

### Features

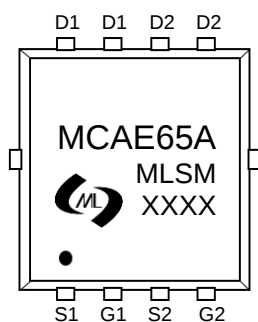
- High density cell design for ultra low  $R_{DS(ON)}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation

### Product Summary

| $V_{DS}$ | $R_{DS(ON)}$ TYP | $I_D$ |
|----------|------------------|-------|
| 40V      | 6.5mΩ@10V        | 65A   |
|          | 8.0mΩ@4.5V       |       |

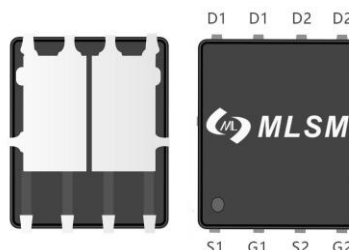
### Application

- Power switching application

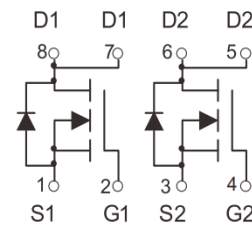


Marking and pin assignment

MCAE65A : Device code  
 XXXX : Code



PDFN5X6-8L view



Schematic diagram



Halogen-Free

### Absolute Maximum Ratings (TA=25°C unless otherwise noted)

| Symbol                                                 | Parameter                        | Rating        | Unit |
|--------------------------------------------------------|----------------------------------|---------------|------|
| <b>Common Ratings (TC=25°C Unless Otherwise Noted)</b> |                                  |               |      |
| $V_{DS}$                                               | Drain-Source Breakdown Voltage   | 40            | V    |
| $V_{GS}$                                               | Gate-Source Voltage              | ±20           | V    |
| $T_J$                                                  | Maximum Junction Temperature     | 150           | °C   |
| $T_{STG}$                                              | Storage Temperature Range        | -50 to 155    | °C   |
| $I_S$                                                  | Diode Continuous Forward Current | Tc=25°C<br>65 | A    |

### Mounted on Large Heat Sink

|          |                                                |                |    |
|----------|------------------------------------------------|----------------|----|
| $I_{DM}$ | Pulse Drain Current Tested                     | Tc=25°C<br>200 | A  |
| $I_D$    | Continuous Drain Current                       | Tc=25°C<br>65  | A  |
| $P_D$    | Maximum Power Dissipation                      | Tc=25°C<br>85  | W  |
| $E_{AS}$ | Single pulse avalanche energy <sup>Note1</sup> | 81             | mJ |

### Ordering Information (Example)

| Type    | Package    | Marking | Minimum Package(pcs) | Inner Box Quantity(pcs) | Outer Carton Quantity(pcs) | Delivery Mode |
|---------|------------|---------|----------------------|-------------------------|----------------------------|---------------|
| MCAE65A | PDFN5X6-8L | MCAE65A | 5,000                | 10,000                  | 70,000                     | 13"reel       |

