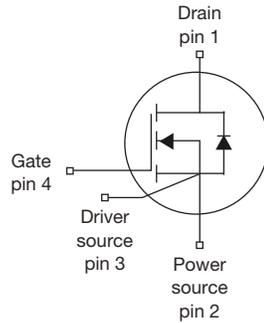


MaxSiC[®] 750 V N-Channel SiC MOSFET

TO-247AD 4L


Marking Code: 075A040SL

FEATURES

- Fast switching speed
- Short circuit withstand time 3 μ s
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912


RoHS
 COMPLIANT
 HALOGEN
FREE

APPLICATIONS

- Solar inverters
- DC/DC converters
- Energy storage systems
- UPS (uninterruptible power supplies)

| PRODUCT SUMMARY | |
|--|----------------------|
| V_{DS} (V) at T_J max. | 750 |
| $R_{DS(on)}$ typ. (m Ω) at 25 °C | $V_{GS} = 18$ V 40 |
| Q_g typ. (nC) | 77 |
| I_D (A) | 51 |
| C_{oss} typ. (pF) | 124 |
| P_D (W) | 208 |
| Configuration | Single |

| ORDERING INFORMATION | |
|---------------------------------|------------------|
| Package | TO-247AD 4L |
| Lead (Pb)-free and halogen-free | MXP075A040SL-GE3 |

| ABSOLUTE MAXIMUM RATINGS ($T_C = 25$ °C, unless otherwise noted) | | | | |
|---|---------------|----------------|----------------|---------|
| PARAMETER | | SYMBOL | LIMIT | UNIT |
| Drain-source voltage | | V_{DS} | 750 | V |
| Gate-source voltage | | V_{GS} | -10 / +22 | |
| Recommended operation voltage of gate-source | | V_{GSOP} | -5 to -3 / +18 | |
| Continuous drain current | $T_C = 25$ °C | I_D | 51 | A |
| Pulsed drain current ^a | | I_{DM} | 102 | |
| Short-circuit withstand time ^b | | T_{SC} | 3 | μ s |
| Maximum power dissipation | $T_C = 25$ °C | P_D | 208 | W |
| Operating junction and storage temperature range | | T_J, T_{stg} | -55 to +175 | °C |
| Soldering recommendations (peak temperature) | For 10 s | | 260 | °C |
| Single pulse avalanche energy ^c | | E_{AS} | 540 | mJ |

Notes

- Repetitive rating; pulse width limited by maximum junction temperature
- $V_{GS} = 18$ V, $V_{DS} = 400$ V, $R_{g(ext)} = 20$ Ω , verified by the design / characterization
- $T_J = 25$ °C, $V_{DD} = 120$ V, $L = 30$ mH, $V_{GS} = 18$ V, $I_{AS} = 6$ A, verified by the design / characterization



| THERMAL RESISTANCE RATINGS | | | | |
|----------------------------------|------------|------|------|------|
| PARAMETER | SYMBOL | TYP. | MAX. | UNIT |
| Maximum junction-to-ambient | R_{thJA} | - | 40 | °C/W |
| Maximum junction-to-case (drain) | R_{thJC} | - | 0.72 | |

