PowerCubeSemi, Inc.
Potential · Convergence · Smart

PCM080R120EY

1,200V 33A 80mΩ Silicon Carbide MOSFET

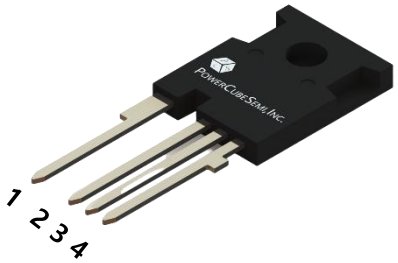
Features

- High-Speed Switching
- Essentially no switching losses
- Reduction of heat sink requirements
- Maximum working temperature at 175℃
- High blocking voltage
- Fast Intrinsic diode with low recovery current
- High-frequency operation

Applications

- Power Factor Correction, PFC
- Solar Inverters
- Uninterruptible Power Supply, UPS
- Motor Drives
- Photovoltaic Inverter
- Electric Car and Charger

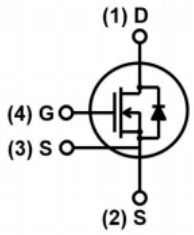
Package Outline



RoHS

Halogen-Free

(1) D (Drain)
(2) S (Source)
(3) S (Driver Source)
(4) G (Gate)



Absolute Maximum Ratings

T_C = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	1200	V
I_D	Drain Current - Continuous (T_j = 25℃)	33	A
	Drain Current - Continuous (T_j = 110℃)	24	A
I_{DM}	Drain Current - Pulsed	81	A
$V_{GSS\ Max}$	Gate-Source Voltage	-10 / 25	V
V_{GSS}	Gate-Source Voltage (Recommended operational)	-5 / 20	V
P_D	Power Dissipation (T_C = 25℃, T_J = 175℃)	224	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	℃

Thermal Characteristics

Symbol	Parameter	Value			Units
		Min	Typ	Max	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	-	0.67	-	℃/W

Electrical Characteristics

Static Electrical Characteristics T_C = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D = 100 uA	1200	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 1200 V, V_{GS} = 0 V	-	1	50	μA
		V_{DS} = 1200 V, V_{GS} = 0 V, T_J=175 ℃	-	10	-	
I_{GSS}	Gate-Source Leakage Current	V_{GS} = 20 V, V_{DS} = 0 V	-	-	250	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 20 mA	-	3	4.5	V
$R_{DS(on)}$	Drain-Source On-Resistance	V_{GS} = 20 V, I_D = 15 A	-	80	110	mΩ
		V_{GS} = 20 V, I_D = 15 A, T_J=175℃	-	134	-	
g_f	Transconductance	V_{DS}=9.8V, I_D=15A	-	6.5	-	S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = 800 V, V_{GS} = 0 V, f = 1 ㎒, V_{AC} = 25 mV	-	2644	-	pF
C_{oss}	Output Capacitance		-	85	-	
C_{rss}	Reverse Transfer Capacitance		-	8	-	

Switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 800 V, V_{GS} = -4 / 20 V, I_D = 30 A, R_L = 27 Ω, R_G = 2.7 Ω	-	28	-	ns
t_r	Turn-On Rise Time		-	64	-	
$t_{d(off)}$	Turn-Off Delay Time		-	60	-	
t_f	Turn-Off Fall Time		-	26.4	-	
E_{on}	Turn-On Switching loss	V_{DD} = 800 V, V_{GS} = 0 / 20 V I_D= 30A, R_G = 2.7 Ω	-	22	-	uJ
E_{off}	Turn-Off Switching loss		-	22	-	
Q_g	Total Gate Charge	V_{DS} = 800 V, I_D = 30 A, V_{GS} = -5 / 20 V	-	131	-	nC
Q_{gs}	Gate-Source Charge		-	57	-	
Q_{gd}	Gate-Drain Charge		-	23	-	
R_G	Internal Gate Resistance	V_{AC}=25mV, f=1㎒	-	0.75	-	Ω

Body Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_S	Maximum Continuous Diode Forward Current	V_{GS} = 0 V, T_J=25℃	-	36	-	A
V_{SD}	Diode Forward Voltage	V_{GS} = 0 V, I_S = 7.5A	-	3	-	V
t_{rr}	Reverse Recovery Time	V_R = 400 V, V_{GS} = 0 V, I_{SD} = 30 A, di/dt = 300 A/us	-	50	-	ns
Q_{rr}	Reverse Recovery Charge		-	81	-	nC
I_{rr}	Reverse Recovery Current		-	3.2	-	A

