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650V 20A 0.37Ω N-ch Power MOSFET

Description

DT2 MOS is DIN-TEK 2nd generation VDMOS family that is dramatic reduction in on-resistance and ultra-low gate charge for applications requiring high power density and high efficiency. And it is very robust and RoHS compliant.

TO-220F

TO-247





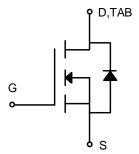
TO-263



Features

- Typ.R_{DS(on)}=0.37 Ω @V_{GS}=10V
- 100% avalanche tested
- RoHS Compliant





Applications

- SMPS
- Charger
- DC-DC

Absolute Maximum Ratings (Tc=25℃)

| Parameter | Symbol | DTP20N65F | DTP20N65/DTK20N65 | DTN20N65 | Unit |
|---|---------------------|-----------|-------------------|----------|------|
| Drain-source voltage | V _{DSS} | 650 | | V | |
| Gate-source voltage | Vgs | ±30 | | V | |
| Continuous drain current | ΙD | | 20 | | А |
| Pulsed drain current ¹ | I _{DM} | | 80 | | А |
| Avalanche energy, single pulse ² | Eas | 980 | | mJ | |
| Power dissipation | PD | 74 | 250 | 313 | W |
| Derate above 25°C | | 0.6 | 2 | 2.5 | W/°C |
| Operating junction temperature | Tj | | -55~150 | | °C |
| Storage temperature | T _{stg} | -55~150 | | °C | |
| Continuous diode forward current | Is | 20 | | Α | |
| Diode pulse current ¹ | I _{Spulse} | | 80 | | Α |

Thermal Characteristic

| Thermal resistance,junction-to-case | R ₀ JC | 1.7 | 0.5 | 0.4 | °C/W |
|--|-------------------|------|------|-----|------|
| Thermal resistance,junction-to-ambient | $R_{\theta JA}$ | 62.5 | 62.5 | 40 | °C/W |

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| Electrical | Characteristics | of MOSEET |
|------------|------------------------|------------|
| Electrical | Characteristics | OT MOSEE I |

| | | | | Min. | Typ. | Max. | |
|---|---------------------|--|----------|------|------|------|----|
| Drain-source break down voltage | BV _{DSS} | I _D =250μA, V _{GS} =0V | Tc=25°C | 650 | - | - | V |
| Gate threshold voltage | V _{GS(th)} | $I_D=250\mu A$, $V_{DS}=V_{GS}$ | TJ=25°C | 2.0 | - | 4.0 | V |
| Drain course leakage current | 1 | V _{DS} =650V, V _{GS} =0V | TJ=25°C | - | - | 1 | μA |
| Drain-source leakage current I _{DS} | I _{DSS} | V _{DS} =520V, V _{GS} =0V | TJ=125°C | - | - | 100 | μA |
| Gate-source leakage current,forward | IGSSF | V _{DS} =0V, V _{GS} =30V | TJ=25°C | - | - | 100 | nA |
| Gate-source leakage current,reverse | I _{GSSR} | V_{DS} =0 V , V_{GS} =-30 V | TJ=25°C | - | - | -100 | nA |
| Drain-source on-state resistance ³ | R _{DS(ON)} | V _{GS} =10V, I _D =10A | TJ=25°C | - | 0.37 | 0.44 | Ω |
| Transconductance ³ | Gfs | V _{DS} =20V | TJ=25°C | - | 22 | - | S |

Dynamic Characteristics of MOSFET (Tc=25℃)

| | | | IVIII. | тур. | wax. | |
|------------------------------|------------------|---|--------|------|------|----|
| Input capacitance | C _{iss} | f=1MHz. | - | 3280 | - | pF |
| Output capacitance | Coss | V _{DS} =25V. V _{GS} =0V | - | 244 | - | pF |
| Reverse transfer capacitance | Crss | VDS=23V, VGS=UV | - | 26 | - | pF |
| Gate to source charge | Qgs | V _{DD} =320V | - | 17 | - | nC |
| Gate to drain charge | Q_{gd} | I _D =20A | - | 26 | - | nC |
| Total gate charge | Qg | V _{GS} = 0 to 10V | - | 73 | - | nC |

Switching Characteristics of MOSFET $(T_C=25^{\circ}C)$

| | | • | Min. | Тур. | Max. | |
|---------------------|--------------------|---|------|------|------|----|
| Turn-on delay time | t _{d on} | - V _{DS} =320V. | - | 18 | - | ns |
| Rise time | t _r | - I _D =20A, R _G =25Ω. | - | 33 | - | ns |
| Turn-off delay time | t _{d off} | - V _G s=0 to 10V | - | 104 | - | ns |
| Fall time | t _f | VGS=0 to 10V | - | 50 | - | ns |

