Silicon Carbide (SiC), 25 mohm, 750 V, T2PAK-7L QXTS025N075

$V_{(BR)DSS}$	$R_{DS(ON)}$	I_D
750V	25mΩ	100A

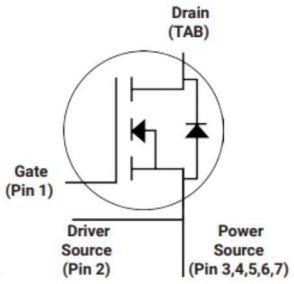
Features

- High speed switching
- Very low switching losses
- Fully controllable dv/dt
- High blocking voltage with low on-resistance
- Fast intrinsic diode with low reverse recovery (Qrr)
- Temperature independent turn-off switching losses
- Halogen free, RoHS compliant

Typical Applications

- On-board charger/PFC
- EV battery chargers
- Booster/DC-DC converter
- Switch mode power supplies

N−CHANNEL MOSFET





1234567

T2PAK-7L

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

Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	750	V
Gate−to−Source Voltage			V_{GS}	−8/+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	101	A
Power Dissipation (Note 1)	Steady State	T_C = 25°C	P_D	385	W
Continuous Drain Current (Notes 1, 3)	Steady State	T_C = 100°C	I_D	71	A
Power Dissipation (Note 1)	Steady State	T_C = 100°C	P_D	270	W
Pulsed Drain Current	T_C = 25°C		I_{DM}	261	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	75	A
Single Pulse Drain−to−Source Avalanche Energy (Note 4)			E_{AS}	220	mJ
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 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 220 mJ is based on starting T_j = 25°C; L = 1mH, I_{AS} = 75 A, V_{DD} = 100V, V_{GS} = 16V.

ORDERING INFORMATION

Device	Package	Shipping
QXTS025N075	T2PAK-7L	30 Units / Tube

TYPICAL CHARACTERISTICS

Table 1. THERMAL CHARACTERISTICS

Parameter	Symbol	Max	Unit
Junction−to−Case −Steady State (Note 1)	$R_{\theta JC}$	0.39	°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 =100μA		750	−	−	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} = 750V, T_j = 25°C		−	−	10	μA
Gate−to−Source Leakage Current	I_{GSS}	V_{GS} = 18V, V_{DS} = 0V		−	−	100	nA
ON−STATE CHARACTERISTICS (Note 2)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 11mA		2.3	2.8	3.6	V
Recommended Gate Voltage	V_{GOP}			−4	−	+18	V
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 18V, I_D =34A	T_j = 25°C	−	25	33	mΩ
			T_j =175°C	−	38	−	mΩ
		V_{GS} = 15V, I_D =34A	T_j = 25°C	−	29	42	mΩ
			T_j =175°C	−	39	−	mΩ
Forward Transconductance	g_{FS}	V_{DS} = 20V, I_D = 34A		−	24	−	S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{iss}	V_{DS} = 500V V_{GS} = 0V T_J = 25°C V_{AC} = 25mV f = 100kHz		−	2020	−	pF
Output Capacitance	C_{oss}			−	183	−	pF
Reverse Transfer Capacitance	C_{rss}			−	10.2	−	pF
Total Gate Charge	$Q_{G(TOT)}$	V_{DS} = 500V, V_{GS} = -4/+18V I_D = 34A		−	61	−	nC
Threshold Gate Charge	$Q_{G(TH)}$			−	23	−	nC
Gate−to−Source Charge	Q_{GS}			−	20	−	nC
Gate−to−Drain Charge	Q_{GD}			−	18	−	nC
Gate−Resistance	R_G	V_{GS} = 0V, f = 1MHz		−	2.8	−	Ω
SWITCHING CHARACTERISTICS							
Turn−On Delay Time	$T_{d(on)}$	V_{DS} = 500V V_{GS} = -4/+18V I_D = 34A Rg = 2.5Ω L = 16.7μH	T_j = 25°C	−	11.4	−	ns
			T_j = 125°C	−	−	−	ns
			T_j = 175°C	−	−	−	ns
Rise Time	t_r		T_j = 25°C	−	10.6	−	ns
			T_j = 125°C	−	−	−	ns
			T_j = 175°C	−	−	−	ns
Turn−Off Delay Time	$T_{d(off)}$		T_j = 25°C	−	23	−	ns
			T_j = 125°C	−	−	−	ns
			T_j = 175°C	−	−	−	ns
Fall Time	t_f		T_j = 25°C	−	9	−	ns
			T_j = 125°C	−	−	−	ns
			T_j = 175°C	−	−	−	ns

