PowerCubeSemi, Inc.
Potential · Convergence · Smart

PCM020R065EY

650V 107A 20mΩ Silicon Carbide MOSFET

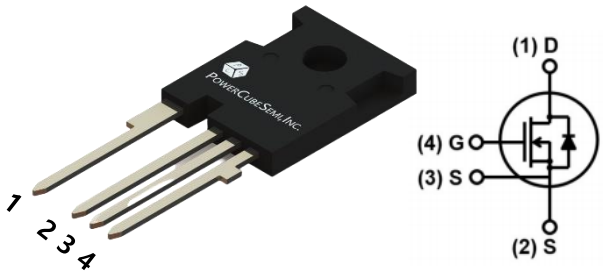
Features

- 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 inverter
- 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)

Halogen-Free

RoHS

Absolute Maximum Ratings

Tj = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{DSS}	Drain-Source Voltage	650	V
I_D	Drain Current - Continuous (T_j = 25℃)	107	A
	Drain Current - Continuous (T_j = 110℃)	72	A
I_{DM}	Drain Current - Pulsed	305	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	3.2	J
P_D	Power Dissipation (T_j = 25℃)	375	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	-	0.4	-	℃/W

Electrical Characteristics

Static Electrical Characteristics T_j = 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	650	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 650 V, V_{GS} = 0 V	-	1	100	μA
		V_{DS} = 650 V, V_{GS} = 0 V, T_J=175 ℃	-	10	500	
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 = 50 mA	-	3.1	-	V
$R_{DS(on)}$	Drain-Source On-Resistance	V_{GS} = 20 V, I_D = 50 A	-	20	26	mΩ
		V_{GS} = 20 V, I_D = 50 A, T_J=175 ℃	-	30	-	
g_{fs}	Transconductance	V_{DS}=10 V, I_D=60 A	-	18.2	-	S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
C_{iss}	Input Capacitance	V_{DS} = 400 V, V_{GS} = 0 V, f = 1 MHz	-	4838	-	pF
C_{oss}	Output Capacitance		-	359	-	
C_{rss}	Reverse Transfer Capacitance		-	47	-	
E_{OSS}	Coss stored energy		-	34	-	uJ
Q_g	Total Gate Charge	V_{DS} = 400 V, I_D = 50 A, V_{GS} = -5 / 20 V	-	287	-	nC
Q_{gs}	Gate-Source Charge		-	80	-	
Q_{gd}	Gate-Drain Charge		-	75	-	
R_G	Internal Gate Resistance	f=1MHz, V_{AC}=25mV	-	0.6	-	Ω

Electrical Characteristics

Switching Characteristics

T_j = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 400V, V_{GS} = -4/20V, I_D = 35A, R_L = 11.4Ω, R_G = 2.7Ω	-	29	-	ns
t_r	Turn-On Rise Time		-	51	-	
$t_{d(off)}$	Turn-Off Delay Time		-	30	-	
t_f	Turn-Off Fall Time		-	16	-	
E_{on}	Turn-On Switching loss	V_{DD} = 400V, V_{GS} = 0/20V, I_D= 50A, R_G = 2.7Ω	-	61.7	-	uJ
E_{off}	Turn-Off Switching loss		-	101	-	

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 ℃	-	61.5	-	A
V_{SD}	Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 10 A	-	2.9	-	V
T_{rr}	Reverse Recovery Time	V_R = 400 V, V_{GS} = 0 V, I_S = 30 A, dI_F / dt = 300 A/us	-	77	-	ns
Q_{rr}	Reverse Recovery Charge		-	301	-	nC
I_{rr}	Reverse Recovery Current		-	6.9	-	A

