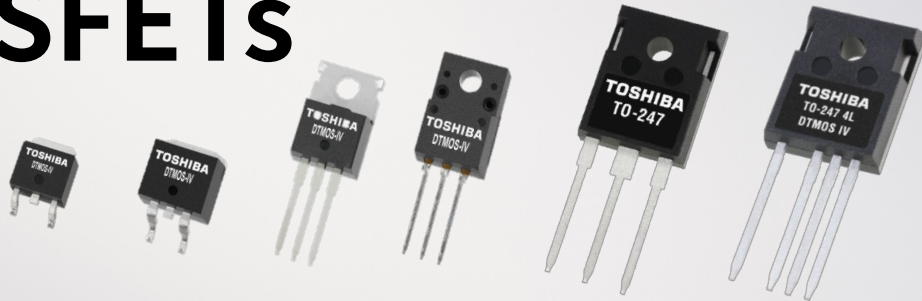


High Voltage MOSFETs



Latest Super-Junction Technology

Toshiba has developed generations of super-junction 500V, 600V, 650V, and 800V DTMOS MOSFET series. Fabricated using the state-of-the-art single epitaxial process, DTMOS IV provides a 30% reduction in $R_{on} \cdot A$, a figure of merit (FOM) for MOSFETs, compared to its predecessor DTMOS III. A reduction in $R_{on} \cdot A$ leads to smaller $R_{DS(ON)}$ chips in the same packages. This helps users to improve efficiency and reduce the size of power systems. Fast switching X-type and fast body-diode W5-type versions are also available. DTMOS V series is providing even better EMI performance. New DTMOS VI series is designed for highest efficiency switching.

Applications

- Switched Mode Power Supply
- Lighting
- Power Factor Control
- Industrial applications (including UPS)

Features

- DTMOS IV: 30% reduction in $R_{DS(ON)} \cdot A$ compared to previous generation
- Reduction in C_{oss}
- Application of latest process technology: single epitaxial process
- Wide range of on-resistances and packaging options, see tables
- Lowest FOM ($R_{DS(ON)} \times Q_{gd}$) offered by DTMOS VI

Advantages

- Reduction of chip size at same performance or improved performance at same chip size
- DTMOS IV offers 12% reduced switching loss, E_{oss} , compared to the predecessor
- Lower increase in on-resistance at temperature rise
- Freedom of choice and flexibility on package and on $R_{DS(ON)}$ lineup
- DTMOS VI for highest efficiency switching at power supply

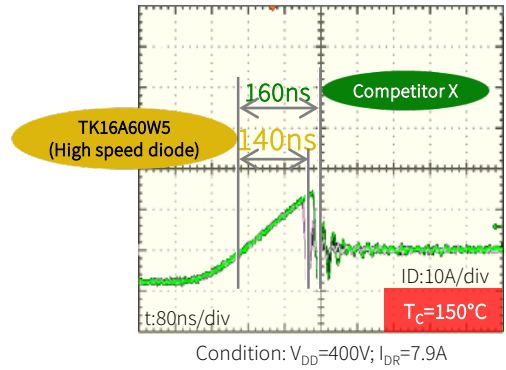
Benefits

- Reduced heat system costs
- Less costs of field failure
- Less passive component costs
- Reduced BOM costs due to most effective solutions
- Easy design-in for faster time to market and product launch
- Ready to support high volume markets with competitive prices
- Allows higher power density

| DTMOS - series | Applications |
|-------------------------------------------------------------------------|-------------------------------------------------|
| DTMOS VI Z-Series: Lowest FOM ($R_{DS(ON)} \times Q_{gd}$) NEW | Data Center, PV-Inverter, UPS |
| DTMOS V Y-Series: Low EMI series | For lighting, battery charger and AC/DC adapter |
| DTMOS IV W-Series: Standard type | For general switching |
| DTMOS IV W5-Series: With high speed body diode | For bridge circuitry, like UPS or server SMPS |
| DTMOS IV X-Series: High speed type | For PFC circuit |
| DTMOS IV X5-Series: High speed MOSFET & body diode | For bridge circuitry, like UPS or server SMPS |

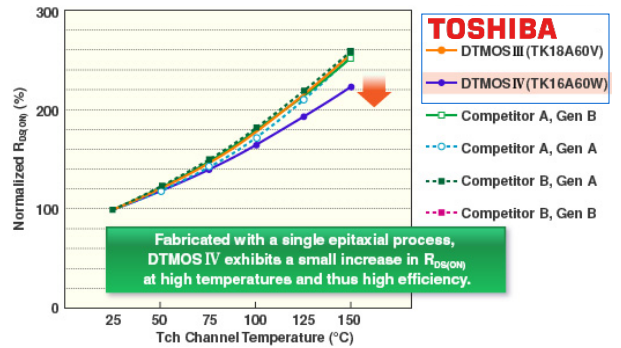
DTMOS IV W5: Fast reverse recovery time

The DTMOS IV option with fast body diode (“W5”- suffix) offers a fast recovery time even at high temperature. This results in lower power losses, less heat generation and lower power costs for a better and more thermally efficient design.



