Silicon Carbide (SiC), 30 mohm, 1200V QDPAK-22L QXDP080N120

Features

- Typ. $R_{DS(on)}$ = 30mΩ @ V_{GS} =18V
- Ultra Low Gate Charge ($Q_{G(tot)}$ = 257nC)
- High Speed Switching with Low Capacitance(C_{oss}=279pF)
- 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}	−4/+18	V
Continuous Drain Current (Notes 1, 3)	Steady State	T_C = 25°C	I_D	80	A
Power Dissipation (Note 1)	Steady State	T_C = 25°C	P_D	313	W
Continuous Drain Current (Notes 1, 3)	Steady State	T_C = 100°C	I_D	52	A
Power Dissipation (Note 1)	Steady State	T_C = 100°C	P_D	156	W
Pulsed Drain Current		T_C = 25°C	I_{DM}	193	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} = −3V			I_S	80	A
Maximum Lead Temperature for Soldering (1/25 from case for 10 s)			T_L	260	°C

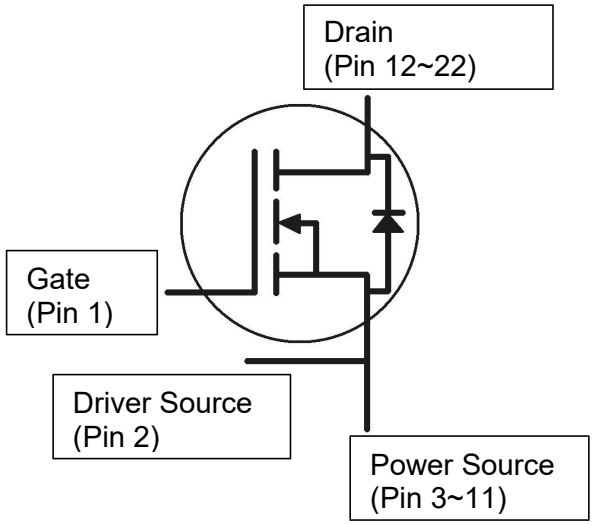
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may beaffected.

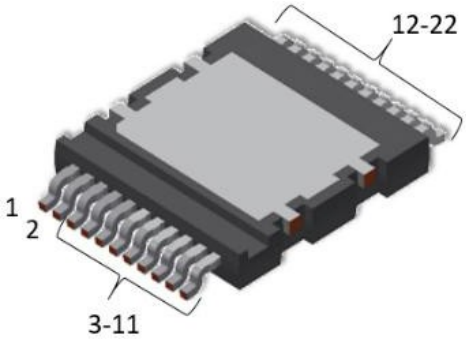
1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Repetitive rating, limited by max junction temperature.
3. The maximum current rating is based on typical $R_{DS(on)}$ performance.

QXDP080N120 Summary

$V_{(BR)DSS}$	$R_{DS(ON)}$	I_D
1200 V	30mΩ	80A

Equivalent Schematic





QDPAK-22L

ORDERING INFORMATION

Device	Package	Shipping
QXDP080N120	QDPAK-22L	30 Units / Tube

TYPICAL CHARACTERISTICS

Table 1. THERMAL CHARACTERISTICS

Parameter	Symbol	Max	Unit
Junction−to−Case −Steady State (Note 1)	$R_{\theta JC}$	0.48	°C/W
Junction−to−Ambient −Steady State (Note 1)	$R_{\theta JA}$	40	°C/W