| SPECIFICATIONS ($T_J = 25\text{ °C}$, unless otherwise noted) | | | | | | | |
|---|--------------|--|---|------|------|------|----|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT | |
| Static | | | | | | | |
| Drain-source breakdown voltage | V_{DS} | $V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$ | 750 | - | - | V | |
| Gate-source threshold voltage (N) ^a | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 10\text{ mA}$ | - | 2.65 | - | V | |
| | | $V_{DS} = V_{GS}, I_D = 10\text{ mA}, T_J = 175\text{ °C}$ | - | 1.8 | - | V | |
| Gate-source leakage | I_{GSS} | $V_{GS} = 22\text{ V}, V_{DS} = 0\text{ V}$ | - | - | 100 | nA | |
| | | $V_{GS} = -10\text{ V}, V_{DS} = 0\text{ V}$ | - | - | -100 | | |
| Zero gate voltage drain current | I_{DSS} | $V_{DS} = 750\text{ V}, V_{GS} = 0\text{ V}$ | - | - | 10 | μA | |
| Drain-source on-state resistance | $R_{DS(on)}$ | $V_{GS} = 15\text{ V}, I_D = 24\text{ A}$ | - | 49 | 61 | mΩ | |
| | | $V_{GS} = 18\text{ V}, I_D = 24\text{ A}$ | - | 40 | 50 | | |
| | | $V_{GS} = 18\text{ V}, I_D = 24\text{ A}, T_J = 175\text{ °C}$ | - | 64 | - | | |
| Transconductance | g_{fs} | $V_{DS} = 10\text{ V}, I_D = 24\text{ A}$ | - | 11 | - | S | |
| Dynamic | | | | | | | |
| Input capacitance | C_{iss} | $V_{GS} = 0\text{ V}, V_{DS} = 400\text{ V}, f = 100\text{ KHz}$ | - | 2245 | - | pF | |
| Output capacitance | C_{oss} | | - | 124 | - | | |
| Reverse transfer capacitance | C_{rss} | | - | 4 | - | | |
| Total gate charge | Q_g | $V_{GS} = -5\text{ V} \sim 18\text{ V}, I_D = 24\text{ A}, V_{DS} = 400\text{ V}$ | - | 77 | - | nC | |
| Gate-source charge | Q_{gs} | | - | 17 | - | | |
| Gate-drain charge | Q_{gd} | | - | 18 | - | | |
| Gate Resistance | R_g | | $V_{DS} = 0\text{ V}, f = 1\text{ MHz}$ | - | 2.4 | | - |
| Switching Characteristics | | | | | | | |
| Turn-on delay time | $t_{d(on)}$ | $V_{GS} = -5\text{ V} \sim 18\text{ V}, I_D = 24\text{ A}, V_{DS} = 400\text{ V}, R_{g(ext)} = 4.4\text{ Ω}$ | $T_J = 25\text{ °C}$ | - | 13 | - | ns |
| | | | $T_J = 175\text{ °C}$ | - | 12 | - | |
| Rise time | t_r | | $T_J = 25\text{ °C}$ | - | 13 | - | |
| | | | $T_J = 175\text{ °C}$ | - | 12 | - | |
| Turn-off delay time | $t_{d(off)}$ | | $T_J = 25\text{ °C}$ | - | 23 | - | |
| | | | $T_J = 175\text{ °C}$ | - | 26 | - | |
| Fall time | t_f | | $T_J = 25\text{ °C}$ | - | 6 | - | |
| | | | $T_J = 175\text{ °C}$ | - | 6 | - | |
| Turn-on switching energy | E_{on} | | $T_J = 25\text{ °C}$ | - | 35 | - | μJ |
| | | | $T_J = 175\text{ °C}$ | - | 29 | - | |
| Turn-off switching energy | E_{off} | | $T_J = 25\text{ °C}$ | - | 34 | - | |
| | | | $T_J = 175\text{ °C}$ | - | 33 | - | |
| Body Diode Ratings and Characteristic | | | | | | | |
| Forward diode voltage | V_{SD} | $V_{GS} = -5\text{ V}, I_{SD} = 12\text{ A}, T_J = 25\text{ °C}$ | - | 4.6 | - | V | |
| Continuous diode forward current | I_{SD} | $V_{GS} = -5\text{ V}, T_J = 25\text{ °C}$ | - | - | 32 | A | |
| Pulsed diode forward current | I_{SDM} | | - | - | 102 | | |
| Reverse recovery time | t_{rr} | $V_{GS} = -5\text{ V}, I_{SD} = 24\text{ A}, V_R = 400\text{ V}, di/dt = 1000\text{ A/μs}$ | - | 17 | - | ns | |
| Reverse recovery charge | Q_{rr} | | - | 67 | - | nC | |
| Reverse recovery current | I_{RRM} | | - | 7 | - | A | |

Note

a. Test after 1 ms pulse at $V_{GS} = 22\text{ V}$



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)

