650V N-Channel Silicon Carbide Power MOSFET

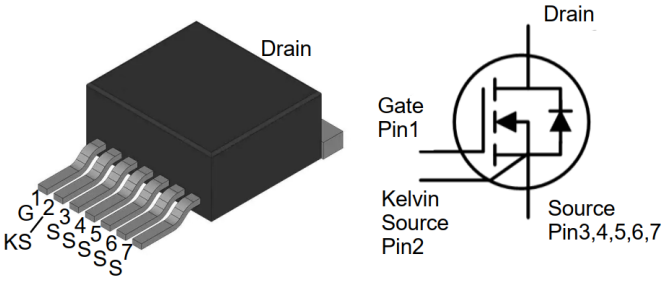
Features:

- High blocking voltage with low on-resistance
- High speed switching with low capacitance
- High operating junction temperature capability
- Very fast and robust intrinsic body diode
- Kelvin gate input easing driver circuit design

Applications:

- Solar inverters
- UPS
- Motor drivers
- High voltage DC/DC converters
- Switch mode power supplies

Package:



Top View

Part Number	Package
DTK47N65SC7	TO-263-7L

Absolute Maximum Ratings (T_C=25°C unless otherwise specified)

Symbol	Parameter	Value	Unit	Test Conditions	Note
V_{DS}	Drain-Source voltage	650	V	V_{GS}=0V, I_D=100μA	
V_{GS}	Gate-Source voltage	-8 to 20	V	Recommended maximum	
I_D	Drain current (continuous)	47	A	V_{GS}=20V, T_C=25°C	Fig. 9
		34	A	V_{GS}=20V, T_C=100°C	
I_{DM}	Drain current (pulsed)	132	A	Pulse width limited by SOA	Fig. 11
P_{TOT}	Total power dissipation	148	W	T_C=25°C	Fig. 12
T_{stg}	Storage temperature range	-55 to 175	°C		
T_J	Operating junction temperature	-55 to 175	°C		
T_L	Solder Temperature	260	°C	Wave soldering only allowed at leads, 1.6mm from case for 10 s	

Thermal Data

Symbol	Parameter	Value	Unit	Note
$R_{\theta(J-C)}$	Thermal Resistance from Junction to Case	0.88	°C/W	Fig. 13

Electrical Characteristics (T_C=25°C unless otherwise specified)

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
I_{DSS}	Zero gate voltage drain current		5	150	μA	V_{DS}=650V, V_{GS}=0V	
I_{GSS}	Gate leakage current		1	±100	nA	V_{DS}=0V, V_{GS}=-20V	
V_{TH}	Gate threshold voltage		2.5		V	V_{GS}=V_{DS}, I_D=5mA	
			2.1			V_{GS}=V_{DS}, I_D=5mA @ T_C=175°C	
R_{ON}	Static drain-source on-resistance		45	60	mΩ	V_{GS}=20V, I_D=20A @T_J=25°C	Fig. 2, 3, 4
			62		mΩ	V_{GS}=20V, I_D=20A @T_J=175°C	
C_{iss}	Input capacitance		1510		pF	V_{DS}=400V, V_{GS}=0V, f=1MHz	Fig. 8
C_{oss}	Output capacitance		98		pF		
C_{rss}	Reverse transfer capacitance		6		pF		
E_{oss}	C_{oss} stored energy		12		μJ		
Q_g	Total gate charge		59		nC	V_{DS}=400V, I_D=20A, V_{GS}=-5 to 15V	Fig. 7
Q_{gs}	Gate-source charge		18		nC		
Q_{gd}	Gate-drain charge		14		nC		
R_g	Gate input resistance		3		Ω	f=1MHz	
E_{ON}	Turn-on switching energy		39		μJ	V_{DS}=400V, I_D=20A, V_{GS}=-5 to 15V, $R_{G(ext)}$=2.5Ω, L=100μH	
E_{OFF}	Turn-off switching energy		10		μJ		
$t_{d(on)}$	Turn-on delay time		9		ns		
t_r	Rise time		10				
$t_{d(off)}$	Turn-off delay time		18				
t_f	Fall time		7				

