



Silicon Carbide Power RugSiC

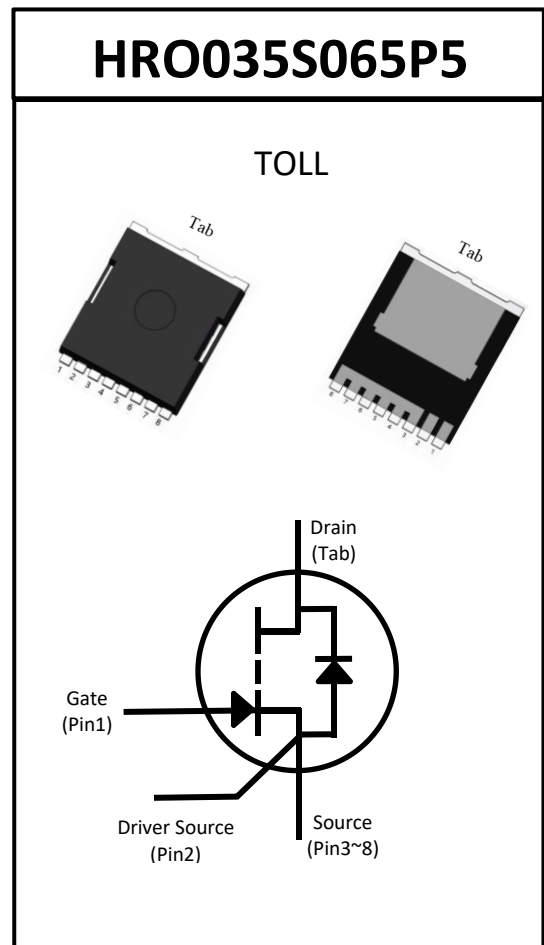
N-Channel Enhancement Mode

1. Product Features

- Ultra-low switching losses
- Ultra-low static losses
- Maximum junction temperature 175°C
- RoHS compliant

2. Product Applications

- AC-DC & DC-DC converters for PSU and power supplies
- High power density DC-DC modules
- Totem pole PFC
- Resonant and soft-switching converters



3. Typical Performance Parameters

V_{DS}	I_{DDC}	$R_{DS(on),typ}$	$R_{DS(on),max}$	T_{vjmax}	Marking	Package
650V	80A	35mΩ	45mΩ	175°C	HRO035S065P5	TOLL

4. Maximum Ratings

Symbol	Parameters	Value	Unit	Test Conditions
V_{DSS}	Drain - Source Voltage	650	V	$V_{GS} = 0V, I_D = 1mA$
V_{GS}	Gate - Source Voltage	-5/+3	V	Absolute maximum values
V_{GSop}	Recommended Operation Values of Gate - Source Voltage	-3/+2.8	V	Recommended operational values
I_{DDC}	Continuous Drain Current	80	A	$V_{GS} = 2.8V, T_C = 25^\circ C$
		38		$V_{GS} = 2.8V, T_C = 100^\circ C$
I_{DM}	Pulsed Drain Current	131	A	Pulse width t_p limited by T_{jmax} $t_p=10\mu s, D=0.1$
P_{tot}	Power Dissipation	278	W	$T_C = 25^\circ C, T_{jmax} = 175^\circ C$
T_j	Operating Junction	-55 to 175	$^\circ C$	-
T_{stg}	Storage Temperature	-55 to 175	$^\circ C$	-
t_{SC}	Short-circuit withstand time	10	μs	$V_{DD}=400V, T_C = 150^\circ C, V_{GS}=2.8V$
E_{AS}	Avalanche energy	450	mJ	$L = 1mH, V_{DD} = 100V, I_{AS} = 30A$

5. Thermal Characteristics

Symbol	Parameters	Max.	Unit
$R_{th(j-c)}$	Thermal Resistance from Junction to Case	0.48	$^\circ C/W$
$R_{th(j-a)}$	Thermal Resistance From Junction to Ambient	62	