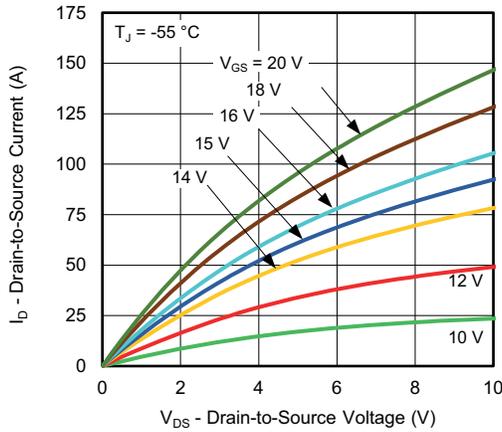


Fig. 1 Typical Output Characteristics

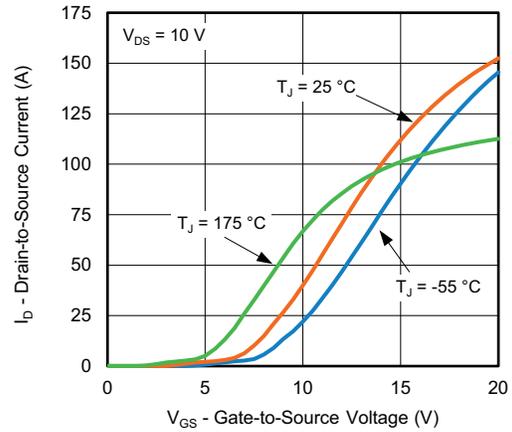


Fig. 4 Typical Transfer Characteristics

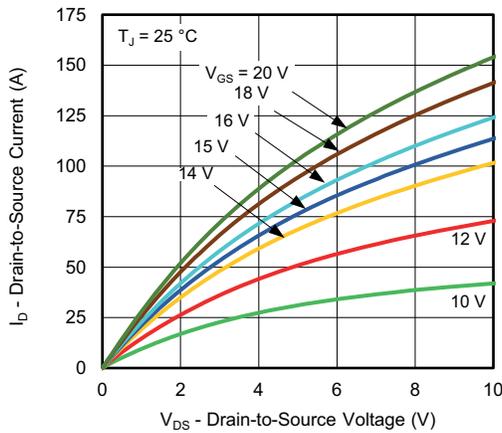


Fig. 2 Typical Output Characteristics

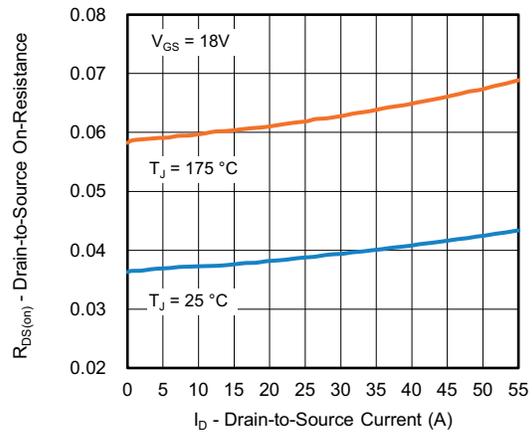


Fig. 5 Normalized On-Resistance vs. Drain Current

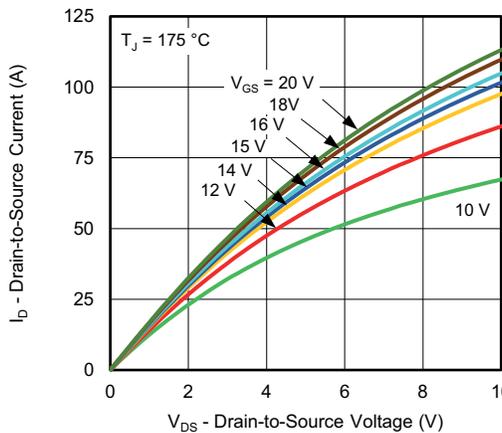


Fig. 3 Typical Output Characteristics

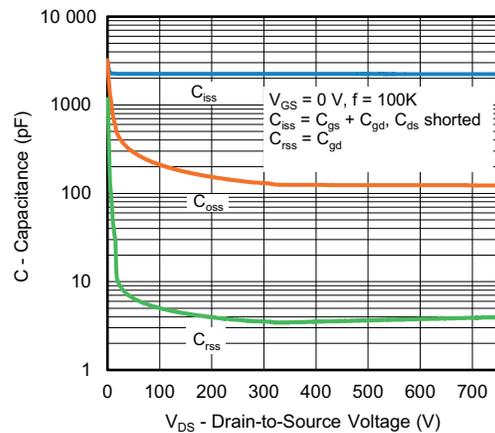


Fig. 6 Typical Capacitance vs. Drain-to-Source Voltage