Reverse Diode Characteristics (T_C=25°C unless otherwise specified)

Symbol	Parameter	Value			Unit	Test Conditions	Note
		Min.	Typ.	Max.			
V_{SD}	Diode forward voltage		4.2		V	I_{SD}=10A, V_{GS}=0V	Fig. 6
			3.8		V	I_{SD}=10A, V_{GS}=0V, T_J=175°C	
t_{rr}	Reverse recovery time		13		ns	I_{SD}=10A, V_R=400V, di/dt=1000A/us	
Q_{rr}	Reverse recovery charge		101		nC		
I_{RRM}	Peak reverse recovery current		8.5		A		

Typical Performance (curves)

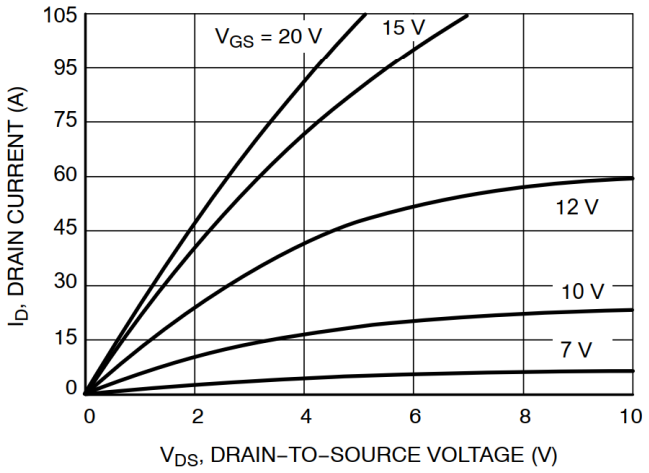


Figure 1. On–Region Characteristics

