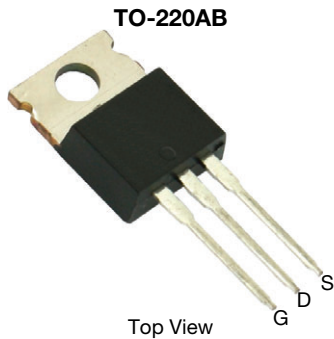


## N-Channel 200 V (D-S) MOSFET



| PRODUCT SUMMARY                                    |                  |
|--|------------------|
| $V_{DS}$ (V)                                       | 200              |
| $R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 10$ V  | 0.0109           |
| $R_{DS(on)}$ max. ( $\Omega$ ) at $V_{GS} = 7.5$ V | 0.0124           |
| $Q_g$ typ. (nC)                                    | 56.7             |
| $I_D$ (A)  | 150 <sup>d</sup> |
| Configuration                                      | Single           |

### FEATURES

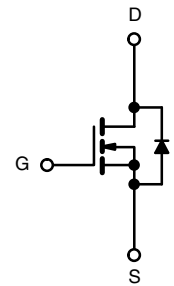
- TrenchFET® power MOSFET
- Maximum 175 °C junction temperature
- Very low  $Q_{gd}$  reduces power loss from passing through  $V_{plateau}$
- 100 %  $R_g$  and UIS tested
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

### APPLICATIONS

- Switching power supply
- DC/DC converter
- Power tools
- Motor drive switch
- DC/AC inverter
- Battery management
- OR-ing / e-fuse



N-Channel MOSFET

| ORDERING INFORMATION            |               |
|---------------------------------|---------------|
| Package                         | TO-220        |
| Lead (Pb)-free and halogen-free | SUP90100E-GE3 |

| ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C, unless otherwise noted) |                |                |                  |
|---|----------------|----------------|------------------|
| PARAMETER   | SYMBOL         | LIMIT          | UNIT             |
| Drain-source voltage  | $V_{DS}$       | 200            | V                |
| Gate-source voltage   | $V_{GS}$       | $\pm 20$       |                  |
| Continuous drain current ( $T_J = 150$ °C)                        | $I_D$          | $T_C = 25$ °C  | 150 <sup>d</sup> |
|   |                | $T_C = 70$ °C  | 150 <sup>d</sup> |
| Pulsed drain current ( $t = 100$ $\mu$ s)                         | $I_{DM}$       | 250            | A                |
| Avalanche current   | $I_{AS}$       | 70             |                  |
| Single avalanche energy <sup>a</sup>                              | $E_{AS}$       | 245            | mJ               |
| Maximum power dissipation <sup>a</sup>                            | $P_D$          | $T_C = 25$ °C  | 375 <sup>b</sup> |
|   |                | $T_C = 125$ °C | 125 <sup>b</sup> |
| Operating junction and storage temperature range                  | $T_J, T_{stg}$ | -55 to +175    | °C               |

| THERMAL RESISTANCE RATINGS                   |            |       |      |
|--|------------|-------|------|
| PARAMETER                                    | SYMBOL     | LIMIT | UNIT |
| Junction-to-ambient (PCB mount) <sup>c</sup> | $R_{thJA}$ | 40    | °C/W |
| Junction-to-case (drain)                     | $R_{thJC}$ | 0.4   |      |

### Notes

- Duty cycle  $\leq 1$  %
- See SOA curve for voltage derating
- When mounted on 1" square PCB (FR4 material)
- Package limited