Typical Characteristics

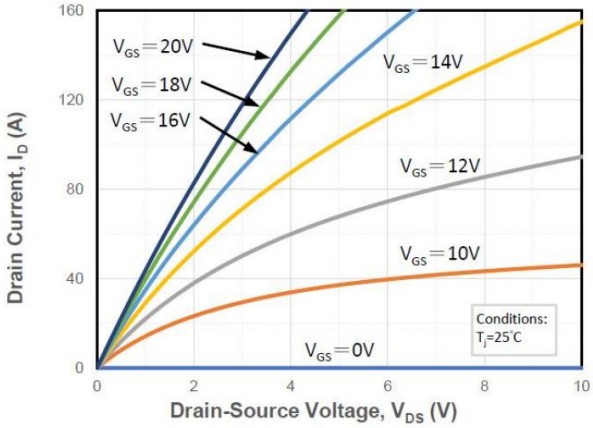


Figure 1. Output Characteristics at T_J=25 ℃

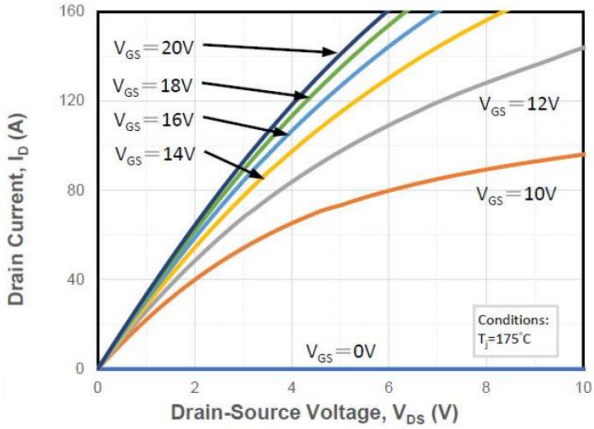


Figure 2. Output Characteristics at T_J=175 ℃

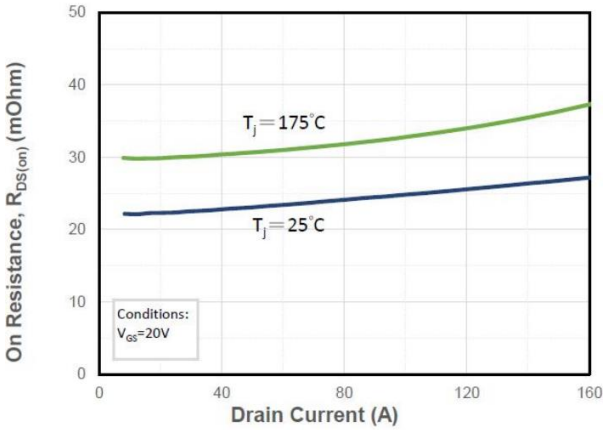


Figure 3. On Resistance vs. Drain Current

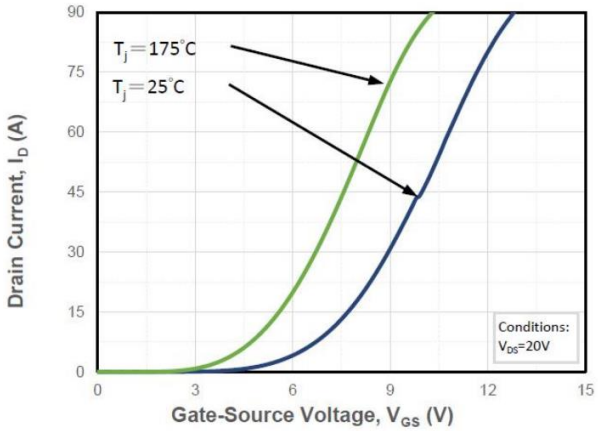


Figure 4. Transfer Characteristics for various T_J