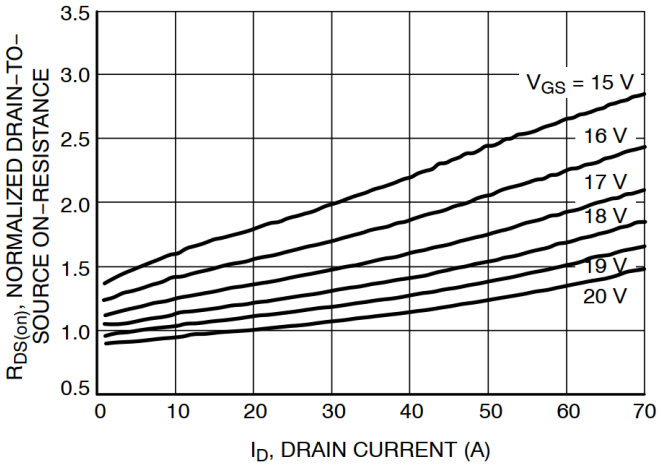


Figure 2. Normalized On–Resistance vs. Drain Current and Gate Voltage

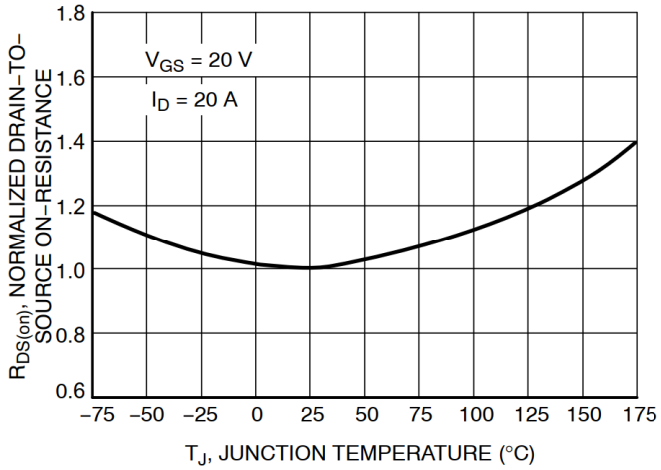


Figure 3. On–Resistance Variation with Temperature

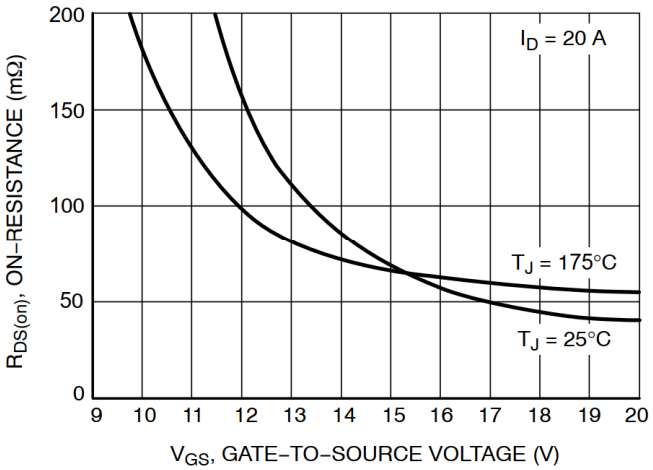


Figure 4. On–Resistance vs. Gate–to–Source Voltage

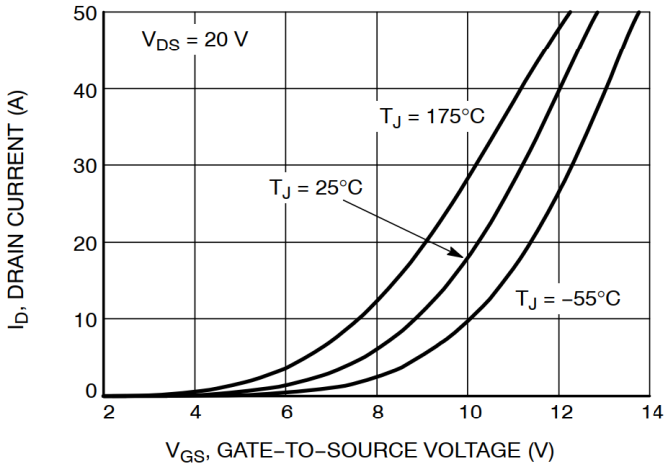


Figure 5. Transfer Characteristics

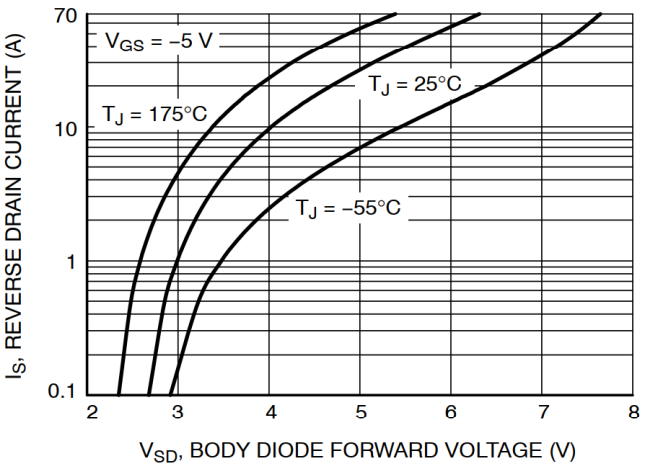


Figure 6. Diode Forward Voltage vs. Current

Typical Performance (curves)

