

Normally-On Trench Silicon Carbide Power JFET

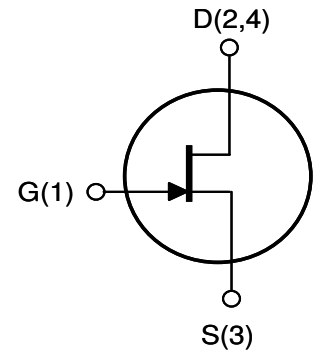
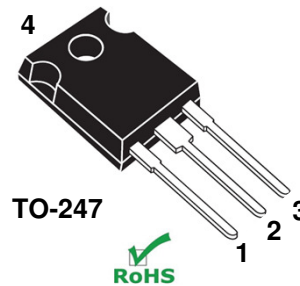
Product Summary		
BV_{DS}	1200	V
$R_{DS(ON)max}$	0.085	Ω
$E_{TS,typ}$	290	μJ

Features:

- Positive Temperature Coefficient for Ease of Paralleling
- Extremely Fast Switching with No "Tail" Current at 150 °C
- $R_{DS(on)}$ typical of 0.075 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	$I_{D, TC=25}$	$T_C = 25\text{ }^\circ\text{C}$	27	A
	$I_{D, TC=100}$	$T_C = 100\text{ }^\circ\text{C}$	17	
Pulsed Drain Current ⁽¹⁾	I_{DM}	$T_j = 25\text{ }^\circ\text{C}$	75	A
Short Circuit Withstand Time	t_{SC}	$V_{DD} < 800\text{ V}, T_j < 125\text{ }^\circ\text{C}$	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⁾ $R_{g(EXT)} = 1\text{ ohm}, t_p \leq 200\text{ns}$, see Figure 5 for static conditions
⁽³⁾ See Figure 13 for gate driver and switching test circuit

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

On Characteristics

Drain-Source On-resistance	$R_{DS(on)}$	$I_D = 17\text{ A}, V_{GS} = 2\text{ V}, T_j = 25^\circ\text{C}$	-	0.075	0.085	Ω
		$I_D = 17\text{ A}, V_{GS} = 2\text{ V}, T_j = 100^\circ\text{C}$	-	0.11	-	
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = 1\text{ V}, I_D = 30\text{ mA}$	-	-5	-	V
Gate Forward Current	$I_{G(FWD)}$	$V_{GS} = +2\text{ V}$	-	40	-	μA
Gate Resistance	R_G	$f = 1\text{ MHz}, \text{ drain-source shorted}$	-	6	-	Ω
	$R_{G(on)}$	$V_{GS} > 2.7\text{ V}; \text{ See Figure 5}$	-	0.5	-	Ω

Dynamic Characteristics

Input Capacitance	C_{iss}	$V_{DD} = 100\text{ V}, V_{GS} = -15\text{ V}, f = 100\text{ kHz}$	-	255	-	pF
Output Capacitance	C_{oss}		-	80	-	
Reverse Transfer Capacitance	C_{rss}		-	80	-	
Effective Output Capacitance, energy related	$C_{o(er)}$	$V_{DS} = 0\text{ V to } 600\text{ V}, V_{GS} = -15\text{ V}$	-	50	-	

Switching Characteristics

Turn-on Delay	t_{on}	$V_{DS} = 600\text{ V}, I_D = 17\text{ A}, \text{ Inductive Load}, T_j = 25^\circ\text{C}$ Gate Driver = +15V, -15V, $R_{g(EXT)} = 5\ \Omega$	-	TBD	-	ns
Rise Time	t_r		-	TBD	-	
Turn-off Delay	t_{off}		-	TBD	-	
Fall Time	t_f		-	TBD	-	
Turn-on Energy	E_{on}		-	160	-	
Turn-off Energy	E_{off}	See Figure 13	-	130	-	μJ
Total Switching Energy	E_{ts}		-	290	-	
Turn-on Delay	t_{on}		$V_{DS} = 600\text{ V}, I_D = 17\text{ A}, \text{ Inductive Load}, T_j = 150^\circ\text{C}$ Gate Driver = +15V, -15V, $R_{g(EXT)} = 5\ \Omega$	-	TBD	
Rise Time	t_r	-		TBD	-	
Turn-off Delay	t_{off}	-		TBD	-	
Fall Time	t_f	-		TBD	-	
Turn-on Energy	E_{on}	-		165	-	
Turn-off Energy	E_{off}	See Figure 13	-	125	-	μJ
Total Switching Energy	E_{ts}		-	290	-	
Total Gate Charge	Q_g		$V_{DS} = 600\text{ V}, I_D = 10\text{ A}, V_{GS} = +2.5\text{ V}$	-	32	
Gate-Source Charge	Q_{gs}	-		2	-	
Gate-Drain Charge	Q_{gd}	-		27	-	