| SPECIFICATIONS ( $T_J = 25\text{ }^\circ\text{C}$ , unless otherwise noted)   |               |  |      |        |           |               |
|---|---------------|--|------|--------|-----------|---------------|
| PARAMETER   | SYMBOL        | TEST CONDITIONS  | MIN. | TYP.   | MAX.      | UNIT          |
| <b>Static</b>   |               |  |      |        |           |               |
| Drain-source breakdown voltage  | $V_{DS}$      | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$  | 200  | -      | -         | V             |
| Gate threshold voltage  | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$  | 2    | -      | 4         |               |
| Gate-body leakage   | $I_{GSS}$     | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$  | -    | -      | $\pm 250$ | nA            |
| Zero gate voltage drain current   | $I_{DSS}$     | $V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}$   | -    | -      | 1         | $\mu\text{A}$ |
|   |               | $V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}, T_J = 125\text{ }^\circ\text{C}$  | -    | -      | 150       |               |
|   |               | $V_{DS} = 200\text{ V}, V_{GS} = 0\text{ V}, T_J = 175\text{ }^\circ\text{C}$  | -    | -      | 5         | mA            |
| On-state drain current <sup>a</sup>   | $I_{D(on)}$   | $V_{DS} \geq 10\text{ V}, V_{GS} = 10\text{ V}$  | 120  | -      | -         | A             |
| Drain-source on-state resistance <sup>a</sup>   | $R_{DS(on)}$  | $V_{GS} = 10\text{ V}, I_D = 16\text{ A}$  | -    | 0.0091 | 0.0109    | $\Omega$      |
|   |               | $V_{GS} = 7.5\text{ V}, I_D = 13\text{ A}$   | -    | 0.0095 | 0.0124    |               |
| Forward transconductance <sup>a</sup>   | $g_{fs}$      | $V_{DS} = 15\text{ V}, I_D = 13\text{ A}$  | -    | 85     | -         | S             |
| <b>Dynamic <sup>b</sup></b>   |               |  |      |        |           |               |
| Input capacitance   | $C_{iss}$     | $V_{GS} = 0\text{ V}, V_{DS} = 100\text{ V}, f = 1\text{ MHz}$   | -    | 3930   | -         | $\mu\text{F}$ |
| Output capacitance  | $C_{oss}$     |  | -    | 450    | -         |               |
| Reverse transfer capacitance  | $C_{rss}$     |  | -    | 12     | -         |               |
| Total gate charge <sup>c</sup>  | $Q_g$         | $V_{DS} = 100\text{ V}, V_{GS} = 10\text{ V}, I_D = 16\text{ A}$   | -    | 72.8   | 110       | nC            |
| Gate-source charge <sup>c</sup>   | $Q_{gs}$      |  | -    | 19.4   | -         |               |
| Gate-drain charge <sup>c</sup>  | $Q_{gd}$      |  | -    | 19.0   | -         |               |
| Gate resistance   | $R_g$         | $f = 1\text{ MHz}$   | 0.7  | 3.5    | 7.0       | $\Omega$      |
| Turn-on delay time <sup>c</sup>   | $t_{d(on)}$   | $V_{DD} = 80\text{ V}, R_L = 6.2\text{ }\Omega$<br>$I_D \cong 13\text{ A}, V_{GEN} = 10\text{ V}, R_g = 1\text{ }\Omega$ | -    | 20     | 40        | ns            |
| Rise time <sup>c</sup>  | $t_r$         |  | -    | 50     | 100       |               |
| Turn-off delay time <sup>c</sup>  | $t_{d(off)}$  |  | -    | 60     | 120       |               |
| Fall time <sup>c</sup>  | $t_f$         |  | -    | 18     | 36        |               |
| <b>Drain-Source Body Diode Ratings and Characteristics <sup>b</sup> (<math>T_C = 25\text{ }^\circ\text{C}</math>)</b> |               |  |      |        |           |               |
| Pulsed current ( $t = 100\text{ }\mu\text{s}$ )   | $I_{SM}$      |  | -    | -      | 250       | A             |
| Forward voltage <sup>a</sup>  | $V_{SD}$      | $I_F = 10\text{ A}, V_{GS} = 0\text{ V}$   | -    | 0.8    | 1.5       | V             |
| Reverse recovery time   | $t_{rr}$      | $I_F = 13\text{ A}, di/dt = 100\text{ A}/\mu\text{s}$  | -    | 118    | 177       | ns            |
| Peak reverse recovery charge  | $I_{RM(REC)}$ |  | -    | 9.4    | 14.1      | A             |
| Reverse recovery charge   | $Q_{rr}$      |  | -    | 0.632  | 0.948     | $\mu\text{C}$ |
| Reverse recovery fall time  | $t_a$         |  | -    | 94     | -         | ns            |
| Reverse recovery rise time  | $t_b$         |  | -    | 24     | -         |               |

