

PCM040R120EY

1,200V 62A 40mΩ Silicon Carbide MOSFET

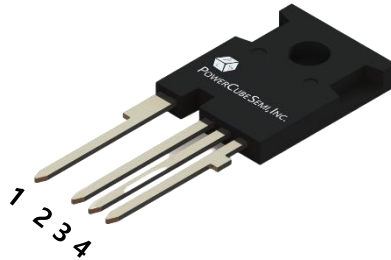
Features

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

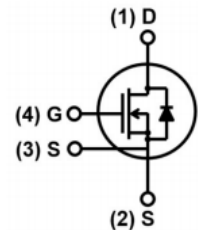
Applications

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

Package Outline



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



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	1200	V
I_D	Drain Current - Continuous ($T_j = 25^\circ\text{C}$) - Continuous ($T_j = 100^\circ\text{C}$)	62	A
		42	A
I_{DM}	Drain Current - Pulsed	223	A
$V_{GSS\ Max}$	Gate-Source Voltage	-10 / 25	V
V_{GSS}	Gate-Source Voltage (Recommended operational)	-5 / 20	V
E_{AS}	Avalanche Energy, Single Pulse	1875	mJ
P_D	Power Dissipation ($T_j = 25^\circ\text{C}$)	326	W
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Value			Units
		Min	Typ	Max	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	-	0.46	-	$^\circ\text{C/W}$

Electrical Characteristics

Static Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 100\ \mu\text{A}$	1200	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$	-	1	50	μA
		$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}, T_J = 175^\circ\text{C}$	-	10	500	
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$	-	-	250	nA
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 40\text{ mA}$	-	2.7	-	V
$R_{DS(on)}$	Drain-Source On-Resistance	$V_{GS} = 20\text{ V}, I_D = 30\text{ A}$	-	40	52	m Ω
		$V_{GS} = 20\text{ V}, I_D = 30\text{ A}, T_J = 175^\circ\text{C}$	-	75	-	
g_f	Transconductance	$V_{DS} = 15\text{ V}, I_D = 30\text{ A}$	-	15	-	S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	$V_{DS} = 800\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$	-	3619	-	pF
C_{oss}	Output Capacitance		-	145	-	
C_{rss}	Reverse Transfer Capacitance		-	18	-	

Switching Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 800\text{ V}, V_{GS} = -4 / 20\text{ V}, I_D = 30\text{ A}, R_L = 27\ \Omega, R_G = 2.7\ \Omega$	-	26	-	ns
t_r	Turn-On Rise Time		-	50	-	
$t_{d(off)}$	Turn-Off Delay Time		-	7	-	
t_f	Turn-Off Fall Time		-	11	-	
E_{on}	Turn-On Switching loss	$V_{DD} = 800\text{ V}, V_{GS} = 0 / 20\text{ V}, I_D = 30\text{ A}, R_G = 2.7\ \Omega$	-	83	-	μJ
E_{off}	Turn-Off Switching loss		-	128	-	
Q_g	Total Gate Charge	$V_{DS} = 800\text{ V}, I_D = 30\text{ A}, V_{GS} = -5 / 20\text{ V}$	-	229	-	nC
Q_{gs}	Gate-Source Charge		-	68	-	
Q_{gd}	Gate-Drain Charge		-	66	-	

Body Diode Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
I_S	Maximum Continuous Diode Forward Current	$V_{GS} = 0\text{ V}, T_J = 25^\circ\text{C}$	-	48	-	A
V_{SD}	Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 7.5\text{ A}$	-	2.9	-	V
t_{rr}	Reverse Recovery Time	$V_R = 400\text{ V}, V_{GS} = 0\text{ V}, I_{SD} = 30\text{ A}, di/dt = 300\text{ A/us}$	-	59	-	ns
Q_{rr}	Reverse Recovery Charge		-	212	-	nC
I_{rr}	Reverse Recovery Current		-	5.1	-	A