※ When using SiC Body Diode the Maximum recommended V_{GS}= -5V

Typical Characteristics

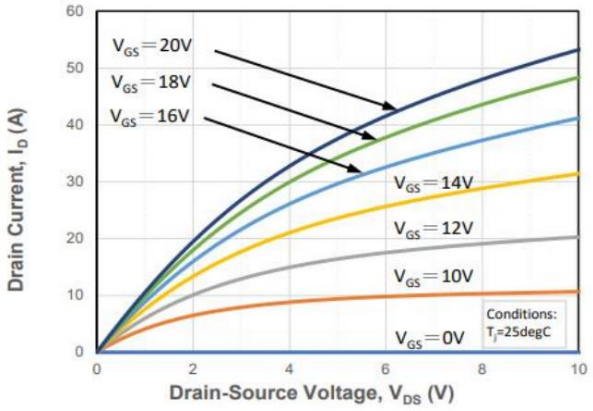


Figure 1. Output Characteristics at T_J=25 ℃

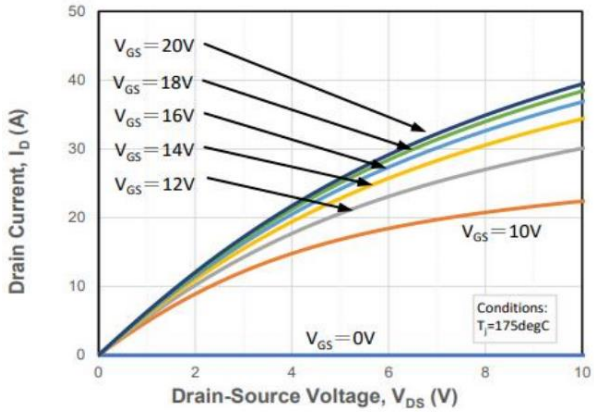


Figure 2. Output Characteristics at T_J=175 ℃

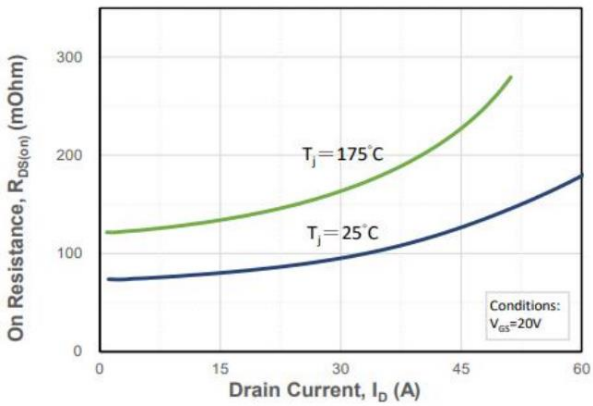


Figure 3. On-resistance vs. Drain Current

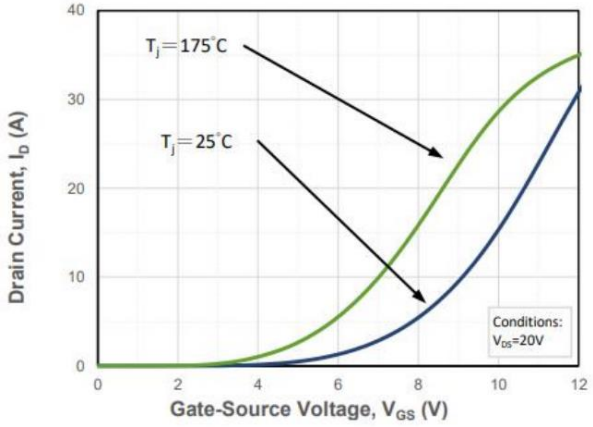


Figure 4. Transfer characteristics for various T_J

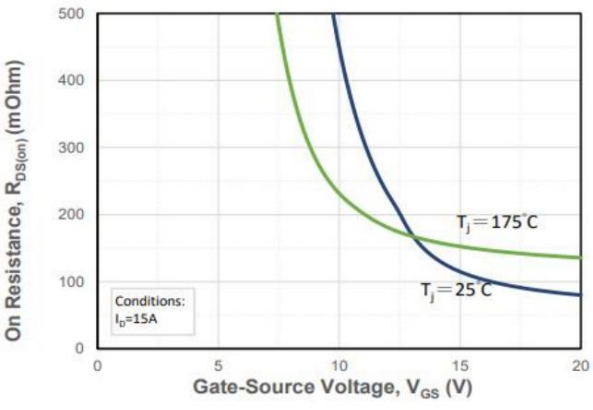


