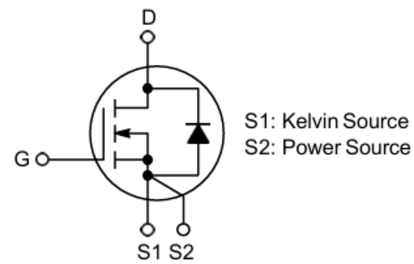
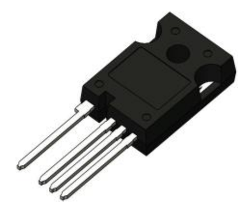
Silicon Carbide (SiC), 14 mohm, 1200 V, TO-247-4L

RCS**014N120**P4L

$V_{(BR)DSS}$	$R_{DS(ON)}$ TYP	I_D MAX
1200 V	14 mΩ	160 A



N−CHANNEL MOSFET



TO247−4L

Features

- Typ. $R_{DS(on)}$ = 14 mΩ
- Ultra Low Gate Charge ($Q_{G(tot)}$ = 254 nC)
- High Speed Switching with Low Capacitance (C_{oss} = 262 pF)
- 100% Avalanche Tested
- This Device is Halide Free and RoHS Compliant with exemption 7a, Pb−Free 2LI (on second level interconnection)

Typical Applications

- Solar Inverters
- Electric Vehicle Charging Stations
- UPS (Uninterruptible Power Supplies)
- Energy Storage Systems
- SMPS (Switch Mode Power Supplies)

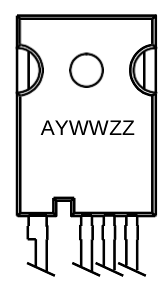
MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Drain−to−Source Voltage	V_{DSS}	1200	V
Gate−to−Source Voltage	V_{GS}	−10/+22	V
Recommended Operation Values of Gate−to−Source Voltage, T_C < 175°C	V_{GSop}	−5/+20	V
Continuous Drain Current − Steady State (Notes 1, 3) T_C = 25°C T_C = 100°C	I_D	 160 107	A
Power Dissipation − Steady State (Note 1) T_C = 25°C T_C = 100°C	P_D	 682 340	W
Pulsed Drain Current (Note 2), T_C = 25°C	I_{DM}	505	A
Operating Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +175	°C
Source Current (Body Diode), T_C = 25°C, V_{GS} = −3 V	I_S	160	A
Single Pulse Drain−to−Source Avalanche Energy (Note 4)	E_{AS}	800	mJ
Maximum Lead Temperature for Soldering (1/25″ from case for 10 s)	T_L	270	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Repetitive rating, limited by max junction temperature.
3. The maximum current rating is based on typical $R_{DS(on)}$ performance.
4. E_{AS} of 800 mJ is based on starting T_J = 25°C; L = 1 mH, I_{AS} = 40 A, V_{DD} = 100 V, V_{GS} = 20 V.

MARKING DIAGRAM



A	= Assembly Location
Y	= Year
WW	= Work Week
ZZ	= Lot Traceability

ORDERING INFORMATION

Device	Package	Shipping
RCS014N120P4L	TO247−4L	30 Units / Tube

THERMAL CHARACTERISTICS

Parameter	Symbol	Typ	Max	Unit
Junction−to−Case − Steady State (Note 1)	R_{JC}	0.17	0.22	°C/W
Junction−to−Ambient − Steady State (Note 1)	R_{JA}	−	40	