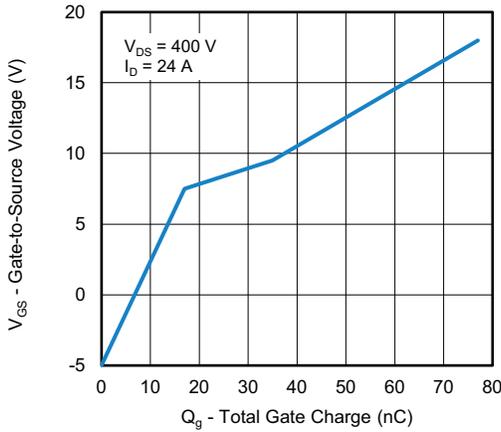


Fig. 7 Typical Gate Charge vs. Gate-to-Source Voltage

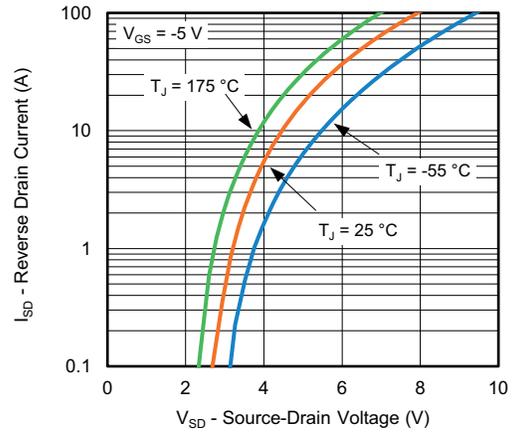


Fig. 10 Typical Source-Drain Diode Forward Voltage

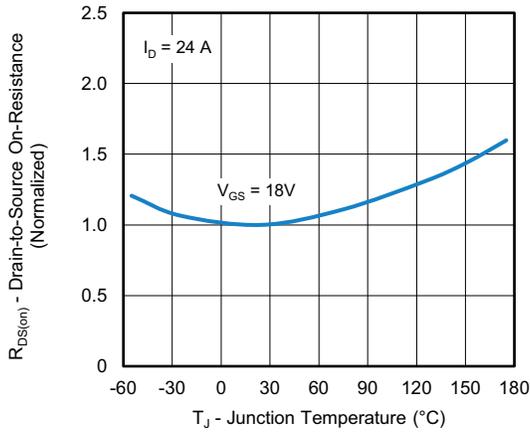


Fig. 8 Normalized On-Resistance vs. Temperature

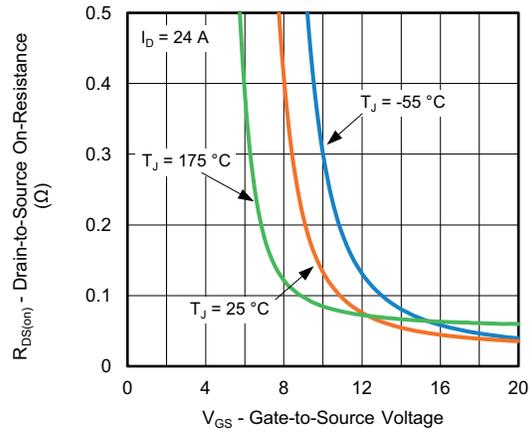


Fig. 11 On-Resistance vs. Gate-to-Source Voltage

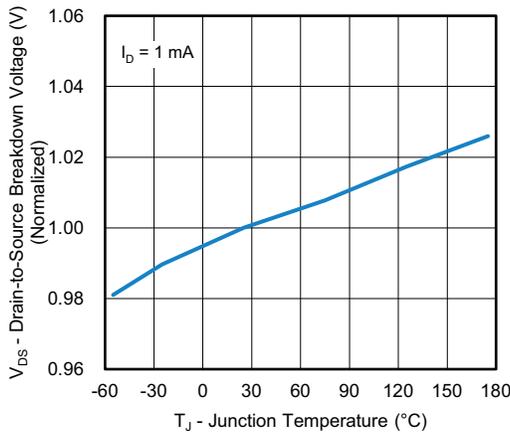


Fig. 9 Drain-to-Source Voltage vs. Temperature

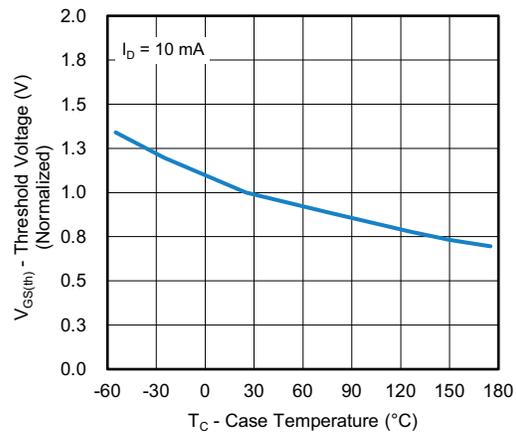