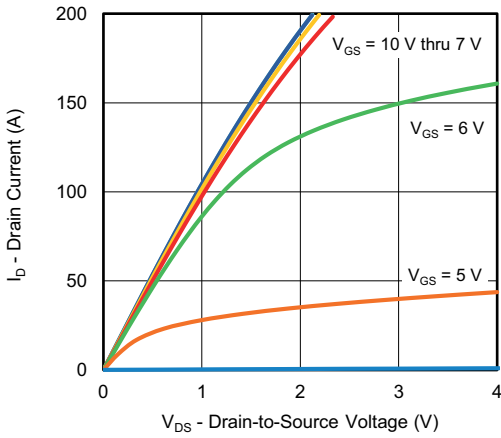
**Notes**

- Pulse test; pulse width  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$
- Guaranteed by design, not subject to production testing
- Independent of operating temperature

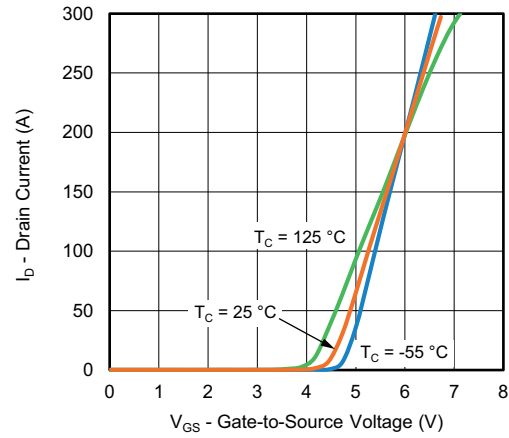
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.



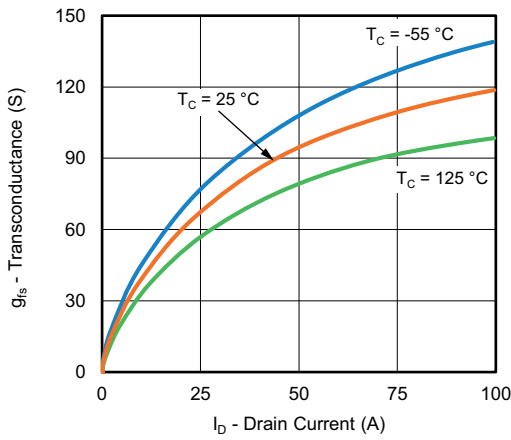
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, unless otherwise noted)