Table 2. 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} = 0V, I_D = 1mA		1200	−	−	V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_j$	I_D = 1mA, referenced to 25°C		−	0.3	−	V/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0V, V_{DS} = 1200V, T_j = 25°C		−	−	100	μA
Gate−to−Source Leakage Current	I_{GSS}	V_{GS} = -10/+22V, V_{DS} = 0V		−	−	±1	μA
ON−STATE CHARACTERISTICS (Note 2)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 15mA		2.4	2.9	4.1	V
Recommended Gate Voltage	V_{GOP}			−4	−	+18	V
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 18V, I_D =30A	T_j = 25°C	−	25.6	27.1	mΩ
			T_j =125°C	−	38.4	−	mΩ
			T_j =175°C	−	48.4	−	mΩ
		V_{GS} = 16V, I_D =30A	T_j = 25°C	−	26.5	28.6	mΩ
			T_j =125°C	−	40.1	−	mΩ
			T_j =175°C	−	50.4	−	mΩ
Forward Transconductance	g_{FS}	V_{DS} = 10V, I_D = 30A		−	30	−	S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{iss}	V_{GS} = 0V, f = 1MHz, V_{DS} = 800V		−	2660	−	pF
Output Capacitance	C_{oss}			−	143	−	pF
Reverse Transfer Capacitance	C_{rss}			−	9.52	−	pF
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = −4/16V, V_{DS} = 800V		−	136	−	nC
Threshold Gate Charge	$Q_{G(TH)}$			−	15.8	−	nC
Gate−to−Source Charge	Q_{GS}			−	37.1	−	nC
Gate−to−Drain Charge	Q_{GD}			−	59.5	−	nC
Gate−Resistance	R_G	V_{GS} = 0V, f = 1MHz		−	2.08	−	Ω
SWITCHING CHARACTERISTICS							
Turn−On Delay Time	$T_{d(on)}$	V_{GS} = −4/16V, V_{DS} = 800V, I_D = 30A, R_G = 4.7Ω, Inductive load	T_j = 25°C	−	32.6	−	ns
			T_j = 125°C	−	34.8	−	ns
			T_j = 175°C	−	28.7	−	ns
Rise Time	t_r		T_j = 25°C	−	13.4	−	ns
			T_j = 125°C	−	13.76	−	ns
			T_j = 175°C	−	14.72	−	ns
Turn−Off Delay Time	$T_{d(off)}$		T_j = 25°C	−	49.6	−	ns
			T_j = 125°C	−	59.5	−	ns
			T_j = 175°C	−	62.7	−	ns
Fall Time	t_f		T_j = 25°C	−	26.5	−	ns
			T_j = 125°C	−	24.3	−	ns
			T_j = 175°C	−	24.9	−	ns

SWITCHING CHARACTERISTICS

Turn−On Switching Loss	E_{on}	V_{GS} = −4/16V, V_{DS} = 800V, I_D = 30A, R_G = 4.7Ω, Inductive load	T_j = 25°C	−	300.9	−	μJ
			T_j =125°C	−	327.7	−	μJ
			T_j =175°C	−	373.3	−	μJ
Turn−Off Switching Loss	E_{off}		T_j = 25°C	−	67.4	−	μJ
			T_j =125°C	−	65.1	−	μJ
			T_j =175°C	−	77.2	−	μJ
Total Switching Loss	E_{tot}		T_j = 25°C	−	368.3	−	μJ
			T_j =125°C	−	392.8	−	μJ
			T_j =175°C	−	450.5	−	μJ

SOURCE−DRAIN DIODE CHARACTERISTICS

Continuous Source−Drain Diode Forward Current	I_{SD}	V_{GS} = −4V, T_C = 25°C		−	−	80	A
Pulsed Source−Drain Diode Forward Current	I_{SDM}			−	−	193	A
Forward Diode Voltage	V_{SD}	V_{GS} = −4V, I_{SD} = 30A	T_j = 25°C	−	3.88	−	V
			T_j =125°C	−	3.48	−	V
			T_j =175°C	−	3.34	−	V

Table 2. 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} = −4V, I_{SD} = 30A, -dis/dt = 236 A/μs, V_{DS} = 800 V	T_j = 25°C	−	18.5	−	ns
			T_j =125°C	−	31.4	−	ns
			T_j =175°C	−	39.5	−	ns
Reverse Recovery Charge	Q_{rr}		T_j = 25°C	−	230	−	nC
			T_j =125°C	−	470	−	nC
			T_j =175°C	−	620	−	nC
Reverse Recovery Energy	E_{rec}		T_j = 25°C	−	123	−	μJ
			T_j =125°C	−	279	−	μJ
			T_j =175°C	−	352	−	μJ
Peak Reverse Recovery Current	I_{rrm}		T_j = 25°C	−	32.2	−	A
			T_j =125°C	−	43.1	−	A
			T_j =175°C	−	54.2	−	A

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.