Characteristics of Body Diode (Tc=25℃)

| | | | IVIII 1. | τyp. | wax. | |
|--------------------------|-----------------|---|----------|------|------|----|
| Forward voltage | V _{SD} | I _{SD} =20A, V _{GS} =0V | - | - | 1.5 | V |
| Reverse recovery time | t _{rr} | V _{DS} =320V, | - | 420 | - | ns |
| Reverse recovery current | Irr | Is=20A, V _{GS} =10V | - | 20 | - | Α |
| Recovery charge | Qrr | -di/dt=100A/µs | - | 4.2 | - | μC |

Notes:

- 1. Repetitive rating, pulse width limited by junction temperature $T_{J(MAX)}$ =150°C.
- 2. The E_{AS} data shows Max. rating . The test condition is V_{DD} =80V, V_{GS} =10V, L=10mH, I_{AS} =14A,Tc=25°C.
- 3. The data tested by pulsed , pulse width \leq 300 μ s , duty cycle \leq 2%.



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TYPICAL CHARACTERISTICS

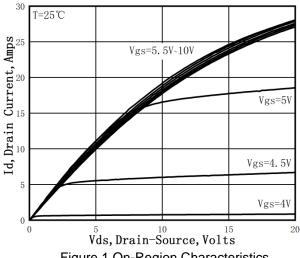


Figure 1.On-Region Characteristics

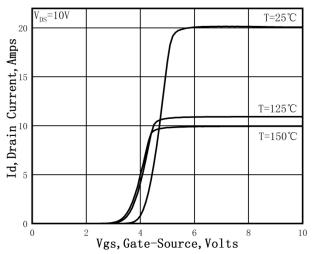


Figure 2. Transfer Characteristics

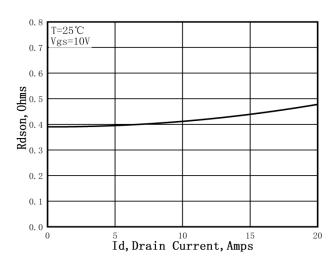


Figure 3. Static Drain-Source On Resistance

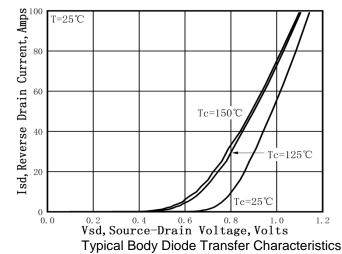


Figure 4.

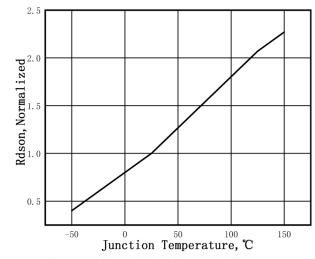


Figure 5. Normalized RDS(on) vs.Temperature

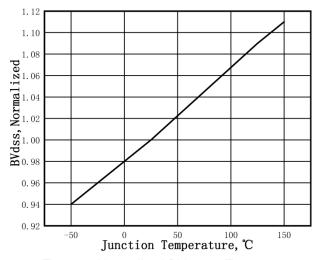


Figure 6. Normalized BV_{DSS} vs.Temperature



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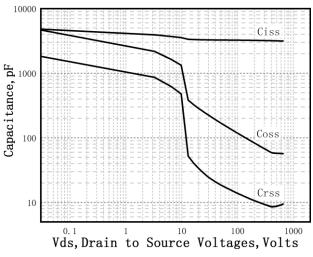


Figure 7. Capacitance Characteristics

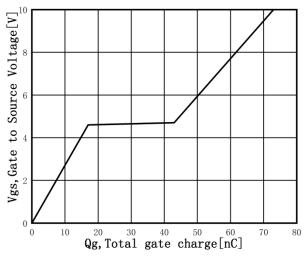


Figure 8. Gate Charge Characteristics

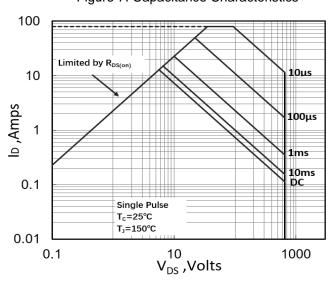


Figure 9. Maximum Safe Operating Area (TO-220F)

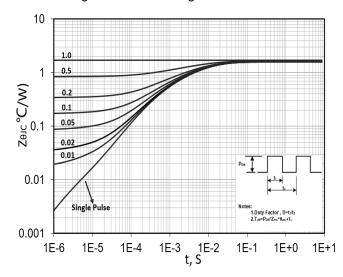


Figure 10. Transient Thermal Response Curve (TO-220F)

