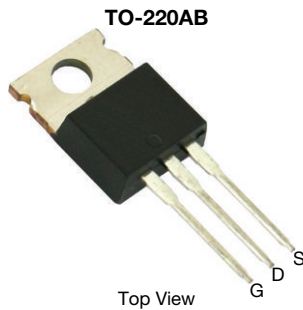


N-Channel 200 V (D-S) 175 °C MOSFET



Top View

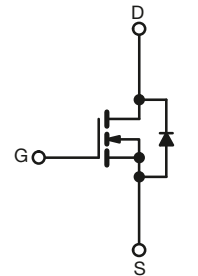

RoHS
 COMPLIANT
 HALOGEN
FREE

FEATURES

- ThunderFET® power MOSFET
- Tuned for the lowest $R_{DS(on)}$ - Q_{oss} FOM
- Maximum 175 °C junction temperature
- 100 % R_g and UIS tested
- Material categorization:
for definitions of compliance please see www.vishay.com/doc?99912

APPLICATIONS

- Power supplies:
 - Uninterruptible power supplies
 - AC/DC switch-mode power supplies
 - Lighting
- Synchronous rectification
- DC/DC converter
- Motor drive switch
- DC/AC inverter
- Solar micro inverter
- Class D audio amplifier



N-Channel MOSFET

| PRODUCT SUMMARY | |
|--|--------|
| V_{DS} (V) | 200 |
| $R_{DS(on)}$ max. (Ω) at $V_{GS} = 10$ V | 0.0152 |
| $R_{DS(on)}$ max. (Ω) at $V_{GS} = 7.5$ V | 0.0169 |
| Q_g typ. (nC) | 58 |
| I_D (A) | 90 |
| Configuration | Single |

| ORDERING INFORMATION | |
|---------------------------------|---------------|
| Package | TO-220AB |
| Lead (Pb)-free and halogen-free | SUP90142E-GE3 |

| ABSOLUTE MAXIMUM RATINGS ($T_A = 25$ °C, unless otherwise noted) | | | |
|---|----------------|----------------|------------------|
| PARAMETER | SYMBOL | LIMIT | UNIT |
| Drain-source voltage | V_{DS} | 200 | V |
| Gate-source voltage | V_{GS} | ± 20 | |
| Continuous drain current | I_D | $T_C = 25$ °C | 90 |
| | | $T_C = 125$ °C | 52 |
| Pulsed drain current ($t = 100$ μ s) | I_{DM} | 240 | A |
| Continuous source-drain diode current | I_S | 90 | |
| Single pulse avalanche current ^a | I_{AS} | 60 | mJ |
| Single pulse avalanche energy ^a | | | |
| Maximum power dissipation | P_D | $T_C = 25$ °C | 375 ^b |
| | | $T_C = 125$ °C | 125 ^b |
| Operating junction and storage temperature range | T_J, T_{stg} | -55 to +175 | °C |
| Soldering recommendations (peak temperature) ^c | | 260 | |

| THERMAL RESISTANCE RATINGS | | | |
|--|------------|---------|------|
| PARAMETER | SYMBOL | MAXIMUM | UNIT |
| Maximum junction-to-ambient (PCB mount) ^c | R_{thJA} | 40 | °C/W |
| Maximum junction-to-case (drain) | R_{thJC} | 0.4 | |