| Electrical Characteristics (TJ=25°C unless otherwise noted)              |                                  |                                                                                       |     |      |      |      |
|--------------------------------------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------|-----|------|------|------|
| Symbol                                                                   | Parameter                        | Condition                                                                             | Min | Typ  | Max  | Unit |
| Static Electrical Characteristics @ TJ = 25°C (unless otherwise stated)  |                                  |                                                                                       |     |      |      |      |
| BV <sub>(BR)DSS</sub>                                                    | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                                            | 40  | --   | --   | V    |
| I <sub>DSS</sub>                                                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =40V, V <sub>GS</sub> =0V                                             | --  | --   | 1.0  | μA   |
| I <sub>GSS</sub>                                                         | Gate-Body Leakage Current        | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                                            | --  | --   | ±100 | nA   |
| V <sub>GS(th)</sub>                                                      | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                              | 1.0 | 1.5  | 2.5  | V    |
| R <sub>DS(on)</sub>                                                      | Drain-Source On-State Resistance | V <sub>GS</sub> =10V, I <sub>D</sub> =20A                                             | --  | 6.5  | 8.0  | mΩ   |
|                                                                          |                                  | V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A                                            | --  | 8.0  | 12   | mΩ   |
| Dynamic Electrical Characteristics @ TJ = 25°C (unless otherwise stated) |                                  |                                                                                       |     |      |      |      |
| C <sub>ISS</sub>                                                         | Input Capacitance                | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz                                     | --  | 1800 | --   | pF   |
| C <sub>OSS</sub>                                                         | Output Capacitance               |                                                                                       | --  | 210  | --   | pF   |
| C <sub>RSS</sub>                                                         | Reverse Transfer Capacitance     |                                                                                       | --  | 170  | --   | pF   |
| Switching Characteristics                                                |                                  |                                                                                       |     |      |      |      |
| Q <sub>g</sub>                                                           | Total Gate Charge                | V <sub>DS</sub> =20V, I <sub>D</sub> =20A, V <sub>GS</sub> =10V                       | --  | 45   | --   | nC   |
| Q <sub>gs</sub>                                                          | Gate Source Charge               |                                                                                       | --  | 6    | --   | nC   |
| Q <sub>gd</sub>                                                          | Gate Drain Charge                |                                                                                       | --  | 10   | --   | nC   |
| t <sub>d(on)</sub>                                                       | Turn-on Delay Time               | V <sub>DS</sub> =30V, I <sub>D</sub> =20A, V <sub>GS</sub> =10V, R <sub>G</sub> =2.2Ω | --  | 6    | --   | nS   |
| t <sub>r</sub>                                                           | Turn-on Rise Time                |                                                                                       | --  | 20   | --   | nS   |
| t <sub>d(off)</sub>                                                      | Turn-Off Delay Time              |                                                                                       | --  | 53   | --   | nS   |
| t <sub>f</sub>                                                           | Turn-Off Fall Time               |                                                                                       | --  | 33   | --   | nS   |
| Source- Drain Diode Characteristics                                      |                                  |                                                                                       |     |      |      |      |
| V <sub>SD</sub>                                                          | Forward on voltage               | Tj=25°C, Is=20A                                                                       | --  | 0.8  | 1.2  | V    |

Note:

1: EAS Test condition: V<sub>DD</sub>=35V, V<sub>GS</sub>=10V, L=0.5mH, I<sub>AS</sub>=18A, R<sub>G</sub>=25Ω, Starting T<sub>J</sub> = 25°C