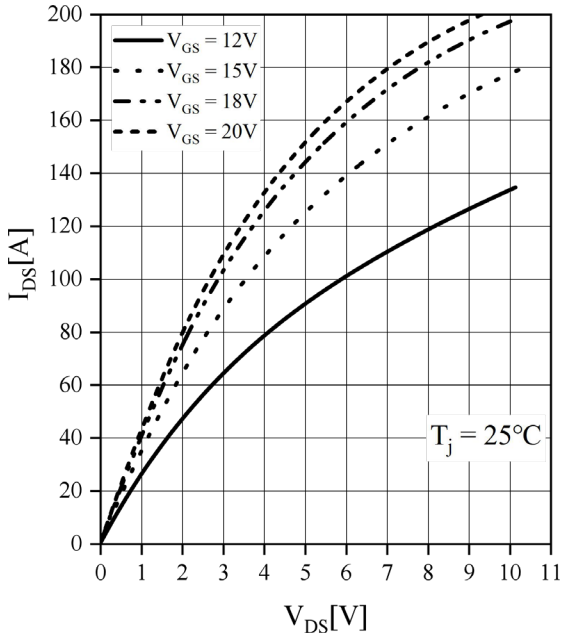


Figure 1. On−Region Characteristics

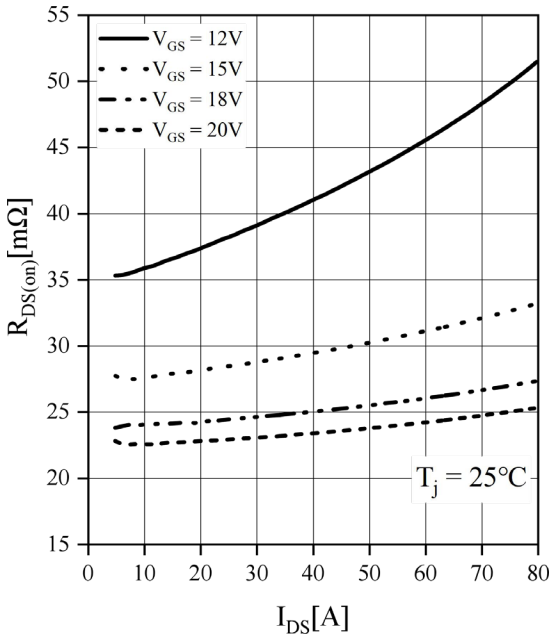


Figure 2. On−Resistance vs. Drain Current and Gate Voltage

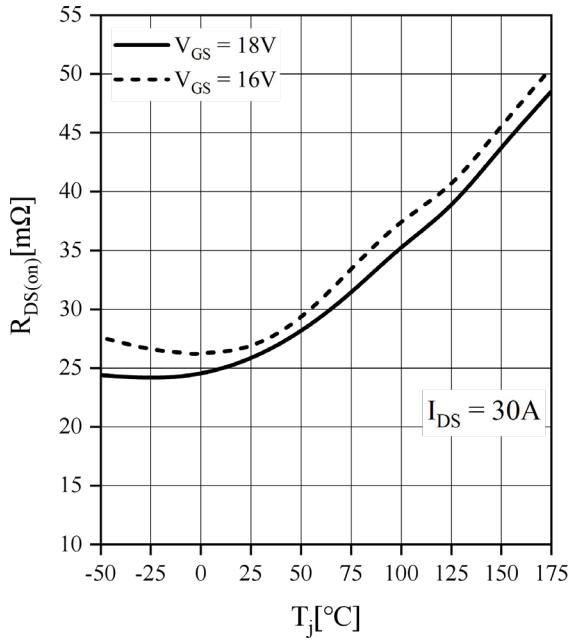


Figure 3. On−Resistance Variation with Temperature

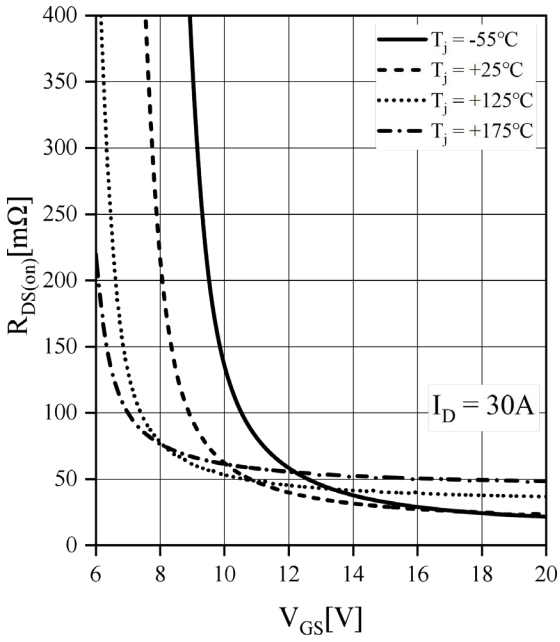


Figure 4. On−Resistance vs. Gate−to−Source Voltage