SWITCHING CHARACTERISTICS

Turn−On Switching Loss	E_{on}	V_{DS} = 500V V_{GS} = -4/+18V I_D = 34A Rg = 2.5Ω L = 16.7μH	T_j = 25°C	−	130	−	μJ
			T_j =125°C	−	−	−	μJ
			T_j =175°C	−	−	−	μJ
Turn−Off Switching Loss	E_{off}		T_j = 25°C	−	41	−	μJ
			T_j =125°C	−	−	−	μJ
			T_j =175°C	−	−	−	μJ
Total Switching Loss	E_{tot}		T_j = 25°C	−	171	−	μJ
			T_j =125°C	−	-	−	μJ
			T_j =175°C	−	-	−	μJ

SOURCE−DRAIN DIODE CHARACTERISTICS

Continuous Source−Drain Diode Forward Current	I_{SD}	V_{GS} = −4V, T_C = 25°C		−	−	83	A
Pulsed Source−Drain Diode Forward Current	I_{SDM}			−	−	193	A
Forward Diode Voltage	V_{SD}	V_{GS} = −4V, I_{SD} = 17A	T_j = 25°C	−	3.7	−	V
			T_j =175°C	−	3.3	−	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_R = 500V, V_{GS} = -4V I_{SD} = 34A di/dt = 3039A/μs T_J = 175°C	T_j = 25°C	−	−	−	ns
			T_j =125°C	−	−	−	ns
			T_j =175°C	−	15	−	ns
Reverse Recovery Charge	Q_{rr}		T_j = 25°C	−	−	−	nC
			T_j =125°C	−	−	−	nC
			T_j =175°C	−	176	−	nC
Reverse Recovery Energy	E_{rec}		T_j = 25°C	−	−	−	μJ
			T_j =125°C	−	−	−	μJ
			T_j =175°C	−	352	−	μJ
Peak Reverse Recovery Current	I_{rrm}		T_j = 25°C	−	−	−	A
			T_j =125°C	−	−	−	A
			T_j =175°C	−	20	−	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.