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF−STATE CHARACTERISTICS						
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 1 mA	1200	−	−	V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	I_D = 1 mA, referenced to 25°C (Note 6)	−	0.3	−	V/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 1200 V; T_J = 25°C	−	−	100	μA
Gate−to−Source Leakage Current	I_{GSS}	V_{GS} = +22/−10 V, V_{DS} = 0 V	−	−	±1	μA
ON−STATE CHARACTERISTICS (Note 2)						
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 37 mA	2.04	2.8	4.4	V
Recommended Gate Voltage	V_{GOP}		−5	−	+20	V
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 20 V, I_D = 75 A, T_J = 25°C	−	14	20	mΩ
		V_{GS} = 20 V, I_D = 75 A, T_J = 175°C (Note 6)	−	29	−	
Forward Transconductance	g_{FS}	V_{DS} = 10 V, I_D = 75 A (Note 6)	−	57	−	S
CHARGES, CAPACITANCES & GATE RESISTANCE						
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 800 V (Note 6)	−	5813	−	pF
Output Capacitance	C_{OSS}		−	262	−	
Reverse Transfer Capacitance	C_{RSS}		−	21	−	
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −5/20 V, V_{DS} = 800 V, I_D = 75 A (Note 6)	−	254	−	nC
Threshold Gate Charge	$Q_{G(TH)}$		−	37	−	
Gate−to−Source Charge	Q_{GS}		−	46	−	
Gate−to−Drain Charge	Q_{GD}		−	61	−	
Gate−Resistance	R_G	f = 1 MHz	−	1.4	−	
SWITCHING CHARACTERISTICS						
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = −5/20 V, V_{DS} = 800 V, I_D = 75 A, R_G = 4.7 Inductive load (Notes 5, 6)	−	22	−	ns
Rise Time	t_r		−	23	−	
Turn−Off Delay Time	$t_{d(OFF)}$		−	56	−	
Fall Time	t_f		−	10	−	
Turn−On Switching Loss	E_{ON}		−	563	−	μJ
Turn−Off Switching Loss	E_{OFF}		−	390	−	
Total Switching Loss	E_{tot}		−	953	−	
SOURCE−DRAIN DIODE CHARACTERISTICS						
Continuous Source−Drain Diode Forward Current	I_{SD}	V_{GS} = −3 V, T_C = 25°C (Note 6)	−	−	151	A
Pulsed Source−Drain Diode Forward Current (Note 2)	I_{SDM}		−	−	505	
Forward Diode Voltage	V_{SD}	V_{GS} = −3 V, I_{SD} = 75 A, T_J = 25°C	−	4.7	−	V

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified) (continued)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
SOURCE−DRAIN DIODE CHARACTERISTICS						
Reverse Recovery Time	t_{RR}	V_{GS} = −5/20 V, I_{SD} = 75 A, dI_S/dt = 1000 A/ s, V_{DS} = 800 V (Note 6)	−	29	−	ns
Reverse Recovery Charge	Q_{RR}		−	252	−	nC
Reverse Recovery Energy	E_{REC}		−	26	−	μJ
Peak Reverse Recovery Current	I_{RRM}		−	18	−	A
Charge Time	T_A		−	17	−	ns
Discharge Time	T_B		−	12	−	ns

