

STE53NA50

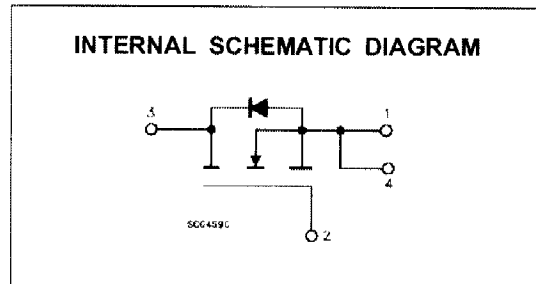
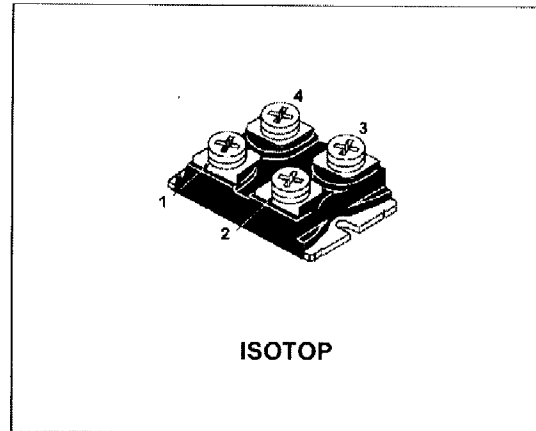
N - CHANNEL ENHANCEMENT MODE FAST POWER MOS TRANSISTOR

| TYPE | V _{DSS} | R _{DS(on)} | I _D |
|-----------|------------------|---------------------|----------------|
| STE53NA50 | 500 V | < 0.085 Ω | 53 A |

- TYPICAL R_{DS(on)} = 0.075 Ω
- HIGH CURRENT POWER MODULE
- AVALANCHE RUGGED TECHNOLOGY
- VERY LARGE SOA - LARGE PEAK POWER CAPABILITY
- EASY TO MOUNT
- SAME CURRENT CAPABILITY FOR THE TWO SOURCE TERMINALS
- EXTREMELY LOW R_{th} (Junction to case)
- VERY LOW INTERNAL PARASITIC INDUCTANCE
- ISOLATED PACKAGE UL RECOGNIZED

APPLICATIONS

- SMPS & UPS
- MOTOR CONTROL
- WELDING EQUIPMENT
- OUTPUT STAGE FOR PWM, ULTRASONIC CIRCUITS

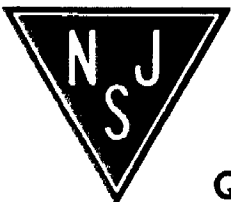


ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---------------------|---|------------|------|
| V _{DS} | Drain-source Voltage (V _{GS} = 0) | 500 | V |
| V _{DGR} | Drain- gate Voltage (R _{GS} = 20 kΩ) | 500 | V |
| V _{GS} | Gate-source Voltage | ± 30 | V |
| I _D | Drain Current (continuous) at T _c = 25 °C | 53 | A |
| I _D | Drain Current (continuous) at T _c = 100 °C | 33 | A |
| I _{DM} (•) | Drain Current (pulsed) | 212 | A |
| P _{tot} | Total Dissipation at T _c = 25 °C | 460 | W |
| | Derating Factor | 3.68 | W/°C |
| T _{stg} | Storage Temperature | -55 to 150 | °C |
| T _J | Max. Operating Junction Temperature | 150 | °C |
| V _{ISO} | Insulation Withstand Voltage (AC-RMS) | 2500 | V |

(•) Pulse width limited by safe operating area

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STE53NA50

THERMAL DATA

| | | | | |
|----------------|---|-----|------|---------------|
| $R_{thj-case}$ | Thermal Resistance Junction-case | Max | 0.27 | $^{\circ}C/W$ |
| R_{thc-h} | Thermal Resistance Case-heatsink With Conductive Grease Applied | Max | 0.05 | $^{\circ}C/W$ |

AVALANCHE CHARACTERISTICS

| Symbol | Parameter | Max Value | Unit |
|----------|---|-----------|------|
| I_{AR} | Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$) | 26 | A |
| E_{AS} | Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}C$, $I_D = I_{AR}$, $V_{DD} = 50 V$) | 1014 | mJ |

ELECTRICAL CHARACTERISTICS ($T_{case} = 25^{\circ}C$ unless otherwise specified)

OFF

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|--|---|------|------|-------------|--------------------|
| $V_{(BR)DSS}$ | Drain-source Breakdown Voltage | $I_D = 1 mA$ $V_{GS} = 0$ | 500 | | | V |
| I_{DSS} | Zero Gate Voltage Drain Current ($V_{GS} = 0$) | $V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$ $T_c = 125^{\circ}C$ | | | 100 1000 | μA μA |
| I_{GSS} | Gate-body Leakage Current ($V_{DS} = 0$) | $V_{GS} = \pm 30 V$ | | | ± 400 | nA |

ON (*)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|-----------------------------------|--|------|-------|-------|----------|
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS} = V_{GS}$ $I_D = 1 mA$ | 2.25 | 3 | 3.75 | V |
| $R_{DS(on)}$ | Static Drain-source On Resistance | $V_{GS} = 10V$ $I_D = 27 A$ | | 0.075 | 0.085 | Ω |
| $I_{D(on)}$ | On State Drain Current | $V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10 V$ | 53 | | | A |