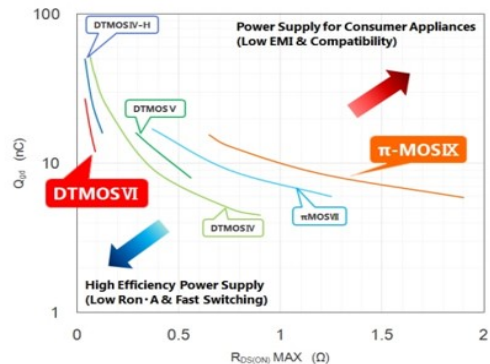
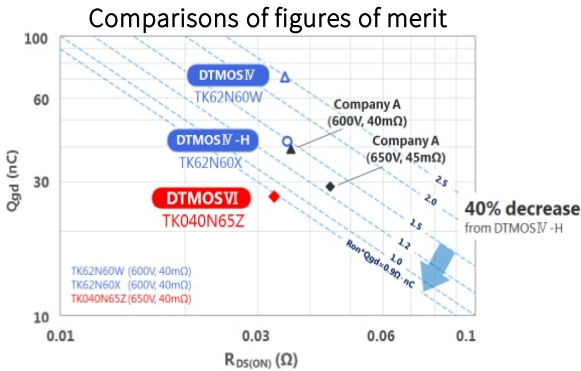
DTMOS : 15% lower $R_{DS(ON)}$ at maximum operating temperature

For the single-epitaxial process the dependency of $R_{DS(ON)}$ from temperature is much smaller compared to multi-epitaxial process. As DTMOS IV is manufactured with a single-epitaxial process, the $R_{DS(ON)}$ value will be 15% smaller at operating temperature, resulting in lower power consumption and higher system efficiency. At the same time, system cooling set-up can be relaxed and reliability is increased.



DTMOS VI: For highest efficiency switching

Offering the lowest figure of merit $R_{DS(ON)} \times Q_{gd}$, the DTMOS VI series has the high efficiency switching while additionally supporting DFN 8 x 8 and TO-247 4L packages with a Kelvin Source. Future developments will also include a TOLL package with Kelvin source.



DTMOS VI 650V “Z” -series (lowest $R_{DS(ON)} \times Q_{gd}$) **NEW**

| | DFN 8x8mm | TO-220 | TO-220SIS | TO-247 | TO-247-4L | TOLL |
|--|-----------|--------|-----------|--------|-----------|------|
|--|-----------|--------|-----------|--------|-----------|------|

Outline



| | | | | | | |
|--------|------------|------------|------------|------------|------------|------------|
| 0.110Ω | TK125V65Z* | | TK110A65Z* | TK110N65Z* | TK110Z65Z* | TK110U65Z* |
| 0.09Ω | TK099V65Z | TK090E65Z* | TK090A65Z | TK090N65Z | TK090Z65Z | TK090U65Z* |
| 0.065Ω | | | | TK065N65Z | TK065Z65Z | TK065U65Z* |
| 0.04Ω | | | | TK040N65Z | TK040Z65Z | |

* Under development

toshiba.semicon-storage.com

DTMOS IV & V 600V standard “W” & “Y” series

| | DPAK | IPAK | D2PAK | DFN 8x8mm | TO-220 | TO-220SIS | TO-247 |
|---------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Outline |  |  |  |  |  |  |  |
| 0.9Ω | TK5P60W | TK5Q60W | | | | TK5A60W | |
| 0.75Ω | TK6P60W | TK6Q60W | | | | TK6A60W | |
| 0.60Ω | TK560P60Y* TK7P60W | TK7Q60W | | | | TK560A60Y* TK7A60W | |
| 0.50Ω | TK8P60W | TK8Q60W | | | | TK8A60W | |
| 0.38Ω | TK380P60Y* TK10P60W | TK10Q60W | | TK10V60W | TK10E60W | TK380A60Y* TK10A60W | |
| 0.30Ω | TK290P60Y* TK12P60W | TK12Q60W | | TK12V60W | TK12E60W | TK290A60Y* TK12A60W | |
| 0.19Ω | | | TK16G60W | TK16V60W | TK16E60W | TK16A60W | TK16N60W |
| 0.155Ω | | | TK20G60W | TK20V60W | TK20E60W | TK20A60W | TK20N60W |
| 88mΩ | | | | TK31V60W | TK31E60W | TK31A60W | TK31N60W |
| 65mΩ | | | | | | TK39A60W | TK39N60W |
| 40mΩ | | | | | | | TK62N60W |