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

5. E_{ON}/E_{OFF} result is with body diode.
6. Defined by design, not subject to production test.

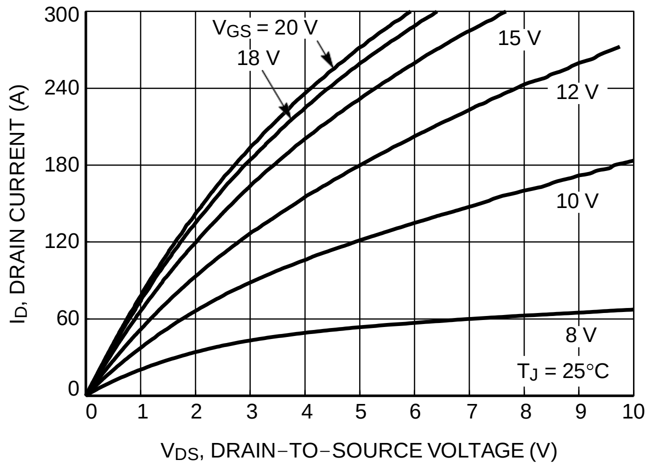


Figure 1. On−Region Characteristics

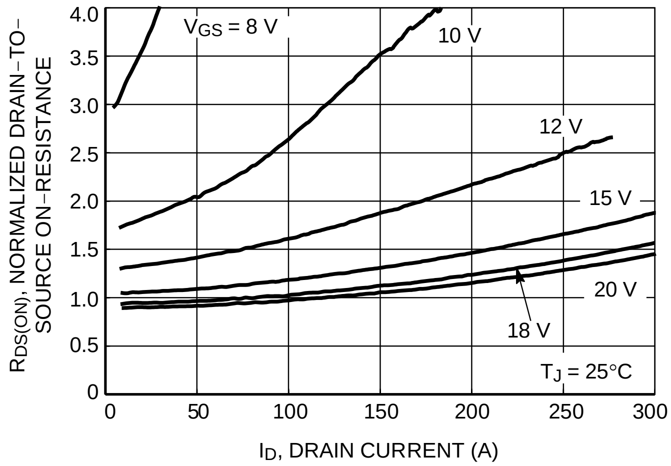


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

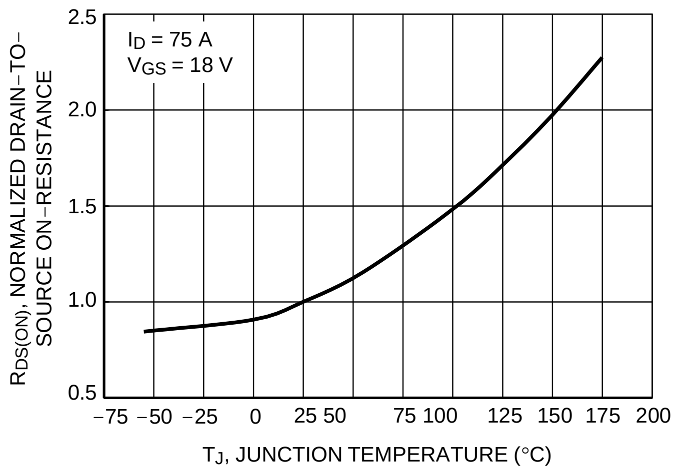


Figure 3. On−Resistance Variation with Temperature

