

QIAOXIN N-Channel **Super Trench** Power MOSFET

Description

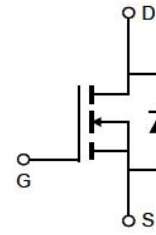
The VCRR60T20D uses **Super Trench** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification.

General Features

- $V_{DS} = 60V, I_D = 200A$
 $R_{DS(ON)} = 1.8m\Omega$ (typical) @ $V_{GS} = 10V$
- Excellent gate charge x $R_{DS(on)}$ product
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating
- 100% UIS tested

Application

- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification



Schematic diagram



TO-263T-2L top view

Package Marking and Ordering Information

| Device Marking | Device | Device Package |
|----------------|--------|----------------|
| VCRR60T20D | | TO-263-2L |

Absolute Maximum Ratings ($T_c = 25^\circ C$ unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|--------------------|------------|---------------|
| Drain-Source Voltage | V_{DS} | 60 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Drain Current-Continuous (Silicon Limited) | I_D | 200 | A |
| Drain Current-Continuous ($T_c = 100^\circ C$) | $I_D(100^\circ C)$ | 150 | A |
| Pulsed Drain Current | I_{DM} | 800 | A |
| Maximum Power Dissipation | P_D | 255 | W |
| Derating factor | | 1.7 | W/ $^\circ C$ |
| Single pulse avalanche energy ^(Note 1) | E_{AS} | 2000 | mJ |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 175 | $^\circ C$ |

Thermal Characteristic

| | | | |
|--------------------------------------|-----------------|------|--------------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 0.59 | $^\circ C/W$ |
|--------------------------------------|-----------------|------|--------------|

Electrical Characteristics (T_c=25°C unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---------------------|--|-----|------|------|------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | V _{GS} =0V, I _D =250μA | 60 | | - | V |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} =60V, V _{GS} =0V | - | - | 1 | μA |
| Gate-Body Leakage Current | I _{GSS} | V _{GS} =±20V, V _{DS} =0V | - | - | ±100 | nA |
| On Characteristics | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} =V _{GS} , I _D =250μA | 2.2 | 3.0 | 4.0 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =10V, I _D =100A | - | 1.8 | 2.2 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} =10V, I _D =100A | - | 60 | - | S |
| Dynamic Characteristics | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} =30V, V _{GS} =0V, F=1.0MHz | - | 9200 | - | PF |
| Output Capacitance | C _{OSS} | | - | 1900 | - | PF |
| Reverse Transfer Capacitance | C _{rss} | | - | 61 | - | PF |
| Switching Characteristics (Note 2) | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =30V, I _D =100A V _{GS} =10V, R _G =4.7Ω | - | 23 | - | nS |
| Turn-on Rise Time | t _r | | - | 19 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 58 | - | nS |
| Turn-Off Fall Time | t _f | | - | 14 | - | nS |
| Total Gate Charge | Q _g | V _{DS} =30V, I _D =100A, V _{GS} =10V | - | 130 | | nC |
| Gate-Source Charge | Q _{gs} | | - | 40.6 | | nC |
| Gate-Drain Charge | Q _{gd} | | - | 23.9 | | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage | V _{SD} | V _{GS} =0V, I _S =200A | - | | 1.2 | V |
| Diode Forward Current | I _S | | - | - | 120 | A |
| Reverse Recovery Time | t _{rr} | T _J = 25°C, I _F = I _S | - | 67 | | nS |
| Reverse Recovery Charge | Q _{rr} | di/dt = 100A/μs | - | 112 | | nC |

Notes:

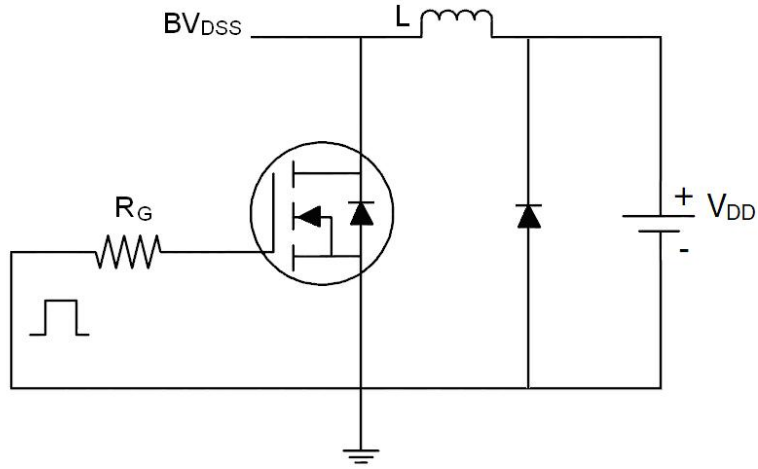
1. EAS condition : T_J=25°C, V_{DD}=30V, V_G=10V, L=0.5mH, R_G=25Ω

2. Guaranteed by design, not subject to production

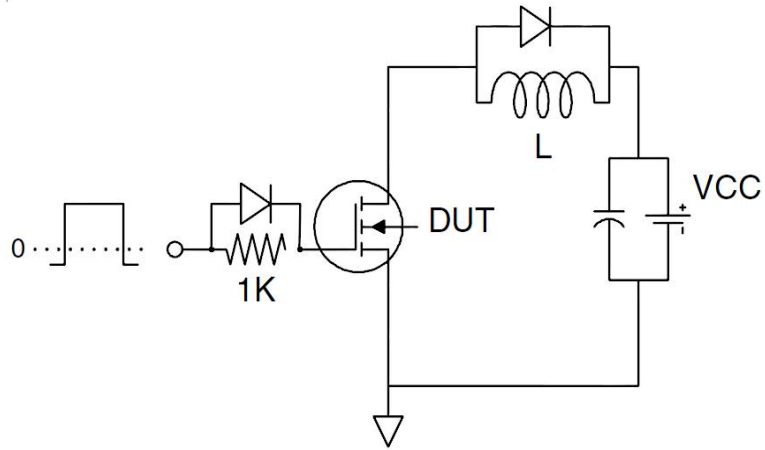
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_J(MAX)=175°C. The SOA curve provides a single pulse rating.

Test Circuit

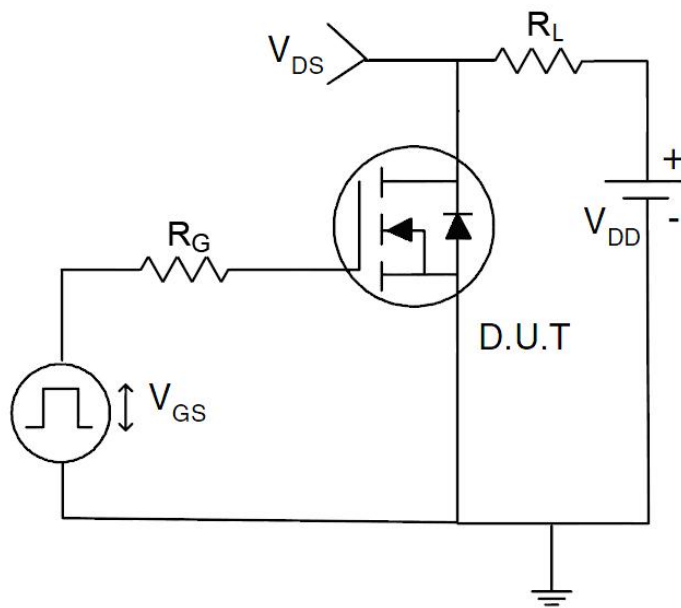
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