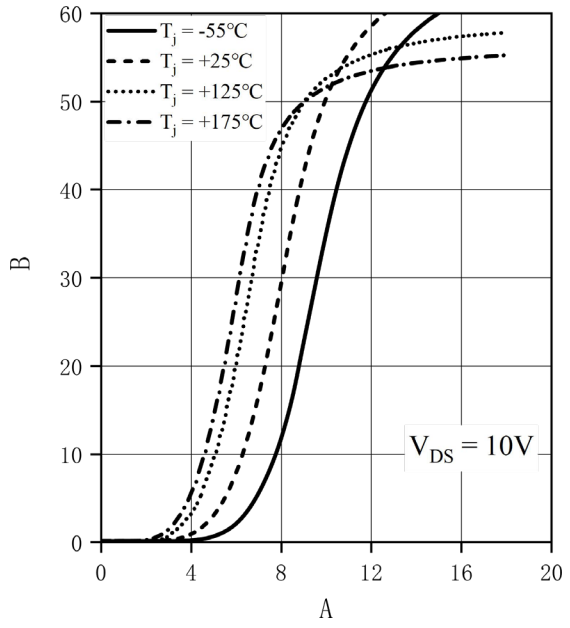


Figure 5. Transfer Characteristics

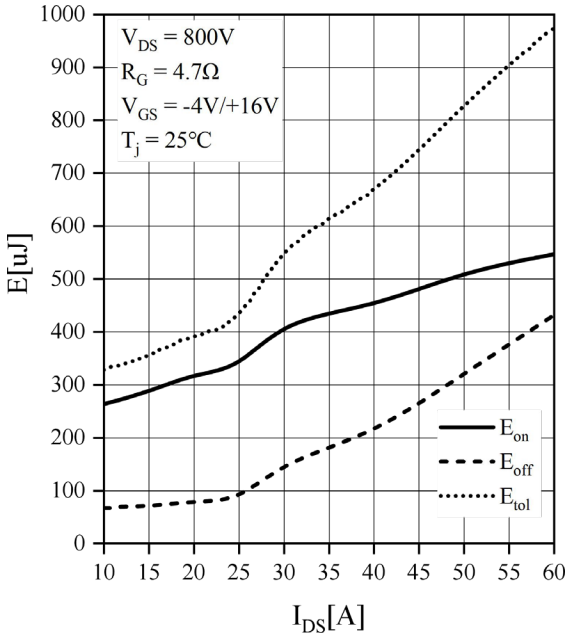


Figure 6. Switching Loss vs. Drain Current

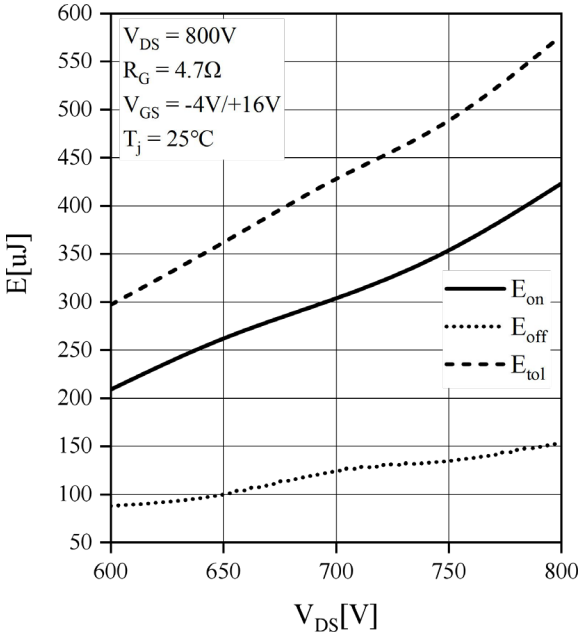


Figure 7. Switching Loss vs. Drain−to−Source Voltage

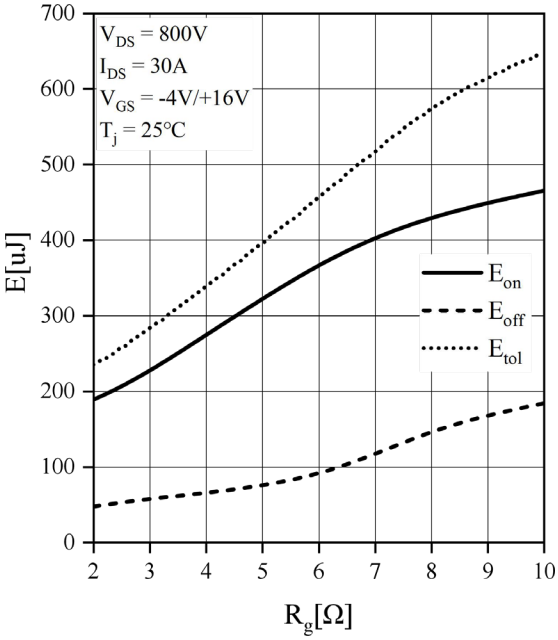


Figure 8. Switching Loss vs. Gate Resistance