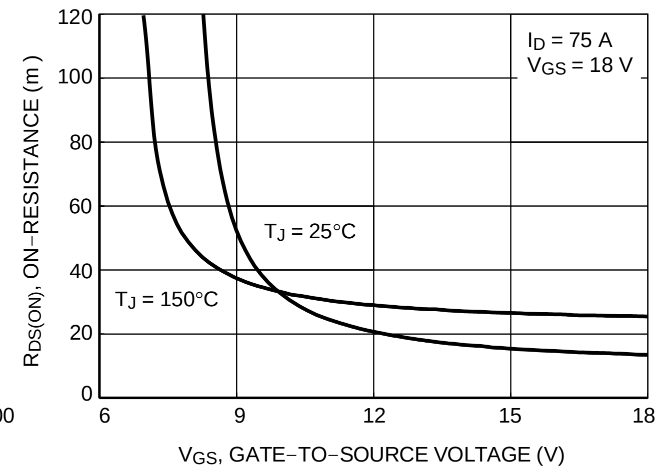


Figure 4. On−Resistance vs. Gate−to−Source Voltage

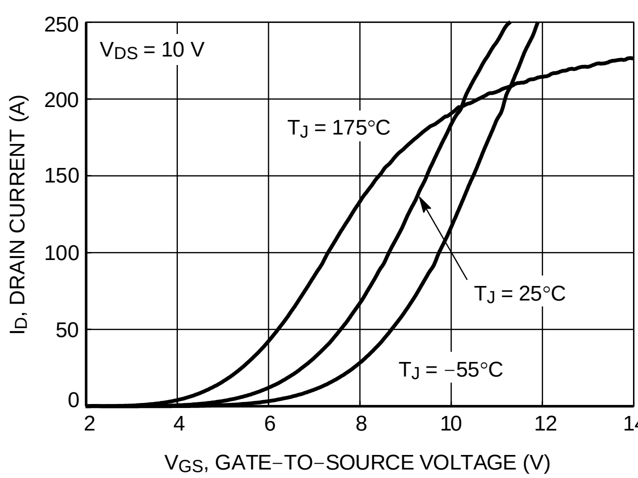


Figure 5. Transfer Characteristics

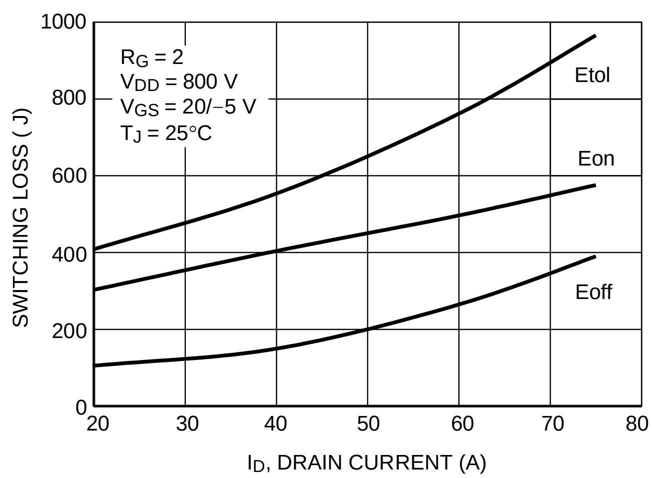


Figure 6. Switching Loss vs. Drain Current

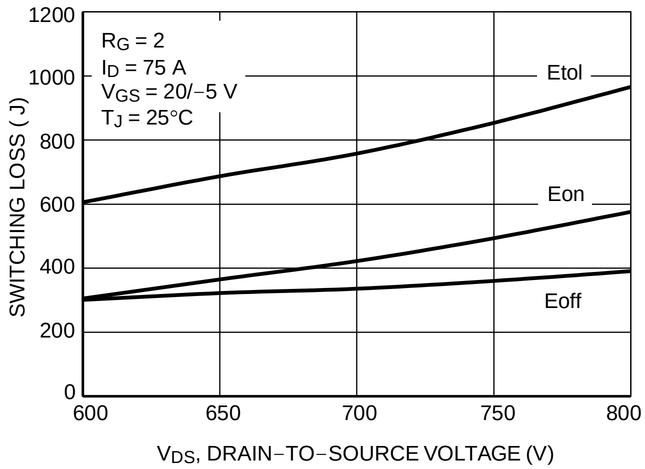


Figure 7. Switching Loss vs. Drain−to−Source Voltage

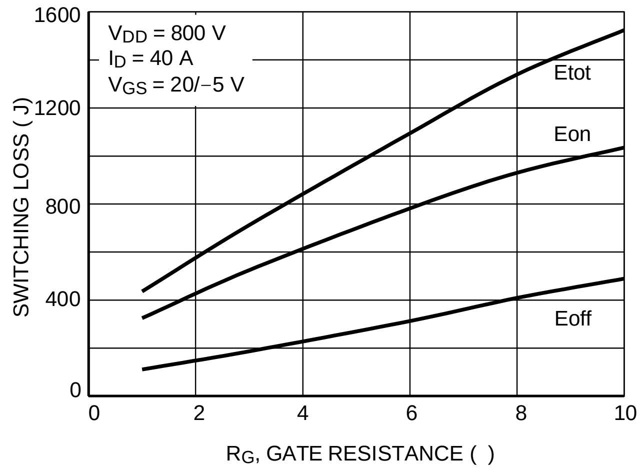


Figure 8. Switching Loss vs. Gate Resistance