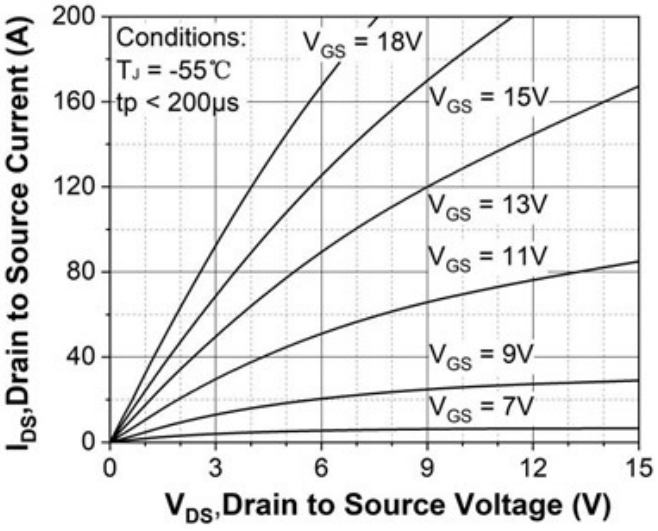


Figure 1. On−Region Characteristics

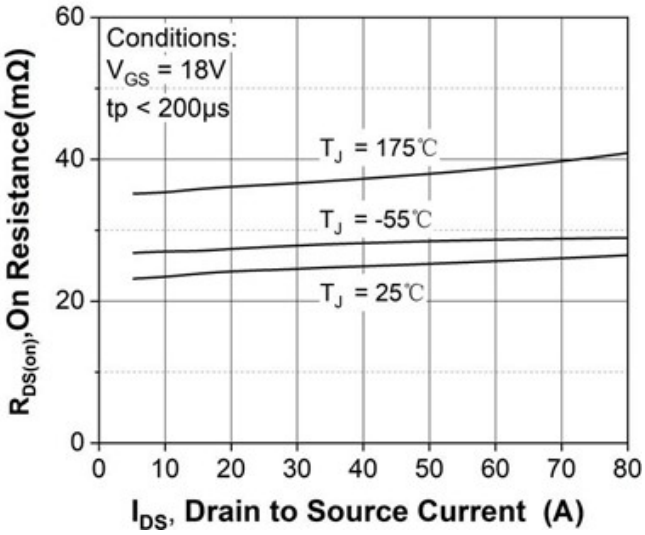


Figure 2. On−Resistance vs. Drain Current and Gate Voltage

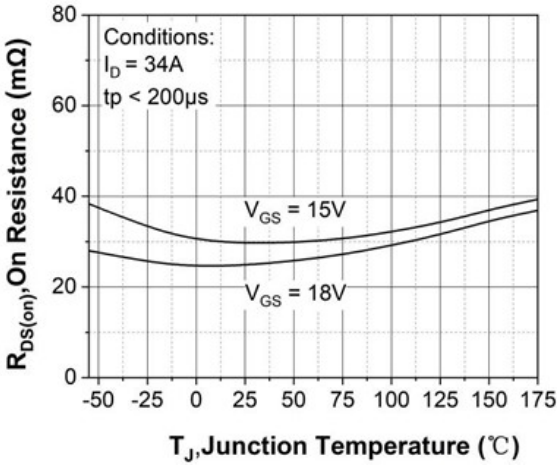


Figure 3. On−Resistance Variation with Temperature

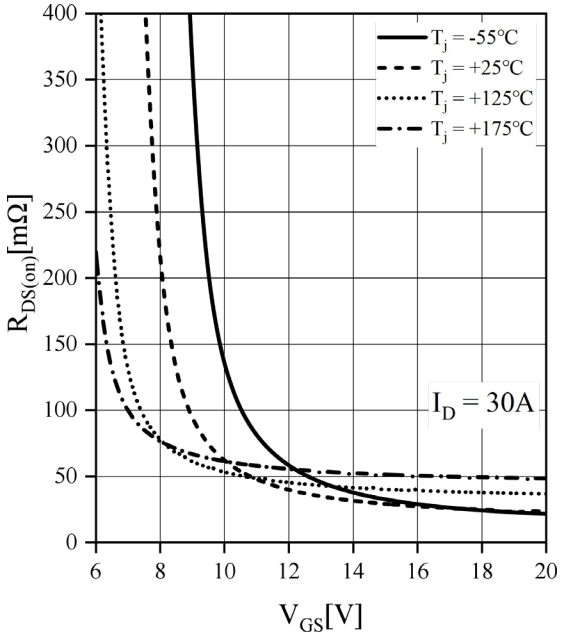


Figure 4. On−Resistance vs. Gate−to−Source Voltage

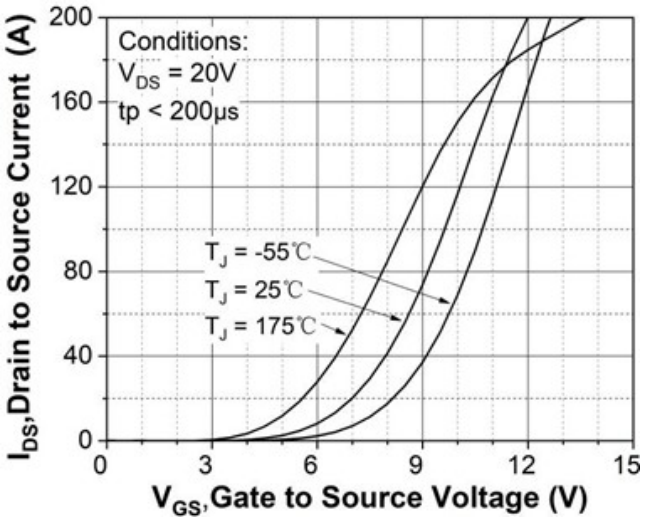


Figure 5. Transfer Characteristics

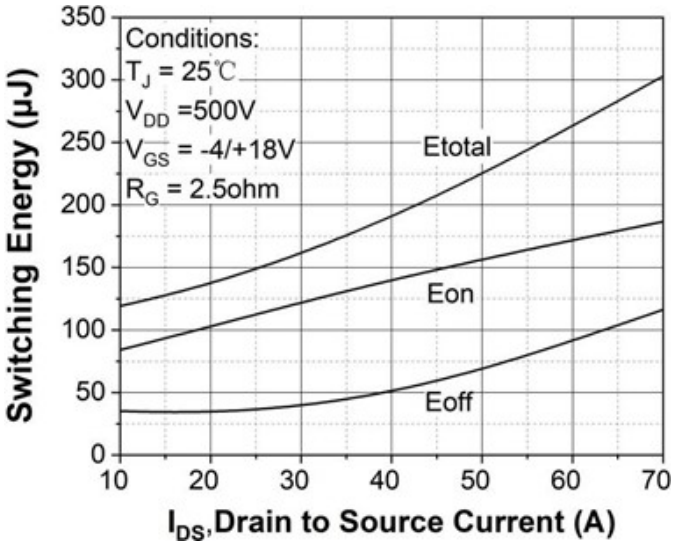