Notes

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



| SPECIFICATIONS (T _J = 25 °C, unless otherwise noted) | | | | | | |
|---|----------------------|---|------|--------|--------|------|
| PARAMETER | SYMBOL | TEST CONDITIONS | MIN. | TYP. | MAX. | UNIT |
| Static | | | | | | |
| Drain-source breakdown voltage | V _{DS} | V _{GS} = 0 V, I _D = 250 μA | 200 | - | - | V |
| Gate-source threshold voltage | V _{GS(th)} | V _{DS} = V _{GS} , I _D = 250 μA | 2 | - | 4 | V |
| Gate-source leakage | I _{GSS} | V _{DS} = 0 V, V _{GS} = ± 20 V | - | - | 250 | nA |
| Zero gate voltage drain current | I _{DSS} | V _{DS} = 200 V, V _{GS} = 0 V | - | - | 1 | μA |
| | | V _{DS} = 200 V, V _{GS} = 0 V, T _J = 125 °C | - | - | 150 | |
| | | V _{DS} = 200 V, V _{GS} = 0 V, T _J = 175 °C | - | - | 5 | mA |
| On-state drain current ^a | I _{D(on)} | V _{DS} ≥ 10 V, V _{GS} = 10 V | 60 | - | - | A |
| Drain-source on-state resistance ^a | R _{DS(on)} | V _{GS} = 10 V, I _D = 30 A | - | 0.0126 | 0.0152 | Ω |
| | | V _{GS} = 7.5 V, I _D = 30 A | - | 0.0133 | 0.0169 | |
| Forward transconductance ^a | g _{fs} | V _{DS} = 15 V, I _D = 30 A | - | 63 | - | S |
| Dynamic^b | | | | | | |
| Input capacitance | C _{iss} | V _{DS} = 100 V, V _{GS} = 0 V, f = 1 MHz | - | 3120 | - | pF |
| Output capacitance | C _{oss} | | - | 280 | - | |
| Reverse transfer capacitance | C _{rss} | | - | 24 | - | |
| Total gate charge | Q _g | V _{DS} = 100 V, V _{GS} = 10 V, I _D = 60 A | - | 58 | 87 | nC |
| Gate-source charge | Q _{gs} | | - | 17.6 | - | |
| Gate-drain charge | Q _{gd} | | - | 17.2 | - | |
| Output charge | Q _{oss} | V _{DS} = 100 V, V _{GS} = 0 V | - | 108 | 162 | |
| Gate resistance | R _g | f = 1 MHz | 1.5 | 3 | 5 | Ω |
| Turn-on delay time | t _{d(on)} | V _{DD} = 100 V, R _L = 1.66 Ω, I _D ≅ 60 A, V _{GEN} = 10 V, R _g = 1 Ω | - | 14 | 28 | ns |
| Rise time | t _r | | - | 125 | 250 | |
| Turn-off delay time | t _{d(off)} | | - | 27 | 54 | |
| Fall time | t _f | | - | 80 | 150 | |
| Drain-Source Body Diode Characteristics | | | | | | |
| Pulse diode forward current (t = 100 μs) | I _{SM} | | - | - | 240 | A |
| Body diode voltage | V _{SD} | I _F = 30 A, V _{GS} = 0 V | - | 0.85 | 1.5 | V |
| Body diode reverse recovery time | t _{rr} | I _F = 30 A, dI/dt = 100 A/μs | - | 150 | 300 | ns |
| Body diode reverse recovery charge | Q _{rr} | | - | 0.9 | 1.8 | nC |
| Reverse recovery fall time | t _a | | - | 125 | - | ns |
| Reverse recovery rise time | t _b | | - | 25 | - | |
| Body diode peak reverse recovery charge | I _{RM(REC)} | | - | 11.5 | 20 | A |

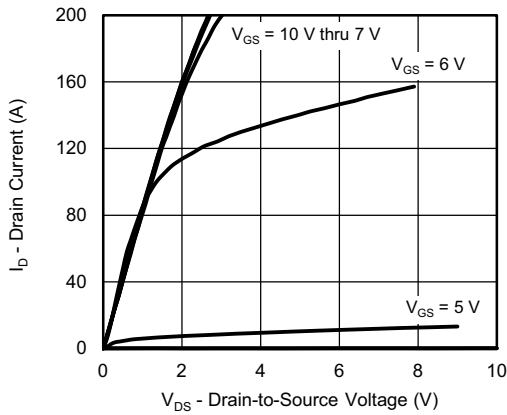
Notes

- Pulse test; pulse width ≤ 300 μs, duty cycle ≤ 2 %.
- Guaranteed by design, not subject to production testing.
- Independent of operating temperature.