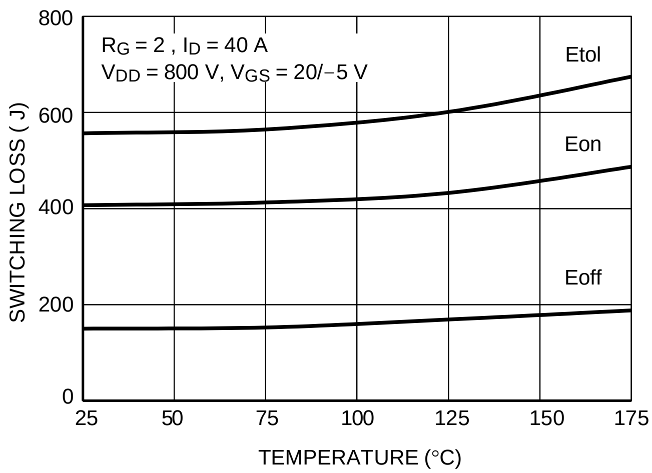


Figure 9. Switching Loss vs. Temperature

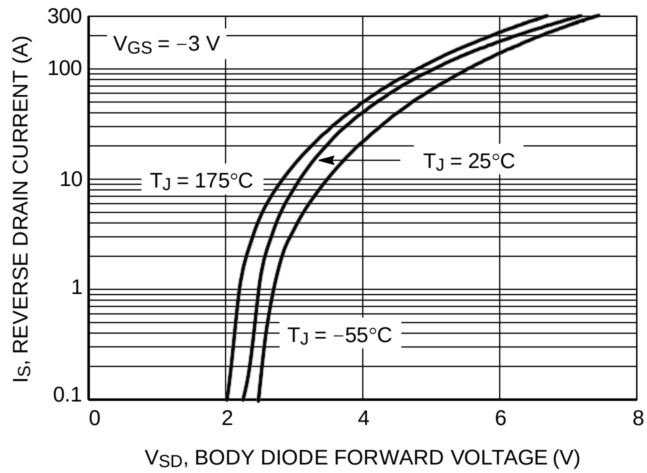


Figure 10. Reverse Drain Current vs. Body Diode Forward Voltage

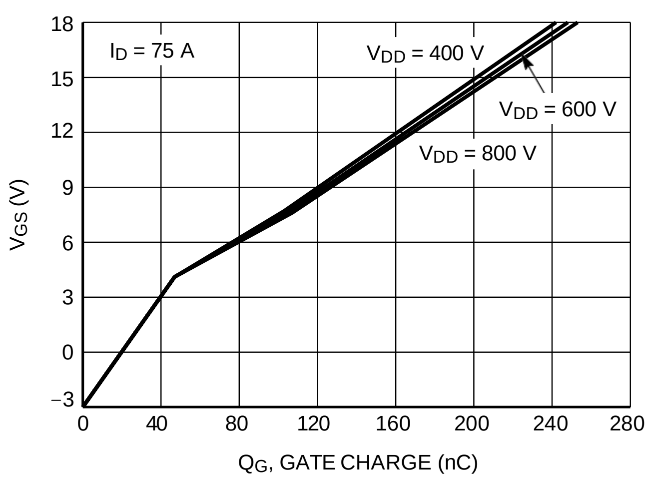


Figure 11. Gate−to−Source Voltage vs. Total Charge

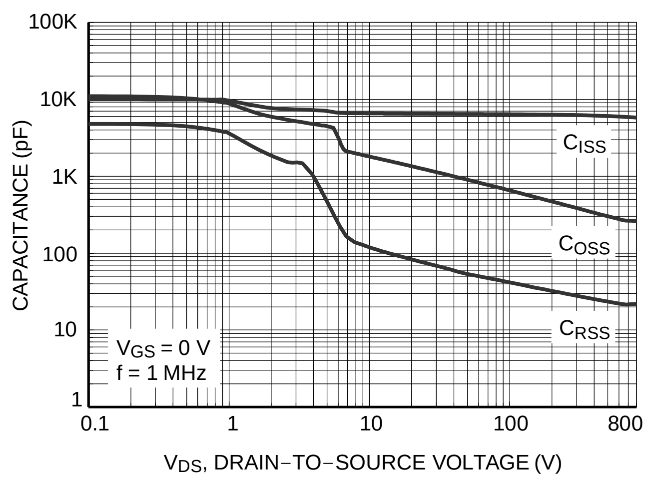


Figure 12. Capacitance vs. Drain−to−Source Voltage

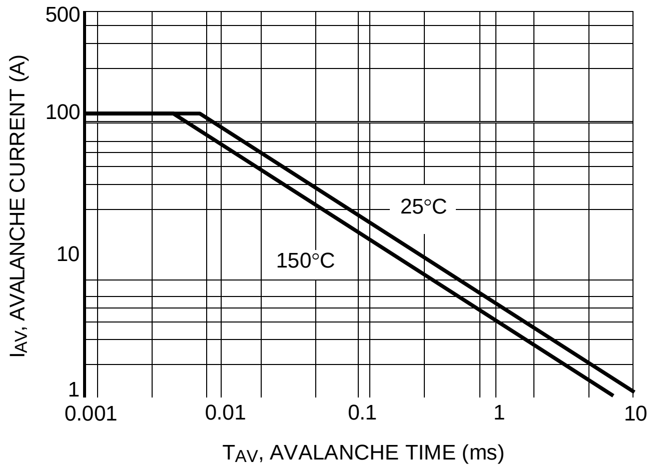