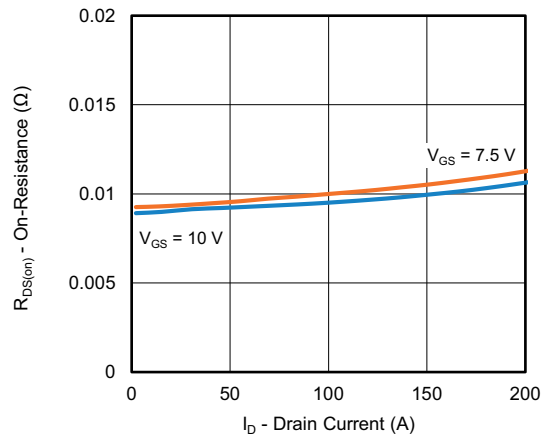
Output Characteristics



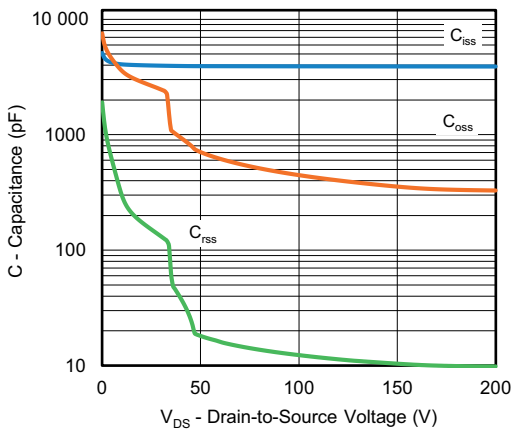
Transfer Characteristics



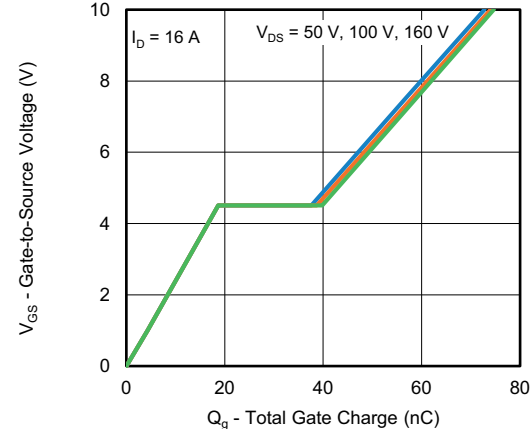
Transconductance



On-Resistance vs. Drain Current



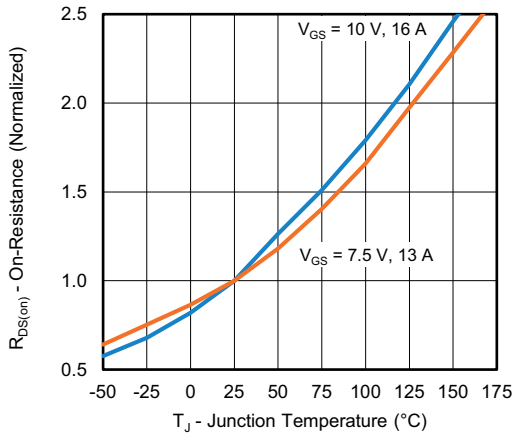
Capacitance



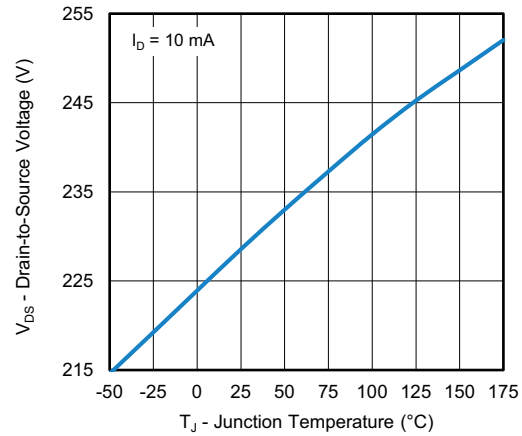
Gate Charge



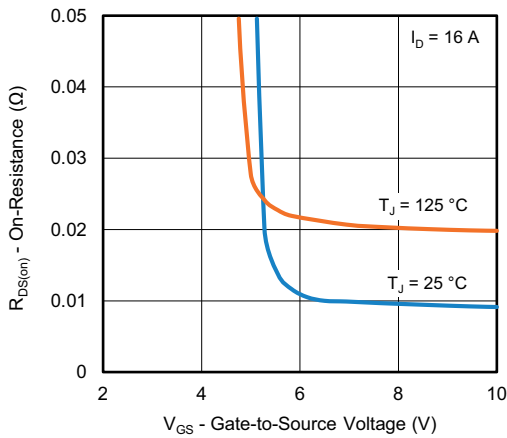
TYPICAL CHARACTERISTICS (T<sub>A</sub> = 25 °C, unless otherwise noted)



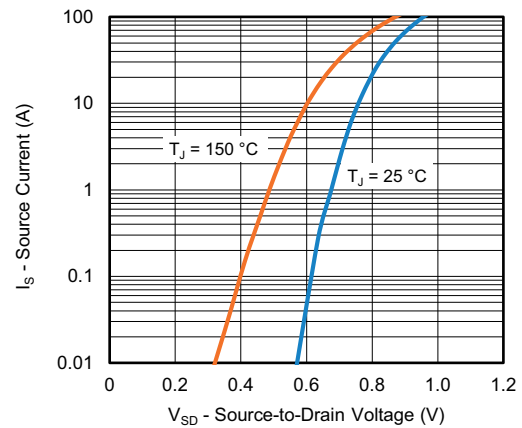
On-Resistance vs. Junction Temperature



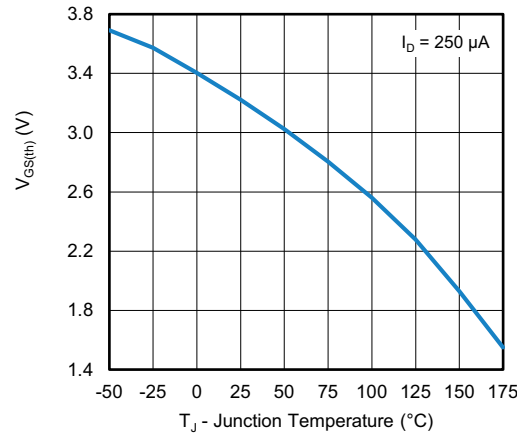
Drain Source Breakdown vs. Junction Temperature