Fig. 12 Threshold Voltage vs. Case Temperature

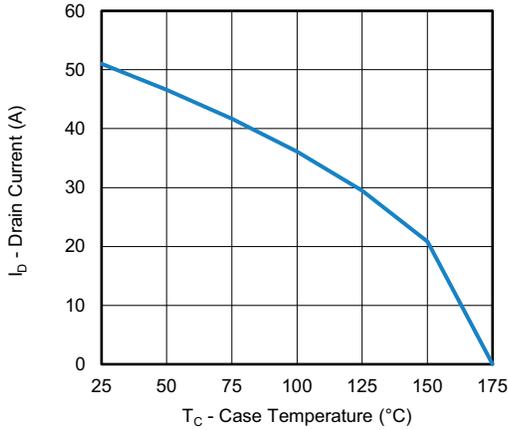


Fig. 13 Drain Current vs. Case Temperature

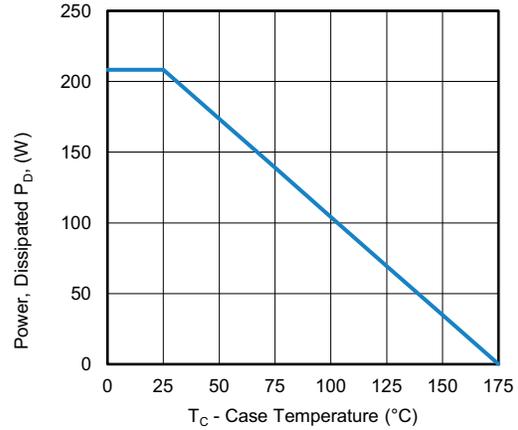


Fig. 15 Power, Dissipated P_D vs. Case Temperature

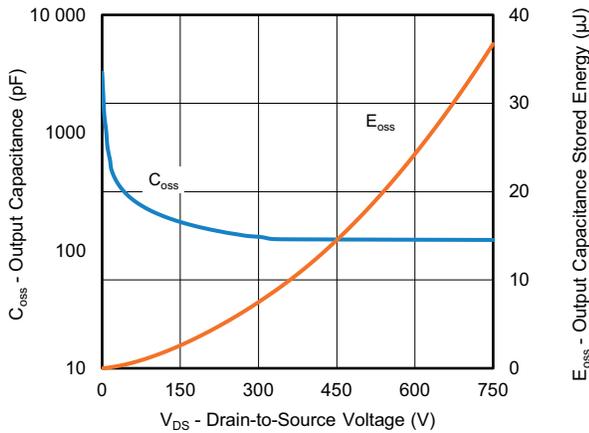


Fig. 14 Output Capacitance and its Stored Energy vs. Drain-to-Source Voltage

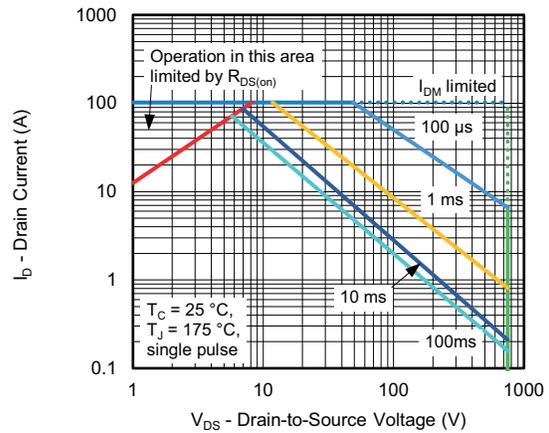


Fig. 16 Safe Operating Area

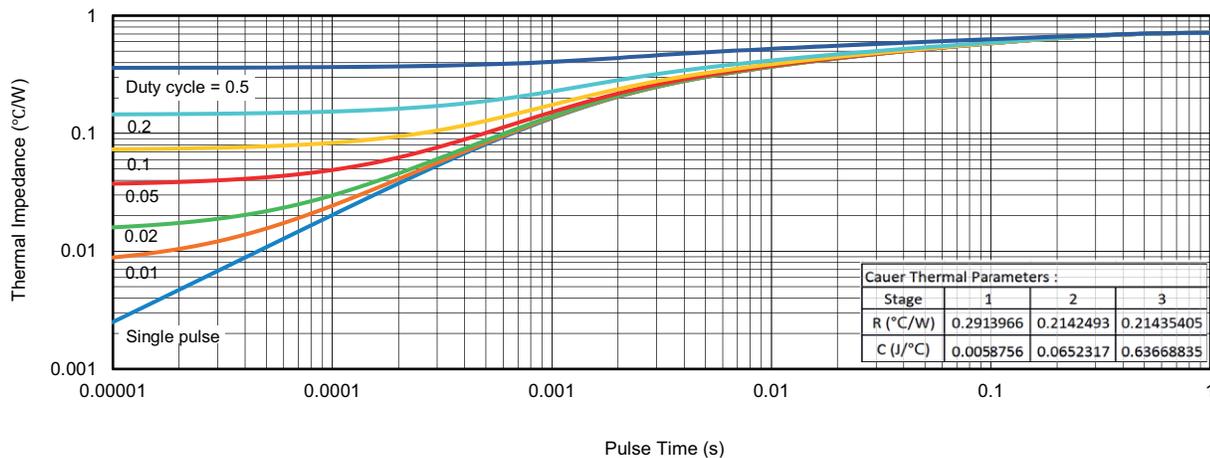


Fig. 17 Transient Thermal Impedance

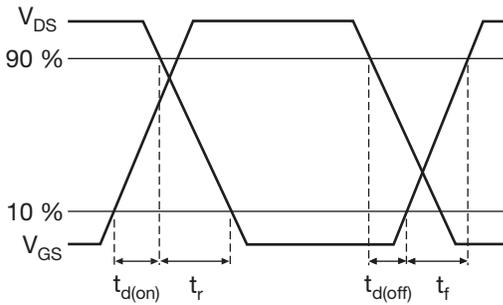