Figure 13. Unclamped Inductive Switching Capability

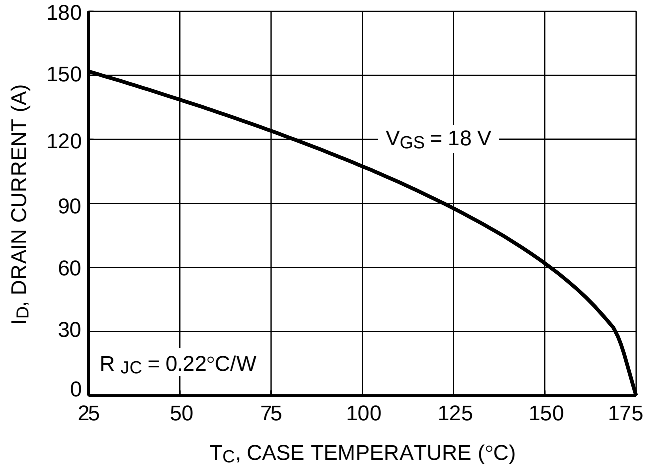


Figure 14. Maximum Continuous Drain Current vs. Case Temperature

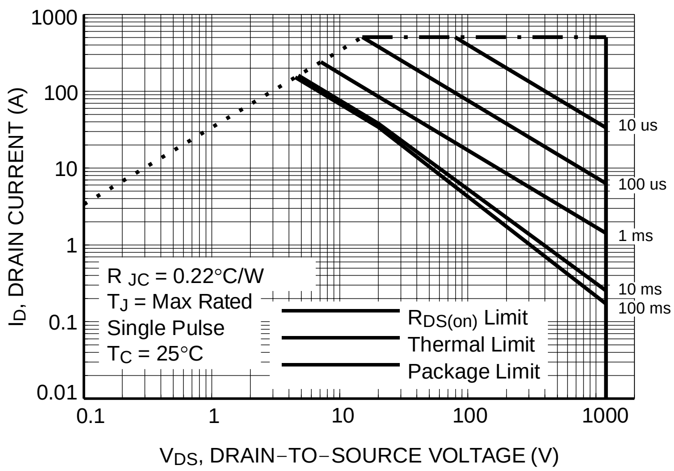


Figure 15. Safe Operating Area

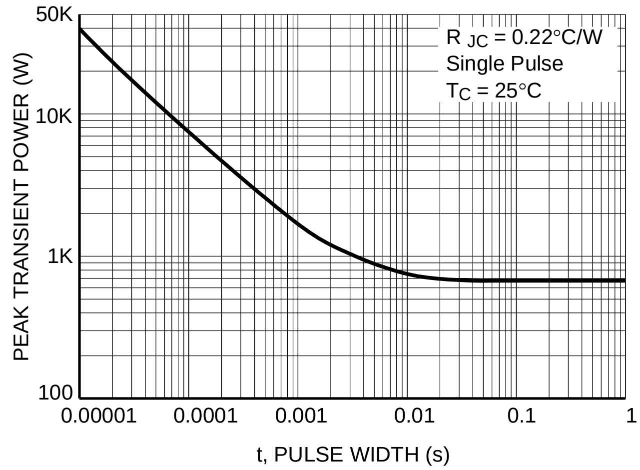


Figure 16. Single Pulse Maximum Power Dissipation

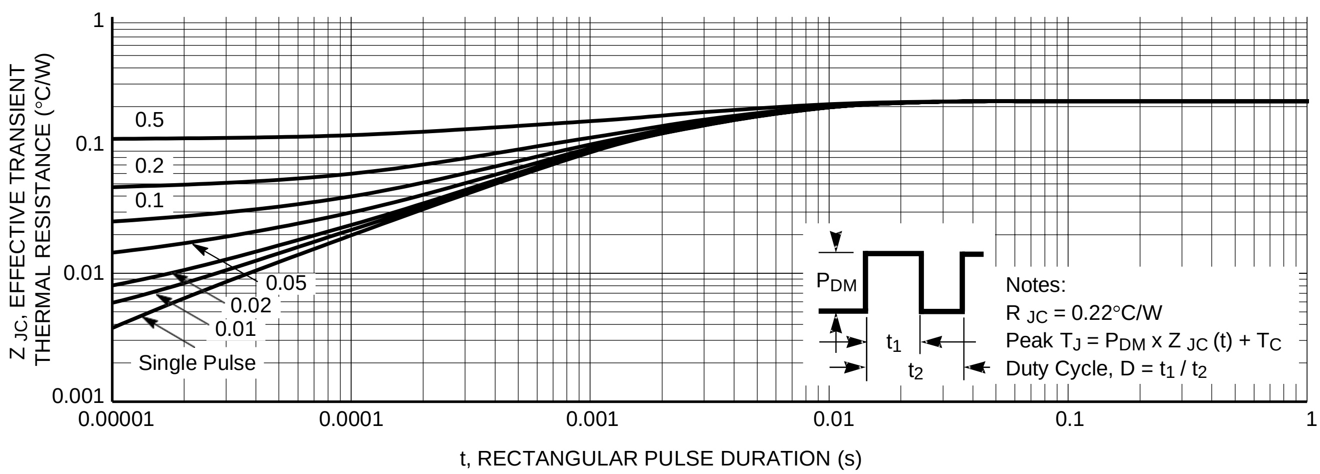


Figure 17. Junction−to−Case Transient Thermal Response