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

Typical Characteristics

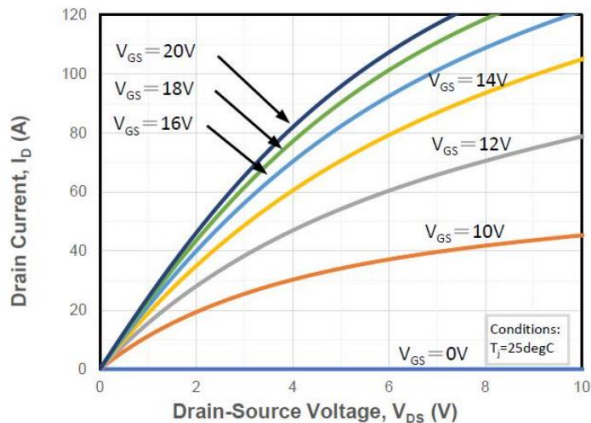


Figure 1. Output Characteristics at $T_j=25\text{ }^\circ\text{C}$

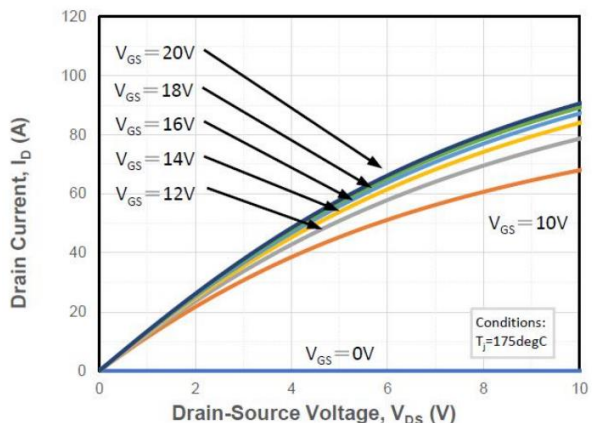


Figure 2. Output Characteristics at $T_j=175\text{ }^\circ\text{C}$

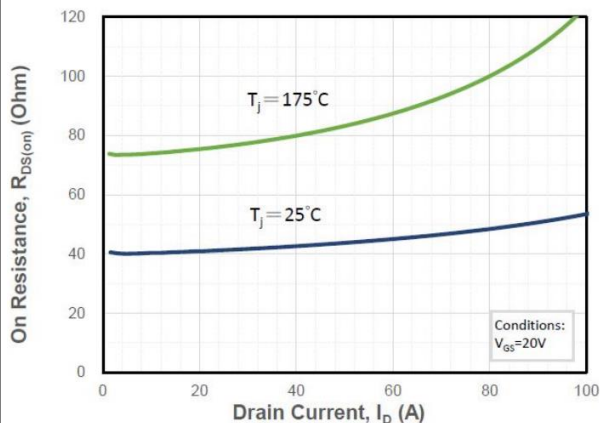


Figure 3. On-resistance vs. Drain Current

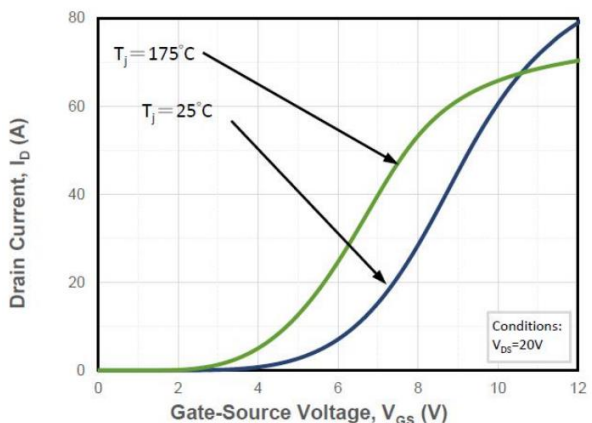