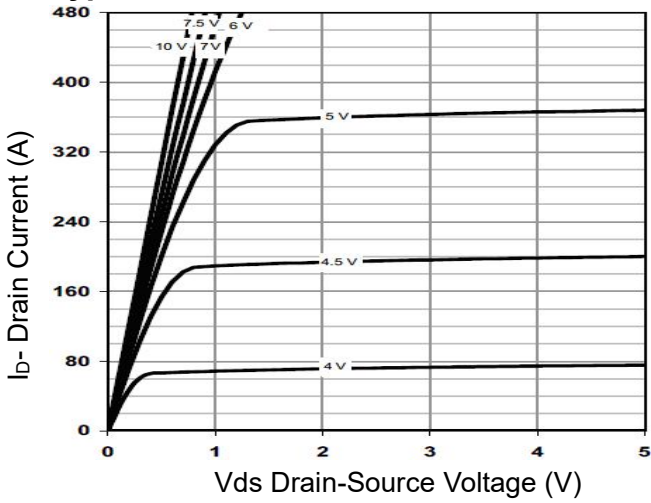


Figure 1 Output Characteristics

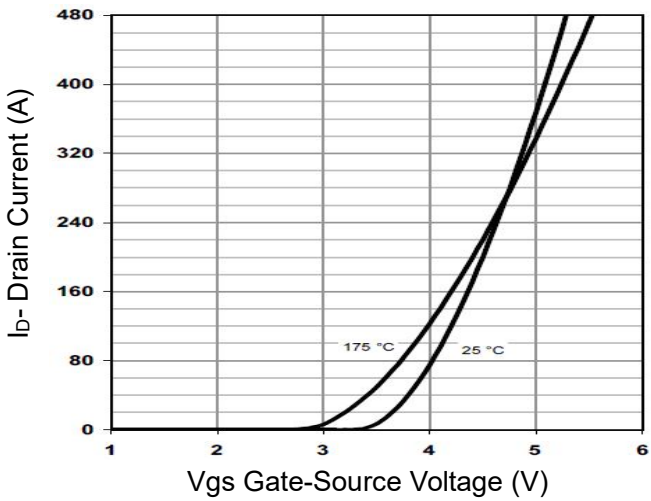


Figure 2 Transfer Characteristics

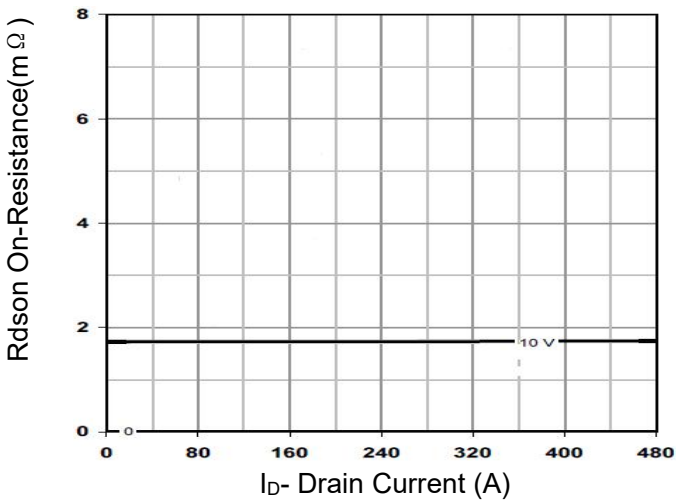


Figure 3 Rds(on)- Drain Current