## Typical Operating Characteristics

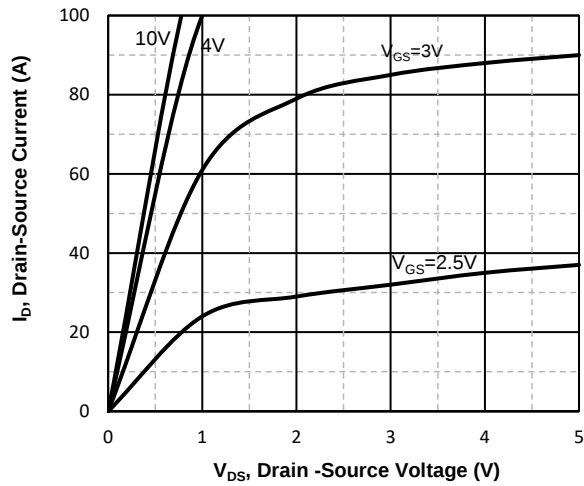


Fig1. Typical Output Characteristics

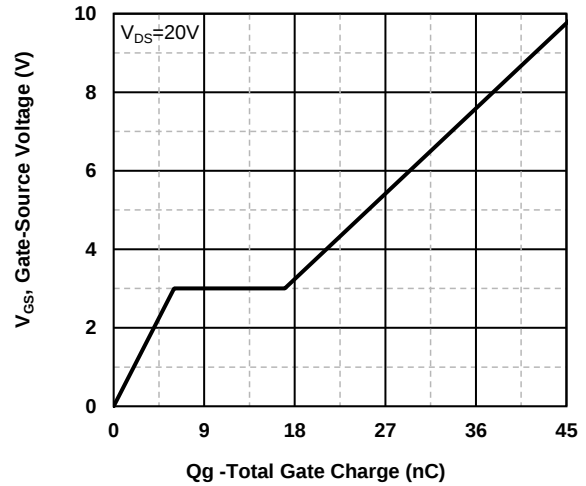


Fig2. Typical Gate Charge Vs. Gate-Source Voltage

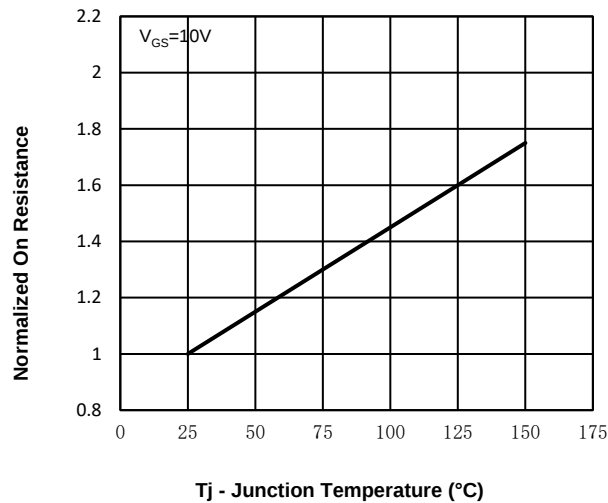


Fig3. Normalized On-Resistance Vs. Temperature

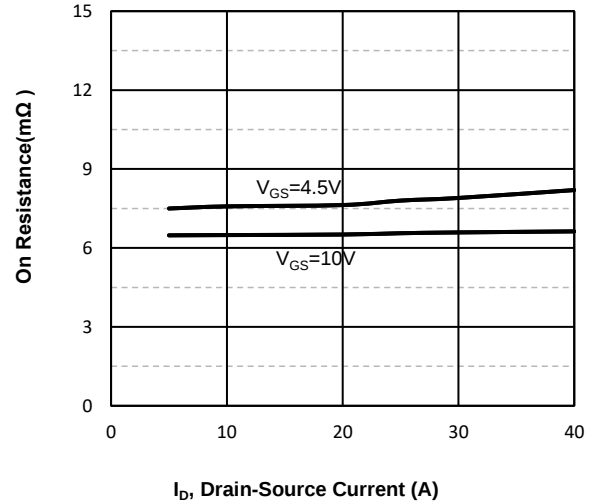


Fig4. On-Resistance Vs. Drain-Source Current

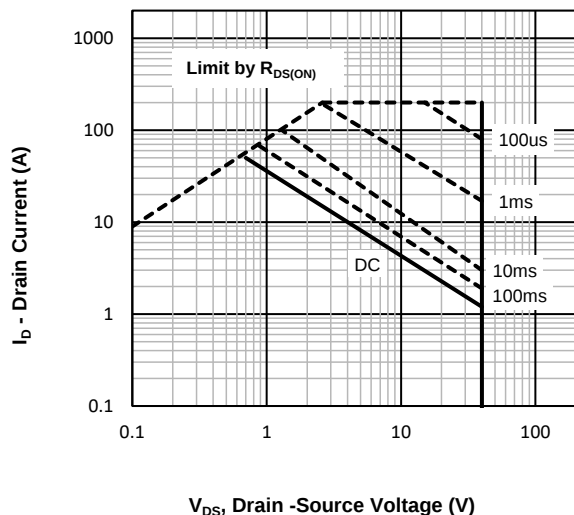


Fig5. Maximum Safe Operating Area

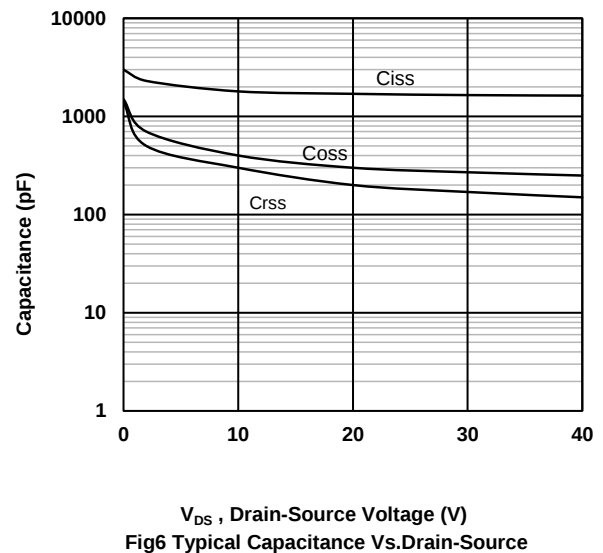
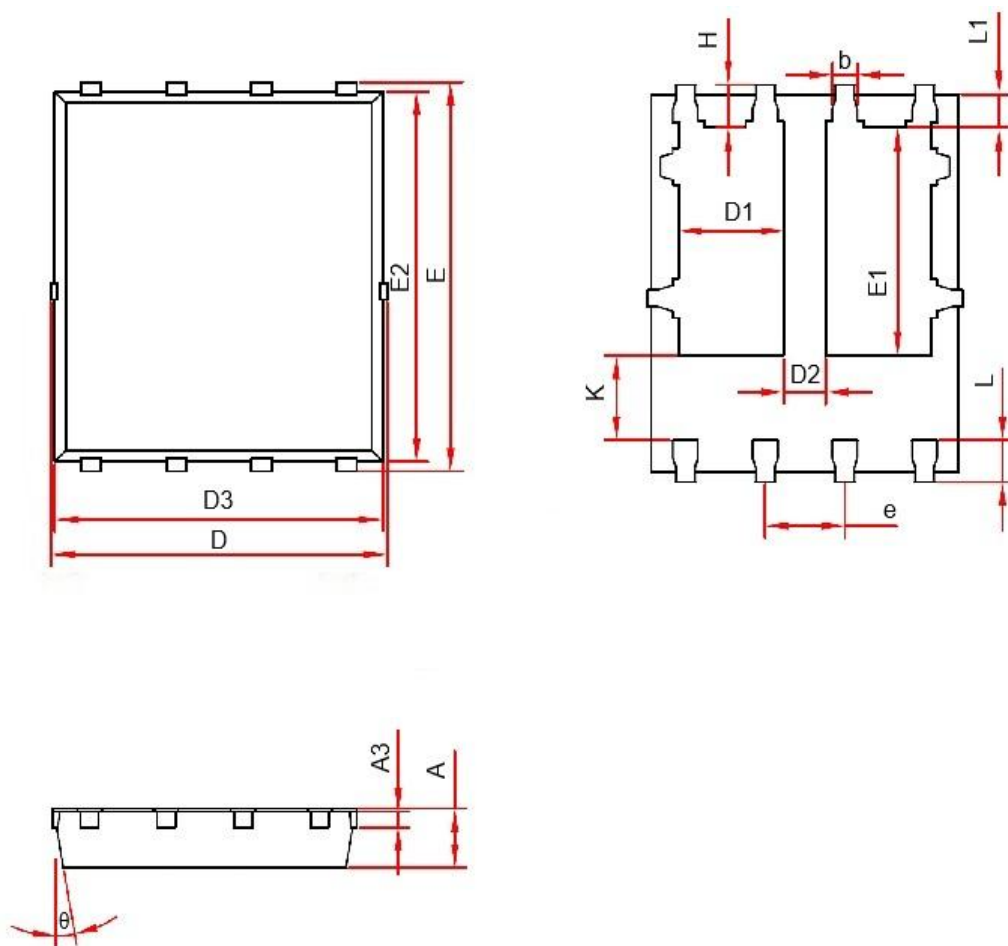


Fig6. Typical Capacitance Vs. Drain-Source

PDFN5X6-8L Package information



| Symbol   | Dimensions in Millimeters(mm) |       | Dimensions In Inches |       |
|----------|-------------------------------|-------|----------------------|-------|
|          | Min                           | Max   | Min                  | Max   |
| A        | 0.950                         | 1.050 | 0.035                | 0.039 |
| A3       | 0.254REF.                     |       | 0.010REF.            |       |
| D        | 4.950                         | 5.050 | 0.196                | 0.200 |
| E        | 5.950                         | 6.050 | 0.235                | 0.239 |
| D1       | 1.470                         | 1.870 | 0.058                | 0.074 |
| D2       | 0.470                         | 0.870 | 0.019                | 0.034 |
| E1       | 3.510                         | 3.610 | 0.139                | 0.143 |
| D3       | 4.850                         | 4.950 | 0.192                | 0.196 |
| E2       | 5.700                         | 5.800 | 0.225                | 0.229 |
| k        | 1.190                         | 1.390 | 0.047                | 0.055 |
| b        | 0.300                         | 0.400 | 0.012                | 0.016 |
| e        | 1.270TYP.                     |       | 0.050TYP.            |       |
| L        | 0.559                         | 0.711 | 0.022                | 0.028 |
| L1       | 0.424                         | 0.576 | 0.017                | 0.023 |
| H        | 0.574                         | 0.726 | 0.023                | 0.029 |
| $\theta$ | 10°                           | 12°   | 10°                  | 12°   |