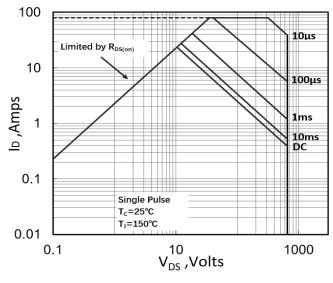


Figure 11. Maximum Safe Operating Area (TO-220/TO-263)

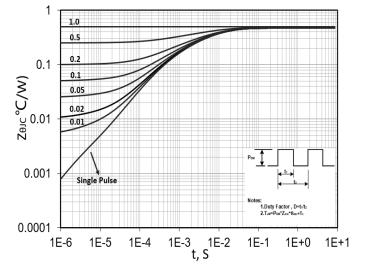


Figure 12. Transient Thermal Response Curve (TO-220/TO-263)

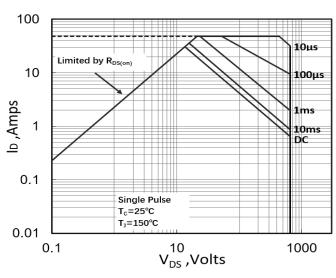


Figure 13. Maximum Safe Operating Area (TO-247)

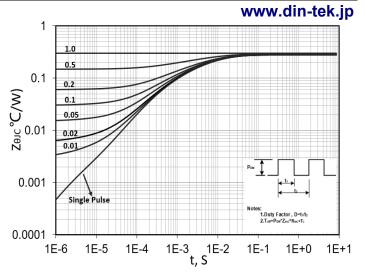
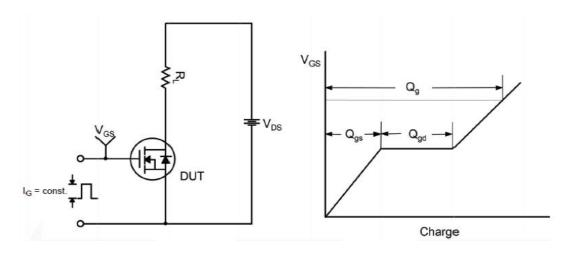


Figure 14. Transient Thermal Response Curve (TO-247)

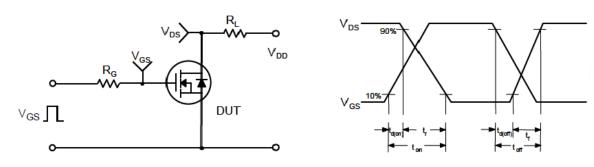
Test Circuit

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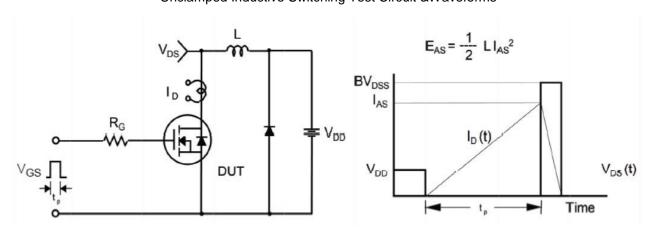
Gate Charge Test Circuit &Waveform



Switching Test Circuit &Waveforms



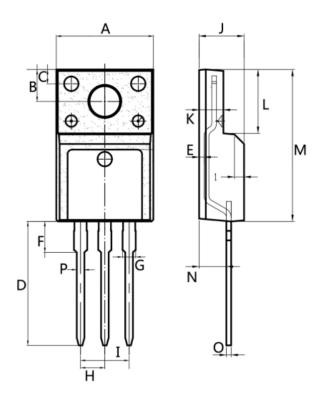
Unclamped Inductive Switching Test Circuit &Waveforms





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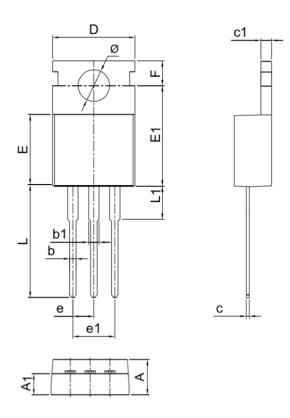
Mechanical Dimensions for TO-220F