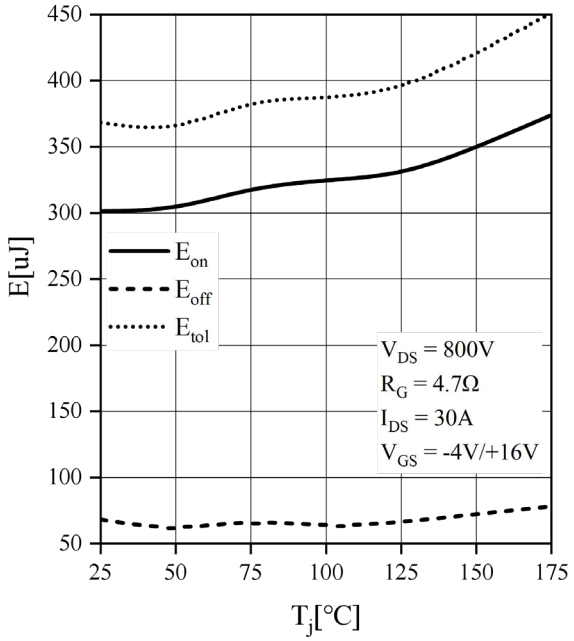


Figure 9. Switching Loss vs. Temperature

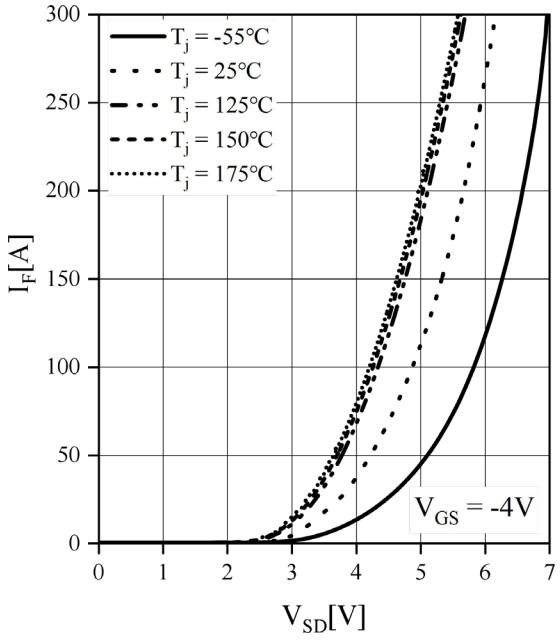


Figure 10. Reverse Drain Current vs. Body Diode Forward Voltage

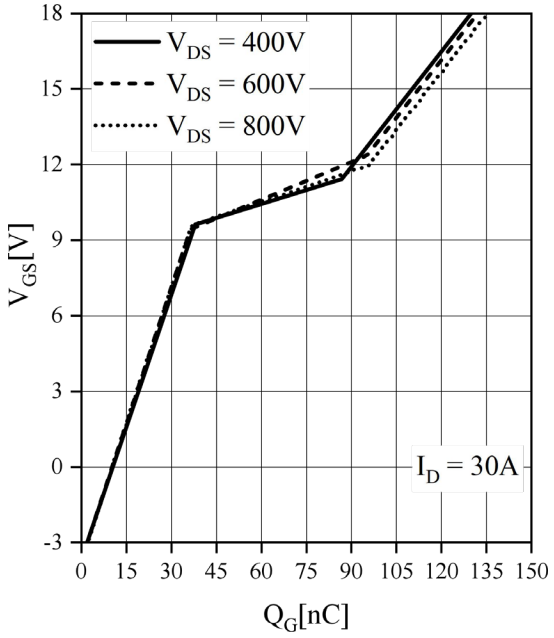


Figure 11. Gate−to−Source Voltage vs. Total Charge

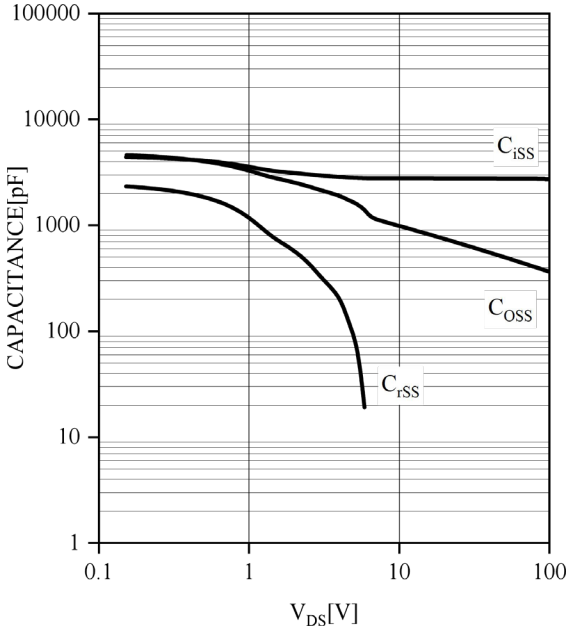


Figure 12. Capacitance vs. Drain−to−Source Voltage