Figure 6. Switching Loss vs. Drain Current

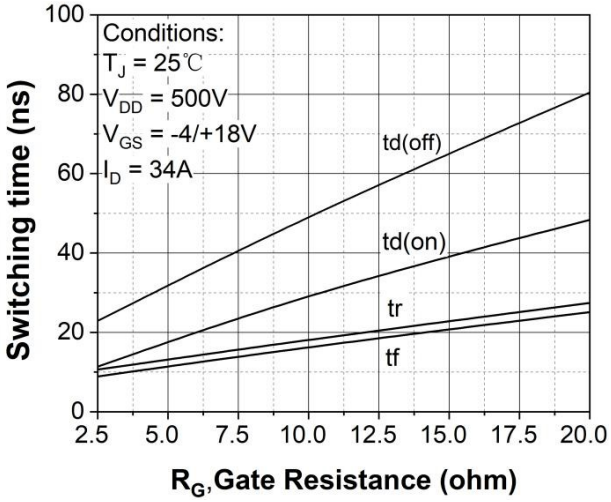


Figure 7. Switching Loss vs. Drain−to−Source Voltage

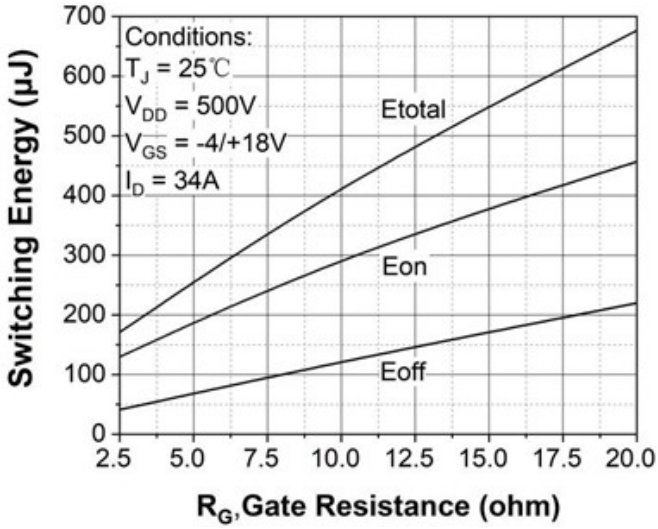


Figure 8. Switching Loss vs. Gate Resistance

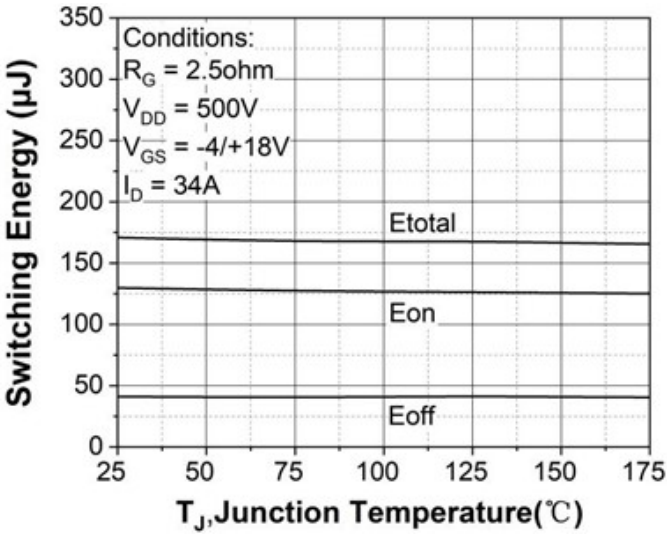


Figure 9. Switching Loss vs. Temperature

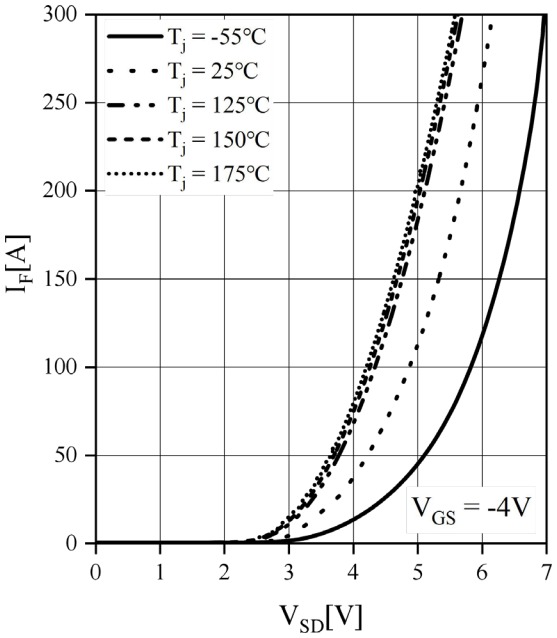


Figure 10. Reverse Drain Current vs. Body Diode Forward Voltage

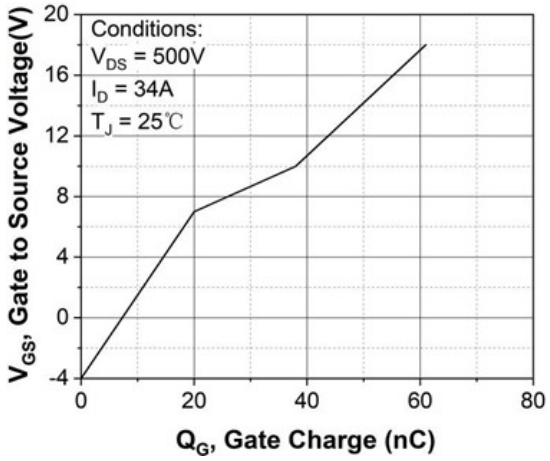


Figure 11. Gate−to−Source Voltage vs. Total Charge