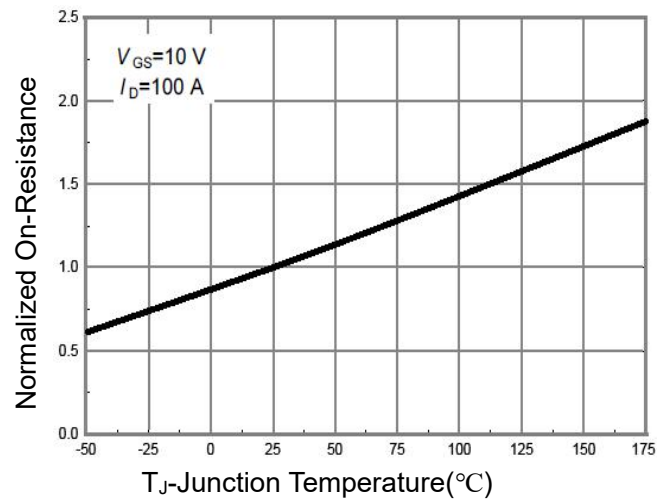


Figure 4 Rds(on)-Junction Temperature

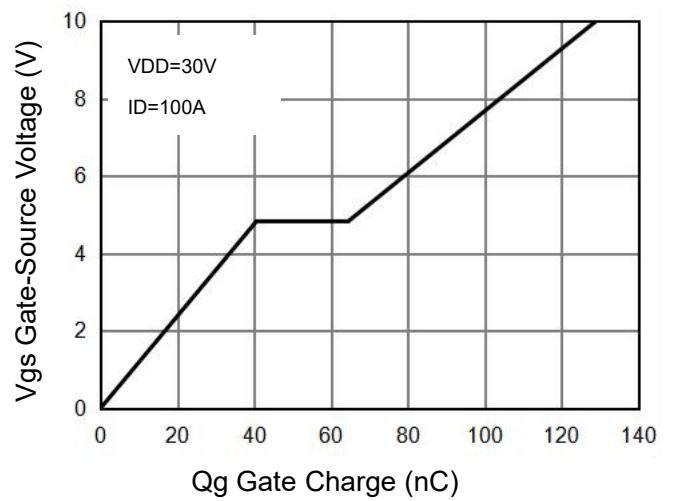


Figure 5 Gate Charge

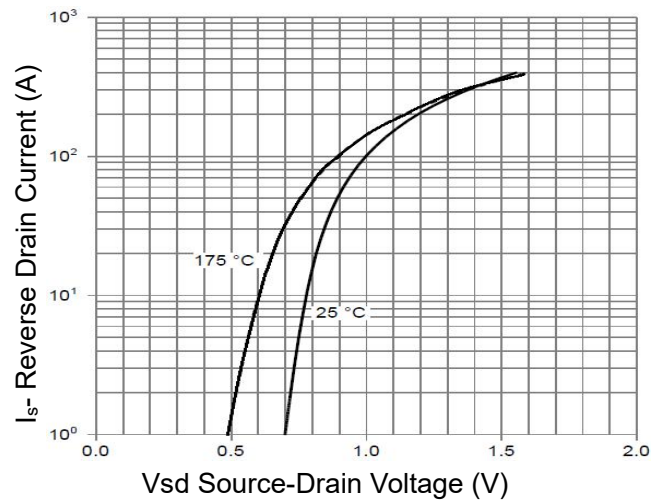


Figure 6 Source- Drain Diode Forward