TYPICAL CHARACTERISTICS

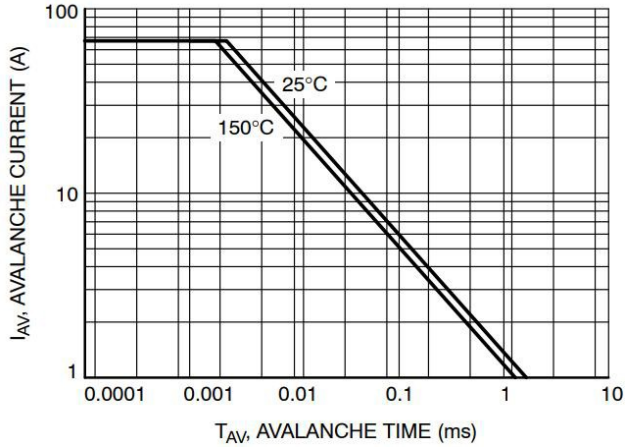


Figure 13. Unclamped Inductive Switching Capability

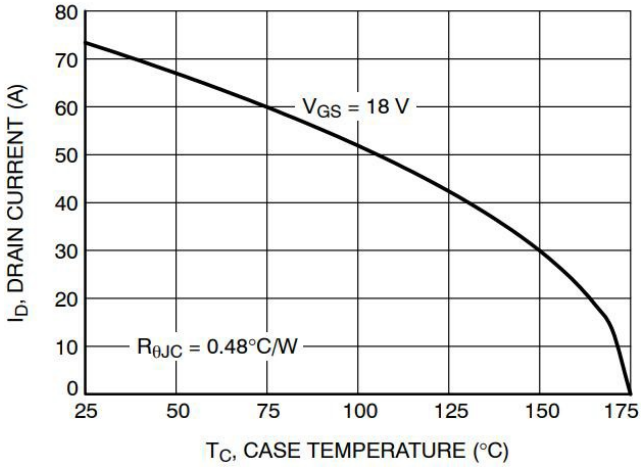


Figure 14. Maximum Continuous Drain Current vs. Case Temperature

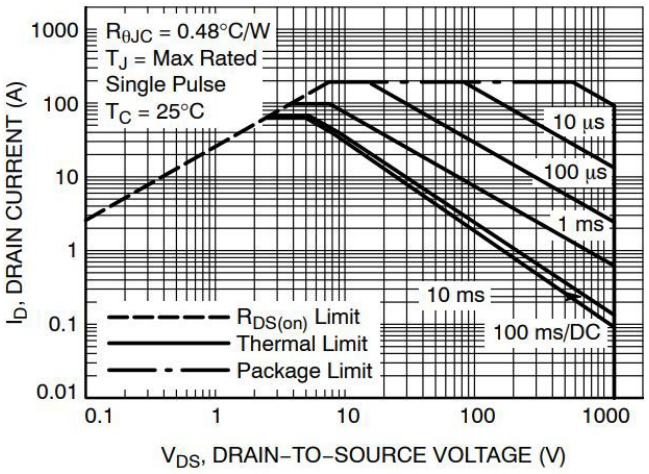


Figure 15. Safe Operating Area

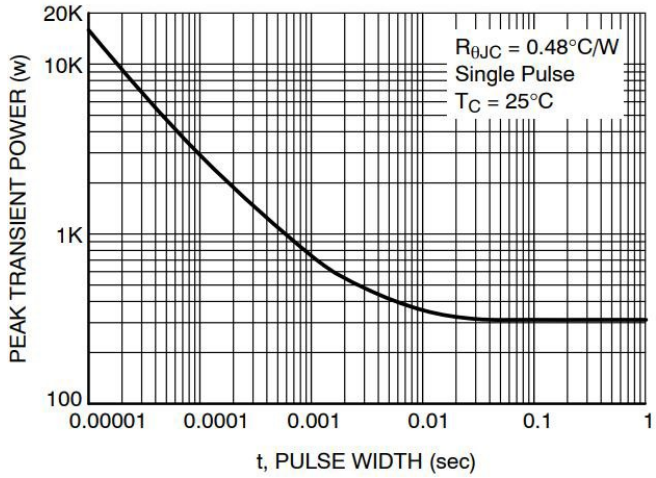


