure 14. Inductive Load Switching Circuit

Single Switch Configuration







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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