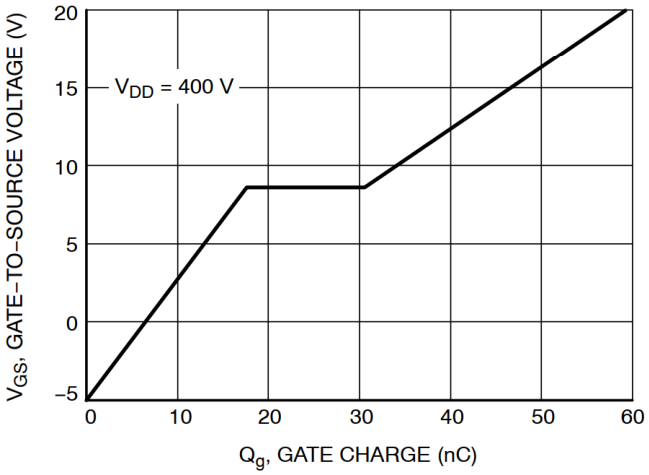


Figure 7. Gate–to–Source Voltage vs. Total Charge

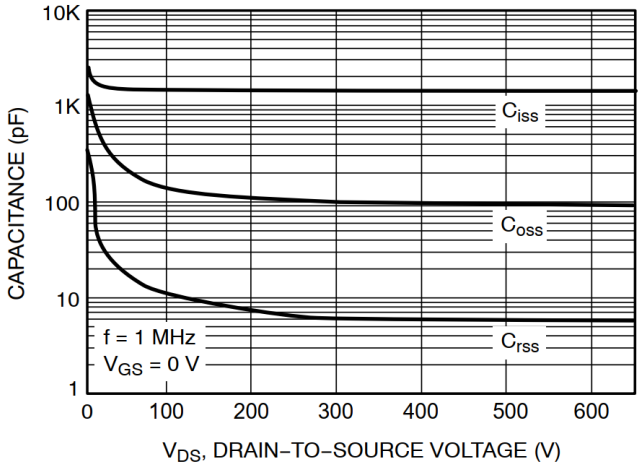


Figure 8. Capacitance vs. Drain–to–Source Voltage

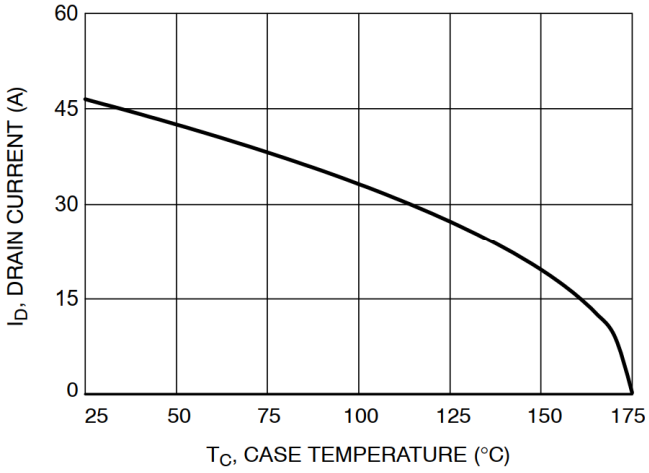


Figure 9. Maximum Continuous Drain Current vs. Case Temperature