DYNAMIC

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------|------------------------------|--|------|------|------|------|
| $g_{fs} (*)$ | Forward Transconductance | $V_{DS} > I_{D(on)} \times R_{DS(on)MAX}$ $I_D = 27 A$ | 25 | | | S |
| C_{iss} | Input Capacitance | $V_{DS} = 25 V$ $f = 1 MHz$ $V_{GS} = 0$ | | 13 | 16 | nF |
| C_{oss} | Output Capacitance | | | 1500 | 2000 | pF |
| C_{rss} | Reverse Transfer Capacitance | | | 450 | 650 | pF |

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------|--------------------|--|------|------|------|------|
| $t_{d(on)}$ | Turn-on Time | $V_{DD} = 250\text{ V}$ $I_D = 27\text{ A}$ | | 57 | 80 | ns |
| t_r | Rise Time | $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 1) | | 92 | 130 | ns |
| Q_g | Total Gate Charge | $V_{DD} = 400\text{ V}$ $I_D = 53\text{ A}$ $V_{GS} = 10\text{ V}$ | | 470 | 658 | nC |
| Q_{gs} | Gate-Source Charge | | | 54 | | nC |
| Q_{gd} | Gate-Drain Charge | | | 219 | | nC |

SWITCHING OFF

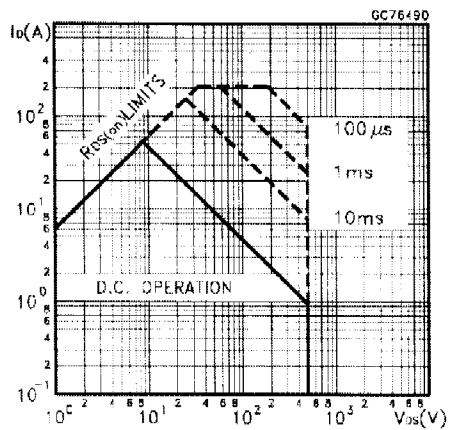
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------|---|------|------|------|------|
| $t_{r(Voff)}$ | Off-voltage Rise Time | $V_{DD} = 400\text{ V}$ $I_D = 53\text{ A}$ | | 105 | 145 | ns |
| t_f | Fall Time | $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ | | 36 | 50 | ns |
| t_c | Cross-over Time | (see test circuit, figure 3) | | 145 | 205 | ns |

SOURCE DRAIN DIODE

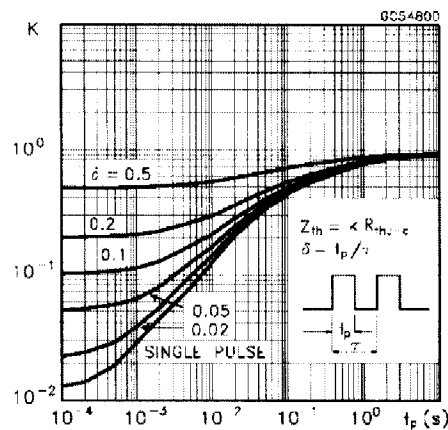
| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|--------------------|-------------------------------|---|------|------|------|---------------|
| I_{SD} | Source-drain Current | | | | 53 | A |
| $I_{SDM(\bullet)}$ | Source-drain Current (pulsed) | | | | 212 | A |
| $V_{SD}(\ast)$ | Forward On Voltage | $I_{SD} = 53\text{ A}$ $V_{GS} = 0$ | | | 1.6 | V |
| t_{rr} | Reverse Recovery Time | $I_{SD} = 53\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_R = 100\text{ V}$ $T_J = 150\text{ }^\circ\text{C}$ | | 1000 | | ns |
| Q_{rr} | Reverse Recovery Charge | (see test circuit, figure 3) | | 31.5 | | μC |
| I_{RRM} | Reverse Recovery Current | | | 63 | | A |

(\ast) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %
 (\bullet) Pulse width limited by safe operating area

Safe Operating Area for



Thermal Impedance



STE53NA50

ISOTOP MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|-------|------|------|-------|------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | 11.8 | | 12.2 | 0.466 | | 0.480 |
| B | 8.9 | | 9.1 | 0.350 | | 0.358 |
| C | 1.95 | | 2.05 | 0.076 | | 0.080 |
| D | 0.75 | | 0.85 | 0.029 | | 0.033 |
| E | 12.6 | | 12.8 | 0.496 | | 0.503 |
| F | 25.15 | | 25.5 | 0.990 | | 1.003 |
| G | 31.5 | | 31.7 | 1.240 | | 1.248 |
| H | 4 | | | 0.157 | | |
| J | 4.1 | | 4.3 | 0.161 | | 0.169 |
| K | 14.9 | | 15.1 | 0.586 | | 0.594 |
| L | 30.1 | | 30.3 | 1.185 | | 1.193 |
| M | 37.8 | | 38.2 | 1.488 | | 1.503 |
| N | 4 | | | 0.157 | | |
| O | 7.8 | | 8.2 | 0.307 | | 0.322 |