COMMON DIMENSIONS

| SYMBOL | MM | | |
|----------|-------|-------|--|
| STIVIBUL | MIN | MAX | |
| Α | 9.95 | 10.36 | |
| В | 2.95 | 3.55 | |
| С | 1.25 | 1.6 | |
| D | 12.64 | 13.5 | |
| Е | 0.40 | 0.60 | |
| F | 2.80 | 3.80 | |
| G | 1.14 | 1.58 | |
| Н | 2.44 | 2.64 | |
| I | 4.88 | 5.26 | |
| J | 4.50 | 4.90 | |
| K | 2.34 | 2.80 | |
| L | 6.48 | 6.90 | |
| М | 15.40 | 16.07 | |
| N | 2.66 | 3.50 | |
| 0 | 0.40 | 0.64 | |
| Р | 0.70 | 0.94 | |

Mechanical Dimensions for TO-220

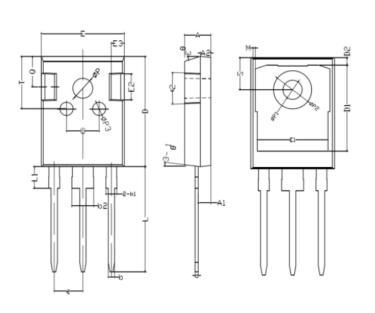


COMMON DIMENSIONS

| SYMBOL | MM | | |
|----------|-------|-------|--|
| STIVIBUL | MIN | MAX | |
| Α | 4.30 | 4.70 | |
| A1 | 2.30 | 2.82 | |
| b | 0.70 | 0.94 | |
| b1 | 1.17 | 1.41 | |
| С | 0.30 | 0.64 | |
| c1 | 1.17 | 1.44 | |
| D | 9.70 | 10.20 | |
| Е | 8.50 | 9.30 | |
| E1 | 12.00 | 12.50 | |
| е | 2.44 | 2.64 | |
| e1 | 4.88 | 5.26 | |
| F | 2.60 | 2.94 | |
| L | 13.00 | 14.00 | |
| L1 | 3.385 | 4.20 | |
| Ø | 3.74 | 3.95 | |

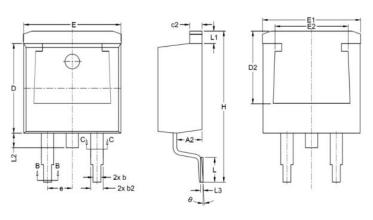


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| SYMBOL | М | М | | | |
|----------|-------|-------|--|--|--|
| STIVIBUL | MIN | MAX | | | |
| Α | 4.80 | 5.20 | | | |
| A1 | 2.21 | 2.59 | | | |
| A2 | 1.85 | 2.15 | | | |
| b | 1.11 | 1.36 | | | |
| b1 | 1.91 | 2.25 | | | |
| b2 | 2.91 | 3.25 | | | |
| С | 0.51 | 0.75 | | | |
| D | 20.70 | 21.30 | | | |
| D1 | 16.25 | 16.85 | | | |
| Е | 15.50 | 16.10 | | | |
| E1 | 13.00 | 13.60 | | | |
| E2 | 4.80 | 5.20 | | | |
| E3 | 2.30 | 2.70 | | | |
| е | 5.40 | 5.48 | | | |
| L | 19.62 | 20.22 | | | |
| L1 | - | 4.30 | | | |
| ØР | 3.40 | 3.80 | | | |
| ØP2 | 6.90 | 7.30 | | | |
| S | 6.05 | 6.25 | | | |

Mechanical Dimensions for TO-263



COMMON DIMENSIONS

| a) ## #B a ! | MM | | |
|--------------|-------|-------|--|
| SYMBOL | MIN | MAX | |
| Α | 4.45 | 4.65 | |
| A1 | 0 | 0.15 | |
| A2 | 2.50 | 2.70 | |
| b | 0.75 | 0.96 | |
| b1 | 0.71 | 0.92 | |
| b2 | 1.21 | 1.41 | |
| b3 | 1.17 | 1.37 | |
| С | 0.33 | 0.52 | |
| c1 | 0.28 | 0.48 | |
| c2 | 1.21 | 1.41 | |
| D | 9.10 | 9.30 | |
| D2 | 7.21 | 7.62 | |
| E | 9.90 | 10.10 | |
| E1 | 9.90 | 10.30 | |
| E2 | 7.34 | 7.74 | |
| е | 2.50 | 2.60 | |
| Н | 15.30 | 15.70 | |
| L | 2.34 | 2.74 | |
| L1 | 1.06 | 1.47 | |
| L2 | 1.40 | 1.60 | |
| L3 | 0.25 | 0.26 | |



Ordering Information

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| Part | Package | Packing method |
|-----------|---------|----------------|
| DTP20N65F | TO-220F | Tube |
| DTP20N65 | TO-220 | Tube |
| DTN20N65 | TO-247 | Tube |
| DTK20N65 | TO-263 | Tape and reel |





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