On-Resistance vs. Gate-to-Source Voltage



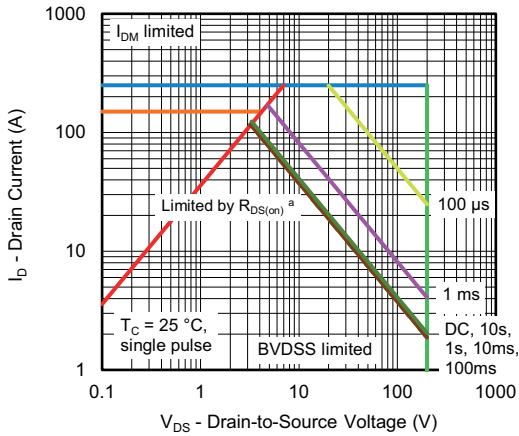
Source Drain Diode Forward Voltage



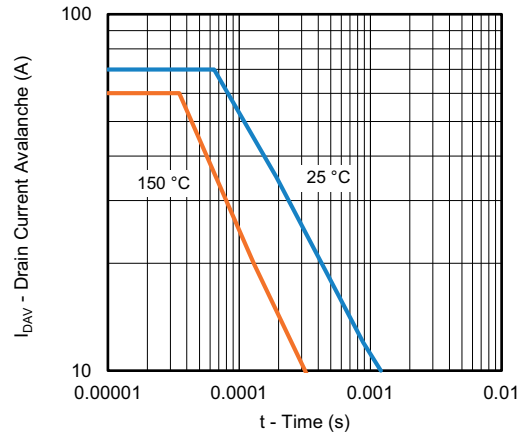
Threshold Voltage



**THERMAL RATINGS** ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)



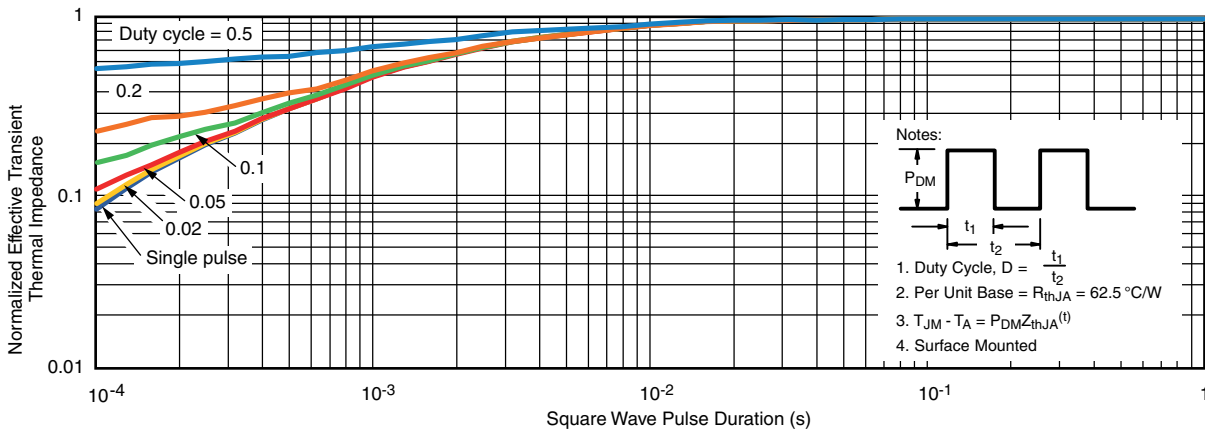
**Safe Operating Area**



**Single Pulse Avalanche Current Capability vs. Time**

**Note**

a.  $V_{GS} >$  minimum  $V_{GS}$  at which  $R_{DS(on)}$  is specified

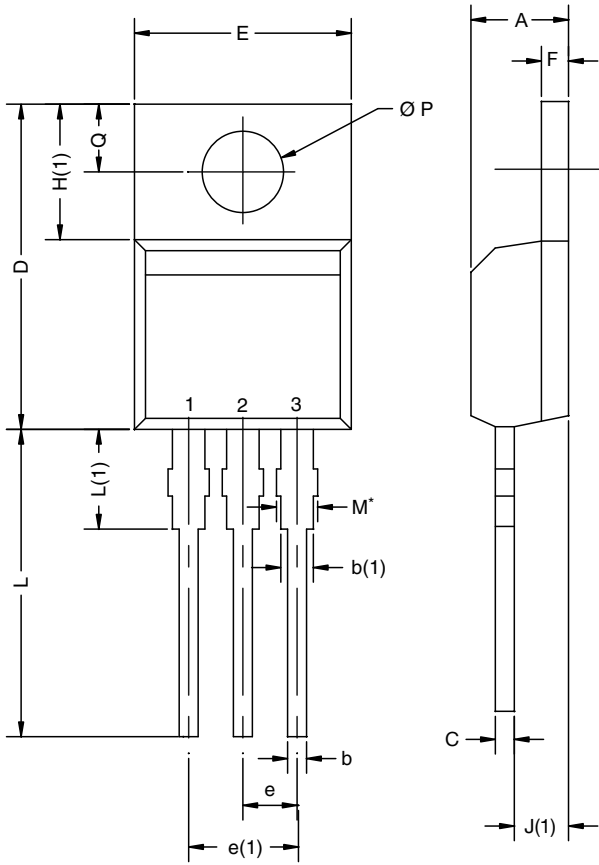


**Normalized Thermal Transient Impedance, Junction-to-Case**

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### TO-220AB

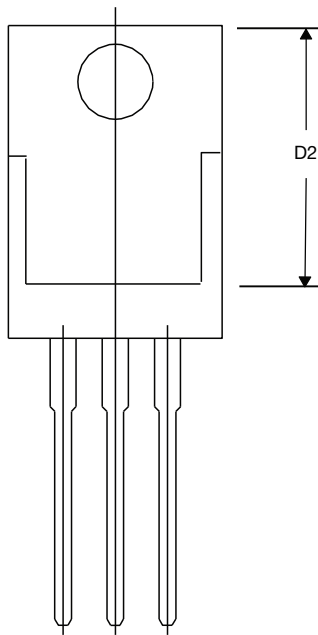


| DIM. | MILLIMETERS |       | INCHES |       |
|------|-------------|-------|--------|-------|
|      | MIN.        | MAX.  | MIN.   | MAX.  |
| A    | 4.25        | 4.65  | 0.167  | 0.183 |