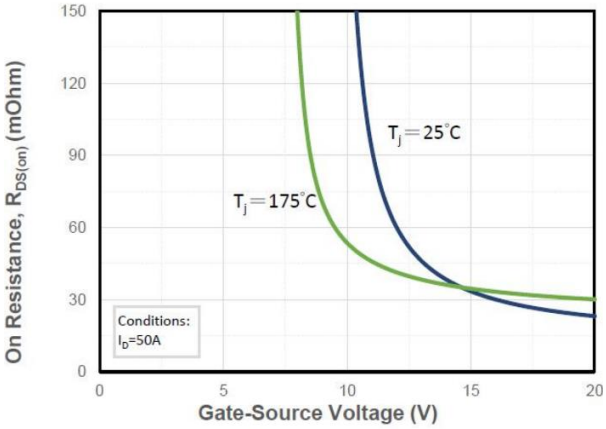


Figure 5. On Resistance vs. gate voltage for various T_J

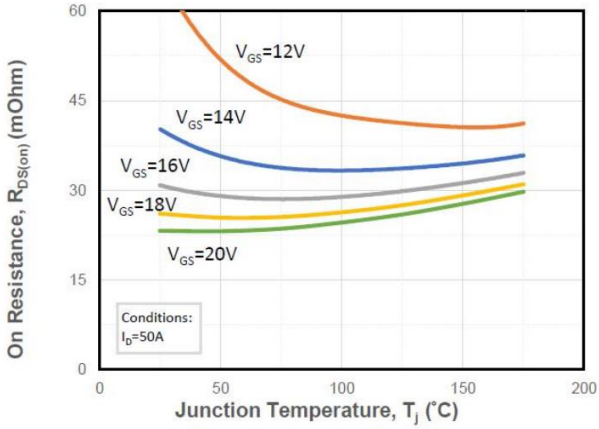


Figure 6. On Resistance vs. Temperature for various gate voltage

Typical Characteristics

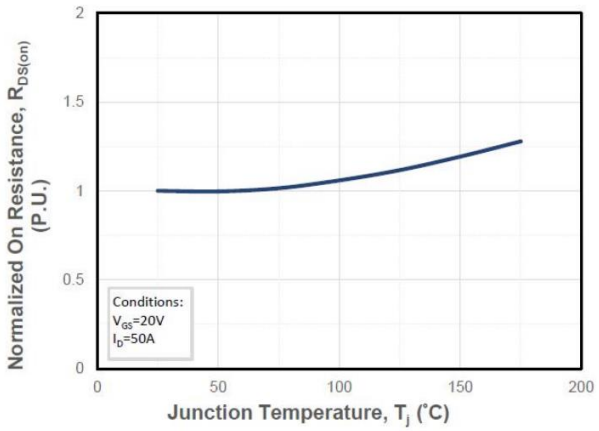


Figure 7. Normalized On Resistance vs. Temperature

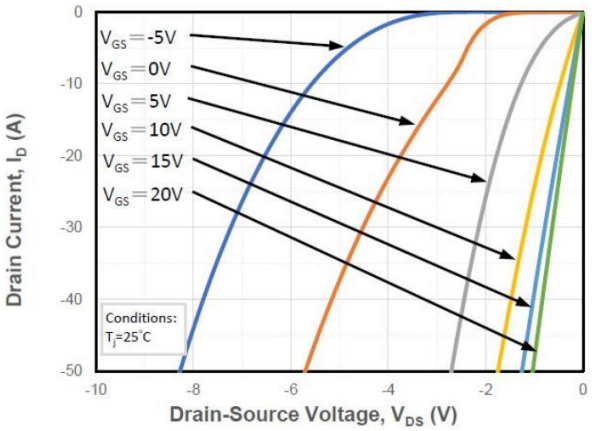


Figure 8. Reverse Output Characteristics at T_J=25℃