6. Electrical Characteristics

TC = 25°C unless otherwise specified

Static characteristics

Symbol	Parameters	Min.	Typ.	Max.	Unit	Test Conditions
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	650	-	-	V	$V_{GS} = 0V, I_D = 1mA$
		650	-	-		$V_{GS} = 0V, I_D = 1mA, T_j = 175^\circ C$
$V_{GS(th)}$	Gate Threshold Voltage	-	1.58	-	V	$V_{DS} = 0.1V, I_D = 50mA$
		-	1.16	-		$V_{DS} = 0.1V, I_D = 50mA, T_j = 175^\circ C$
I_{DSS}	Zero Gate Voltage Drain Current	-	3	-	μA	$V_{DS} = 650V, V_{GS} = 0V$
		-	160	-		$V_{DS} = 650V, V_{GS} = 0V, T_j = 175^\circ C$
I_{GSS}	Gate-Source Leakage Current	-	96	-	mA	$V_{GS} = 2.8V, I_D = 30A,$
		-	620	-		$V_{GS} = 2.8V, I_D = 30A, T_j = 175^\circ C$
$R_{DS(on)}$	Drain-Source On-State Resistance	-	33	45	m Ω	$V_{GS} = 2.8V, I_D = 30A$
		-	30	-		$V_{GS} = 2.8V, I_D = 30A, T_j = 175^\circ C$
		-	26	-		$V_{GS} = 3.0V, I_D = 30A$
		-	30	-		$V_{GS} = 3.0V, I_D = 30A, T_j = 175^\circ C$

Dynamic characteristics

Symbol	Parameters	Min.	Typ.	Max.	Unit	Test Conditions
C_{iss}	Input Capacitance	-	1636	-	pF	$V_{GS} = 0V,$ $V_{DS} = 400V,$ $f = 100kHz$
C_{oss}	Output Capacitance	-	161	-		
C_{rss}	Reverse Transfer Capacitance	-	4.6	-		
$t_{d(on)}$	Turn-On Delay Time	-	73	-	ns	$V_{DS} = 400V,$ $V_{GS} = -3/2.8V,$ $I_D = 30A,$ $R_{G(ext)} = 5.6\Omega$ $T_j = 25^\circ C$
t_r	Rise Time	-	14	-		
$t_{d(off)}$	Turn-Off Delay Time	-	22	-		
t_f	Fall Time	-	12	-		

Reverse Diode Characteristics

Symbol	Parameters	Min.	Typ.	Max.	Unit	Test Conditions
V_{SD}	Diode Forward Voltage	-	1.93	-	V	$V_{GS} = 0V, I_{SD} = 30A$
		-	1.94	-		$V_{GS} = 0V, I_{SD} = 30A, T_j = 175^\circ C$
		-	3.22	-		$V_{GS} = -3V, I_{SD} = 30A$
		-	3.09	-		$V_{GS} = -3V, I_{SD} = 30A, T_j = 175^\circ C$
t_{RR}	Reverse Recovery Time	-	54	-	ns	$V_{DD} = 400V, I_S = 30A,$ $di_S/dt = 1000A/\mu s$
Q_{RR}	Reverse Recovery Charge	-	860	-	nC	
I_{RRM}	Peak Reverse Recovery Current	-	29	-	A	

7. Electrical Characteristic Diagrams

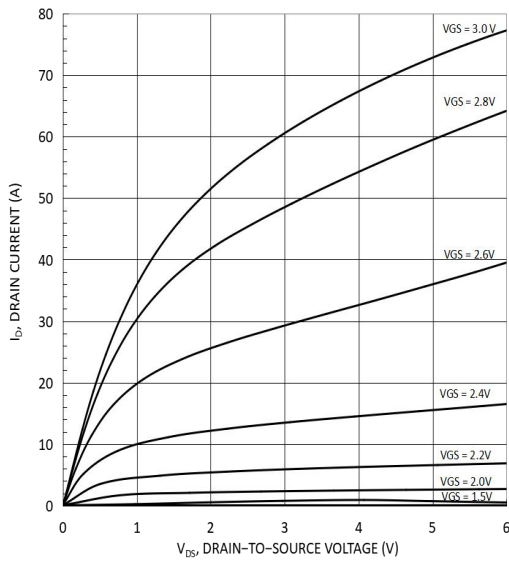


Figure 1. Output Characteristics ($T_j=25^\circ\text{C}$)