| b    | 0.69        | 1.01  | 0.027  | 0.040 |
| b(1) | 1.20        | 1.73  | 0.047  | 0.068 |
| c    | 0.36        | 0.61  | 0.014  | 0.024 |
| D    | 14.85       | 15.49 | 0.585  | 0.610 |
| D2   | 12.19       | 12.70 | 0.480  | 0.500 |
| E    | 10.04       | 10.51 | 0.395  | 0.414 |
| e    | 2.41        | 2.67  | 0.095  | 0.105 |
| e(1) | 4.88        | 5.28  | 0.192  | 0.208 |
| F    | 1.14        | 1.40  | 0.045  | 0.055 |
| H(1) | 6.09        | 6.48  | 0.240  | 0.255 |
| J(1) | 2.41        | 2.92  | 0.095  | 0.115 |
| L    | 13.35       | 14.02 | 0.526  | 0.552 |
| L(1) | 3.32        | 3.82  | 0.131  | 0.150 |
| Ø P  | 3.54        | 3.94  | 0.139  | 0.155 |
| Q    | 2.60        | 3.00  | 0.102  | 0.118 |

ECN: T14-0413-Rev. P, 16-Jun-14  
DWG: 5471

**Note**

\* M = 1.32 mm to 1.62 mm (dimension including protrusion)  
Heatsink hole for HVM





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