Figure 1. Typical Output Characteristics

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

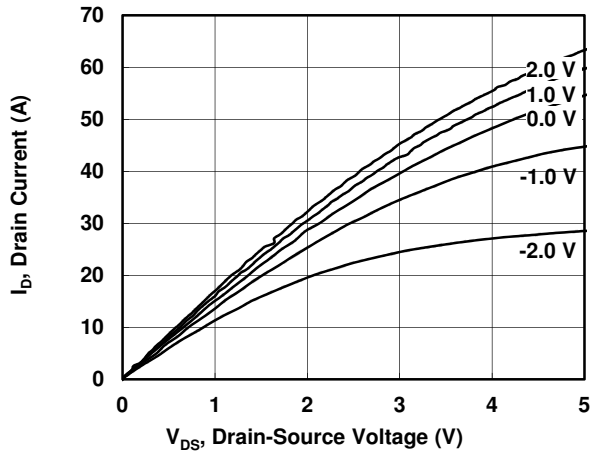


Figure 2. Typical Output Characteristics

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

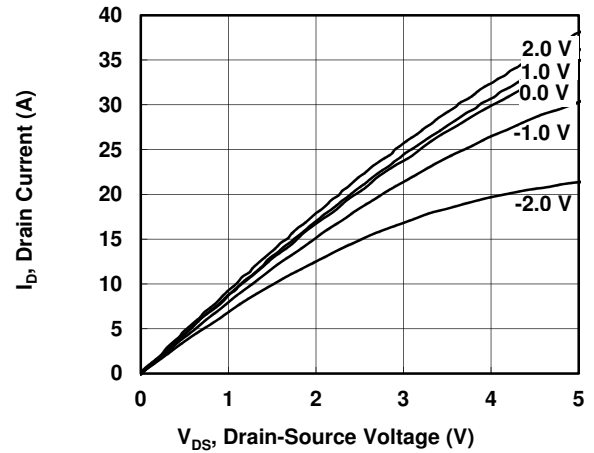


Figure 3. Typical Output Characteristics

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

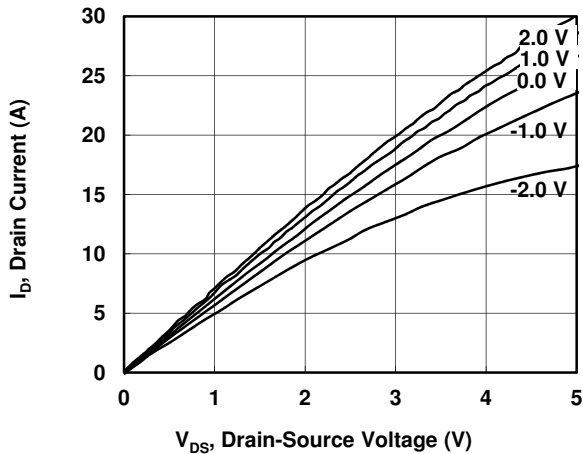


Figure 4. Typical Transfer Characteristics

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