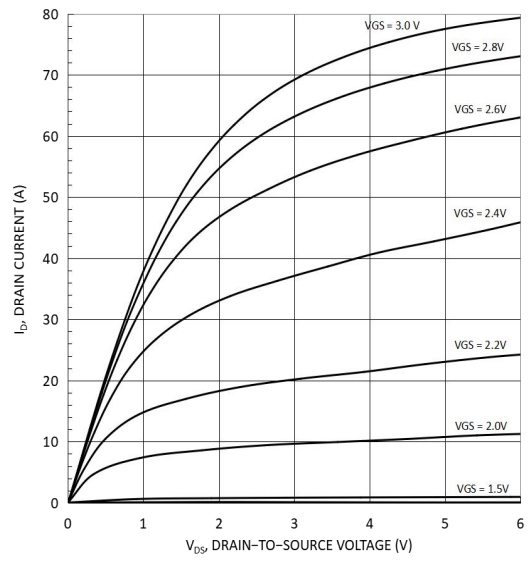


Figure 2. Output Characteristics ($T_j=125^\circ\text{C}$)

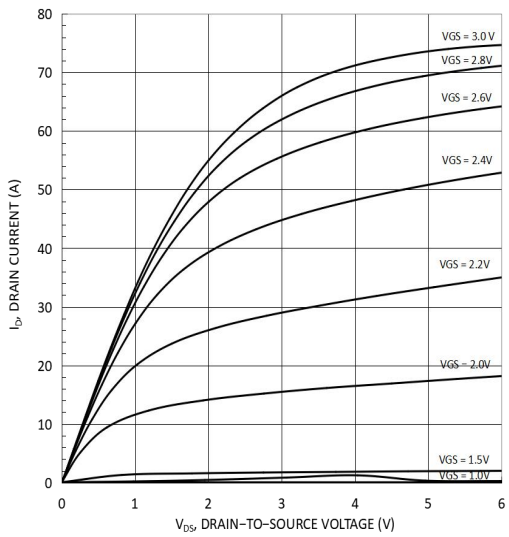


Figure 3. Output Characteristics ($T_j=175^\circ\text{C}$)