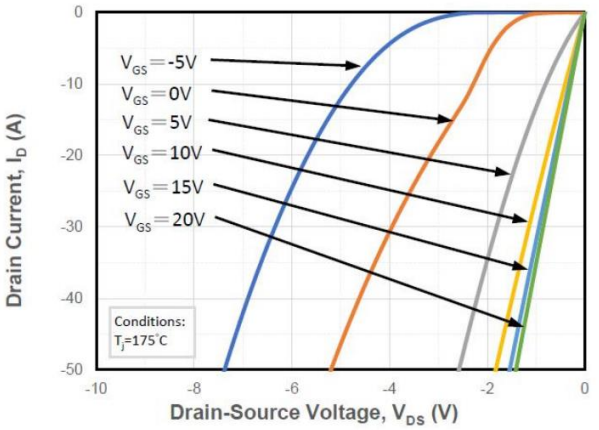


Figure 9. Reverse Output Characteristics at T_J=175℃

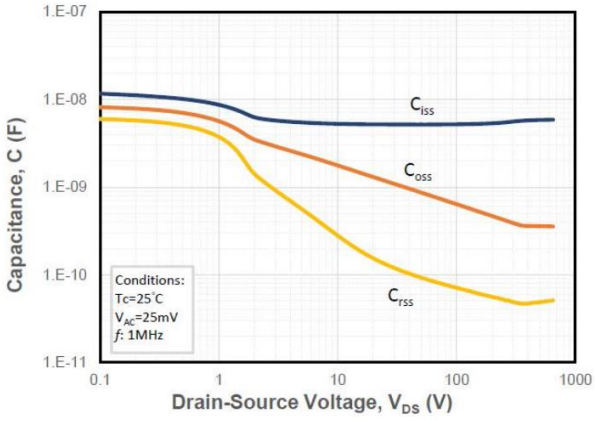


Figure 10. Capacitances vs. Drain to Source Voltage

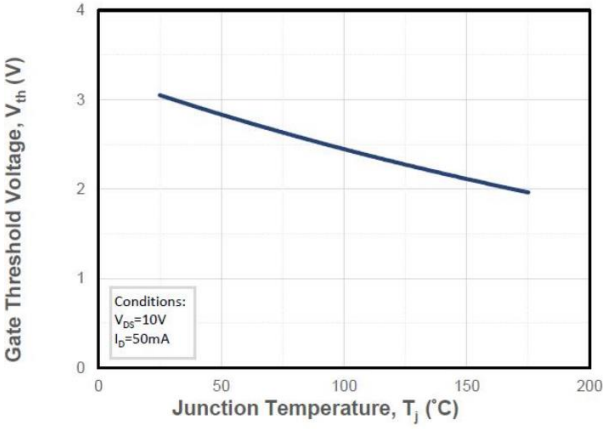


Figure 11. Threshold Voltage vs. Temperature

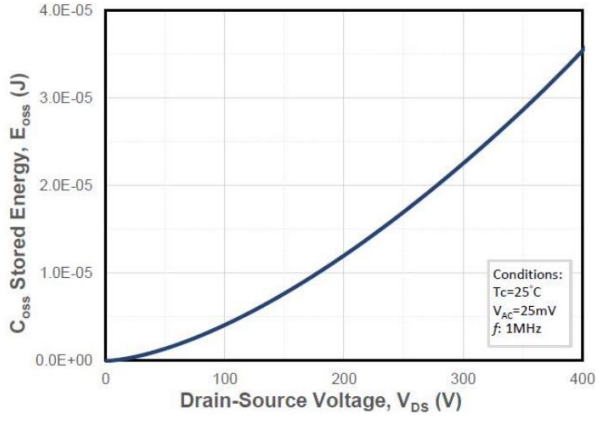


Figure 12. Output Capacitor Stored Energy

Typical Characteristics