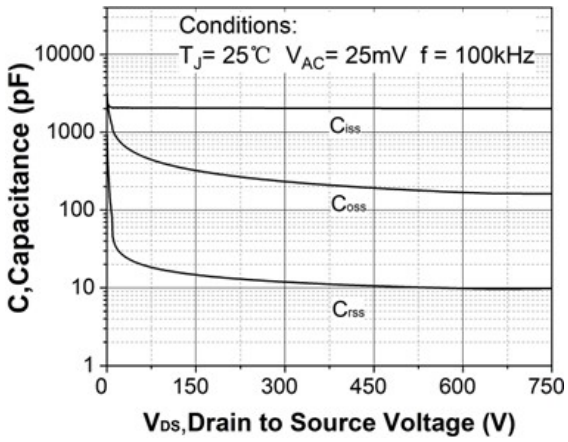


Figure 12. Capacitance vs. Drain−to−Source Voltage

TYPICAL CHARACTERISTICS

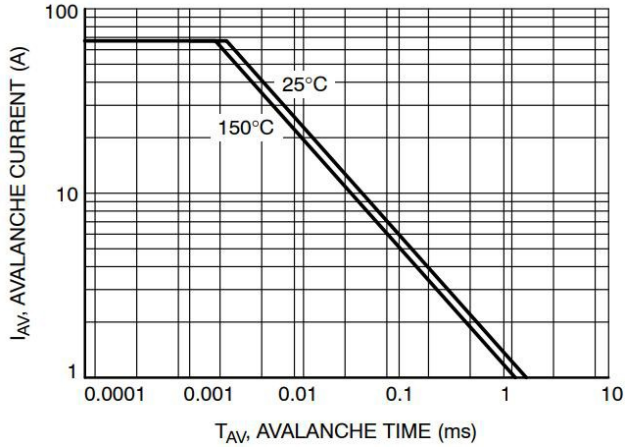


Figure 13. Unclamped Inductive Switching Capability

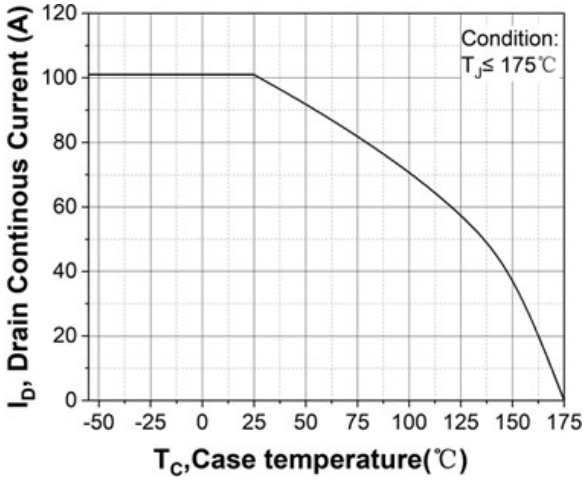


Figure 14. Maximum Continuous Drain Current vs. Case Temperature

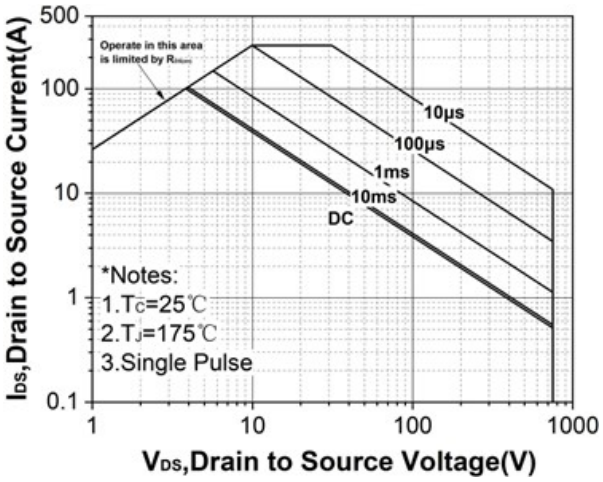


Figure 15. Safe Operating Area

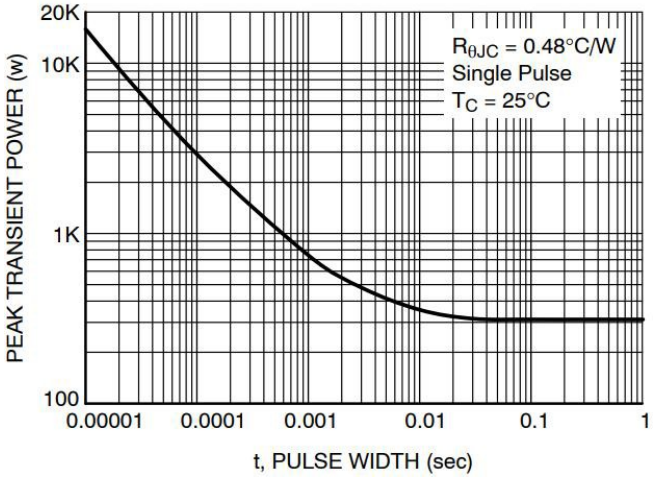


Figure 16. Single Pulse Maximum Power Dissipation