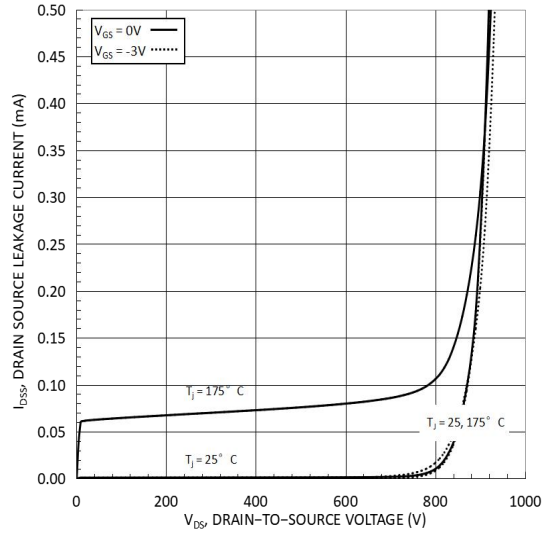


Figure 4. Drain-to-Source Leakage Current vs. Drain-to-Source Voltage

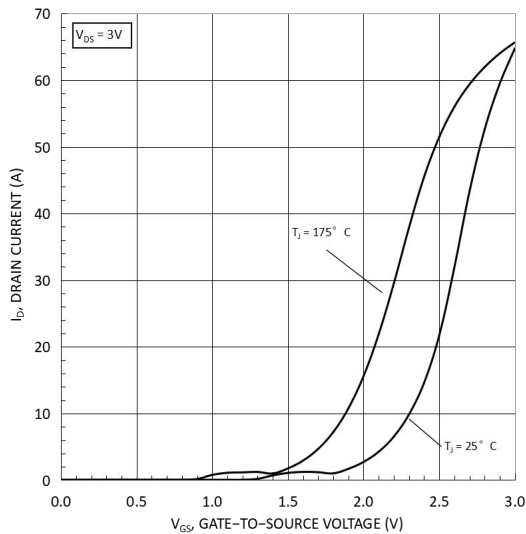


Figure 5. Transfer Characteristic for Various Junction Temperatures

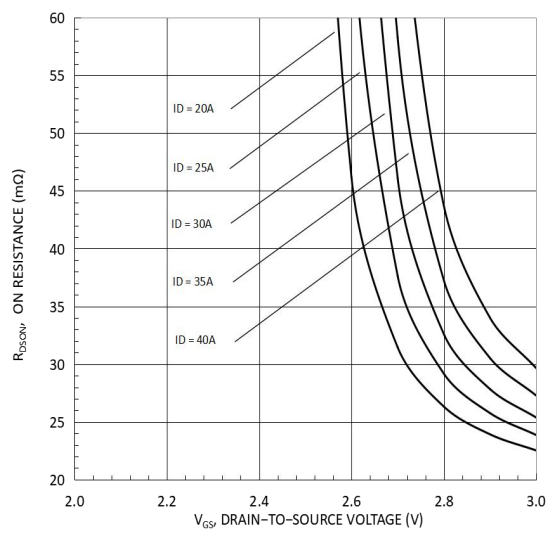


Figure 6. On-Resistance vs. Drain-to-Source Voltage ($T_j=25^\circ\text{C}$)

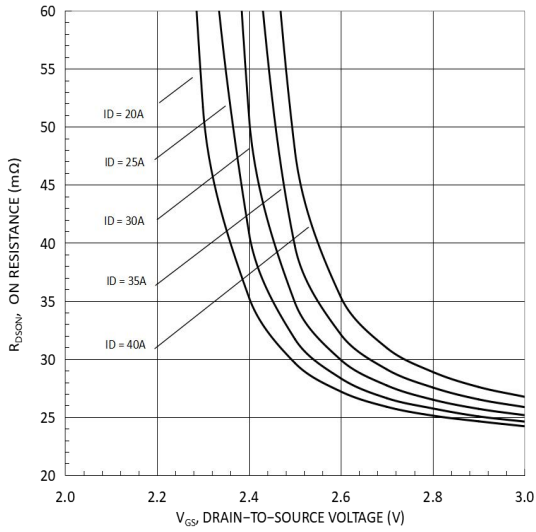


Figure 7. On-Resistance vs. Drain-to-Source Voltage ($T_j = 125^\circ\text{C}$)

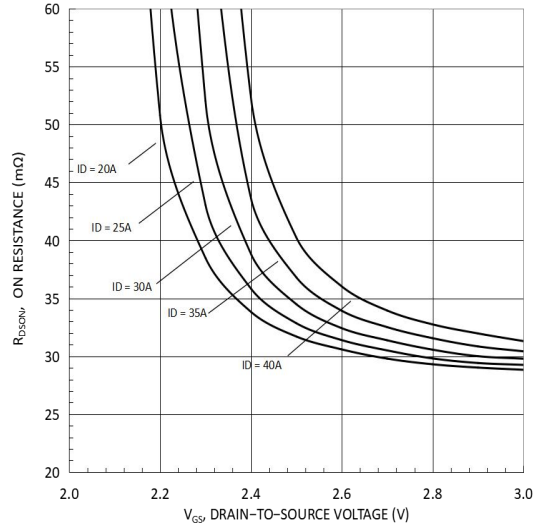


Figure 8. On-Resistance vs. Drain-to-Source Voltage ($T_j = 175^\circ\text{C}$)

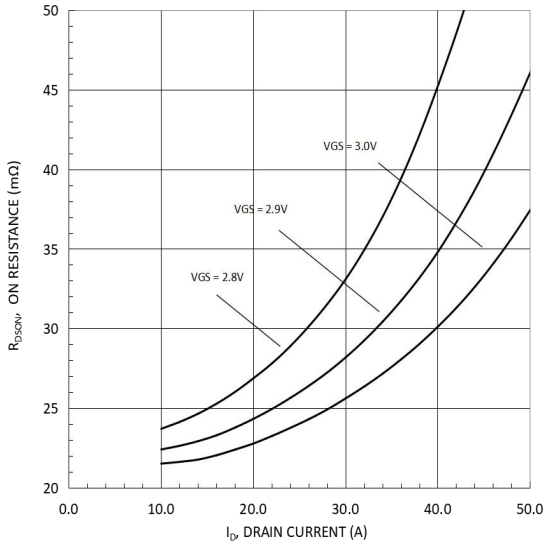


Figure 9. On-Resistance vs. Drain Current ($T_j = 25^\circ\text{C}$)