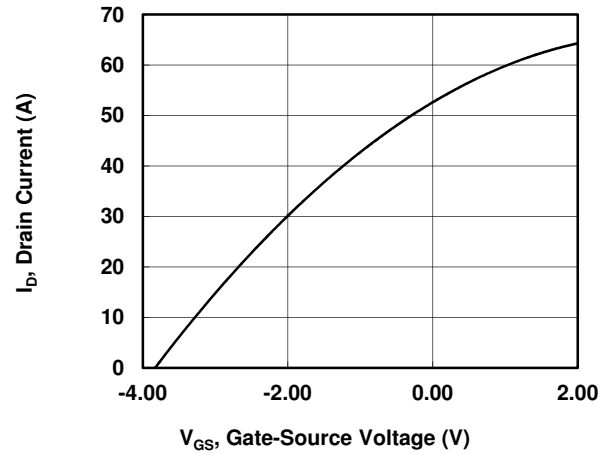


Figure 5. Gate Current

$I_G = f(V_{GS});$ parameter: T_J

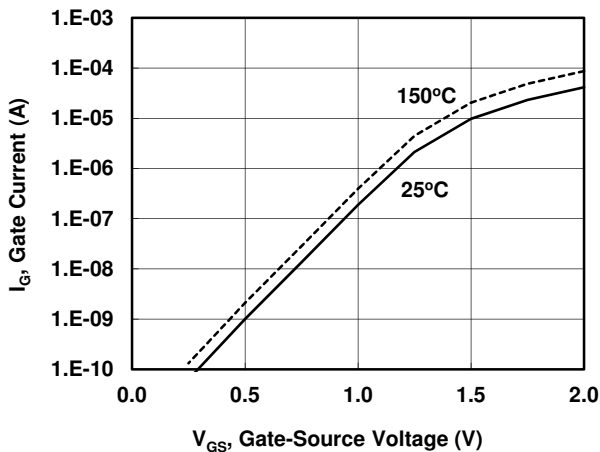


Figure 6. Drain-Source On-resistance

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

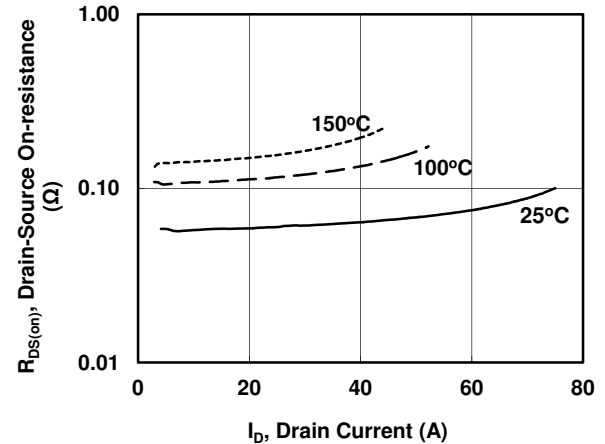


Figure 7. Drain-Source On-resistance

$R_{DS(ON)} = f(T_j)$; $I_D = 17A$; parameter: V_{GS}

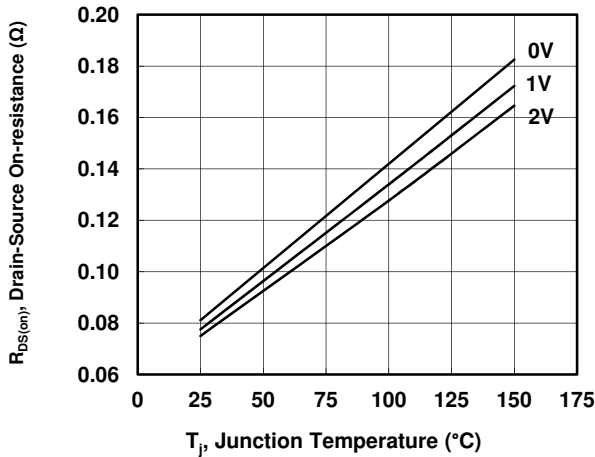


Figure 8. Drain-Source On-resistance

$R_{DS(on)} = f(V_{GS})$; $I_D = 17A$; $T_j = 25^\circ C$