Figure 4. Transfer characteristics for various T_j

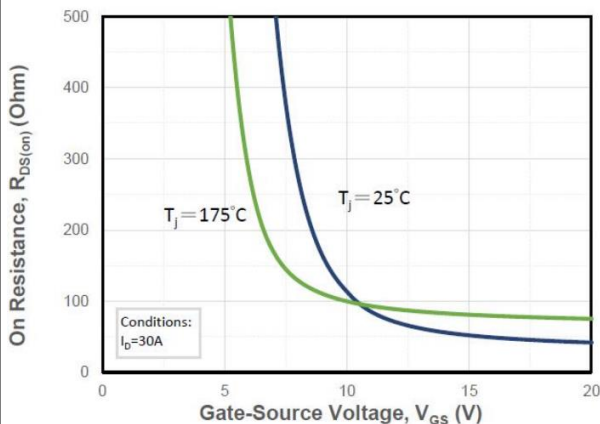


Figure 5. On-Resistance vs. Gate voltage for various T_j

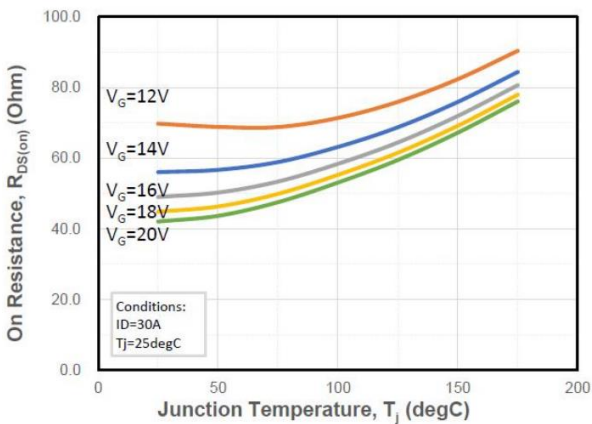


Figure 6. On-Resistance vs. Temperature for various Gate voltage

Typical Characteristics

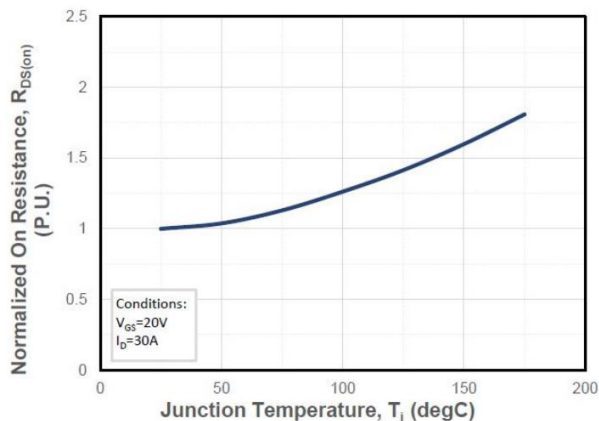


Figure 7. Normalized On-resistance vs. Temperature

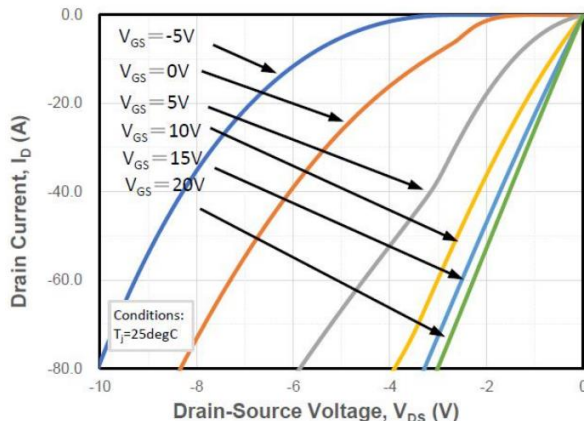