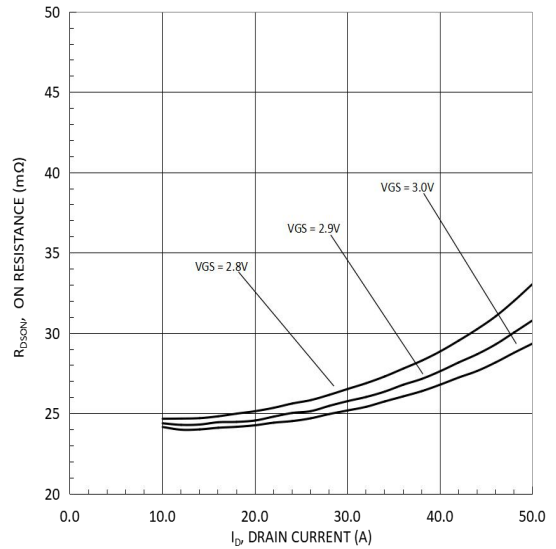


Figure 10. On-Resistance vs. Drain Current ($T_j = 125^\circ\text{C}$)

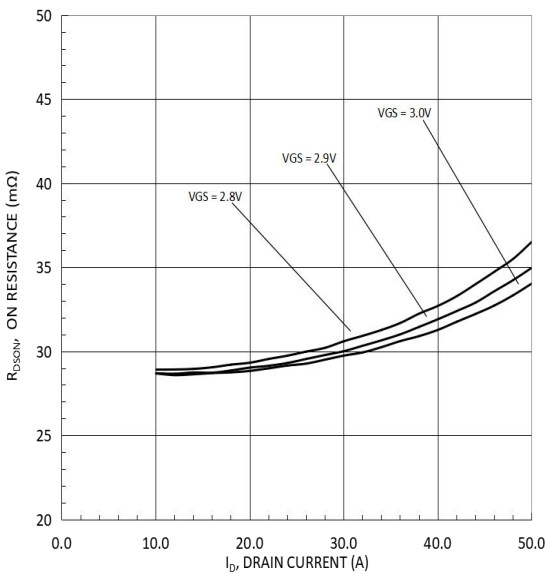


Figure 11. On-Resistance vs. Drain Current ($T_j = 175^\circ\text{C}$)

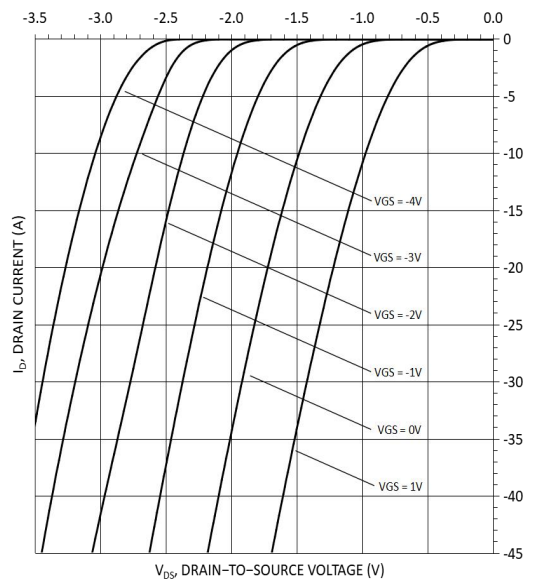


Figure 12. Body Diode Characteristic ($T_j = 25^\circ\text{C}$)

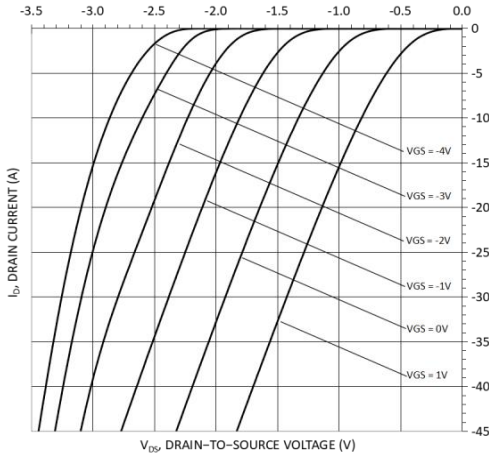


Figure 13. Body Diode Characteristic ($T_j = 125^\circ\text{C}$)