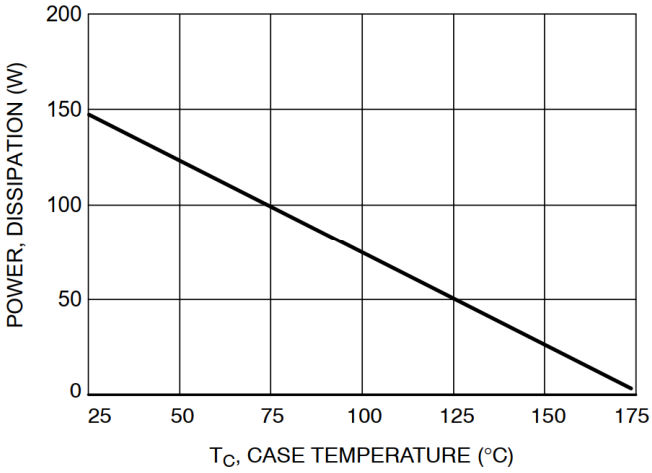


Figure 10. Maximum Power Dissipation Derating vs.Case Temperature

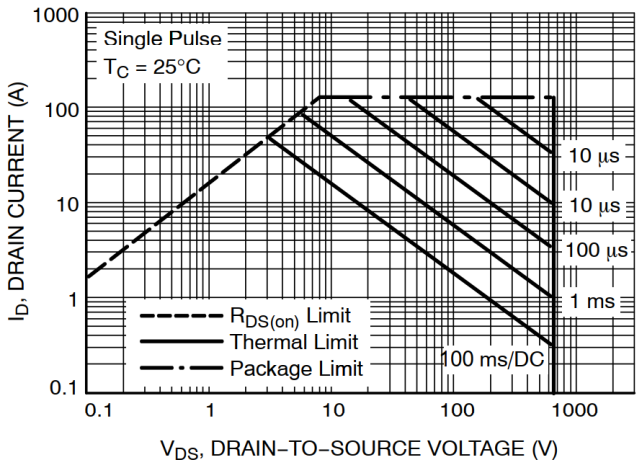


Figure 11. Safe Operating Area

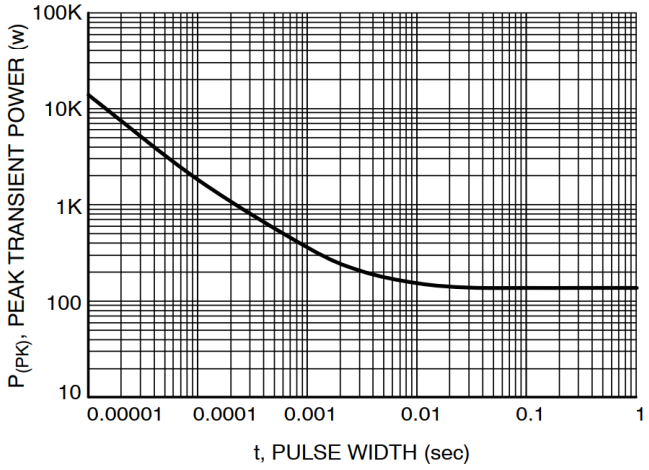


Figure 12. Single Pulse Maximum Power Dissipation

Typical Performance (curves)