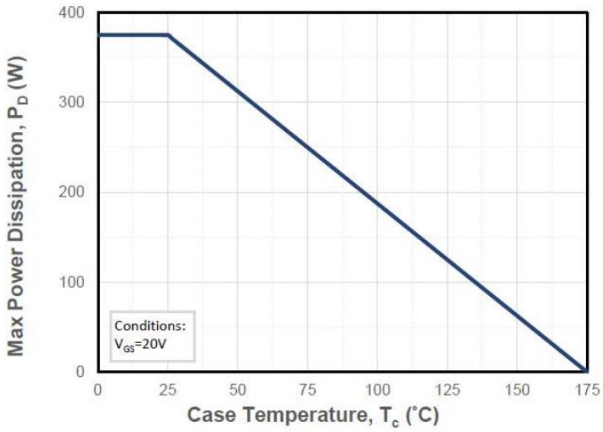


Figure 13. Maximum Power Dissipation Derating vs. Case Temperature

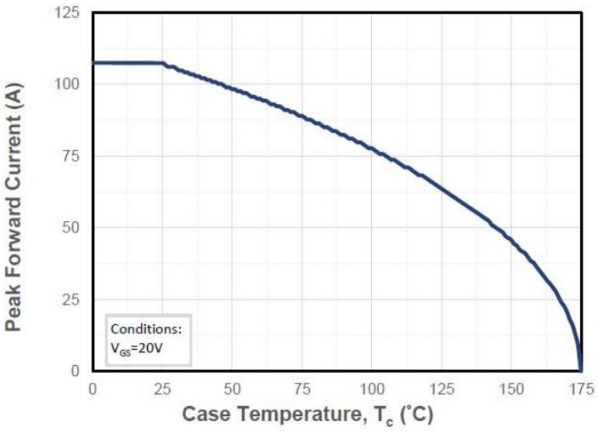


Figure 14. Drain Current Derating vs. Case Temperature

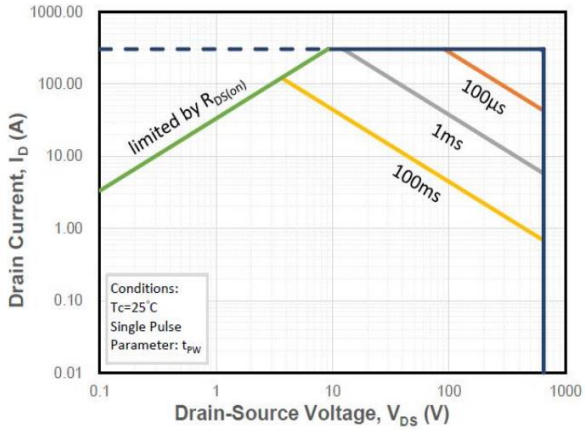


Figure 15. Safe Operating Area

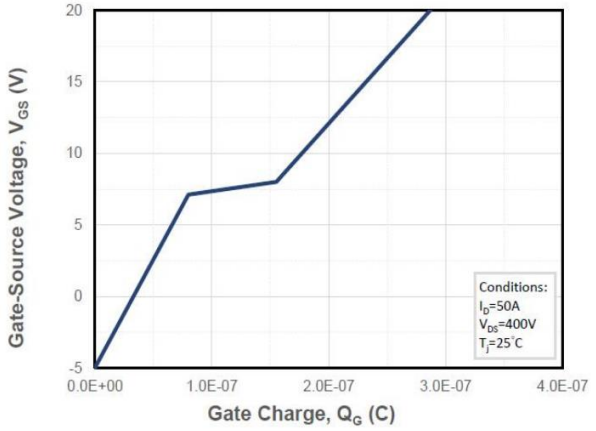


Figure 16. Gate Charge Characteristics

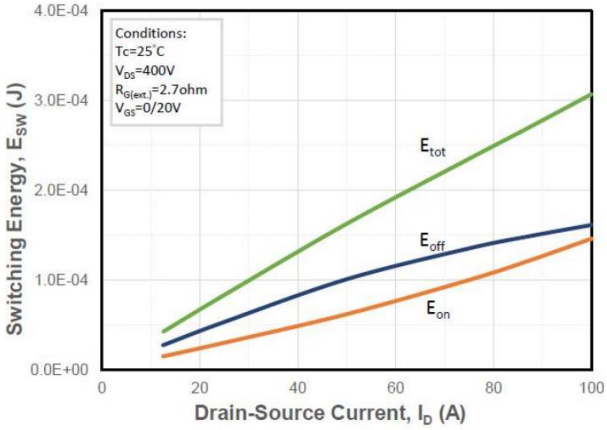