Fig. 18 Waveforms of Switching Time

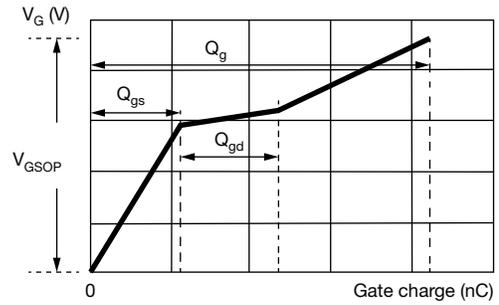


Fig. 21 Waveforms for Gate Charge

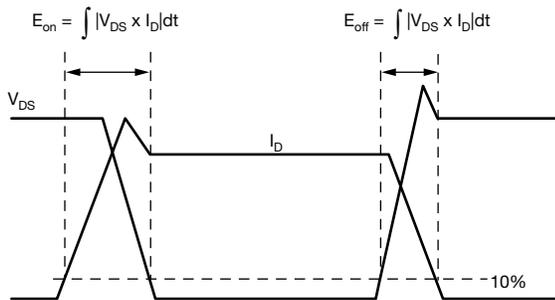


Fig. 19 Waveforms for Switching Energy

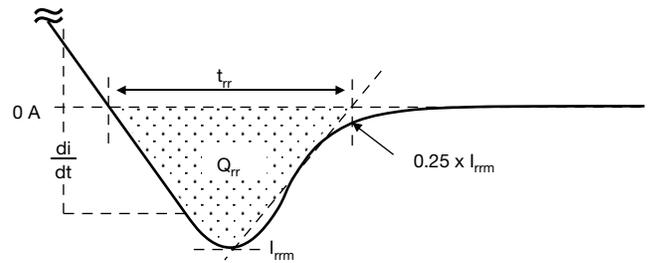


Fig. 22 Waveforms for Reverse Recovery

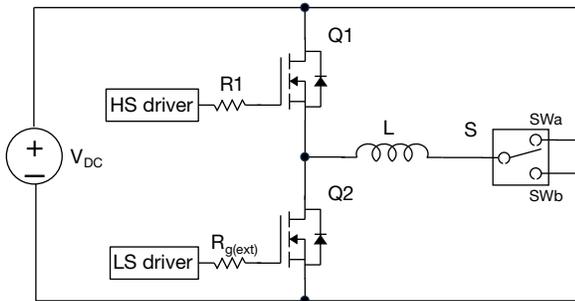


Fig. 20 Switching and Reverse Diode Characteristics Measurement Circuit

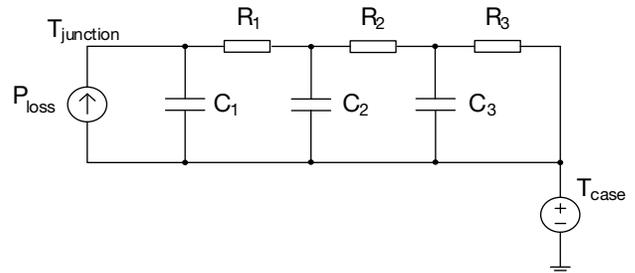


Fig. 23 Thermal Equivalent Circuit

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