* DTMOS V

DTMOS IV 600V fast diode type “W5” series

| | DPAK | D2PAK | DFN 8x8mm | TO-220 | TO-220SIS | TO-247 |
|--------|-------------------|-----------|--------------------|-----------|-----------|-----------|
| 0.95Ω | TK5P60W5 0.99Ω | | | | TK5A60W5 | |
| 0.65Ω | TK7P60W5 0.67Ω | | | | TK7A60W5 | |
| 0.54Ω | TK8P60W5 0.56Ω | | | | TK8A60W5 | |
| 0.45Ω | | | | | TK10A60W5 | |
| 0.23Ω | | TK16G60W5 | TK16V60W5 | TK16E60W5 | TK16A60W5 | TK16N60W5 |
| 0.175Ω | | | TK20V60W5 0.24Ω | TK20E60W5 | TK20A60W5 | TK20N60W5 |
| 99mΩ | | | TK31V60W5 0.19Ω | | | TK31N60W5 |
| 74mΩ | | | | | | TK39N60W5 |
| 45mΩ | | | | | | TK62N60W5 |

DTMOS IV 600V high speed type (low Q_{gd}), fast diode type “X” & “X5” series

| | DFN 8x8mm | TO-220 | TO-220SIS | TO-247 4 L | TO-247 |
|--------|--------------------|-------------|-------------|------------|-------------|
| 0.145Ω | TK25V60X5** | TK25E60X5** | TK25A60X5** | | TK25N60X5** |
| 0.125Ω | TK25V60X 0.135Ω | TK25E60X | TK25A60X | TK25Z60X | TK25N60X |
| 88mΩ | TK31V60X 0.098Ω | TK31E60X | | TK31Z60X | TK31N60X |
| 65mΩ | | | | TK39Z60X | TK39N60X |
| 40mΩ | | | | TK62Z60X | TK62N60X |

* Samples available ** fast Diode

DTMOS IV & V 650V standard “W” & “Y” series

| | PAK | IPAK | D2PAK | DFN 8x8mm | TO-220 | TO-220SIS | TO-247 |
|----------------------|------------|----------|---------|-----------|----------|------------|----------|
| Outline | | | | | | | |
| (1.2/1.22) Ω | TK5P65W | TK5Q65W | | | | TK5A65W | |
| (1.0/1.05) Ω | TK6P65W | TK6Q65W | | | | TK6A65W | |
| (0.78/0.8) Ω | TK7P65W | TK7Q65W | | | | TK7A65W | |
| (0.65/0.67) Ω | TK8P65W | TK8Q65W | | | | TK8A65W | |
| (0.5/0.56) Ω | TK560P65Y* | TK9Q65W | | | | TK560A65Y* | |
| | TK9P65W | | | | | TK9A65W | |
| (0.39/0.44) Ω | TK380P65Y* | TK11Q65W | | | | TK380A65Y* | |
| | TK11P65W | | | | | TK11A65W | |
| (0.25/0.29) Ω | TK290P65Y* | | TK14G65 | TK14V65W | TK14E65W | TK290A65Y* | TK14N65W |
| | | | | | | TK14A65W | |
| (0.20/0.21) Ω | | | | TK17V65W | TK17E65W | TK17A65W | TK17N65W |
| (0.11/0.12) Ω | | | | TK28V65W | TK28E65W | TK28A65W | TK28N65W |
| 80m Ω | | | | | | TK35A65W | TK35N65W |
| 55m Ω | | | | | | | TK49N65W |

*DTMOS V

DTMOS IV 650V high speed type (low Q_{gd}), fast diode type “W5” & “X5” series

| | D2 PAK | DFN 8x8mm | TO-220 | TO-220SIS | TO-247 |
|----------------------|-----------|------------|-----------|-----------|-----------|
| Outline | | | | | |
| 0.3 Ω | TK14G65W5 | | TK14E65W5 | TK14A65W5 | TK14N65W5 |
| 0.23 Ω | | | | TK17A65W5 | |
| (0.16/0.17) Ω | | TK22V65X5* | | TK22A65X5 | |
| (0.13/0.14) Ω | | TK28V65W5* | | | TK28N65W5 |
| 95m Ω | | | | TK35A65W5 | TK35N65W5 |
| 57m Ω | | | | | TK49N65W5 |

DTMOS IV 800V standard “W” series

| | TO-220 | TO-220SIS |
|---------------|----------|-----------|
| Outline | | |
| 0.95 Ω | TK7E80W | TK7A80W |
| 0.55 Ω | TK10E80W | TK10A80W |
| 0.45 Ω | TK12E80W | TK12A80W |
| 0.29 Ω | TK17E80W | TK17A80W |

DTMOS IV 500V standard “W” series

| | PAK | TO-220SIS |
|---------------|----------|-----------|
| Outline | | |
| 0.38 Ω | TK10P50W | TK10A50W |
| 0.30 Ω | TK12P50W | TK12A50W |
| 0.19 Ω | | TK19A50W |