Figure 16. Single Pulse Maximum Power Dissipation

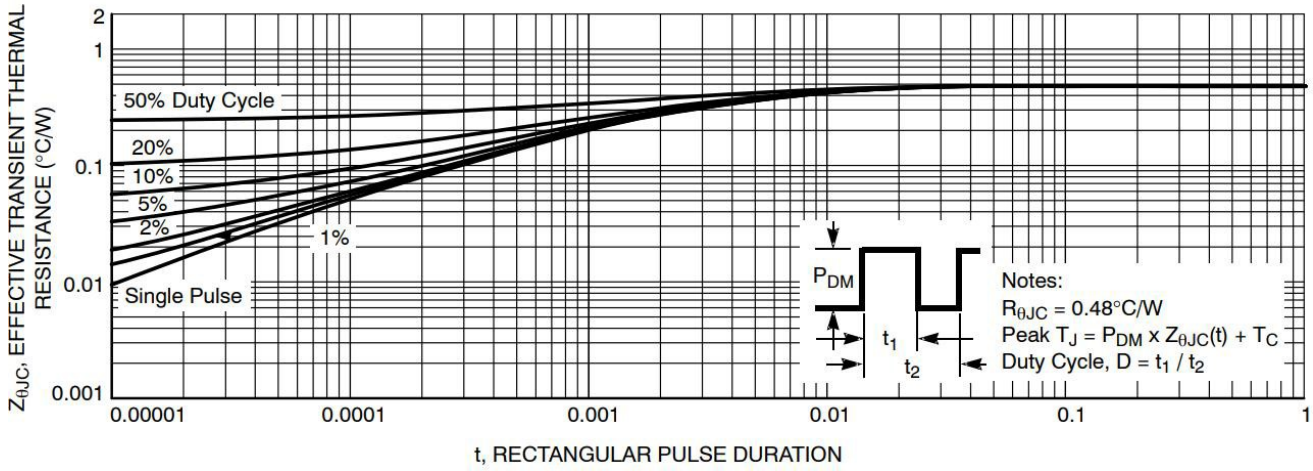
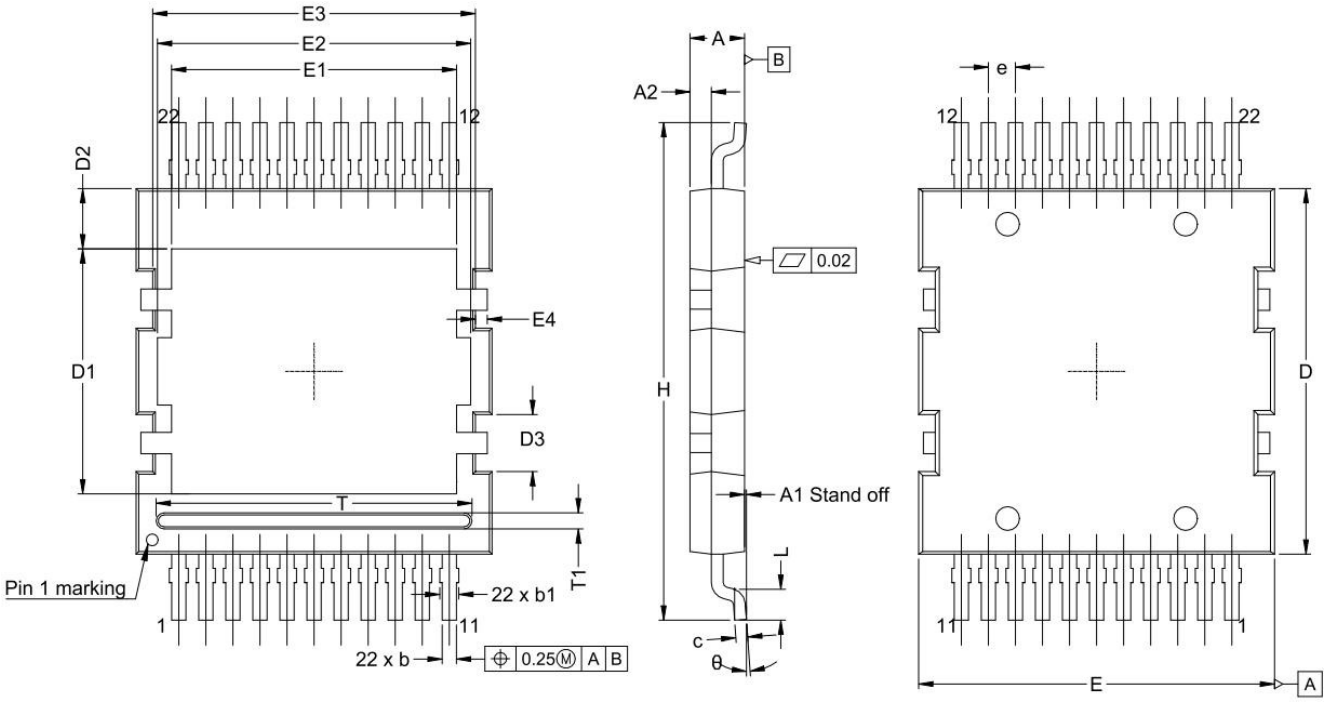


Figure 17. Junction−to−Case Transient Thermal Response

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QDPAK-22L PACKAGE OUTLINE DIMENSIONS



Type	Millimeters		
	Min	Nom	Max
A	2.200	2.300	2.350
A1	0.000	-	0.150
A2	0.800	0.900	1.000
b	0.500	0.600	0.700
b1	0.500	-	0.900
c	0.460	0.500	0.580
e	1.140 BSC		
D	15.300	15.400	15.500
D1	10.23	10.320	10.43
D2	2.540 REF		
D3	2.400 REF		
E	14.900	15.000	15.100
E1	11.910	12.010	12.110
E2	13.200 REF		
E3	13.600 REF		
E4	0.500 REF		
H	20.810	20.960	21.110
L	1.200	1.300	1.400
θ	0°	-	8°
T	13.210	13.310	13.410
T1	0.500	0.670	0.700

UNIT:mm