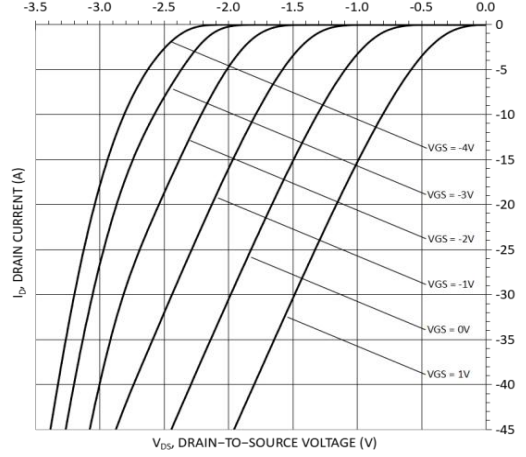


Figure 14. Body Diode Characteristic ($T_j = 175^\circ\text{C}$)

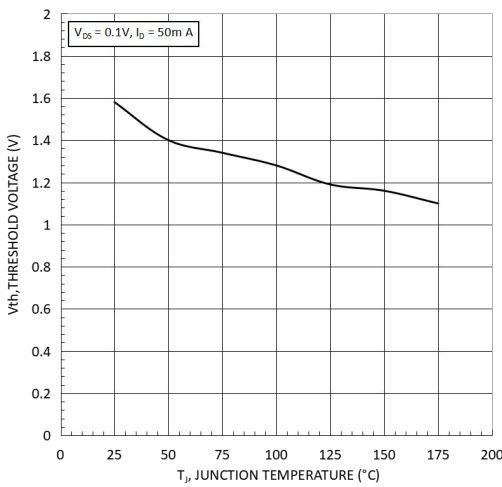


Figure 15. Threshold Voltage vs. Temperature

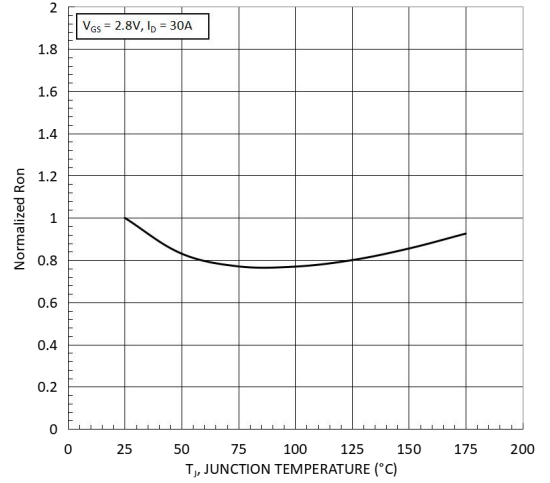


Figure 16. Normalized On-Resistance vs. Temperature

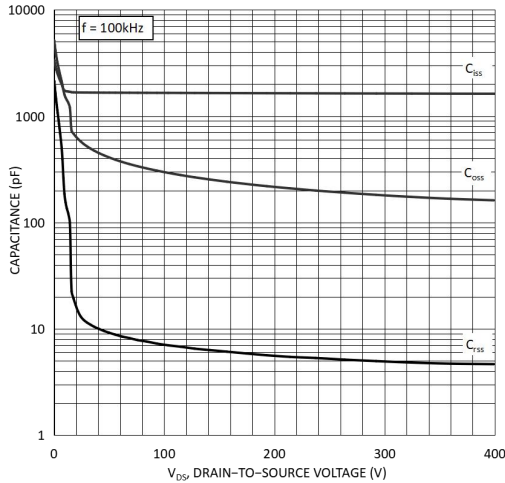


Figure 17. Capacitances vs. Drain-to-Source Voltage

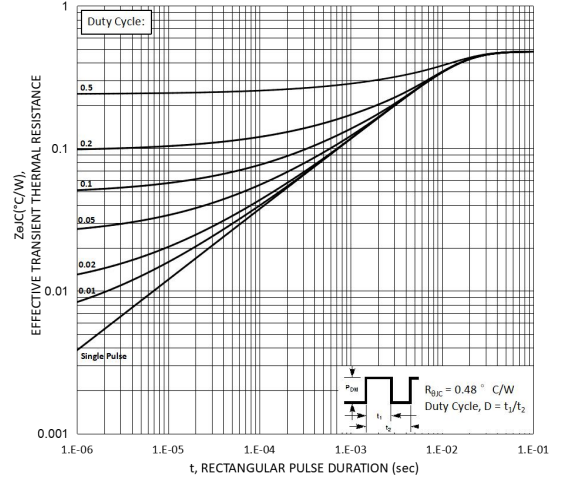
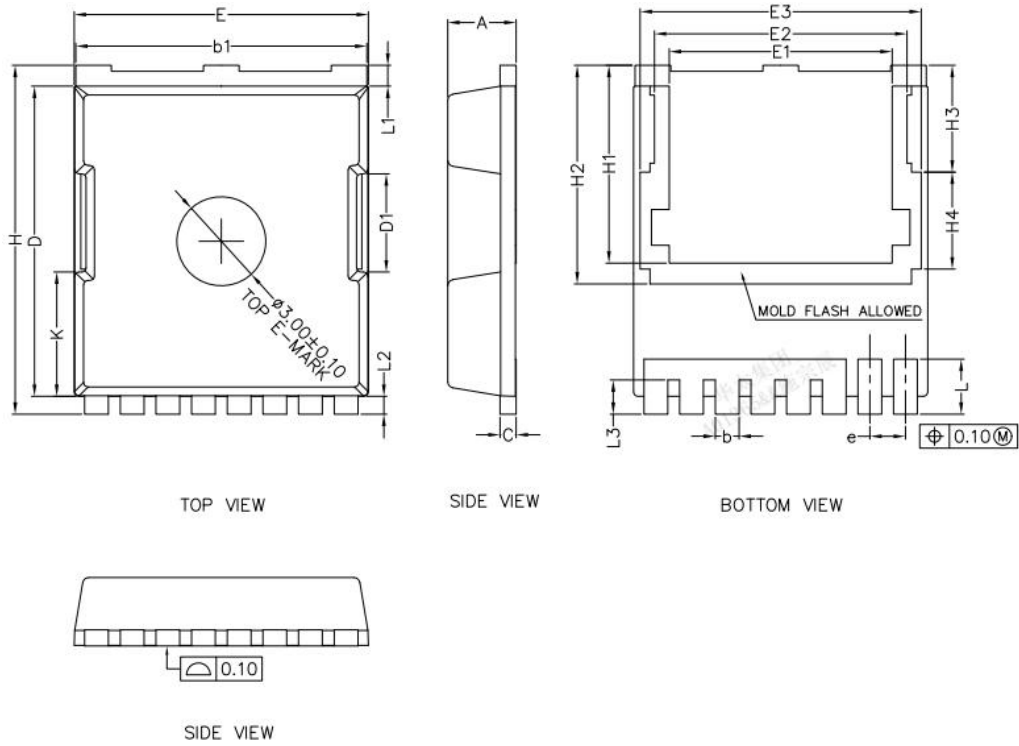


Figure 18. Transient Thermal Impedance

8. Package Dimensions



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	2.20	2.30	2.40
b	0.70	0.80	0.90
b1	9.70	9.80	9.90
c	0.40	0.50	0.60
D	10.28	10.43	10.58
D1	3.15	3.30	3.45
E	9.70	9.90	10.10
E1	7.35	7.50	7.65
E2	8.35	8.50	8.65
E3	9.31	9.46	9.61
e	1.10	1.20	1.30
H	11.48	11.73	11.88
H1	6.55	6.65	6.75
H2	7.20	7.35	7.50
H3	3.44	3.59	3.74
H4	3.11	3.26	3.41
K	4.03	4.18	4.33
L	1.60	1.85	2.10
L1	0.55	0.70	0.85
L2	0.45	0.60	0.75
L3	1.00	1.15	1.30

9. Version Information

Version No.	Date	Version revision record
A1.3	2026/01	Preliminary