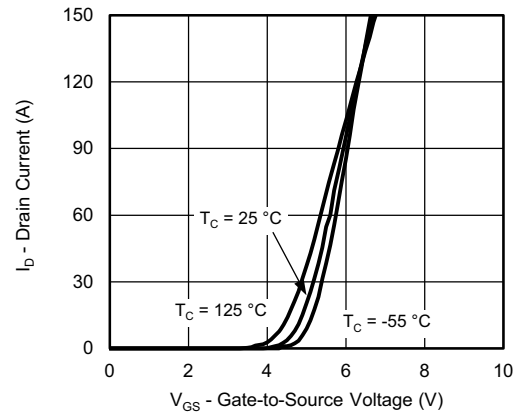
Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure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



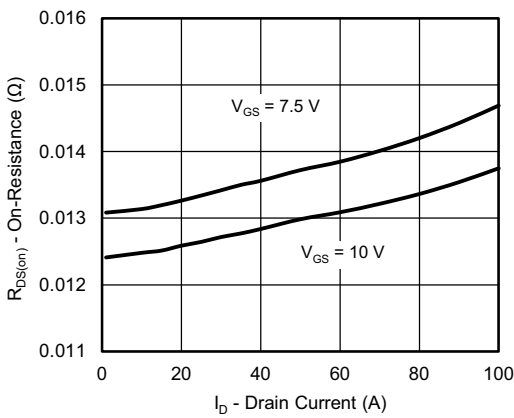
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



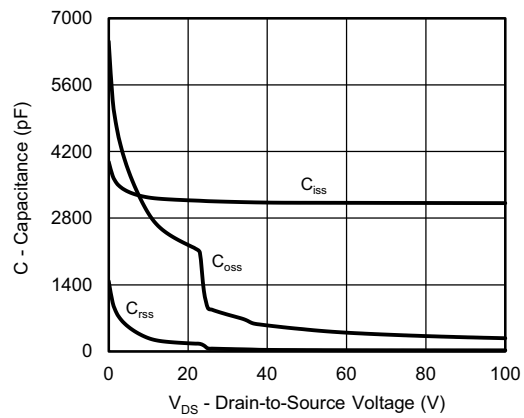
Output Characteristics



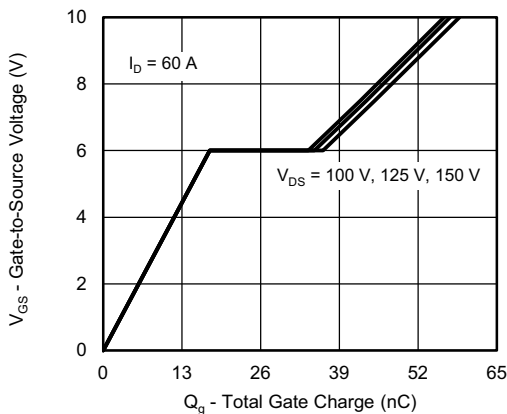
Transfer Characteristics



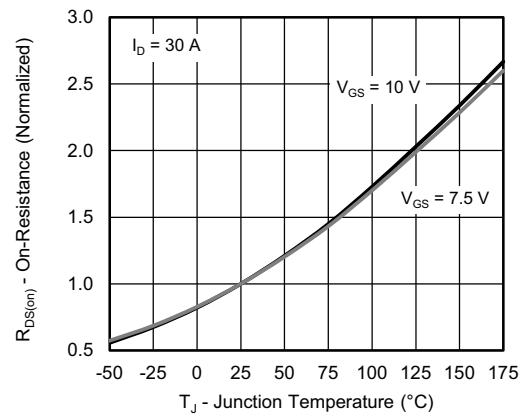
On-Resistance vs. Drain Current and Gate Voltage