Figure 5. On-Resistance vs. Gate voltage for various T_J

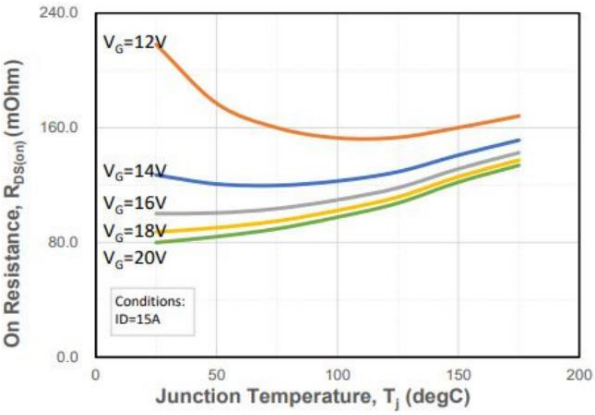


Figure 6. On-Resistance vs. Temperature for various Gate voltage

Typical Characteristics

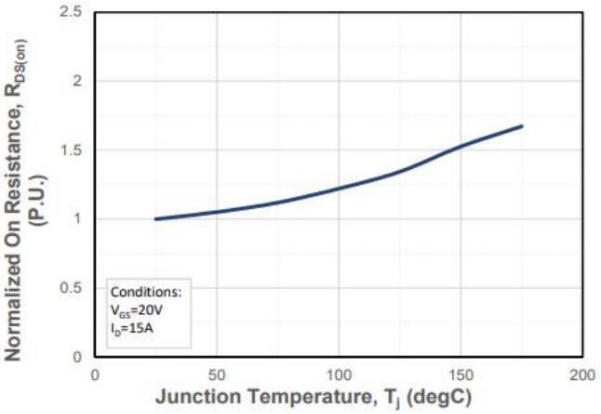


Figure 7. Normalized On-resistance vs. Temperature

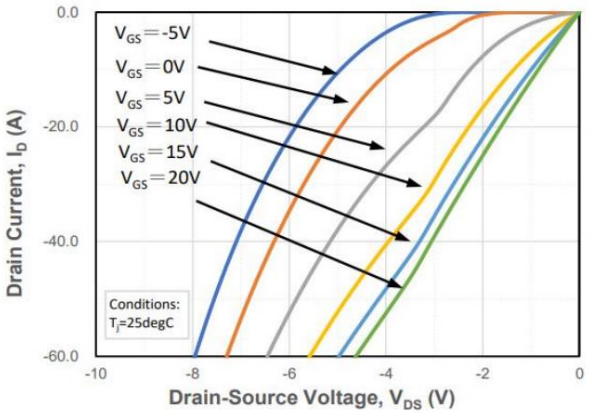


Figure 8. Reverse Output Characteristics at T_J=25℃

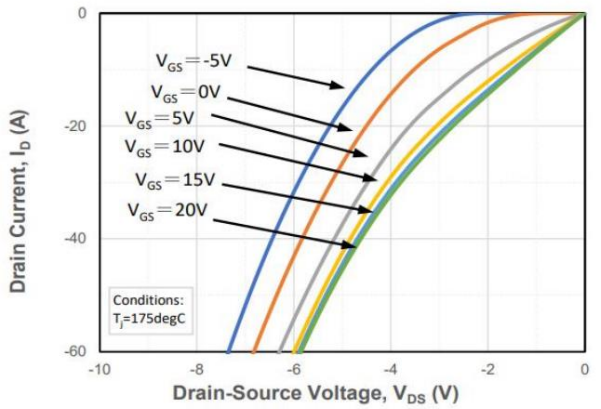


Figure 9. Reverse Output Characteristics at T_J=175 ℃

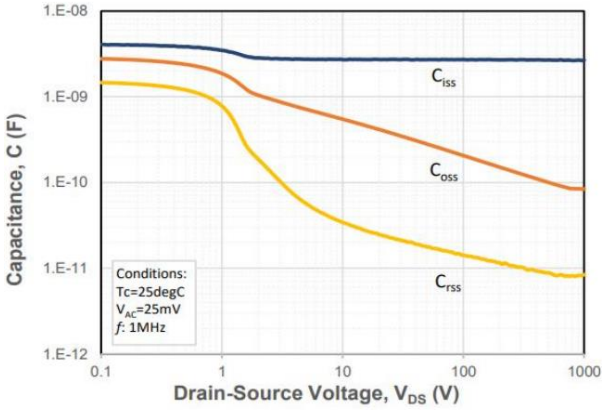