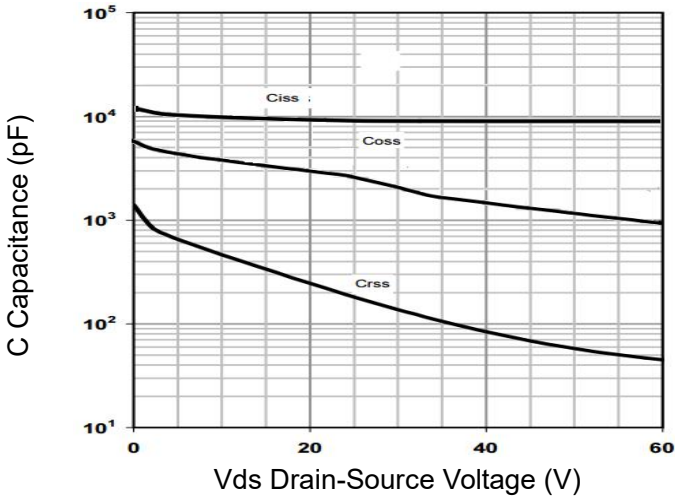


Figure 7 Capacitance vs Vds

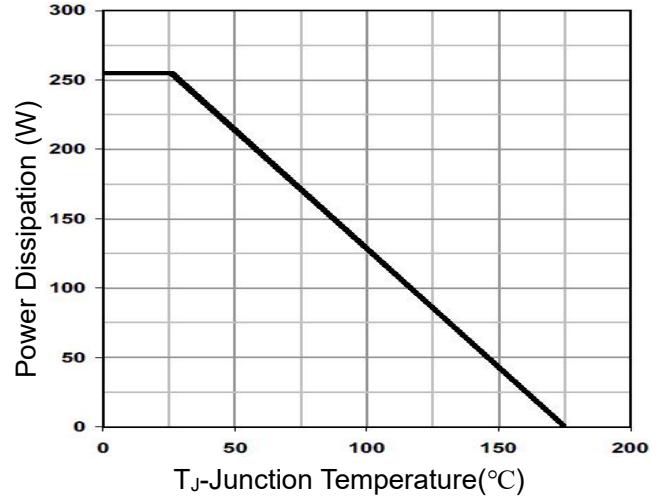


Figure 9 Power De-rating

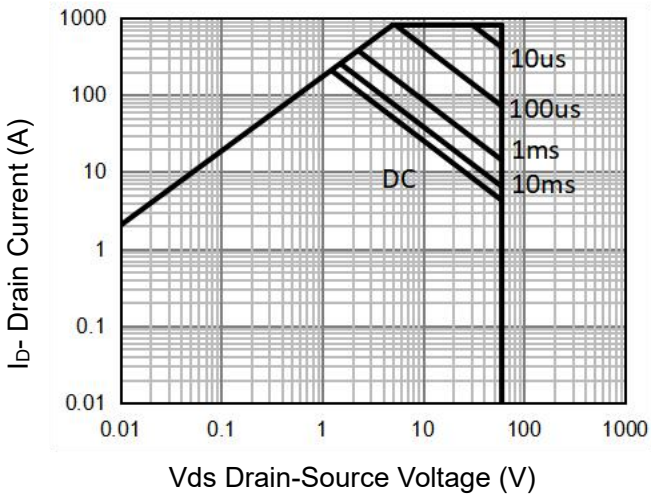


Figure 8 Safe Operation Area (Note3)