Figure 17. Clamped Inductive Switching Energy vs. Drain Current

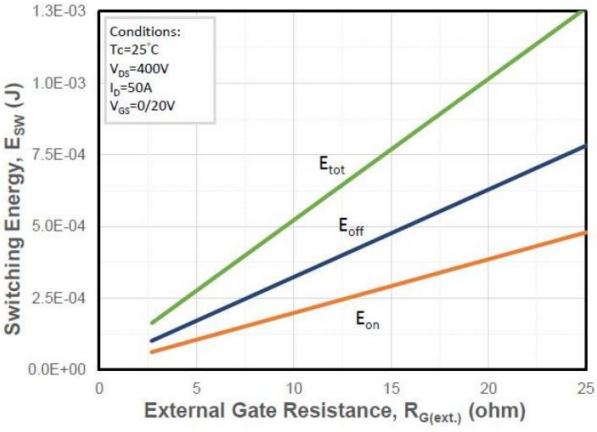


Figure 18. Clamped Inductive Switching Energy vs. External Gate Resistor

Typical Characteristics

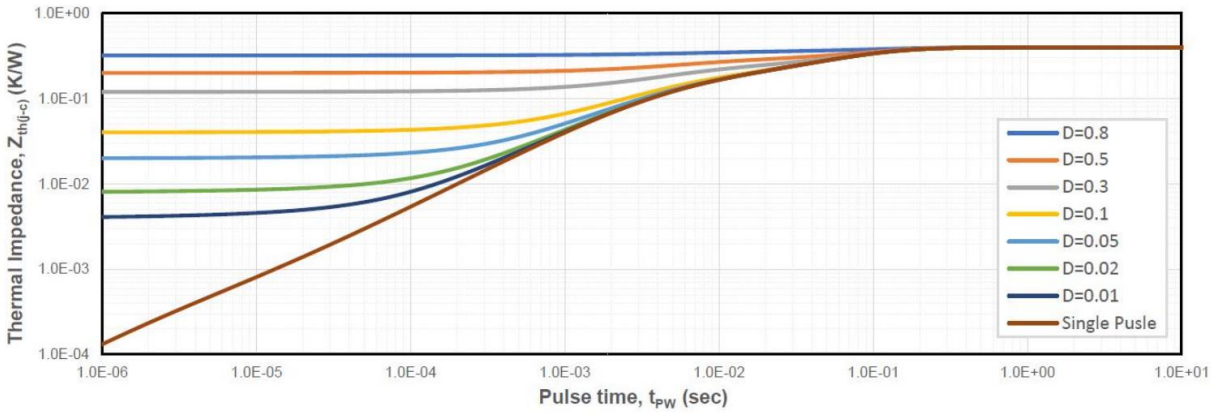
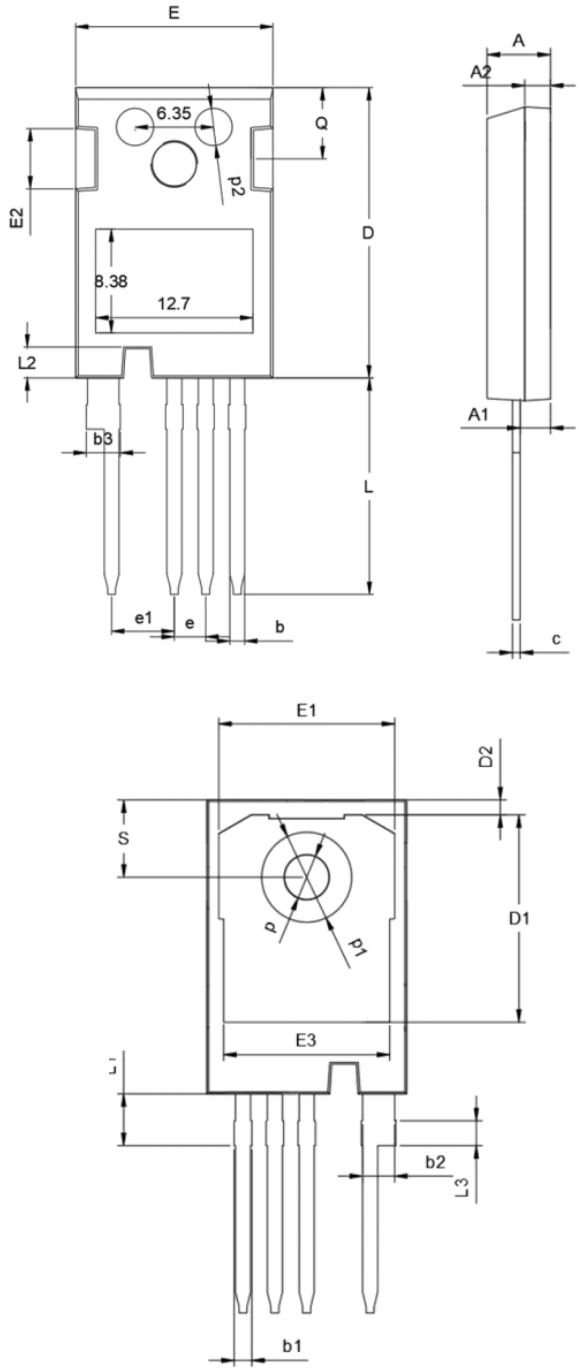


Figure 19. Transient Junction to Case Thermal Impedance

Package 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		