Figure 10. Capacitances vs. Drain to Source Voltage

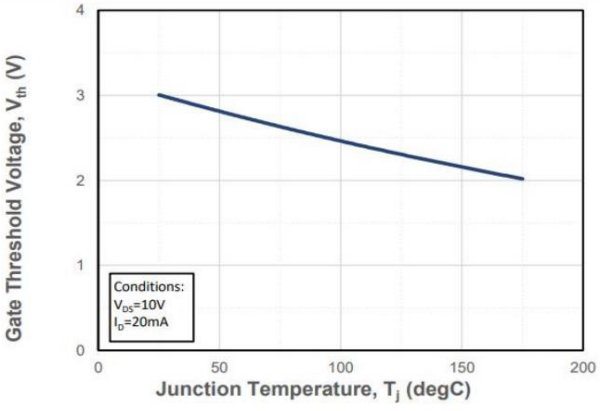


Figure 11. Threshold Voltage vs. Temperature

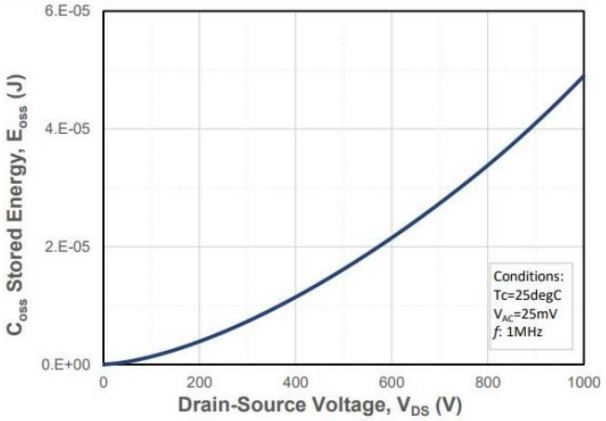


Figure 12. Output Capacitor Stored Energy

Typical Characteristics

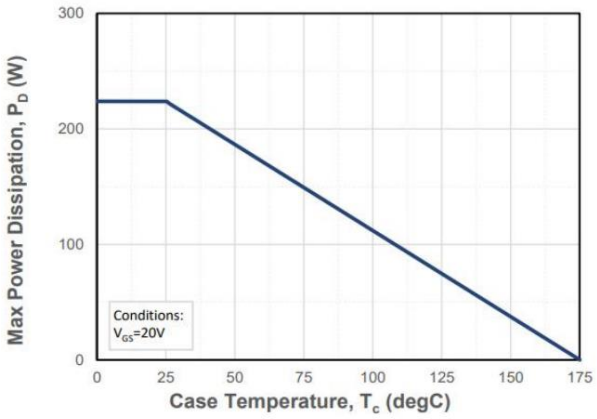


Figure 13. Maximum Power Dissipation Derating vs. Case Temperature

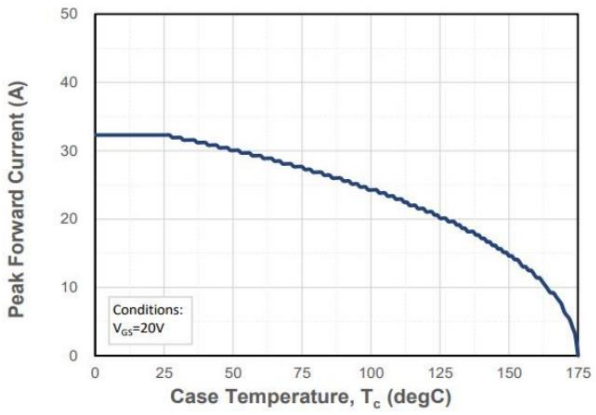


Figure 14. Drain Current Derating vs. Case Temperature

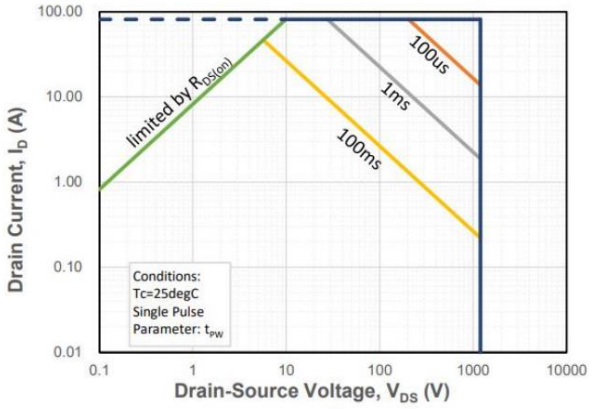