Capacitance



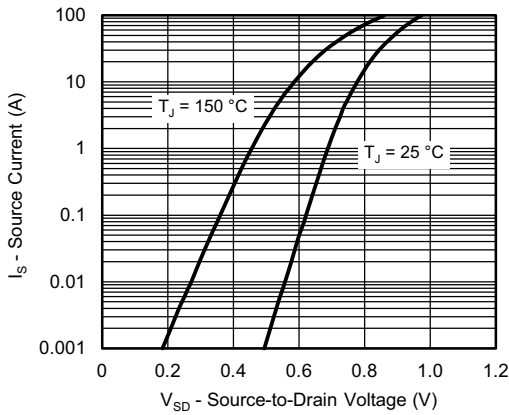
Gate Charge



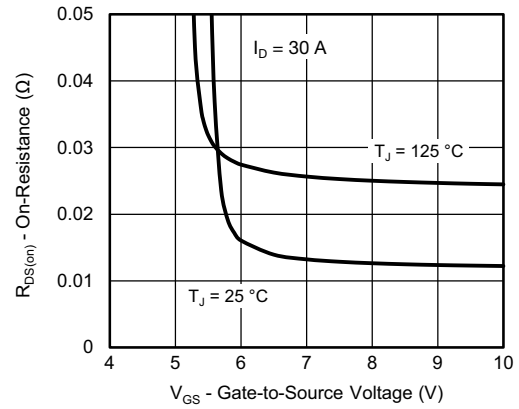
On-Resistance vs. Junction Temperature



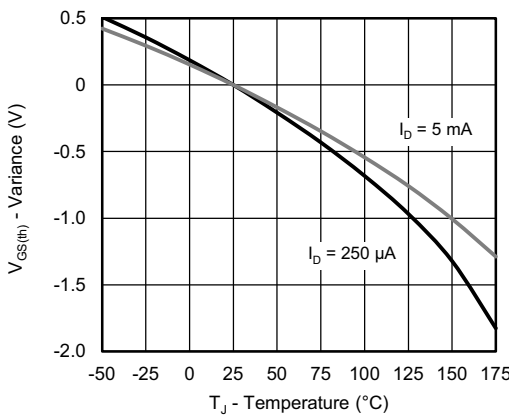
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



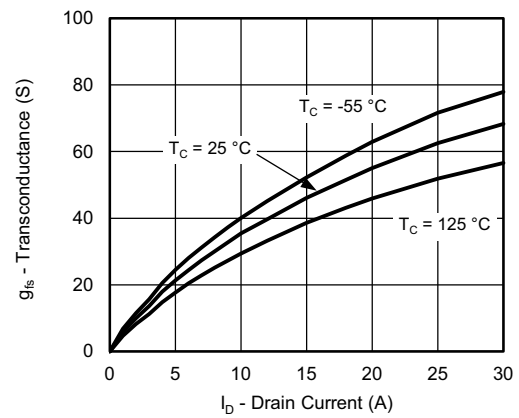
Source-Drain Diode Forward Voltage



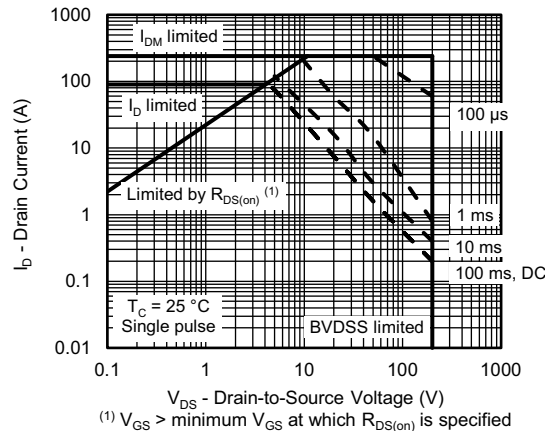
On-Resistance vs. Gate-to-Source Voltage