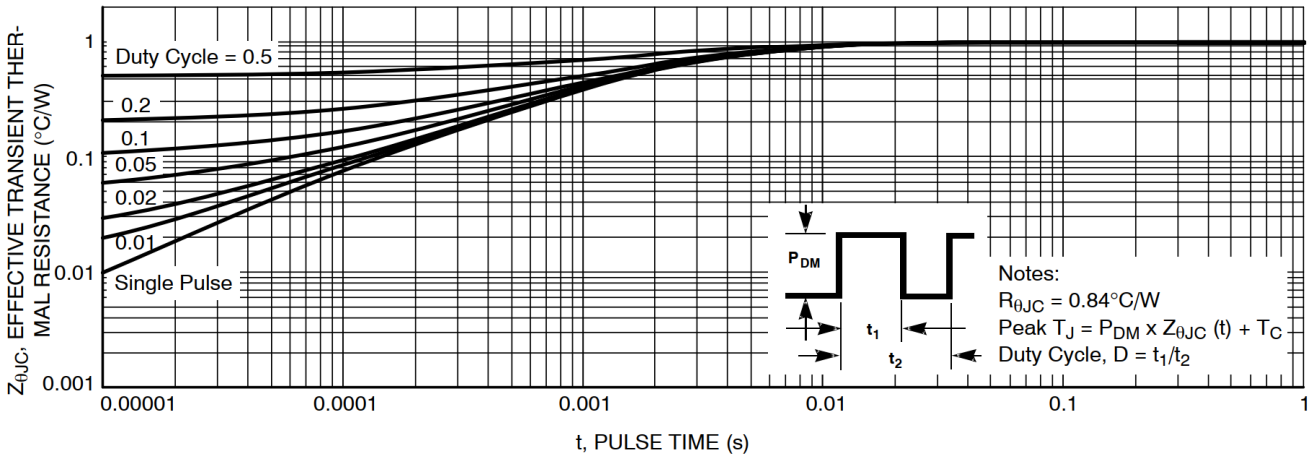
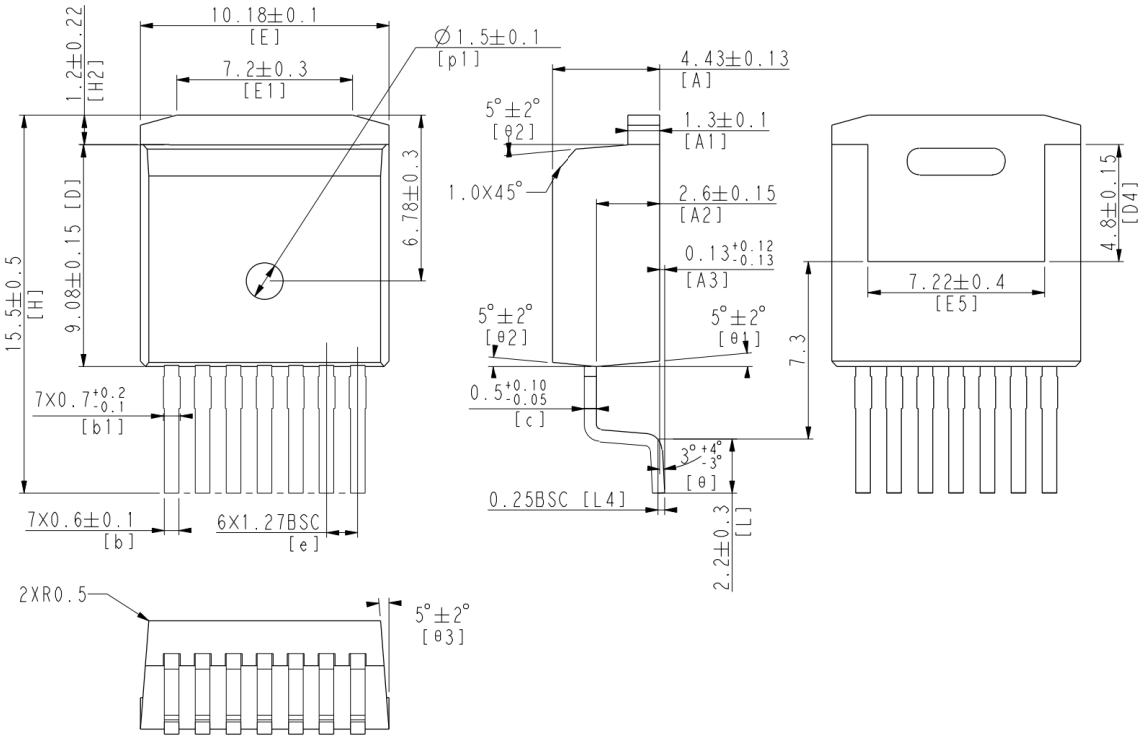
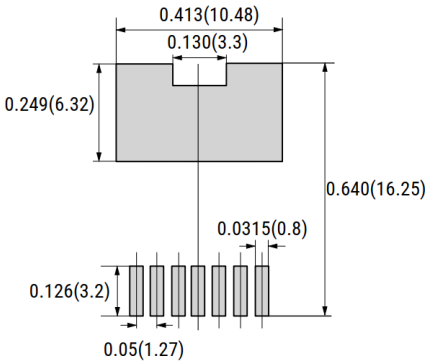


Figure 13. Junction–to–Case Transient Thermal Response Curve

TO-263-7L Package Dimensions





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