Figure 15. Safe Operating Area

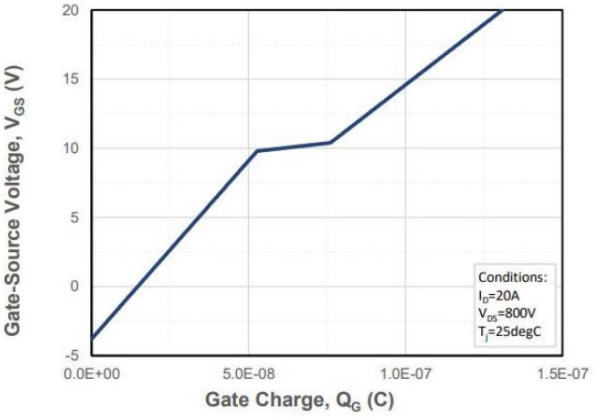


Figure 16. Gate Charge Characteristics

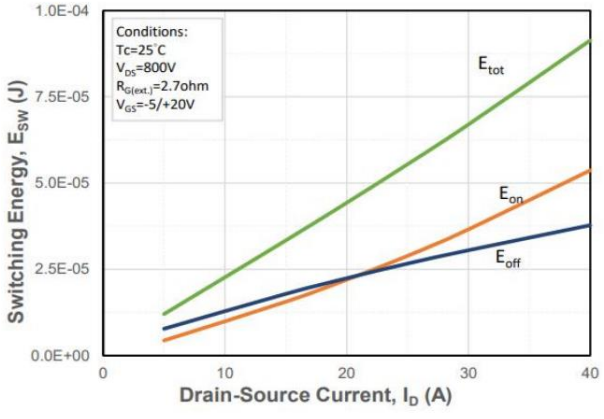


Figure 17. Clamped Inductive Switching Energy vs. Drain Current

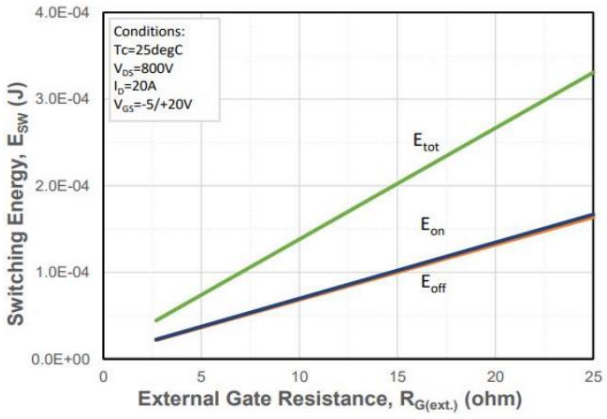


Figure 18. Clamped Inductive Switching Energy vs. External Gate Resistor

Typical Characteristics

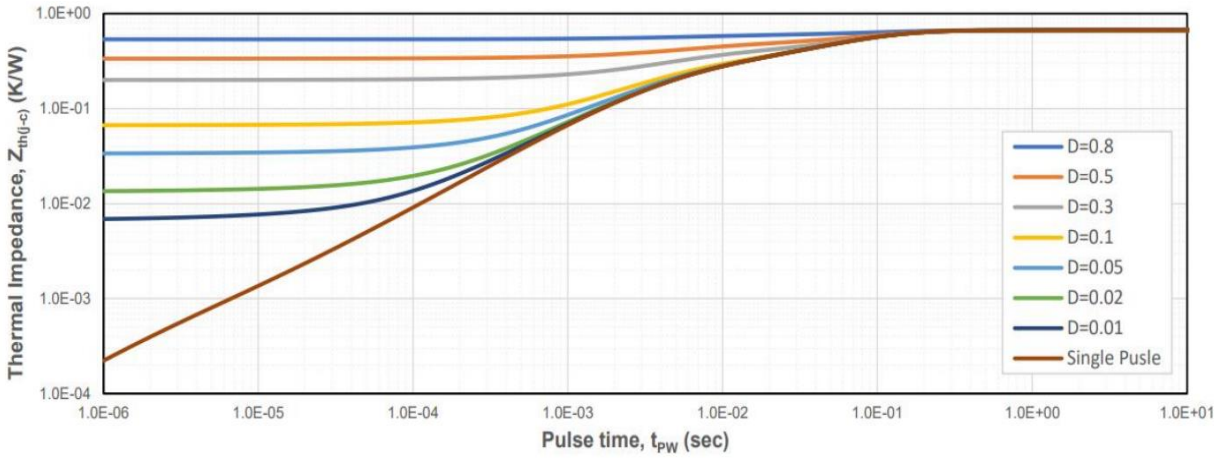
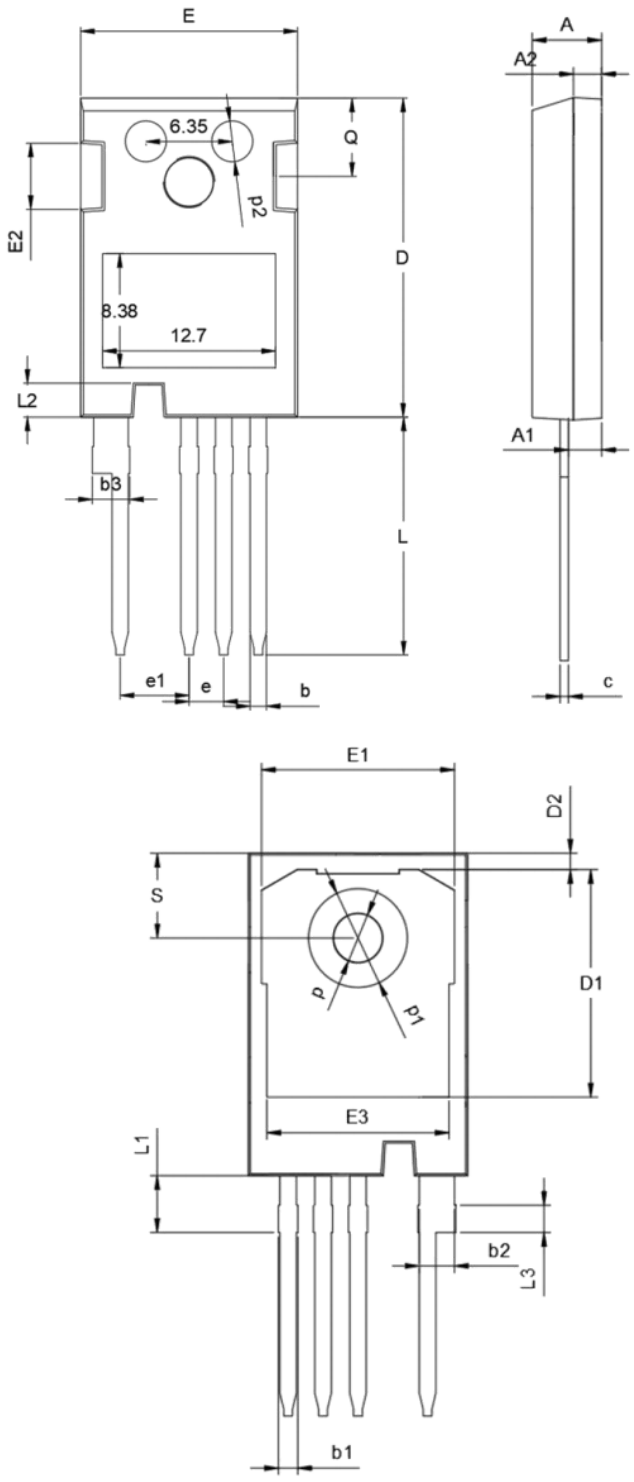


Figure 19. Transient Junction to Case Thermal Impedance

Package Information

Package Outline

Unit : mm



SYMBOL	DIMENSIONS		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.30	2.40	2.50
A2	1.88	1.98	2.08
b	1.10	1.20	1.30
b1	1.20	-	1.50
b2	2.35	2.55	2.75
b3	2.45	-	2.85
c	0.55	0.60	0.65
D	23.3	23.45	23.6
D1	16.25	16.55	16.85
D2	1.00	-	1.30
e	Typ. 2.54		
e1	Typ. 5.06		
E	15.75	15.90	16.05
E1	13.80	-	14.20
E2	4.40	4.75	5.10
E3	13.00	-	13.45
L	17.34	17.49	17.64
L1	4.00	-	4.30
L2	2.35	-	2.65
L3	Typ. 1.98		
Q	5.60	5.80	6.00
S	6.05	-	6.30
p	Typ. 3.58		
p1	Typ. 7.18		
p2	Typ. 3.00		