Threshold Voltage



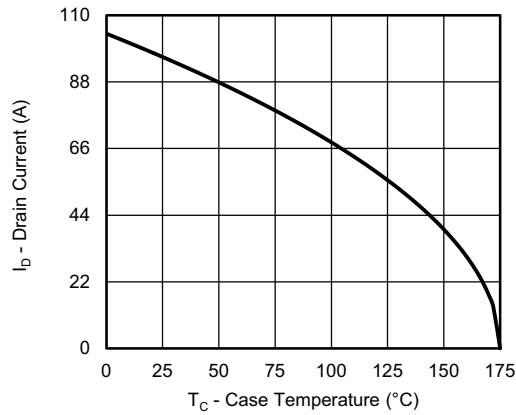
Transconductance



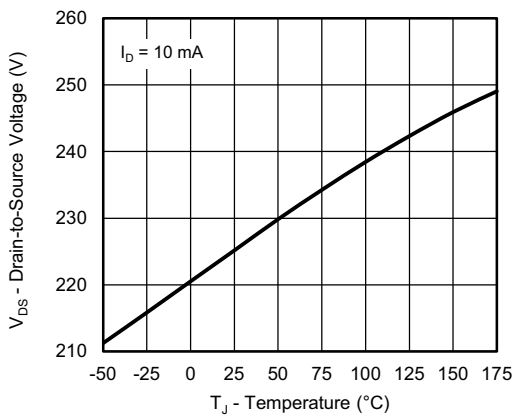
Safe Operating Area, Junction-to-Ambient



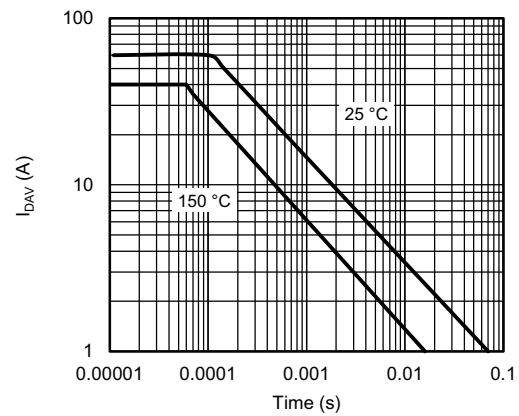
TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Current Derating ^a



Drain Source Breakdown vs. Junction Temperature



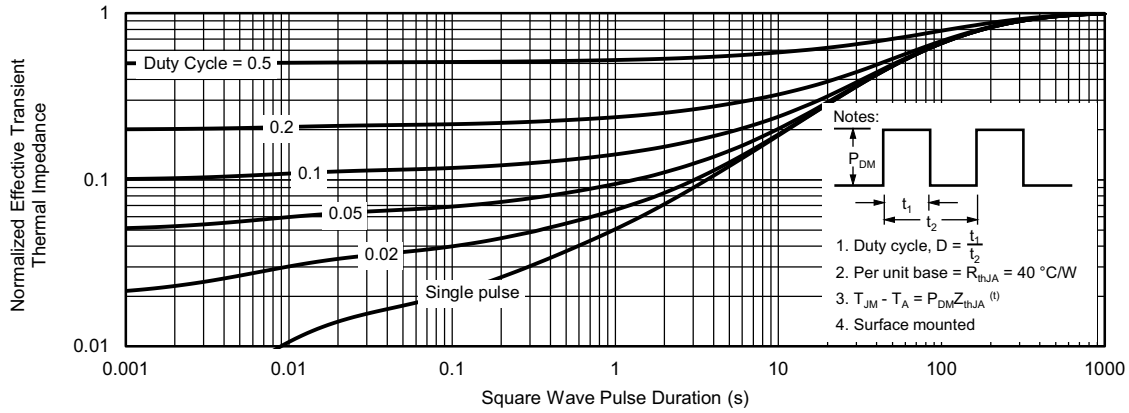
I_{DAV} vs. Time

Note

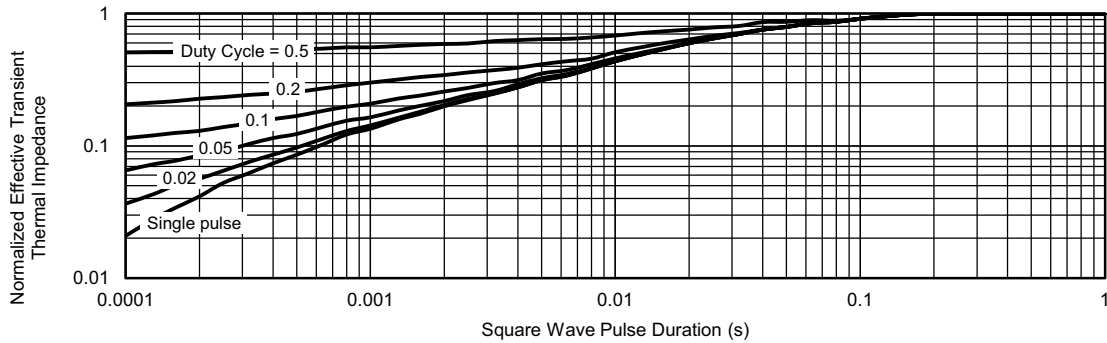
- a. The power dissipation P_D is based on $T_J \text{ max.} = 25 \text{ °C}$, using junction-to-case thermal resistance, and is more useful in settling the upper dissipation limit for cases where additional heatsinking is used. It is used to determine the current rating, when this rating falls below the package limit.