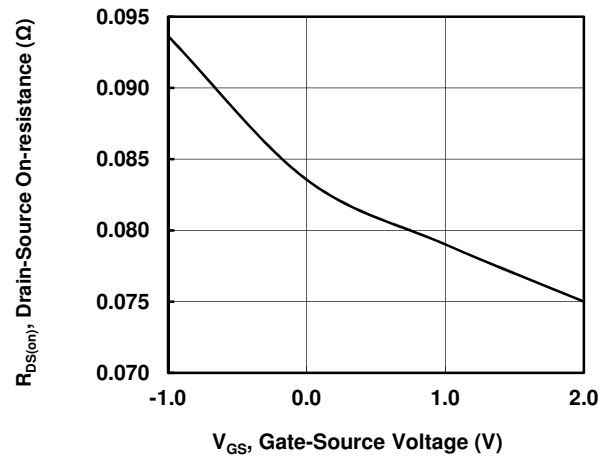


Figure 9. Typical Capacitance

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

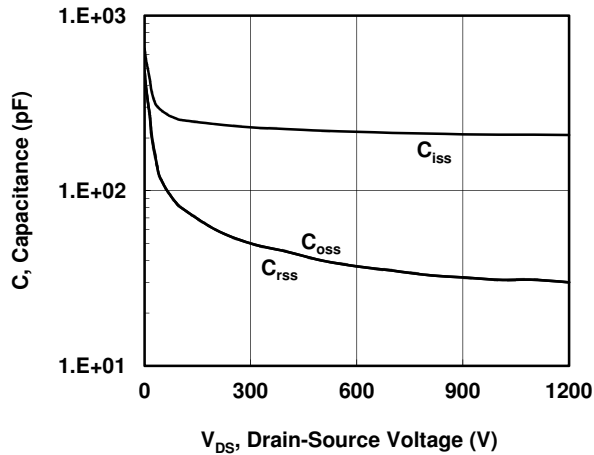


Figure 10. Drain-Source Leakage

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

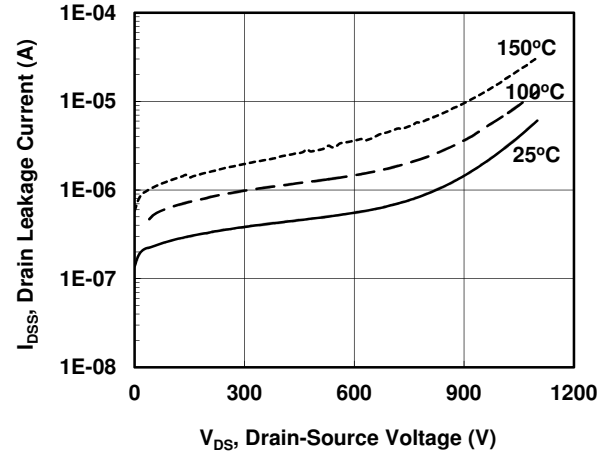


Figure 11. Switching Energy Losses⁽³⁾

$E_s = f(I_D)$; $V_{DS} = 600V$; $GD = +15V/-15V$, $R_{g(EXT)} = 5 \Omega$

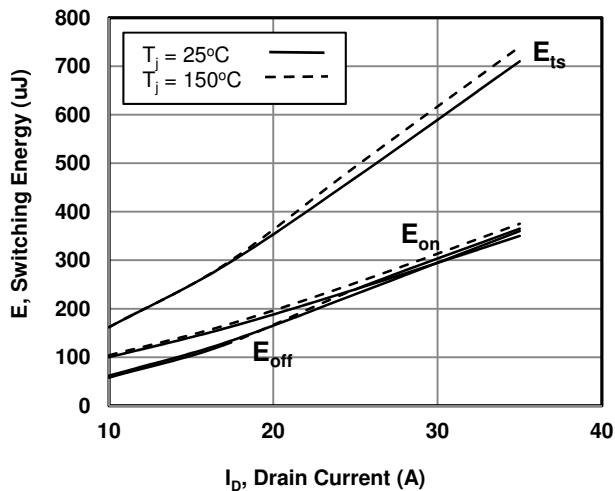


Figure 12. Switching Energy Losses⁽³⁾