Figure 8. Reverse Output Characteristics at $T_J=25^\circ\text{C}$

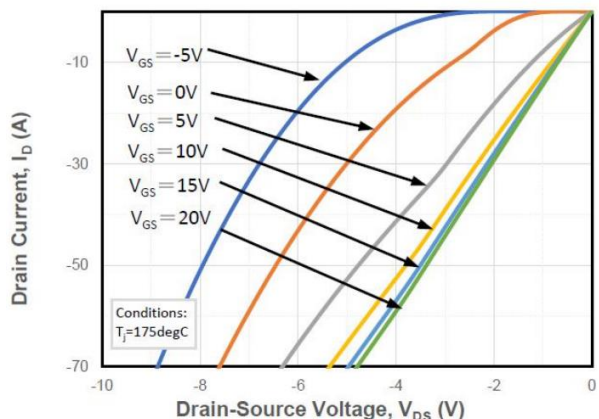


Figure 9. Reverse Output Characteristics at $T_J=175^\circ\text{C}$

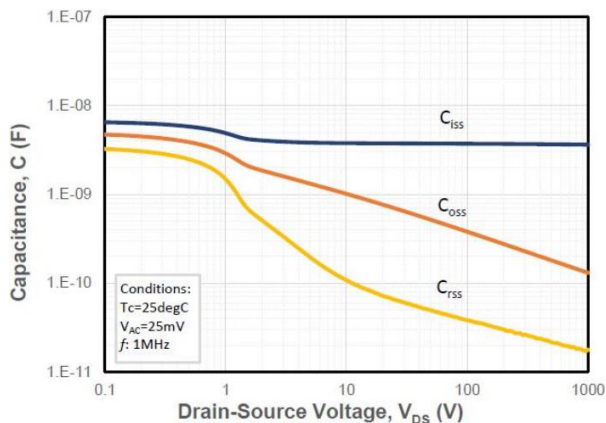


Figure 10. Capacitances vs. Drain to Source Voltage

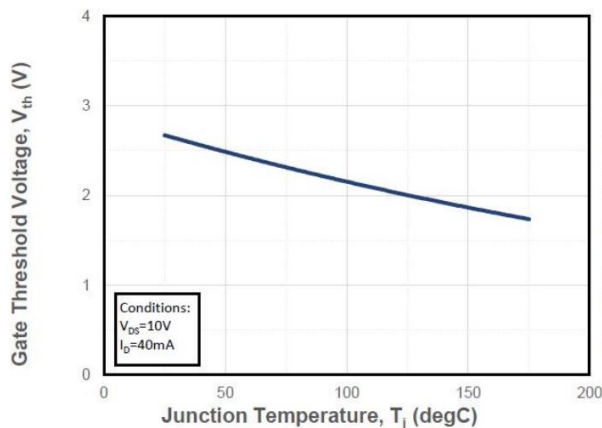


Figure 11. Threshold Voltage vs. Temperature

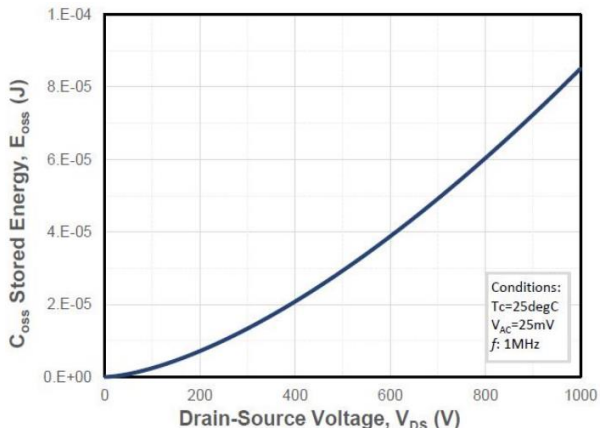


Figure 12. Output Capacitor Stored Energy