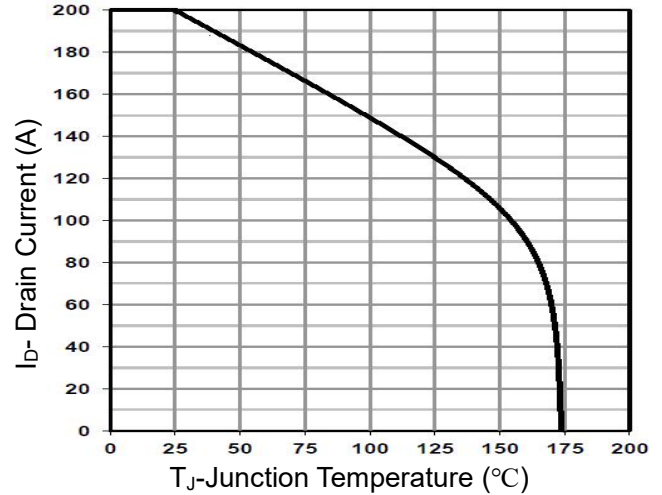


Figure 10 Current De-rating

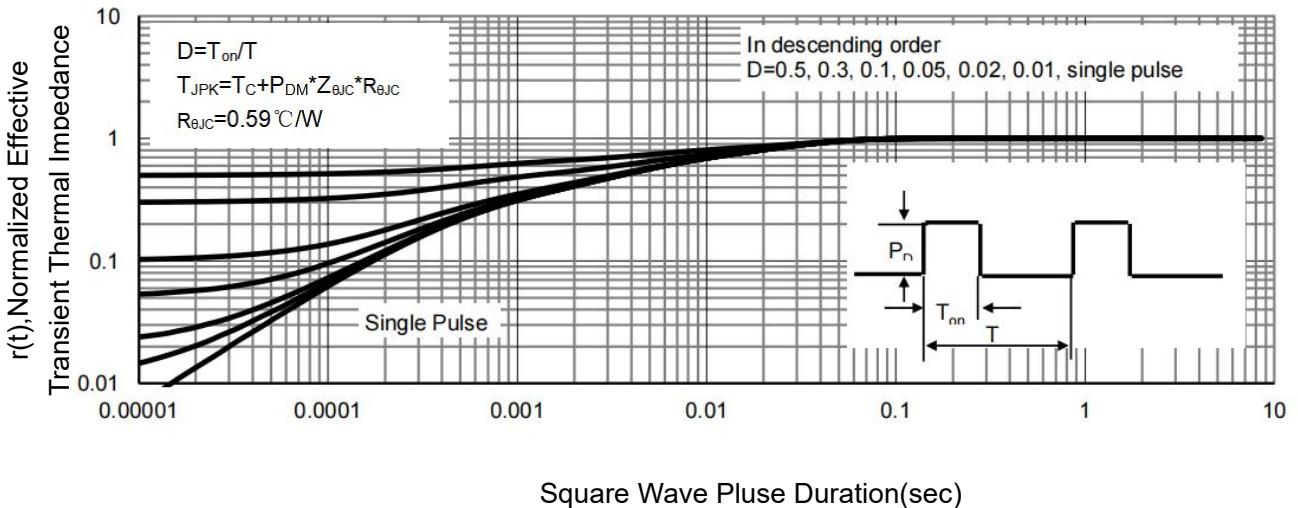
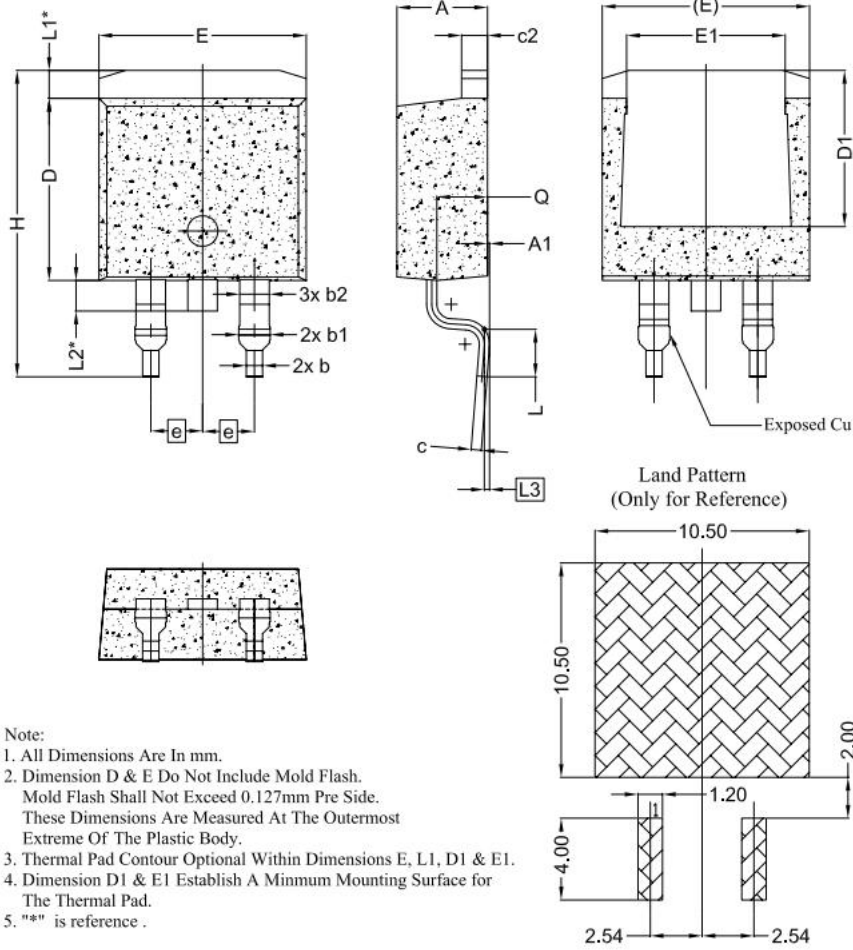