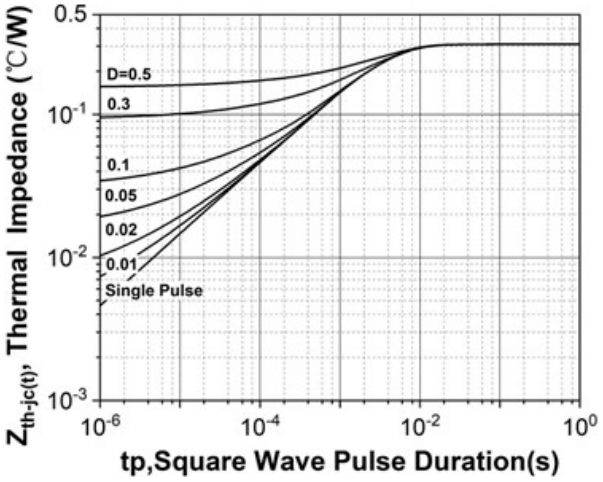
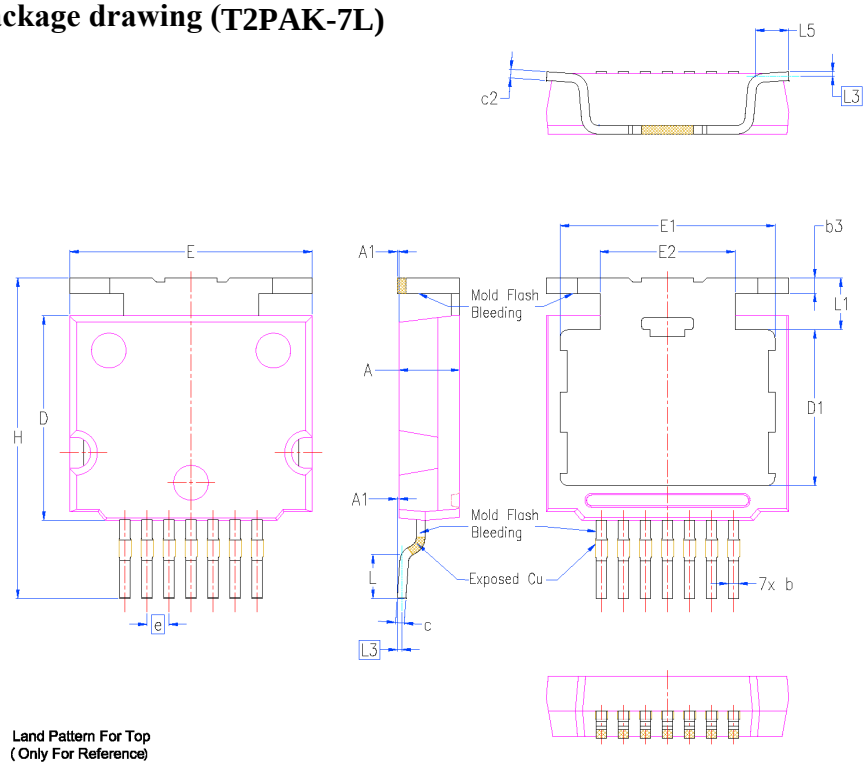


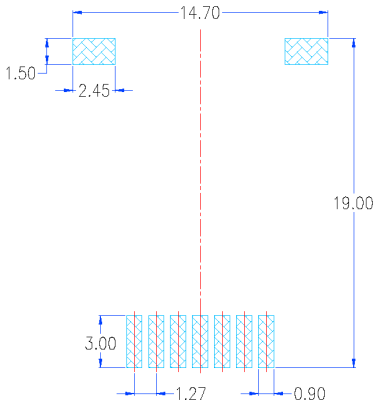
Figure 17. Junction−to−Case Transient Thermal Response

Package drawing (T2PAK-7L)



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	3.40	3.50	3.60
A1	0.00	0.10	0.25
b	0.50	0.60	0.70
b3	0.80	0.90	1.00
c	0.40	0.50	0.60
c2	0.40	0.50	0.60
D	11.70	11.80	11.90
D1	8.80	9.00	9.10
E	13.90	14.00	14.10
E1	12.30	12.40	12.50
E2	7.75	7.80	7.85
e	1.27 BSC		
H	18.00	18.50	19.00
L	2.30	2.50	2.75
L1	---	3.05	---
L3	---	0.26	---
L5	1.70	1.90	2.15

Land Pattern For Top
(Only For Reference)



Note:
1. All Dimensions Are In mm.
2. Dimension D & E Do Not Include Mold Flash.
   Mold Flash Shall Not Exceed 0.127mm Pre Side.
   These Dimensions Are Measured At The Outermost
   Extreme Of The Plastic Body.
3. Thermal Pad Contour Optional Within Dimensions L1, D1 & E1.
4. Dimension D1 & E1 Establish A Minmum Mounting Surface for
   The Thermal Pad.
5. ▨ is Exposed Cu.