Typical Characteristics

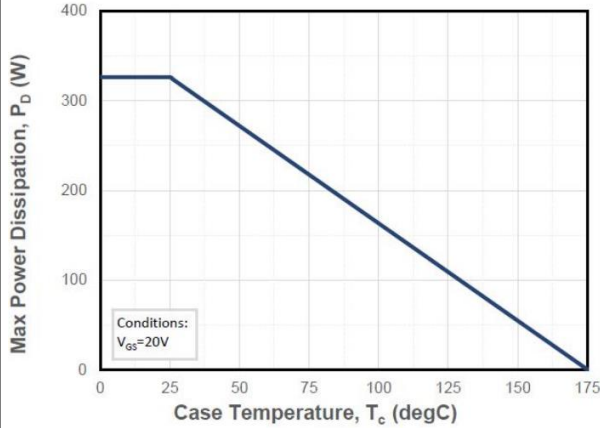


Figure 13. Maximum Power Dissipation Derating vs. Case Temperature

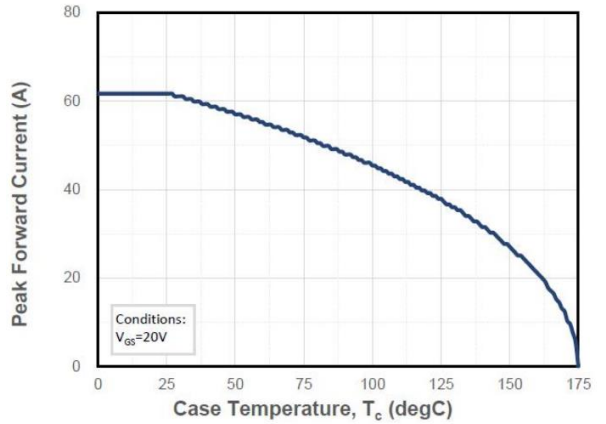


Figure 14. Drain Current Derating vs. Case Temperature

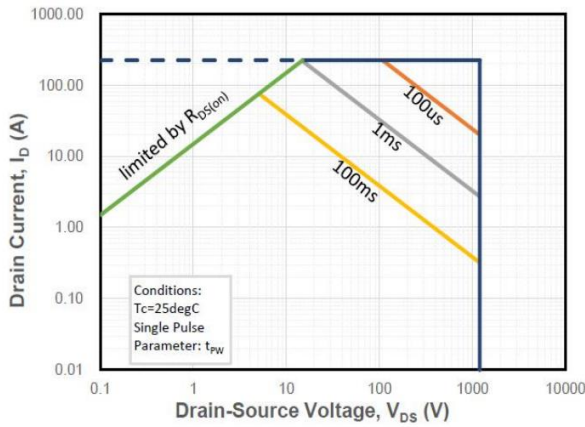


Figure 15. Safe Operating Area

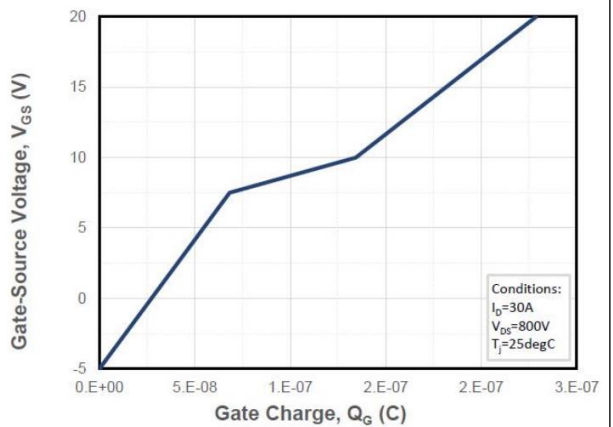


Figure 16. Gate Charge Characteristics

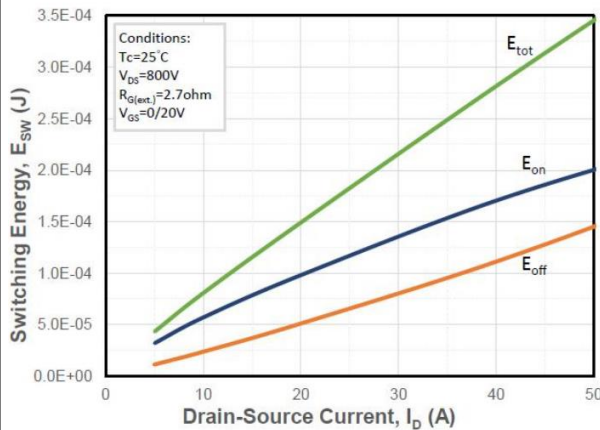