Figure 11 Normalized Maximum Transient Thermal Impedance

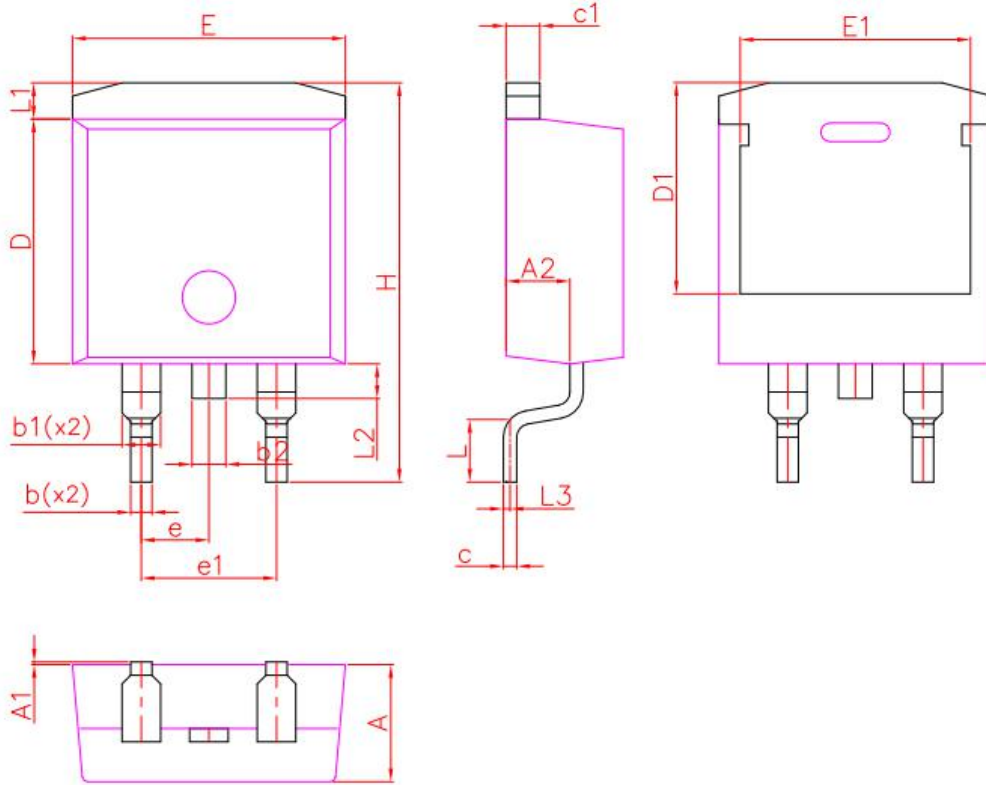
TO-263-2L(G) Package Information



- 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 E, L1, D1 & E1.
 4. Dimension D1 & E1 Establish A Minmum Mounting Surface for The Thermal Pad.
 5. "*" is reference .

| SYMBOL | DIMENSIONS | | |
|--------|------------|-------|-------|
| | MIN. | NOM. | MAX. |
| A | 4,24 | 4,44 | 4,64 |
| A1 | 0,00 | 0,10 | 0,25 |
| b | 0,70 | 0,80 | 0,90 |
| b1 | 1,20 | 1,55 | 1,75 |
| b2 | 1,20 | 1,45 | 1,70 |
| c | 0,40 | 0,50 | 0,60 |
| c2 | 1,15 | 1,27 | 1,40 |
| D | 8,82 | 8,92 | 9,02 |
| D1 | 6,86 | 7,65 | -- |
| E | 9,96 | 10,16 | 10,36 |
| E1 | 6,89 | 7,77 | 7,89 |
| e | 2,54 BSC | | |
| H | 14,61 | 15,00 | 15,88 |
| L | 1,78 | 2,32 | 2,79 |
| L1 | 1,36 REF. | | |
| L2 | 1,50 REF. | | |
| L3 | 0,25 BSC | | |
| Q | 2,30 | 2,48 | 2,70 |

TO-263-2L(E) Package Information



| T0263 | | | |
|-------------------------------|---------|-------|-------|
| DIM. | MIN. | NOM. | MAX. |
| A | 4.20 | 4.40 | 4.60 |
| A1 | 0.00 | 0.10 | 0.25 |
| A2 | 2.20 | 2.40 | 2.60 |
| b | 0.70 | 0.80 | 0.90 |
| b1 | 1.20 | 1.45 | 1.75 |
| b2 | 1.17 | 1.27 | 1.37 |
| c | 0.40 | 0.50 | 0.60 |
| c1 | 1.15 | 1.27 | 1.40 |
| D | 9.10 | 9.20 | 9.30 |
| D1 | 7.63 | 7.93 | 8.23 |
| E | 10.05 | 10.25 | 10.45 |
| E1 | 8.35 | 8.65 | 8.95 |
| e | 2.54BSC | | |
| e1 | 5.08BSC | | |
| H | 14.61 | 15.00 | 15.88 |
| L | 1.78 | 2.35 | 2.79 |
| L1 | 1.36REF | | |
| L2 | 1.3REF | | |
| L3 | 0.25REF | | |
| All dimensions in millimeters | | | |

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