TYPICAL CHARACTERISTICS (25 °C, unless otherwise noted)



Normalized Thermal Transient Impedance, Junction-to-Ambient

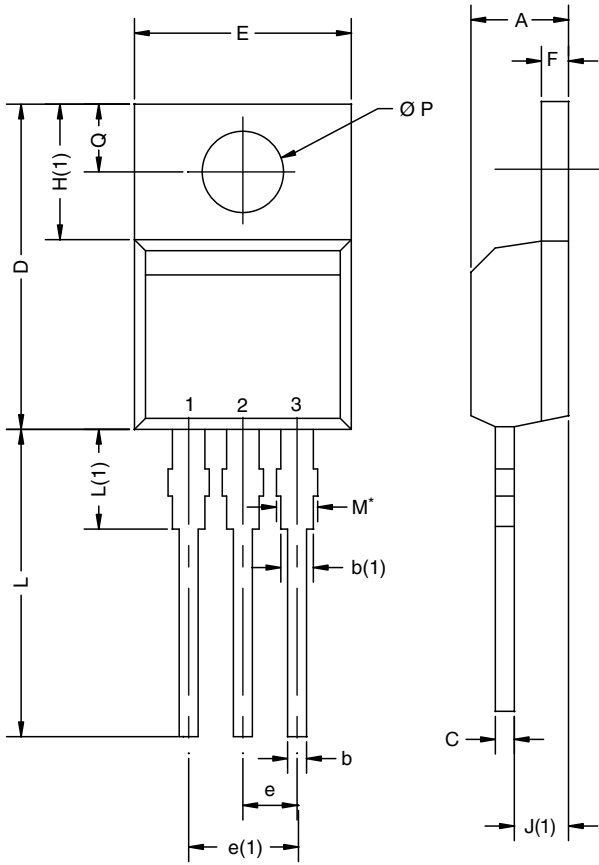


Normalized Thermal Transient Impedance, Junction-to-Case

Vishay Siliconix maintains worldwide manufacturing capability. Products may be manufactured at one of several qualified locations. Reliability data for Silicon Technology and Package Reliability represent a composite of all qualified locations. For related documents such as package/tape drawings, part marking, and reliability data, see www.vishay.com/ppg?75002.



TO-220AB

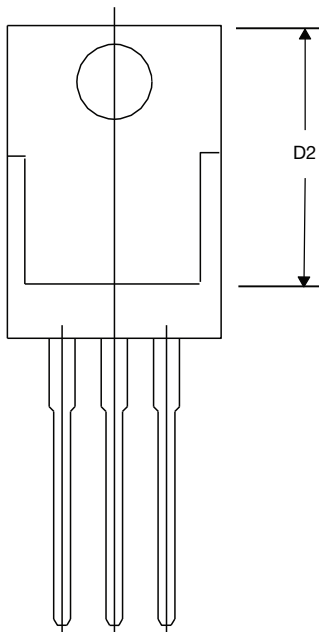


| DIM. | MILLIMETERS | | INCHES | |
|-----------------|-------------|-------|--------|-------|
| | MIN. | MAX. | MIN. | MAX. |
| A | 4.25 | 4.65 | 0.167 | 0.183 |
| b | 0.69 | 1.01 | 0.027 | 0.040 |
| b(1) | 1.20 | 1.73 | 0.047 | 0.068 |
| c | 0.36 | 0.61 | 0.014 | 0.024 |
| D | 14.85 | 15.49 | 0.585 | 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 |
| $\varnothing P$ | 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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