Figure 17. Clamped Inductive Switching Energy vs. Drain Current

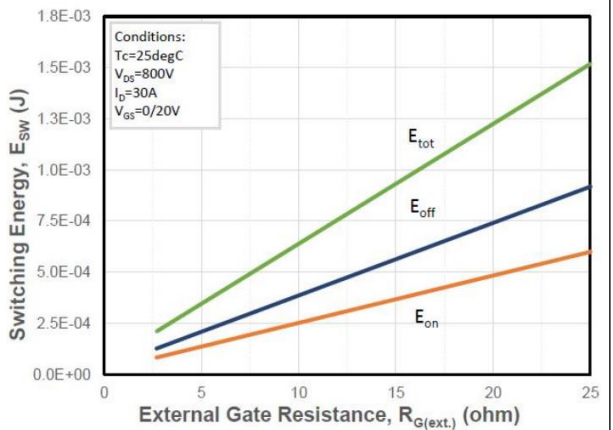


Figure 18. Clamped Inductive Switching Energy vs. External Gate Resistor

Typical Characteristics

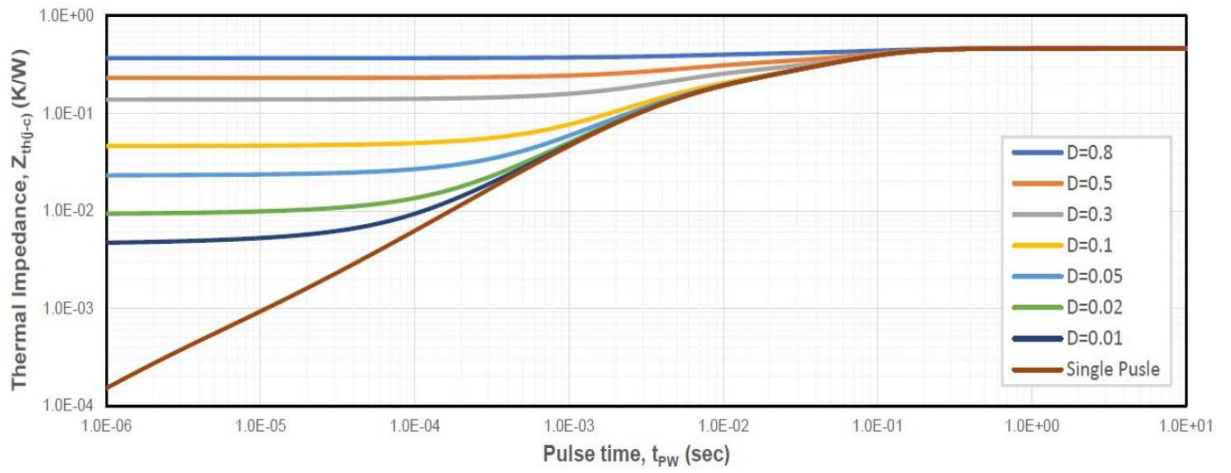
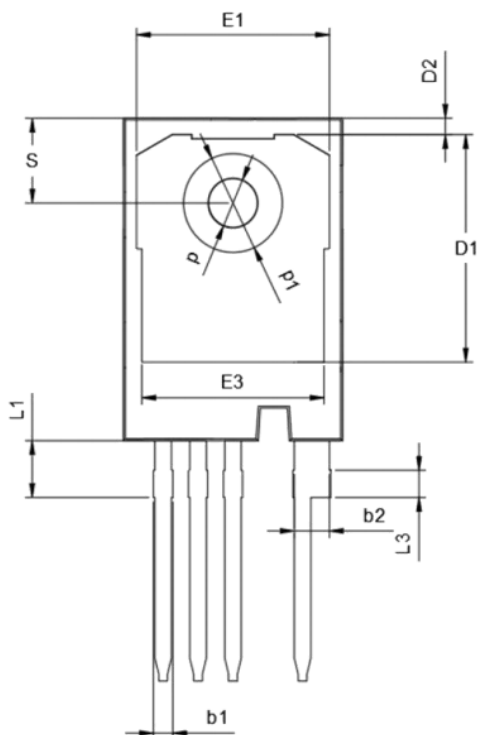
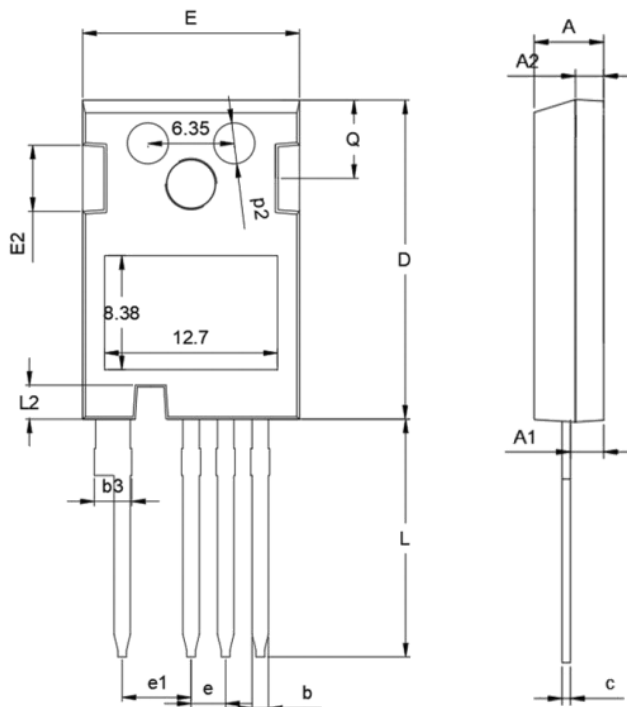


Figure 19. Transient Junction to Case Thermal Impedance

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		