$E_s = f(R_{g(EXT)})$; $V_{DS} = 600V$; $I_D = 17A$, $GD = +15V/-15V$

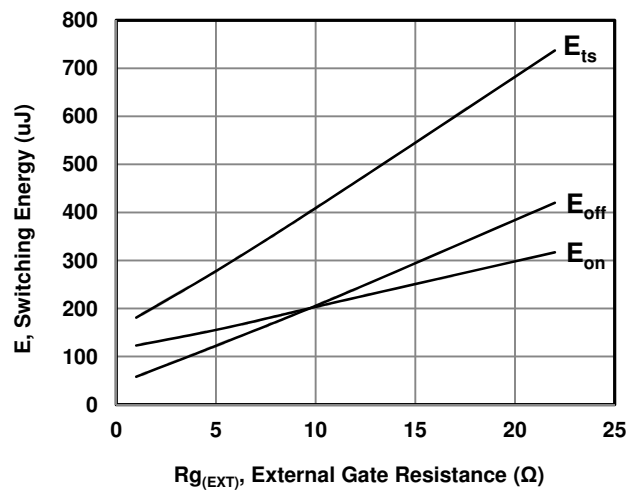


Figure 13. Inductive Load Switching Circuit

Single Switch Configuration

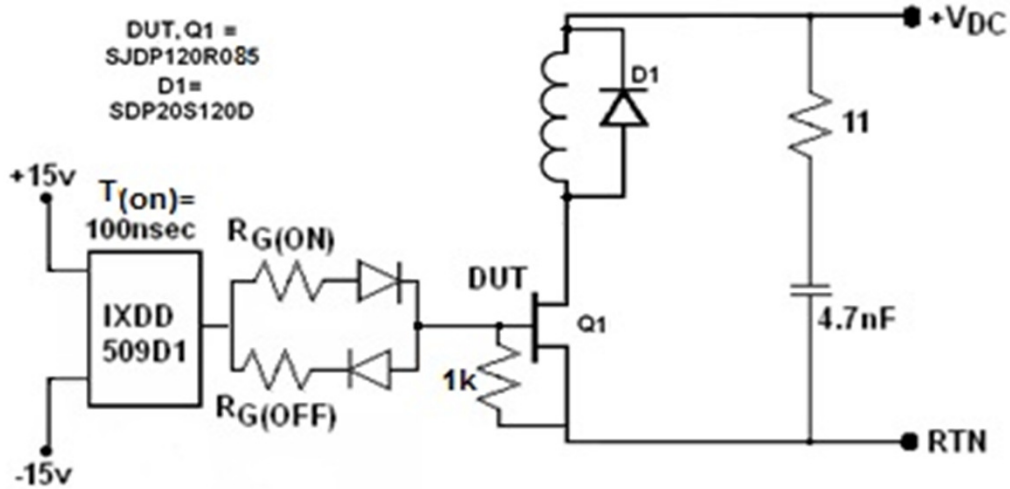
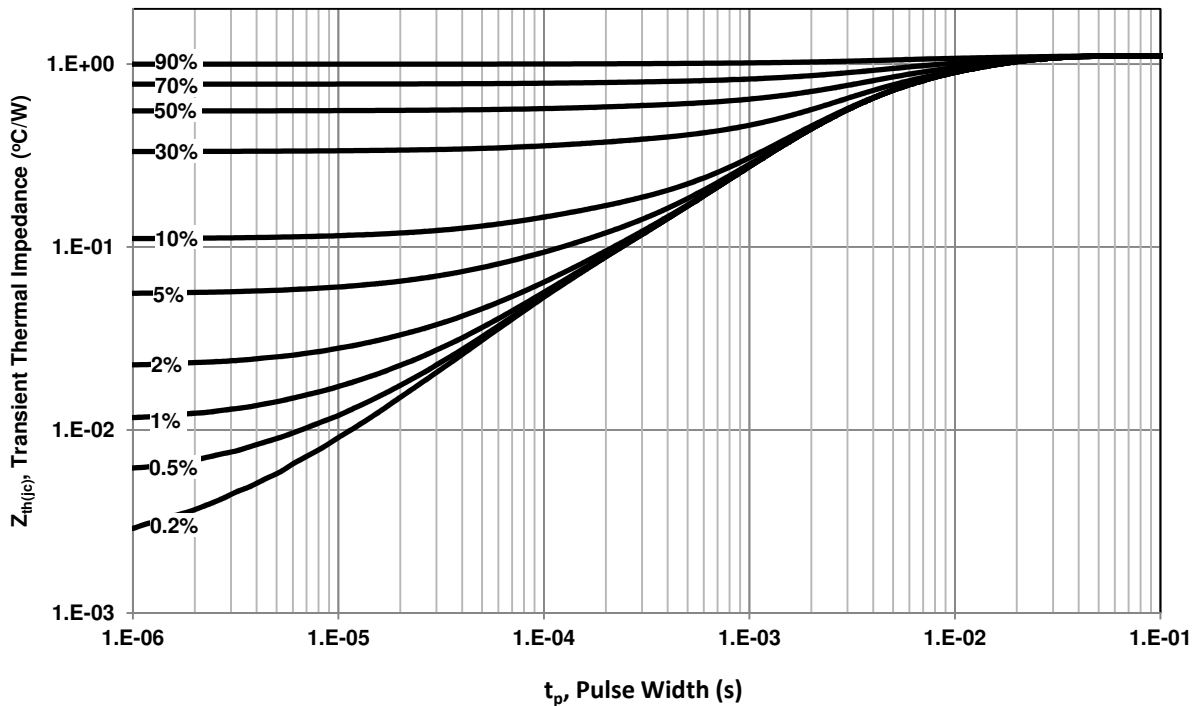
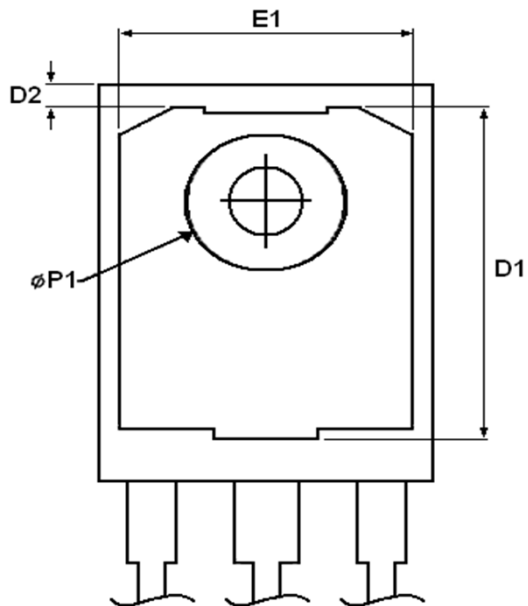
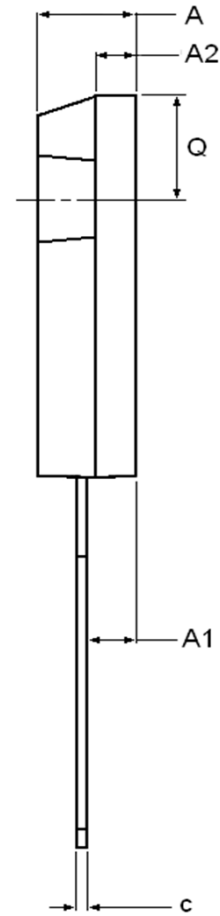
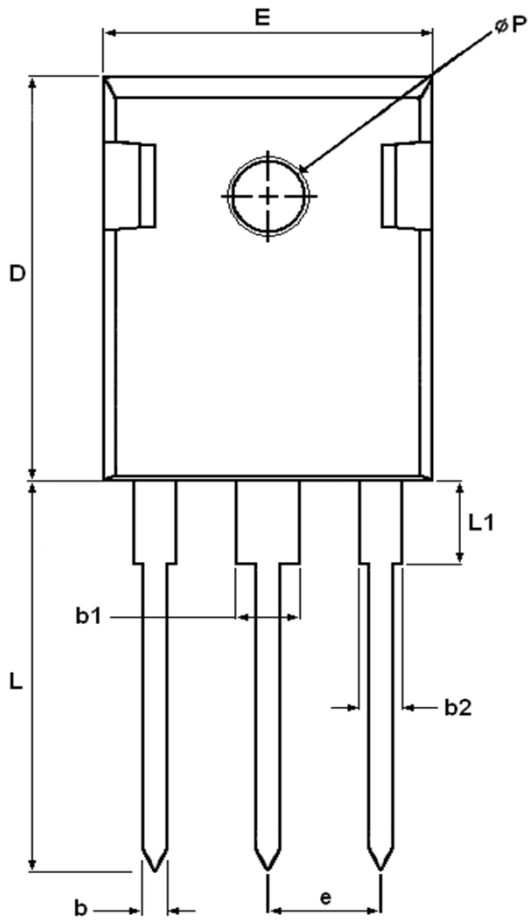


Figure 14. Transient Thermal Impedance

$Z_{th(jc)} = f(t_p)$; parameter: Duty Ratio





DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.903	5.157	0.193	0.203
A1	2.273	2.527	0.090	0.100
A2	1.853	2.108	0.073	0.083
b	1.073	1.327	0.042	0.052
b1	2.873	3.381	0.113	0.133
b2	1.903	2.386	0.042	0.052
c	0.600	0.752	0.024	0.029
D	20.823	21.077	0.820	0.830
D1	17.393	17.647	0.685	0.695
D2	1.063	1.317	0.042	0.052
e	5.450		0.215	
E	15.773	16.027	0.621	0.631
E1	13.893	14.147	0.547	0.557
L	20.053	20.307	0.789	0.799
L1	4.168	4.472	0.165	0.175
Q	6.043	6.297	0.238	0.248
ϕP	3.560	3.660	0.140	0.144
$\phi P1$	7.063	7.317	0.278	0.288

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